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

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 Palæontology, 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.

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CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY.

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 ĝive 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 Aphidinæ.

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. II. 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 unmistakeable 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 Delphacinæ, 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 tegmima 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 neuration 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 neuration, 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. 1, 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.

Cœlidia 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.

Cœlidia columbiana.

Cœlidia columbiana Scudd., Rep. Progr. Geol. Surv. Can., 1877-78, 185 B (1879); Id., Tert. Ins. N. A., 313, pl. II, 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 Cœlidia 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.

Cerecopites torpescens.

Pl. 1, 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, 9mm; of same, including closed wings, 14.5mm; of tegmina, 12mm; breadth of head, 1.8mm; of thorax, 4mm.

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, 16.5mm; breadth of wing at tip of sutura clavi, 5mm; length of sutura clavi, 14mm.

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 Palecphora 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 Palecphora.

Length of tegmina, 25mm.; breadth, 9.75mm.

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

STENECPHORA (*στενὸς, ἐχφορά*) 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.

Stenecphora 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, 19.5mm.; breadth, 6.5mm.

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 Palecphora 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. 1, 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, 3.6mm.; length of tegmina, 9.5mm.; breadth of same, 3.65mm.

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

STENOLOCRIS (στενὸς, Locris, 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. 1, 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, 14mm.; probable complete length, 17mm; breadth, 7mm.

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

Ptysmaphora (*πτύσμα*, *φέρω*) Gen. nov.

This genus is peculiar among Aphrophorinæ for the very early forking of both the ulnar 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. 1, 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.

PALÆOPTYSMA (*παλαιὸς, πτύσμα*). 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. 1, 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 stâli.

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

Telmatrechus stâli 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 Pentatominæ, which I formerly referred to Euschistus, but which a careful study in connection with other American tertiary Pentatominæ 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 scarely 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 carinæ 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, $\frac{3}{3}$.
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, $\frac{3}{3}$.
9. Stenecphora punctulata, $\frac{2}{1}$.
10. Dawsonites veter, $\frac{3}{3}$.
11. Stenolocris venosa, $\frac{2}{1}$.

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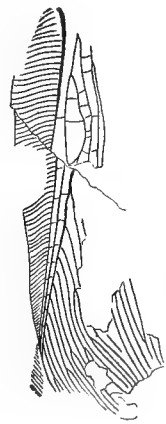

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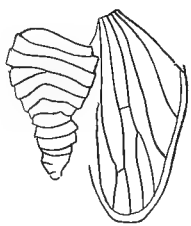

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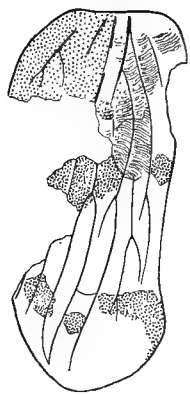

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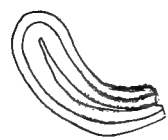

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GEOLOGICAL SURVEY OF CANADA.

CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY.

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 SCOLYTIDÆ.

HYLASTES Erichson.

Hylastes? squalidens.

Scolytidae sp., SCUDD., Can. Ent., XVIII, 194—96 (1886).
Hylastes ? squalidens SCUDD., Tert. Ins. N.A., 468--469, Pl. I, 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^{cm} 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, Phlœosinus, 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 Scarboro' 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 Scarboro', 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. II, 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 stria, 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, $4{\cdot}4^{mm}$.

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, $4{\cdot}9^{mm}$; length of same, $1{\cdot}25^{mm}$; length of hind femora, $2{\cdot}25^{mm}$.

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.

Gallerucella 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, $3{\cdot}75^{mm}$; length of elytra, $5{\cdot}5^{mm}$; breadth of abdomen, $3{\cdot}25^{mm}$; length of penultimate segment, $0{\cdot}4^{mm}$.

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 bettle 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, $1{\cdot}8^{mm}$.

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. I, 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, $3{\cdot}2^{mm}$; breadth of same, $1{\cdot}4^{mm}$.

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

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

Donacia pompatica.

Donacia pompatica SCUDD., Tert. Ins. N.A., 486-487, Pl. I, 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* Kirb. 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, $1{\cdot}45^{mm}$.

Donacia pubicollis occurs in Illinois.

Interglacial clays of Scarboro', 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

Ancylocheira. 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 striæ with rather deeply impressed puncta; these striæ 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 striæ extend to the apex, while the four interior striæ 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 striæ is much broken by slight transverse corrugations, giving, with the punctate striæ, 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, $6{\cdot}5^{mm}$; breadth, $1{\cdot}7^{mm}$.

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 striæ 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 striæ 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, $6{\cdot}2^{mm}$; breadth, $1{\cdot}7^{mm}$.

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 striæ 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 striæ 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, $6{\cdot}7^{mm}$; 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 striæ, 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 striæ 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 striæ 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 striæ 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, resmbling 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 striæ, 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. pettitii*, 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 tibiæ 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, $7{\cdot}5^{mm}$.

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 sexmaculata*, 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 stiricidii.

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, $2{\cdot}4^{mm}$; breadth of elytron, $1{\cdot}35^{mm}$; distance apart of the striæ, $0{\cdot}15^{mm}$.

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

HYDROCHUS 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 rigescens 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 striæ 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 striæ.
- Fifth and sixth elytral striæ 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.
    - Striæ rather delicately punctate..... .....*hindei.*
    - Striæ heavily punctate.....*halli.*
- Fifth and sixth elytral striæ united in the apical sixth of the elytra.
  - Striæ and strial punctures shallow.....*dissipatus.*
  - Striæ and strial punctures deep..... ....*desuetus.*

Elytra with strial punctures very faint.....*dilapidatus.*

Platynus casus.

Platynus casus Scudd., 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 striæ. The intimate texture of the surface is much as in *P. halli*, the fifth and sixth striæ 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, Scarboro', 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. 1, 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. 1, 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. 1, 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 interspacial 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 Guadeloupe 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. herculaneus* 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, $7{\cdot}5^{mm}$.

Pterostichus herculaneus 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 Scarboro'.

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 striæ 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 striæ, well in advance of the interruption of the marginal curve.

Length of elytron, 6^{mm}; breadth, $2{\cdot}5^{mm}$.

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

Interglacial clay beds of Scarboro,' 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 striæ, 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 striæ, 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, $4{\cdot}5^{mm}$; breadth, 2^{mm}.

Interglacial clays of Scarboro,' 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 striæ 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.

Loxandrus gelidus SCUDD., Bull. U.S. Geol. Geog. Surv. Terr., III, 763-764 (1877).
Pterostichus gelidus SCUDD., Tert. Ins. N.A., 527-528, Pl. I, 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 striæ, rather faintly and not very profusely punctate; the interspaces appear as if minutely cracked, and with a simulation of execessively faint and small foveæ 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 foveæ that there is apparently a row of approximated punctures, quite like those of the neighbouring striæ, for a very short distance between the base of the sixth and seventh striæ. The first stria turns outward next the base, to make room for a scutellar stria. The obliquely cut marginal foveæ 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 mammilate conical teeth, or rather transverse ridges.

Length of elytron, 5·75^{mm}; breadth, 2^{mm}; length of prothorax, 2·25^{mm}.; breadth, 3·5^{mm}; breadth of abdomen, 2·25^{mm}.

The species differs from *P. hudsonicus* in the shape of the prothorax (if that belongs here), broader striæ, 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 fossæ 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 striæ and punctures are more heavily marked. The striæ 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, $3{\cdot}2^{mm}$; width, $1{\cdot}35^{mm}$.

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 striæ, 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 striæ are united to each other and to the united third and fourth striæ, 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, $5{\cdot}2^{mm}$; breadth, $1{\cdot}8^{mm}$.

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, $4{\cdot}4^{mm}$; breadth, $1{\cdot}6^{mm}$.

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. 1, 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 striæ, 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. 1, 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 stiricidii, $\frac{10}{1}$.
2. Arpedium stillicidii, $\frac{10}{1}$.
3. Limonius impunctus, $\frac{7}{1}$.
4. Cryptocephalites punctatus, $\frac{9}{1}$.
5. Hylobiites cretaceus, $\frac{8}{1}$.
6. Byrrhus ottawaensis, $\frac{50}{1}$; a fragment of the elytron very highly magnified.
7. *The same*, $\frac{12}{1}$; 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., $\frac{50}{1}$ (recent); a fragment of the elytron for comparison with fig. 6.
10. *The same*, $\frac{12}{1}$, for comparison with fig. 7.

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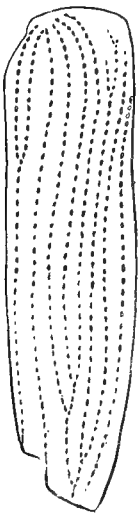

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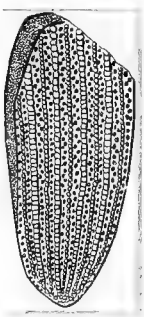

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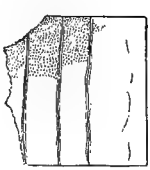

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Plate III.

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, $\frac{20}{1}$; a fragment of the elytron highly enlarged.

4. *The same*, $\frac{4}{1}$; the entire elytron.

5. Elaterites sp., $\frac{9}{2}$.

6. Tenebrio calculensis, $\frac{6}{1}$; the reverse of fig. 1, showing the under surface.

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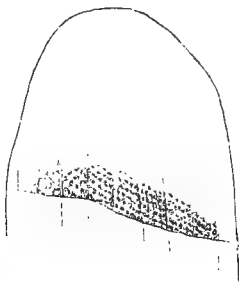

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GEOLOGICAL SURVEY OF CANADA.

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 sigillariæ*. 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 Eoscorpius, 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 facetted 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 $0{\cdot}05^{mm}$ 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 $0{\cdot}1^{mm}$ 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.

Archiulus 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.

Archiulus 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 lyelli 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 Eoscorpius 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 Eoscorpius 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 Eoscorpius 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 Eoscorpius.

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°. Edinburgh, 1882.

as distinct from Eoscorpius. 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 semilunate 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 Eoscorpius 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, $7{\cdot}25^{mm}$; width at base, $6{\cdot}75^{mm}$

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 *Eoscorpius 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 semiglobular 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 sublaminate 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 sigillariæ*, 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. $\frac{8}{1}$.
2. Amynilyspes ? sp. $\frac{8}{1}$.
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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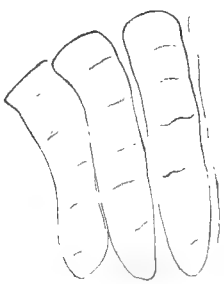
B Meisel lith Boston

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, $\frac{2}{1}$.
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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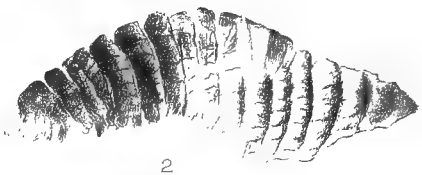

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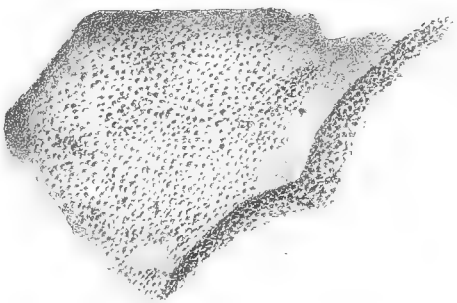

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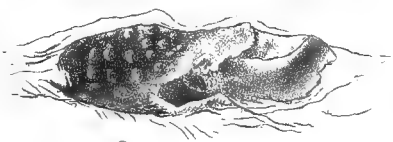

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GEOLOGICAL SURVEY OF CANADA
GEORGE M. DAWSON, C.M.G., LL.D., F.R.S., DIRECTOR

CONTRIBUTIONS

TO

CANADIAN PALÆONTOLOGY

VOLUME II.

PART II.

CANADIAN FOSSIL INSECTS

BY

SAMUEL H. SCUDDER

4. Additions to the Coleopterous fauna of the interglacial clays of the Toronto district. With an Appendix by A. D. Hopkins on the Scolytid borings from the same deposits.

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST EXCELLENT MAJESTY
1900

No. 710.

The present publication forms the second part of Volume II., "Contributions to Canadian Palæcntology." It consists of a report by Dr. S. H. Scudder of Cambridge, Mass., upon the Coleoptera of the interglacial beds of the vicinity of Toronto, to which is added an appendix by Dr. A. P. Hopkins of Morgantown, W. Va., on Scolytid borings from the same deposits.

The Survey is greatly indebted to both of these gentlemen for their gratuitous work upon this contribution to the literature of fossil entomology.

GEORGE M. DAWSON.

Geological Survey of Canada,
Ottawa, December, 1900.

CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY

VOLUME II.

CANADIAN FOSSIL INSECTS.

By Samuel H. Scudder.

4. *Additions to the Coleopterous fauna of the interglacial clays of the Toronto district. With an Appendix by A. D. Hopkins on the Scolytid borings from the same deposits.*

The occurrence of insect remains in interglacial beds at Scarborough, Ontario, was first made known by Hinde in 1877* and a couple of species of Carabidae found in them by him were described by me in the same year.† Later additions to the fauna, due to the efforts of Dr. Hinde, were published by me at different times‡, and finally embodied, with additions, in the second paper of the present volume§, in which, including four species found by Dr. Hinde in very similar beds near Cleveland, Ohio, the total number of determined species was stated to be twenty-nine, referable to five different families,—Carabidae, Hydrophilidae, Staphylinidae, Chrysomelidae and Scolytidae. None of the species could be referred to living forms.

Since then, Professor A. P. Coleman has taken up the investigation of these beds, including new outcrops of the same deposit in the vicinity or within the limits of Toronto‖, and has sent me a large mass of material, amounting in all to several hundred specimens, of which about one third were available by being sufficiently complete or characteristic. These are almost exclusively elytra of beetles and form the subject of the present paper; they consist of fifty-four species belonging to six different families, additional families being Dytiscidae, Gyrinidae and Curculionidae. Only seven of these fifty-four species have been found before in these beds, and all but two of the forty-seven additions are regarded, like those previously

* Can. Journ. Sc., n.s. xv, 399.

† Bull. U.S. Geol. Surv. Terr., iii, 763-764.

‡ Can. Ent., xviii, 194-196 (1886); Proc. Bost. Soc. Nat. Hist., xxiv, 467-468 (1890); Tert. Ins. N.A., passim, pl. 1 (1890).

§ The Coleoptera hitherto found fossil in Canada, 27-56, pl. 2-3 (1892).

‖ See his papers in Amer. Geol., xiii, 85-95 (1894); Journ. Geol. iii, 622-645 (1895); and Bull. Geol. Soc. Amer., x, 165-176 (1899); as well as the Reports of the Committee on Canadian Pleistocene Flora and Fauna (A. P. Coleman, Secretary) in the Reports Brit. Assoc. Adv. Sc., for 1898, 1899 and 1900.

discovered, as extinct forms. The number of known interglacial forms is thereby much more than doubled, for it raises the total number to seventy-six belonging to thirty-three different genera and eight families of which the following is a complete list :—

CARABIDAE (36 sp., 9 gen.)

Elaphrus irregularis.
Loricera glacialis.
" *lutosa.*
" *exita.*
Nebria extracta.
Bembidium glaciatum.
" *fragmentum.*
" *haywardi.*
" *vestigium.*
" *vanum.*
" *praeteritum.*
" *expletum.*
" *damnosum.*
Petrobus gelatus.
" *decessus.*
" *frigidus.*
Pterostichus abrogatus.
" *dormitans.*
" *destitutus.*
" *fractus.*
" *destructus.*
" *gelidus.*
" *depletus.*
Badister antecursor.
Platynus casus.
" *hindei.*
" *halli.*
" *dissipatus.*
" *desuetus.*
" *harttii.*
" *dilapidatus.*
" *exterminatus.*
" *interglacialis.*
" *interitus.*
" *longaevus.*
Harpalus conditus.

DYTISCIDAE (8 sp., 3 gen.)

Hydroporus inanimatus.
" *inundatus.*
" *sectus.*
Agabus perditus.

GYRINIDAE (1 sp.)

Gyrinus confinis LeC.

HYDROPHILIDAE (3 sp., 3 gen.)

Helophorus rigescens.
Hydrochus amictus.
Cymbiodyta exstincta.

STAPHYLINIDAE (19 sp., 11 gen.)

Gymnusa absens.
Quedius deperditus.
Philonthus claudus.
Cryptobium detectum.
" *cinctum.*
Lathrobium interglaciale.
" *antiquatum.*
" *debilitatum.*
" *exesum.*
" *inhibitum.*
" *frustum.*
Oxyporus stiriacus.
Bledius glaciatus.
Geodromicus stiricidii.
Acidota crenata Fabr., var. nigra.
Arpedium stillicidii.
Olophrum celatum.
" *arcanum.*
" *dejectum.*

CHRYSOMELIDAE (2 sp., 1 gen.)

Donacia stiria.
" *pompatica.*

CURCULIONIDAE (6 sp., 4 gen.)

Erycus consumptus.
Anthonomus eversus.
" *fossilis.*
" *lapsus.*

Coelambus derelictus.
" *cribrarius.*
" *infernalis.*
" *disjectus.*
Orchestes avus.
Centrinus disjunctus.
SCOLYTIDAE (1 sp.)
Phloeosinus squalidens (borings.)

The comparison of this assemblage of forms with their recent allies brings one to the same conclusions as were reached* by the study of those first obtained. All come from the same horizon and several are found in more than one locality, but none of the elytra from the Don Valley, where the other remains indicate a warmer climate than the present, were determinable. The Coleoptera from this Scarborough horizon indicate a climate closely resembling that of Ontario to-day, or perhaps a slightly colder one, a considerable proportion of their present allies being known from a more northern habitat. Nevertheless a few of the species belonging to the present additions to the fauna find their apparently nearest allies in southern forms; these are, however, so few as to suggest the probability of a mistaken reference in these cases. One cannot fail, also, to notice that a large number of the allies of the interglacial forms are recorded from the Pacific coast. Taking the case as it stands, I can only repeat as a final conclusion what I said before, that on the whole, the fauna has a boreal aspect, though by no means so decidedly boreal as one would anticipate under the circumstances.

The Scolytid borings, the last species of the list, were recently placed in the hands of Dr. A. P. Hopkins, of Morgantown, W. Va., who is more conversant with American Scolytidae and their work than any other of our naturalists, and he has given me the results of his examination of them, which appear as an Appendix to this paper, illustrated by two plates drawn or photographed by him. He gives a closer determination of the affinities of the insect which made the borings than I could do, as I was unable to make a definite generic reference.

In conclusion, I must express my indebtedness to Mr. Samuel Henshaw of Cambridge, who has kindly given me the statistics of the distribution of the existing beetles with which I have compared the fossils, and through whom I have had access to the LeConte collection of Coleoptera in the Museum of Comparative Zoology for purposes of comparison,—an invaluable opportunity; and to Professor J. W. Folsom of Antioch College, who, when living in Cambridge, made for me a preliminary comparison of most of the fossils with the same extensive museum series at great pains and expense of time and with much enthusiasm, thus greatly lightening my final work; I am glad to be able to add that his determinations in nearly all cases agreed very closely with my own, and rendered the accuracy of what may be regarded as in some sense our joint work more probable.

* See p. 28 of the present volume.

CARABIDAE.

Loricera exita sp. nov.

Pl. VI., Fig. 1.

Represented by a single nearly complete elytron, the central portion obscured by clay which will not bear removal without injury to the specimen. The humerus is very gently rounded, and there are seven rather deeply impressed, very feebly punctate striæ, with the intervals nearly flat; the whole is of a dead black colour. It comes near *L. 10-punctata* Esch., but the striæ are less heavily punctate than in any of our species of Loricera; the fourth interval shows, just before the place where it is obscured by clay, signs of a cross-line connecting the third and fourth striæ, such as is found in *L. 10-punctata*, but this is not shown in the figure. The length of the fragment is 3·2 mm, and its breadth 1·55 mm; the probable length of the elytron is 3·8 mm.

One specimen: No. 16813, Scarborough.

L. 10-punctata is found on the Pacific Coast from Alaska to California.

Nebria abstracta sp. nov.

Pl. VI., Fig. 2.

The basal half of an elytron represents a species of Nebria allied to *N. carbonaria* Esch. It is piceous, with well rounded humerus, a brief humeral stria and seven well impressed, distinctly punctate striæ, besides the marginal stria, with fewer but stout puncta; the intervals are nearly flat. It differs from *N. carbonaria*, to which it is closely allied, by its slightly smaller size, the more pronounced puncta of the marginal stria near the shoulder, the rather flatter intervals, and the more pronounced punctuation of the striæ generally. The length of the fragment is 2·6mm, its breadth 1·6 mm; the probable length of the elytron is 5·5 mm.

One specimen: No. 16805, Reservoir Park, Toronto.

N. carbonaria is known only from Alaska.

Bembidium haywardi sp. nov.

Pl. VI., Fig. 3.

A single complete elytron represents a species apparently falling in the *coxendix* group and of slender form. The humerus is rounded subangulate, rather than rounded as appears in the figure (due to the point of view from which it was drawn), the striæ are entire though obscure at

the very apex, the third interval as wide as the others, and with two small dorsal punctures, one a little behind the middle, the other about one-fourth from apex, neither shown in the drawing. It seems to be most nearly allied to *B. sculpturatum* Motsch., but is a little smaller and slenderer, the striæ a little less impressed, the puncta more delicate, and the intervals a little less convex. It measures 4^{mm} in length by 1^{mm} in breadth.

One specimen: No. 16794, Logan's brickyard, Toronto.

B. sculpturatum was described from Alaska, and according to Hayward, occurs also in California.

The species is named for Mr. Roland Hayward, whose careful revision of the American species of Bembidium has been of much service in the study of these fossils.

Bembidium vestigium sp. nov.

Pl. VI., Fig 4.

Represented by the larger and proximal part of an elytron, piceous, with subangulate humerus, well impressed and rather delicately punctate striæ and flattened intervals, the third interval of a similar width to the others and showing a single dorsal puncture, not given in the drawing, just before the fracture, or probably distinctly beyond the middle of the elytron. It appears to be most nearly allied to *B. robusticolle* Hayw., the flatness of the intervals, the impression of the striæ and their punctuation being very much as in that species, besides being of about the same size; but the first dorsal puncture lies further back, and the first three striæ are more deeply impressed than the others, while all are alike in the existing species. The length of the fragment is $3{\cdot}2^{mm}$, and the probable length of the elytron 5^{mm}; its breadth $1{\cdot}5^{mm}$.

One specimen: No. 16808, Scarborough.

B. robusticolle is reported from Michigan, Iowa and Kansas.

Bembidium vanum sp. nov.

Pl. VI., Fig. 5.

Represented by two elytra, neither quite perfect, one lacking the distal fourth, the other being a little broken both at base and apex; apparently with the two preceding belonging to one group. The humerus is hardly subangulate but strongly rounded, the striæ not very deeply impressed, but somewhat heavily punctate, the intervals nearly flat; the third interval is of similar width to the others and shows the first dorsal

puncture, not given in the figure, distinctly before the middle of the elytron; the second cannot be seen on either specimen from the irregularity of the surface. Both elytra are piceous and appear of rather tenuous structure. The species seems to fall near *B. coxendix* Say, but is a little larger, and has a little less deeply impressed striæ, though equally heavily punctate, and the first dorsal puncture is further forward. The better fragment measures 2·8 mm. in length and the whole elytron was probably 3·6 mm long; its breadth 1·2 mm.

Two specimens: No. 16795 from Scarborough; and No. 16807 from Reservoir Park, Toronto.

Hayward states that *B. coxendix* occurs in Manitoba, Lake Superior, Illinois, Nebraska, Kansas, Colorado, New Mexico and Texas.

Bembidium praeteritum sp. nov.

Pl. VI., Fig. 6.

A single elytron, broken at the apex, represents a small and slender species with rounded humerus, moderately impressed and rather heavily punctate striæ, tolerably flat intervals and with two punctures in the third stria. It appears to be rather near *B. longulum* LeC., but is considerably smaller, with less deeply impressed striæ, considerably coarser punctures, flatter intervals, and the dorsal punctures differently placed, being a trifle less than one-third and two-thirds from base. I find no existing species that appears to come nearer to it. The length of the fragment is 2·1 mm, and the probable length of the elytron 3 mm; its breadth 0·8 mm.

One specimen: No. 16828, Scarborough.

B. longulum is said by Hayward to occur in the Lake Superior region, the mountainous parts of Wyoming, Colorado and Utah, and in California and Washington.

Bembidium expletum sp. nov.

Pl. VII, Fig. 1.

The larger portion of a much broken elytron indicates a species of about the same size as, or slightly larger than, *B. planatum* LeC., to which it appears to be most nearly allied. It has very delicately impressed, delicately and feebly punctate striæ and flat intervals, with a dorsal puncture on the third striæ (not shown in the figure) just before the end of the fragment, further back than in *B. planatum* and not so pronounced; the punctuation of the striæ is a trifle more distinct, and the striæ are similarly impressed throughout, and not more pronounced in the proxima

half of the elytra, as appears to be the case in *B. planatum*, at least on the first three striæ. The length of the fragment is $3{\cdot}1^{mm}$, indicating an elytron about 5^{mm} long; breadth $1{\cdot}7^{mm}$.

One specimen: No. 16812, Reservoir Park, Toronto.

B. planatum occurs, according to Hayward, in the Lake Superior region, the Rocky Mountains as far south as Colorado, and in Nevada, Oregon, Washington and British Columbia.

Bembidium damnosum sp. nov.

Pl. VII, Fig. 5.

A nearly perfect but rather poorly preserved elytron represents a small species with rounded humeri, which appears to approach rather closely *B. complanulum* Mann., having similar flatness of intervals and much the same striation, though with feeblest signs of any punctuation; only one dorsal puncture can be made out on the third stria, not shown in the figure, and that is at the middle of the elytron. The length of the elytron as preserved is $2{\cdot}5^{mm}$; it must have measured about $2{\cdot}7^{mm}$, and the breadth is $0{\cdot}9^{mm}$.

One specimen: No. 16827, Scarborough.

B. complanulum is said by Hayward to occur "on the Pacific coast from Alaska to California, extending eastward to the Rocky Mountains."

Patrobus decessus sp. nov.

Pl. VII, Fig. 4.

A number of specimens of the elytra of this species have been found, none of them perfect, though some nearly so; one with the best surface, though more imperfect than some of the others, was chosen for drawing. The elytra are piceous, about three times as long as broad, with well rounded humeri, flat intervals, delicate but sharply defined punctate striæ, the punctures distinct but delicate, and a sutural stria more than as long as the breadth of the elytra. They appear to represent a species of Patrobus allied to *P. rugicollis* Rand., but a little smaller and with more distinct punctures, though these are somewhat exaggerated in the drawing; the intervals are also flatter, and the surface is more glistening. Length of most perfect specimen $5{\cdot}25^{mm}$; breadth, $1{\cdot}75^{mm}$.

Ten specimens: Nos. 16782, 16783, 16787, 16788, 16791, Reservoir Park, Toronto; Nos. 16784–16786, 16789, 16790, Scarborough.

P. rugicollis is found in Canada, New England, New York and Pennsylvania.

Patrobus frigidus sp. nov.

Pl. VII, Fig. 6.

A nearly complete elytron with only the tip broken represents apparently another species of Patrobus, in which the elytron is about three times as long as broad, dark chocolate brown, profusely and minutely punctate throughout with pallid dots having a reddish tinge, the humerus well rounded, the striæ well defined but not deeply impressed, rather obscurely and minutely impresso-punctate, the intervals faintly convex. It does not appear to be very close to any of our living species, but nearest perhaps to *P. rugicollis* Rand.; the convexity of the intervals is much as in that species, as is also the punctuation of the striæ, but this is a little more pronounced in the fossil, which is also a little smaller than *P. rugicollis*; the profuse punctuation in the colouring is quite peculiar. Length of fragment, 4·8^{mm}; length of restored elytron, 5·2^{mm}; breadth, 1·75^{mm}.

One specimen: No. 16793, Reservoir Park, Toronto.

Pterostichus abrogatus.

Pterostichus abrogatus Scudd., Tert. Ins. N.A., 525, pl. I, fig. 39 (1890).

Two additional specimens have been found: No. 16779 from Scarboro; and No. 16781 from Reservoir Park, Toronto.

Pterostichus dormitans.

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

The original locality for this species was near Cleveland, Ohio; a specimen, No. 16802, is now found at Scarborough.

Pterostichus fractus.

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

An additional specimen, No. 16792, was found at Scarborough.

Pterostichus destructus.

Pterostichus destructus Scudd., Tert. Ins. N.A., 527, pl. I, fig. 46 (1890).

An additional specimen, No. 16801, occurs among the material from Reservoir Park, Toronto.

Pterostichus depletus sp. nov.

Pl. VII., Fig, 3.

A slender elytron, of which the apical third is gone, represents, apparently, a species of Pterostichus near *P. hudsonicus* LeC. The eight striæ are delicately impressed and very finely punctate, the intervals flat and the sutural stria meets the first, from which it is rather narrowly separated, at a distance equal to less than half the basal width of the elytron. It is of a dead black colour, more so than *P. hudsonicus*, and it farther differs from that species in that all the striæ are equally impressed, instead of having the lateral striæ subobsolete. The length of the preserved portion is $2{\cdot}65^{mm}$, indicating an elytron about 4^{mm} long; and its width is $1{\cdot}5^{mm}$.

One specimen: No. 16809, Scarborough.

Badister antecursor sp. nov.

Pl. VII., Fig. 2.

All but the apical fourth is preserved of an elytron which is, or was, a little more than two and a half times as long as broad, with eight well impressed impunctate dorsal striæ, besides two deeply impressed striæ on the deflexed marginal portion, closely approximate, the ninth with a couple of puncta well separated; the humerus is strongly rounded, and between the first and second striæ at the base, is a supplementary stria, subcontinuous with the distal portion of the first stria, and more than half as long as the width of the elytron; a single one of the dorsal puncta of the third interval may be seen at about one third the distance from the apex of the elytron, but is not shown in the figure; the intervals are flat and show an irregular, exceedingly fine cross striation. It seems to be nearly allied to *B. anthracinus* LeC.; but is slightly smaller, not so piceous, the striæ more sharply defined but yet not so deep, and it differs further in the character of the supplementary stria and the cross striation. The fragment measures 3^{mm} in length; the elytron was probably $3{\cdot}4^{mm}$ long, and is $1{\cdot}35^{mm}$ in breadth.

One specimen: No. 16817, Logan's brickyard, Toronto.

B. anthracinus is found in California, Oregon and Vancouver Island.

Platynus exterminatus sp. nov.

Pl. VIII., Fig. 3.

A single elytron with the apical fourth lost represents a species closely allied to *P. pusillus* LeC. The striæ are deeply impressed and very feebly

punctate, the sutural stria of moderate length, running from the base of the second stria to the first and about as long as half the basal breadth of the elytron, the puncta of the proximal part of the marginal stria pronounced; the intervals are shallowly convex. In shape, striation and punctuation it much resembles *P. pusillus*, but it is piceous, the punctuation is slighter, while the marginal puncta are more pronounced, the intervals are flatter, and the sutural stria is quite different. The length of the fragment is 3.1^{mm}, its breadth 1^{mm}, and the probable length of the elytron 4^{mm}.

One specimen: No. 16803, Scarborough.

P. pusillus occurs in Canada, New England, Illinois and Missouri.

Platynus interglacialis sp. nov.

Pl. VIII, Fig. 2.

The basal half or thereabouts of an elytron is all that remains of this species. It shows a piceous flat field with delicately impressed impunctate striæ, a moderate free sutural stria, and the first stria arising close to the base of the second. It is perhaps nearest, though not very close, to *P. moerens* Dej., but it is a smaller species, the elytra probably not above 5^{mm} long, of a more delicate texture and of a different colour. The length of the fragment is 3^{mm}, and the width of the elytron 1·8^{mm}.

One specimen: No. 16773, Scarborough.

P. moerens is reported from Canada, New York, Pennsylvania and Louisiana.

Platynus interitus sp. nov.

Pl. VIII, Fig. 4.

A bronze-green imperfect elytron preserves all the basal parts and shows eight strongly impressed impunctate striæ on a flat ground, the sixth to eighth striæ not reaching the base, the first stria bent angularly to make room for the sutural stria and arising not far from the base of the second stria; the sutural stria is short and likewise does not reach the base. It seems to be intimately allied to *P. cupreus* Dej., differing mainly in the arrangement of parts about the sutural stria, which is widely separated basally from the first stria; it has not the cupreous colour of specimens of *P. cupreus* from Hudson Bay Territory, but agrees very nearly in colour with specimens from Lake Superior described as *P. protractus* by LeConte. I am inclined to believe the fossil distinct. The fragment is 3·6^{mm} long, and 1·7^{mm} broad; the complete elytron would probably be 5^{mm} long.

One specimen: No. 16771, Reservoir Park, Toronto.

P. cupreus is registered from Lake Superior, Michigan, Minnesota, Nebraska, Kansas, Colorado, Wyoming and Nevada.

Platynus longaevus sp. nov.

Pl. VIII, Fig. 1.

This is a similar fragment to the last and is also most nearly allied to *P. cupreus* Dej. It shows similar impunctate striæ on a flat field, but the striæ are less deeply impressed than in the last species and the colour is piceous; the sutural stria is moderate and scarcely inteferes with the basal course of the first stria, which at base is midway between the sutural stria and the second. The elytron is considerably slenderer than in *P. cupreus*, has a longer sutural stria and is of a different colour. The length of the fragment is 4·75^{mm}, and the probable length of the eltyron 5·2^{mm} its breadth. 1·75^{mm}.

One specimen: No. 16772, Scarborough.

Platynus halli.

Platynus halli Scudd., Tert. Ins. N. A., 520–521, pl. I., fig. 41 (1890.)

Several more specimens of this species have been found: Two, Nos. 16774, 16776, from Scarborough; and two, Nos. 16777, 16778 from Logan's brickyard, Toronto.

Platynus desuetus.

Platynus desuetus Scudd., Tert. Ins. N. A., 521–522, pl. I., figs. 43, 51, 58 (1890).

A couple more specimens have been found: No. 16796, from Scarborough; and No. 16797 from Reservoir Park, Toronto.

Harpalus conditus sp. nov.

Pl. VIII., Fig. 5.

An almost perfect elytron shows close resemblance to *H. vulpeculus* Say. It is dead black with nearly rectangular humerus and eight striæ, besides a moderately long sutural stria, between the first and second, arising from the base of the second; the third and fourth striæ unite near the tip, and the fifth and sixth barely before them; the striæ are moderately impressed and very obscurely punctate, except the marginal stria

near the base, where the puncta are large and round, and not as shown in the figure, resembling closely the modern species named, as does the sutural stria; the other striæ differ, however, in being very obscurely punctate and the elytron is smaller and of a deader black. The length of the fragment is 4^{mm}, and the breadth $1{\cdot}6^{mm}$ The probable length of the elytron was 4^{mm}, the portion broken at the tip being hardly more than the basal portion before the striation.

One specimen : No. 16804, Scarborough.

H. vulpeculus occurs in Canada, New England, Pennsylvania and Missouri.

DYTISCIDÆ.

Coelambus derelictus sp. nov.

Pl. IX., Fig. 4.

The complete elytra of this species show a dense punctuation, a sharply defined sutural stria, a very delicately marginate outer border, and indicate a small and rather slender scutellum. It agrees fairly well with *C. dissimilis* Harr., but it is a little larger, and the punctuation is scarcely so delicate. Length 3^{mm}.

Two specimens: Nos. 16900, 16901, Scarborough.

C. dissimilis occurs at Lake Superior and in Massachusetts, New York and Illinois.

Coelambus cribrarius sp. nov.

Pl. IX, Fig. 3.

A single specimen, a nearly perfect right elytron, appears to come very close to *C. impressopunctatus* Sch., and is of much the same size and form. It is densely, conspicuously and finely punctate pretty uniformly over the whole elytron, but the punctuation is a little finer and denser than in the modern species, and there is no sign of a sutural stria or of the mid-elytral basal striæ. Length $3{\cdot}3^{mm}$.

One specimen : No. 16909, Logan's brickyard, Toronto.

C. impressopunctatus is found in Alaska, the Hudson Bay Territories and Lake Superior, as well as in Massachusetts, New York, New Jersey, Pennsylvania, Michigan and Illinois.

Coelambus infernalis sp. nov.

Pl. IX, Fig. 2.

Another species is represented by an elytron, from which much of the tip is broken. It also resembles, so far as punctuation is concerned, the

same species as the last, *C. impressopunctatus* Sch.; the punctuation is very similar though slightly more delicate in the fossil, but the slender shape is very different and the species is a smaller one. The outer edge is delicately marginate, but there is no sutural stria and the inner base is cut so angularly as to indicate a rather long and slender scutellum; the mid-elytral basal sulci of the modern species are indicated more distinctly than appears in the figure, requiring a different light to see at the best. Length of fragment, $2{\cdot}35^{mm}$; probable length of elytra, $2{\cdot}6^{mm}$.

One specimen: No. 16908, Reservoir Park, Toronto.

Coelambus disjectus sp. nov.

Pl. IX, Fig. 1.

Still a third species referable to Coelambus finds its nearest living counterpart in *C. impressopunctatus* Sch. It is a nearly complete but broken elytron, with a fine dense punctuation, a delicately margined outer border, and a distinct, sharp sutural stria. It is piceous and not dark chestnut in colour, and has finer, closer and shallower punctuation than in the living form. Length nearly 4^{mm}.

One specimen: No. 16899, Scarborough.

Hydroporus inanimatus sp. nov.

Pl. x, fig. 3.

A single elytron, somewhat crushed and broken, but practically perfect, appears to belong to Hydroporus, but represents a species considerably broader than any I have seen. It seems to come as near to *H. solitarius* Sharp as anything, but besides being much broader has considerably coarser and more distant punctuation. Exteriorly it is narrowly and delicately marginate, and the punctuation, though distinct and not very delicate, is rather shallow. Length 3^{mm}.

One specimen: No. 16903, Scarborough.

H. solitarius is only known from Massachusetts.

Hydroporus inundatus sp. nov.

Pl. x., Fig. 2.

The only relic of this species is a single perfect right elytron, showing a slender insect with a marginal stria, which hardly appears in the position from which the specimen was drawn (requiring light from the opposite side), and uniformly, rather sparsely and delicately punctate. It is, however, denser than appears by the figure, and denser than in *H. hum-*

eralis Aubé, which, of our living species, it appears most to resemble, and with which it agrees well in size and proportions. Length, 3mm.

One specimen: No. 16902, Logan's brickyard, Toronto.

H. humeralis is found in Alaska.

Hydroporus sectus sp. nov.

Pl. x., Fig. 1.

Two slender elytra, only one of which is perfect, represent a species of Hydroporus allied to *H. oblongus* Steph. The punctuation is delicate and rather dense (hardly shown as dense enough in our figure) and pronounced, and there is an obscure margination to the outer border. It is smaller than the modern species with which it is compared, and has a somewhat denser punctuation. Length 3·8 mm.

Two specimens: No. 16904, Reservoir Park, Toronto; No. 16905, Scarborough.

H. oblongus occurs in Europe and also in this country in Canada, Lake Superior, Michigan, and Vancouver Island.

Agabus perditus sp. nov.

Pl. ix., Fig. 5.

There are preserved two fragments of what appear to be the same species, referable to Agabus, one showing the basal half, the other the apical two-thirds of elytra, both showing a black surface which is microscopically rugulose (scarcely appreciable under a strong hand lens), with widely scattered obscure puncta and a marginate outer border; the humerus is square. It appears to be nearly related to *A. seriatus* Say, but it is wholly without the series of approximated punctures found in that species. The length of the basal fragment is 3·35mm, that of the apical 5mm; the probable length of the whole elytron perhaps 7·5mm.

Two specimens: Nos. 16898, 16906, Scarborough.

A. seriatus is found in Massachusetts, Pennsylvania, Colorado, Lake Superior and Canada.

GYRINIDAE.

Gyrinus confinis LeC.

Pl. x., Fig. 5.

Gyrinus confinis LeC., Proc. Acad. Nat. Sc. Philad., 1868, 368.

A single complete elytron of flattened, tapering, round-tipped form, a heavy sutural stria, distinctly marginate outer border, and with eleven

series of similar, circular or oval, approximate punctures, not shown as near together as they should be in the figure, cannot, so far as I can see, be distinguished from the modern species, whose name is given above. It is the only one of the interglacial beetles completely identical with a living species. Length 5^{mm}.

One specimen : No. 16913, Scarborough.

G. confinis occurs in Massachusetts, Lake Superior, Montana and Oregon.

HYDROPHILIDAE.

Cymbiodyta exstincta sp. nov.

Pl. x., Fig. 4.

One excellently preserved specimen shows a right elytron quite complete, indicating a broad insect. The shape shows the presence of a rather large scutellum; the elytron is marked by a distinct, sharp sutural stria, and externally is very faintly and delicately marginate; it is about twice as long as broad, and the surface is profusely and most delicately punctate. It is referred, somewhat doubtfully, to Cymbiodyta, in the vicinity of *C. fimbriata* Melsh.; the punctuation is similar, though a little coarser than in the modern species, and the puncta do not merge into striæ at the extreme tip as in that; the proportions of the two are much the same, though the fossil is somewhat broader, and it is also a little smaller. Length, nearly 3^{mm}.

One specimen ; No. 16912, Scarborough.

C. fimbriata occurs in Canada and in Massachusetts, Pennsylvania, Iowa and Texas.

STAPHYLINIDAE.

Gymnusa (?) absens sp. nov.

Pl. xi., Fig. 1.

A single elytron perhaps belongs to Gymnusa, and may be compared, though not very well, to *G. variegata* Kies. It is very short compared to its breadth and is nearly smooth and distinctly margined, not only next the suture, but to some extent at the posterior border, an unusual feature in any Staphylinid. The surface is castaneo-piceous, and instead of being, as in the modern species, minutely and profusely punctate, is very faintly, shallowly, and sparsely punctate; there is no sinus in the

posterior margin laterally and the lateral margination is as distinct as the sutural ; the base is a little broken, but it is otherwise perfect. Length, 7^{mm}, breadth, $1{\cdot}25^{mm}$.

One specimen : No. 16873, Scarborough.

G. variegata is only known from Michigan.

Quedius deperditus sp. nov.

Pl. XI., Fig. 2.

A single left elytron, perfect but flattened so as to expose the whole of the lateral face, appears to represent a species of Quedius, not far removed from *Q. capucinus* Grav. It enlarges slightly from the base, the distal half of the sutural border is minutely margined, the lateral fold is sharply carinate and not blunt as in *Q. capucinus*, and the posterior margin squarely truncate but laterally strongly rounded ; the surface is black with only a trace of castaneous and has a rather more abundant though still sparse punctuation as compared with the modern species. Length, 2^{mm}; breadth of dorsal surface, $0{\cdot}9^{mm}$

One specimen : No. 16874, Scarborough.

Q. capucinus is reported from Alaska, Canada, Pennsylvania, Indiana and Missouri.

Philonthus claudus sp. nov.

Pl. XII., Fig. 1.

A species of Philonthus appears to be represented by a pair of elytra which are twice as long as broad, broaden slightly posteriorly, are profusely and deeply punctate, have the lateral plication sharp and slight, while the oblique truncation of the inner base indicates a rather large and long scutellum. They are of the same size and shape as in *P. aeneus* Rossi, which they approach more nearly than the other species, but the punctuation is distinctly coarser and deeper, and if anything more profuse. It is also dead black, instead of having a steely lustre. Length, $2{\cdot}5^{mm}$; breadth, $1{\cdot}25^{mm}$.

Two specimens : Nos. 16875, 16876, Scarborough.

P. aeneus is a cosmopolitan species, and in this country has been reported from the Hudson Bay Territories, Canada and Lake Superior and the Northern United States from Massachusetts to Colorado and Missouri.

Cryptobium detectum sp. nov.

Pl. XII., Fig. 2.

A single elytron, fully two and a third times longer than broad, broadest in the middle, the posterior margin squarely truncate but the inner apical angle obtusangulate, the surface very profusely and very delicately punctate, seems to be a Cryptobium, not very closely allied to *C. pallipes* Grav.; compared with which it has much more delicate, denser and less deeply impressed punctuation, and a relatively slenderer form. The single specimen is a little imperfect, a piece having gone from the outer apical angle, and the humerus is thrust forward with unusual prominence. Length, $2{\cdot}6^{mm}$; breadth, $1{\cdot}1^{mm}$.

One specimen: No. 16877, Scarborough.

C. pallipes is found in Canada and the northern United States from New England to Wisconsin, but also in Florida and Louisiana.

Cryptobium cinctum sp. nov.

Pl. XII., Fig. 3.

Another species of Cryptobium is represented by a couple of elytra from different localities, which seem to be nearly allied to *C. californicum* LeC. They are scarcely more than twice as long as broad, castaneo-piceous, slightly broader a little beyond the middle than elsewhere, the posterior margin faintly excavate, the inner apical angle feebly produced, and the surface coarsely and profusely punctate. Compared with the modern species mentioned, they are a little larger and broader, and the punctuation is hardly so sharp or so deep. Length, $2{\cdot}4^{mm}$; breadth, $1{\cdot}15^{mm}$.

Two specimens: No. 16878, Logan's brickyard, Toronto; and No. 16879, Scarborough.

C. californicum comes from Nevada, California, Oregon and Vancouver Island.

Lathrobium antiquatum sp. nov.

Pl. XI., Fig. 5.

A single elytron less than twice as long as broad, with the inner base cut to indicate a broad and short scutellum, seems to belong to Lathrobium, and may best be compared with *L. divisum* LeC. It broadens regularly though but slightly, has a very broadly rounded apical margin, and the surface profusely and rather minutely punctate. It lacks the distinct margination of the sutural border seen in *L. divisum*, with which

it agrees in size; the punctuation is rather coarser and heavier, and it is wholly black, instead of being apically ferruginous. Length, $2{\cdot}2^{mm}$; breadth, $1{\cdot}15^{mm}$.

One specimen: No. 16880, Logan's brickyard, Toronto.

L. divisum comes from Vancouver Island.

Lathrobium debilitatum sp. nov.

Pl. XI., Fig. 6.

This species is very closely allied to the last, from which it differs slightly in its proportions, its uniform breadth, and its piceous colour; its punctuation is very similar. It is also to be compared with the same modern species, from which it differs similarly and also in the proportions of the elytra which are considerably broader in proportion to the length. Length, 2^{mm}; breadth, $1{\cdot}2^{mm}$.

One specimen: No. 16881, Scarborough.

Lathrobium exesum sp. nov.

Pl. XI., Fig. 7.

Another species of Lathrobium is represented by a single elytron, about twice as long as broad, broadening faintly posteriorly, with marginate sutural border and sharply carinate lateral margination, the posterior margin rigidly truncate, the inner apical angle rectangulate, the outer strongly rounded, the surface uniform dark castaneous, and with moderately profuse sharp and delicate punctuation. It appears to be rather close to *L. nigrum* LeC.; it has the same proportions, but is slightly larger, and the punctuation is deeper, sharper and more profuse. Length, $2{\cdot}1^{mm}$; breadth of dorsal surface, $1{\cdot}1^{mm}$.

One specimen: No. 16882, Reservoir Park, Toronto.

L. nigrum is reported from Massachusetts and Lake Superior.

Lathrobium inhibitum sp. nov.

Pl. XI., Fig. 4.

This and the following species of Lathrobium have relatively much longer elytra than those above described, these being in the present species about a fifth more than twice as long as broad. The elytron broadens slightly posteriorly, has a truncate posterior margin, both apical margins rounded rectangulate, the sutural border delicately marginate in its distal half, the surface blackish castaneous, rather obscurely and some-

what profusely punctate. It appears to approach *L. divisum* LeC., but is a trifle larger, a little more densely and slightly more deeply punctured. Length, 2·65mm; breadth, 1·2mm.

One specimen; No. 16883, Scarborough.

Lathrobium frustum sp. nov.

Pl. XI., Fig. 3.

The last species of Lathrobium falls in the near vicinity of *L. grande* LeC., and is represented by several elytra, which are about a third more than twice as long as broad, of almost uniform breadth, but scarcely broadening posteriorly, the posterior margin truncate, the inner apical angle rectangulate, the outer strongly rounded, with no margination of the sutural border; the surface is piceous, profusely and delicately punctate. It agrees with the modern species mentioned in size, but the posterior border is squarely and in no way obliquely truncate, and the punctuation is more pronounced, slightly coarser and certainly deeper; nor is there any trace of castaneous in the coloring. Length 2.15 mm; breadth 0·9mm.

Seven specimens: Nos. 16884–16889, Scarborough; No. 16890, Logan's brickyard, Toronto.

L. grande is found from Nova Scotia to Lake Superior and North Carolina.

Acidota crenata Fabr., var. **nigra**, var. nov.

Pl. XII., Fig. 4.

Staphylinus crenatus Fabr., Ent. Syst., I, pars 2, p. 525 (1792).

A single left elytron, with puncta serially arranged, apparently represents the modern species *A. crenata* Fabr., but differs from it in that the colouring is dead black instead of dark castaneous, which all the modern specimens I have seen are, though they include some which LeConte described under the specific name *nigro-picea*; the punctures also seem a little more pronounced, but the resemblance is so close that I do not venture to separate it from the modern form by more than a varietal distinction. Length, 2·2mm; breadth, 1mm.

One specimen: No. 16891, Scarborough.

A. crenata occurs in Canada, Lake Superior, Michigan and Massachusetts.

Arpedium stillicidii.

Arpedium stillicidii Scudd., Contr. Can. Pal., II., 42, pl. II., fig. 2 (1892).

Two additional specimens, Nos. 16896, 16897, from Scarborough are found in the material sent by Professor Coleman.

Olophrum celatum sp. nov.

Pl. XII., Fig. 5.

A pair of elytra, a trifle less than twice as long as broad, of equal breadth, with truncate hind margin, but strongly rounded apical angles, delicately margined sutural border, the surface piceous and profusely and sharply punctate, represent a species of Olophrum allied to *O. convexum* Mäkl. The size and proportions are the same, but there is no castaneous in the colouring, and the punctuation in the fossil is a little closer and considerably more delicate. Length, $2{\cdot}2^{mm}$; breadth, $1{\cdot}2^{mm}$.

Two specimens: Nos. 16892, 16893, Scarborough.

O. convexum is found in Alaska.

Olophrum arcanum sp. nov.

Pl. XII., Fig. 6.

Another species of Olophrum is closely allied to the last, and may also be compared with the same modern type. It is slightly smaller and more slender than *O. celatum*, and the puncta are more shallow and less distinct. It is of a dull black colour. Length $2{\cdot}15^{mm}$; breadth, $0{\cdot}9^{mm}$.

One specimen: No. 16894, Scarborough.

Olophrum dejectum sp. nov.

Pl. XII., Fig. 7.

The last species of Olophrum differs considerably from the others in the much greater proportional length of the elytra which are about two and a half times longer than broad, with parallel sides, truncate apical margin, rectangulate apical angles, and the surface piceous at base, changing apically to blackish castaneous, the punctuation profuse and pronounced. It comes in the vicinity of *O. obtectum* Erichs., but is slen-

derer, with more angulate apical angles, a more truncate hind margin, and the punctuation less profuse and not so sharp. Length, $2{\cdot}7^{mm}$; breadth, $1{\cdot}1^{mm}$.

One specimen: No. 16895, Scarborough.

O. obtectum is reported from Canada, Massachusetts, Michigan, Pennsylvania and Missouri.

Curculionidae.

Erycus consumptus sp. nov.

Pl. xiii., Figs. 1, 2.

A single right elytron (Fig. 2) broken across the middle, but otherwise nearly perfect, except at the extreme tip, appears to be an Erycus. The ten striæ are deeply impressed, with profuse and deeper punctuation, the interspaces convex; the fourth and fifth striæ are the shortest and nearly unite at their tips, near the middle of the apical two-fifths of the elytron and near its middle line; the third and sixth unite somewhat beyond this. It appears to fall tolerably near *E. puncticollis* LeC., the striæ, their apical union, the puncta and the size agreeing well; but it differs in that the elytron does not narrow so much apically, and in that the interspaces between the striæ are much more convex. The length of the fragment is $3{\cdot}2^{mm}$; probably the elytron was $3{\cdot}6^{mm}$ long; the breadth is $1{\cdot}4^{mm}$.

One specimen: No. 16850, Scarborough.

With this I place the head and beak of another specimen (Fig. 1), found in a different spot, because by an independent examination of the large series of North American Curculionidae in the Museum of Comparative Zoology, I found no other species with which it corresponded closely but the same *E. puncticollis* LeC., and its size matches well. The beak is a trifle smaller than in the modern species, and not bent as there at the insertion of the antennæ, while the head proper is distinctly larger and more rotund. The sculpturing is very similar as well as the general shape, the obliteration of the markings behind the eye indicating a similar covering by a lobe of the pronotum. Length of beak from base of antennal scrobes, $1{\cdot}8^{mm}$.

One specimen: No. 16866. Logan's brickyard, Toronto.

E. puncticollis is found about Lake Superior and in the Middle and Western United States.

Anthonomus eversus sp. nov.

Pl. XIII., Fig. 6.

A number of perfect or nearly perfect elytra, with ten punctate striæ at subequal distances apart, the outer and the inner three uniting near the apex, and within them the fourth uniting or almost uniting with the fifth, and the sixth with the seventh, a little outside the middle line of the elytron and near the middle of its apical two-fifths. The striæ are well impressed and the puncta circular and closely approximated, while the interspaces between the striæ are convex. The species seems to be very close to *A. ater* LeC.; the apical arrangement of the striæ is the same, but it is a little smaller, the punctuation is a little more pronounced and distinct, and the striæ are deeper; the difference is not great, but seems to be sufficient to distinguish them specifically. The puncta are too feebly drawn in the figure and are not so closely approximated as they should be. Length of elytron $3{\cdot}3^{mm}$; breadth $1{\cdot}5^{mm}$.

Ten specimens: Nos. 16852–16858, 16860, 16869, Reservoir Park, Toronto; and No. 16859, Logan's brickyard, Toronto.

A. ater occurs in California.

Anthonomus fossilis sp. nov.

Pl. XIII., Fig. 7.

Other elytra, some of them quite perfect, smaller than the last species, have a very similar arrangement of the striæ, but they are more crowded together on the outer half or third of the elytron and do not unite so distinctly at apex; the striæ are deeply impressed and the puncta coarse—unusually so for an Anthonomus. The species appears to resemble *A. nigrinus* Boh., but not very closely; the elytron is considerably larger and perhaps broader; the apical arrangement of the striæ is much the same, but the striæ are considerably more deeply impressed, and the puncta are much larger, deeper and coarser. Length, $2{\cdot}4^{mm}$; breadth $1{\cdot}15^{mm}$.

Ten specimens: Nos. 16844, 16845, 16862–16864, 16868, Reservoir Park, Toronto; Nos. 16846, 16847, Scarborough; and Nos. 16848 16849, Logan's brickyard, Toronto.

A. nigrinus is reported from Georgia and Louisiana.

Anthonomus lapsus sp. nov.

Pl. XIII., Fig. 5.

In a third species of Anthonomus the elytron is a little larger than in *A. disjunctus* LeC., with which it can best be compared, though the relation is not very close. There is the same flatness of the interspaces, but the striæ are broader with more sloping sides, while the puncta are a little larger and more distinctly impressed. The elytron is piceous, 3^{mm} long, and $1{\cdot}2^{mm}$ broad.

One specimen: No. 16861, Reservoir Park, Toronto.

A. disjunctus is found in Illinois and Georgia.

Orchestes avus sp. nov.

Pl. XIII., Fig. 4.

A complete right elytron of great relative breadth seems to belong to Orchestes. The two outer and two inner striæ unite apically and another pair of loops within them is formed by the third and sixth, and by the fourth and fifth striæ, while besides these the seventh and eighth striæ are united apically at about the middle of the distal third of the elytron. The striæ are rather coarse and well pronounced, but the puncta are relatively obscure. The whole is dead black. It seems to be rather closely related to *O. niger* Horn, but in this species the fourth stria from the suture unites with the third, and the whole apical arrangement of the striæ becomes thereby different. The fossil is a trifle larger but of the same form, the striæ less deeply impressed and the puncta more obscure. The length is $1{\cdot}8^{mm}$, and the breadth $0{\cdot}9^{mm}$.

One specimen: No. 16867, Logan's brickyard, Toronto.

O. niger is known to occur in Nova Scotia, Canada, Illinois and California.

Centrinus disjunctus sp. nov.

Pl. XIII., Fig. 3.

The basal half or less of an elytron shows ten nearly straight delicate striæ, with delicate punctuation and flat punctate interspaces, all of which closely resembles the appearance of *C. calvus* LeC. It is of about the same size apparently, and differs in being piceous and not castaneous,

and in having distinctly finer and more delicate striæ, which are also a little shallower; the puncta in the striæ are similarly obscure, but the punctuation of the interspaces more profuse and more delicate. The length of the fragment is $1{\cdot}8^{mm}$, and the breadth, $1{\cdot}3^{mm}$; the real length of the elytron may have been nearly 4^{mm}.

One specimen: No. 16865, Reservoir Park, Toronto.

C. calvus occurs in Georgia and Florida.

APPENDIX.

Work of the prehistoric scolytid, phloeosinus squalidens scudd. By A. D. Hopkins, Entomologist of the West Virginia Agricultural Experiment Station. (Plate xiv., xv.)

The work of this prehistoric Scolytid* is of especial interest, and with the large series of Scolytid work in our collection, and that recently collected in the North-west, (mentioned in Bulletin 21, n.s., Div. Ent., U. S. Dept. Agriculture), I have been able to obtain some additional information regarding the wood, the galleries and the generic position of the beetle.

A microscopic examination of the wood fibre in comparison with that of *Juniperus virginiana*, Larix, Picea, Chamaecyparis, Thuja, Thuga, Pseudotsuga, Sequoia and Abies, seems to warrant the conclusion that it comes nearer to Thuja than to any of the other specimens with which it was compared, yet not having compared it with *Juniperus communis*, I would hesitate to say that it is not this species, as determined by Dr. Goodale.

If, as seems quite certain, it is cedar, (either Juniper or Thuja), the work must be that of Phloeosinus, and from a careful comparison with the work of three existing species of this genus it is found to come very close to *Phloeosinus punctatus* LeC., in *Thuja plicata* and *Chamaecyparis lawsoniana*. (Pl. xiv., Fig. 3.)

The species of this genus seem to infest only the Cupresseae and Taxodieae. *P. dentatus* Say has long been known as the common enemy of the eastern Junipers, and I have also found it in *Thuja occidentalis* at Niagara Falls. I have also found *P. punctatus* to be a common enemy of Thuja, Librocedrus and Chamaecyparis in California and Oregon; *P. cristatus* LeC., common in *Sequoia sempervirens*, and three apparently undescribed species, one in *Cupressus macrocarpa*, one in *Sequoia sempervirens* and the other in a Cryptominia sp., all in California. Two European species in our collection from the late W. Eichhoff, *P. aubei* and *P. thujae*, were both collected from *Juniperus communis*, and are also recorded from Thuja.

The "shark's tooth" form of the mating or nuptial chambers is the characteristic normal form of that of all of the species so far as has been observed. There is, however, considerable difference in the size, form and position of the primary, or egg, galleries. Those of *P. dentatus* (figs.

* See a previous paper in this series, pp. 28-30.—S.H.S.

6 and 7) and *P. cristatus* (fig. 8 and 9) are almost identical in form, differing only in size. Both are normally straight and excavated longitudinally in the bark and surface of the wood, while those of *P. punctatus* (figs. 3 to 5) are seldom straight and are excavated obliquely or transversely through the bark and wood, and are often found with one wing of the nuptial chamber extended to accommodate a second female, agreeing almost exactly in this respect with that of the interglacial species.

The genus Phloeosinus is represented by three or four described species from Europe, one from the Himalayas, seven from Japan, one from Mexico, one from Guatemala and four or five from America north of Mexico. There are also several undescribed species that I have observed, in collections, recorded from Texas, Colorado and Canada. I consider this genus one of the oldest survivors of the Hylesinides group. It is not improbable that it reached its maximum development during the Cretaceous period, and that its representatives were then common enemies of the several species of Sequoia, Juniperus, Librocedrus, etc., having descended probably with little change in habit or structure, and shared with their surviving host plants the vicissitudes of the great and minor surface disturbances and climatic changes from the Mesozoic to and through the Cenozoic to the present.

Therefore, the exclusive association of the surviving species of this ancient genus of beetles with the survivors of a number of ancient genera of Cupresseae and Taxodieae is of especial interest, since it seems to present some evidence of a closer natural relationship between these groups than has heretofore been recognized. Especially is this indicated in the fact that one or more species infest the Sequoia, one of the oldest representatives of the Taxodieae, and that so far none have been found to infest Pinus, Picea or Abies, with which the Taxodieae are thought by botanists to be more closely allied than to the Cupresseae.

It seems quite important that an effort should be made to obtain more material from the buried interglacial and other forests and fossil wood, showing the work of insects, since it would lead to the determination of some interesting and important facts regarding the habits of prehistoric forms and their relation to primeval forest trees.

PLATE VI.

Carabidae.

All the figures are by J. Henry Blake and are magnified twenty diameters.

Fig. 1. (16813) Loricera exita.
2. (16805) Nebria abstracta.
3. (16794) Bembidium haywardi.
4. (16808) Bembidium vestigium.
5. (16795) Bembidium vanum.
6. (16828) Bembidium praeteritum.

1

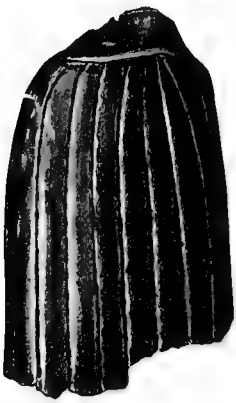

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PLATE VII.

Carabidae.

All the figures are by J. Henry Blake and are magnified twenty diameters.

Fig. 1. (16812) Bembidium expletum.
2. (16817) Badister antecursor.
3. (16809) Pterostichus depletus.
4. (16782) Patrobus decessus.
5. (16827) Bembidium damnosum.
6. (16793) Patrobus frigidus.

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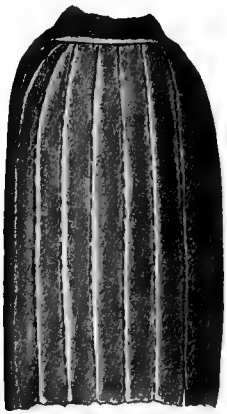

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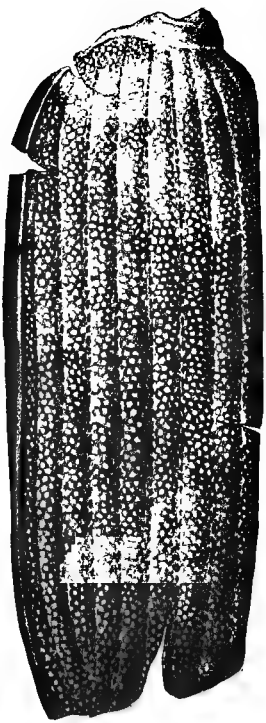

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PLATE VIII.

Carabidae.

All the figures are by J. Henry Blake and are magnified twenty diameters.

Fig. 1. (16772) Platynus longaevus.
2. (16773) Platynus interglacialis.
3. (16803) Platynus exterminatus.
4. (16771) Platynus interitus.
5. (16804) Harpalus conditus.

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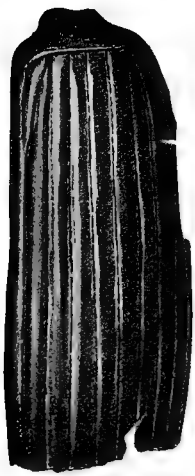

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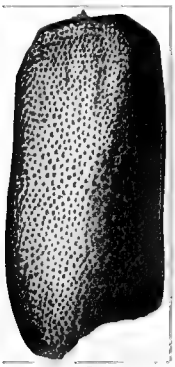
PLATE IX.

Dytiscidae.

All the figures are by J. Henry Blake and are magnified twenty diameters.

Fig. 1. (16899) Coelambus disjectus.
2. (16908) Coelambus infernalis.
3. (16909) Coelambus cribrarius.
4. (16901) Coelambus derelictus.
5. (16898) Agabus perditus.

1



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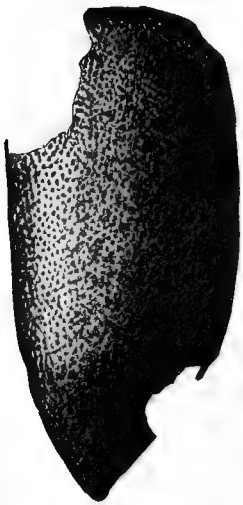

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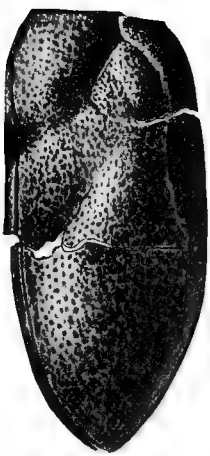

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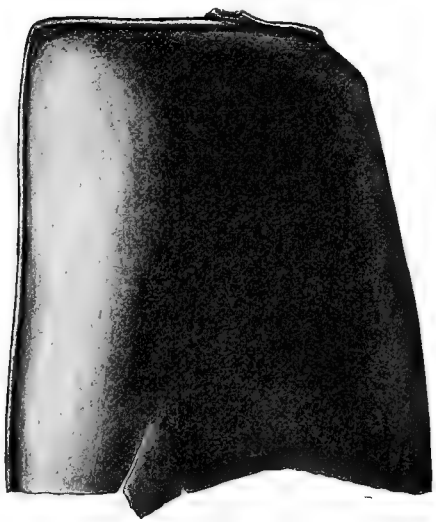

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PLATE X.

Dytiscidae, Gyrinidae, Hydrophilidae.

All the figures are by J. Henry Blake and are magnified twenty diameters.

Fig. 1. (16905) Hydroporus sectus.
2. (16902) Hydroporus inundatus.
3. (16903) Hydroporus inanimatus.
4. (16912) Cymbiodyta exstincta.
5. (16913) Gyrinus confinis LeC.

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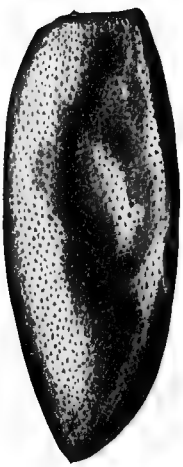

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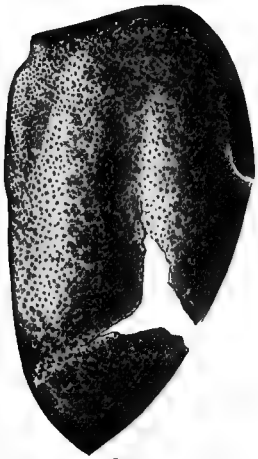

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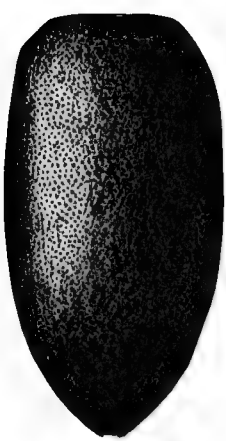

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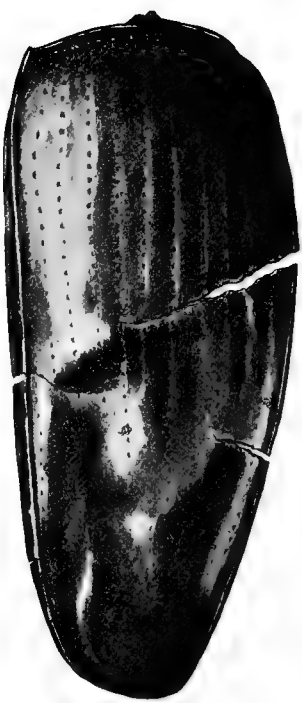

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PLATE XI.

Staphylinidae.

All the figures are by J. Henry Blake and are magnified twenty diameters.

Fig. 1. (16873) Gymnusa absens.
2. (16874) Quedius deperditus.
3. (16884) Lathrobium frustum.
4. (16883) Lathrobium inhibitum.
5. (16880) Lathrobium antiquatum.
6. (16881) Lathrobium debilitatum.
7. (16882) Lathrobium exesum.

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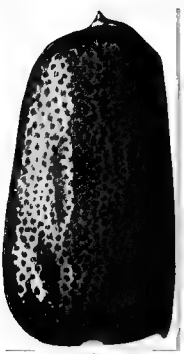

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PLATE XII.

STAPHYLINIDAE.

All the figures are by J. Henry Blake and are magnified twenty diameters.

Fig. 1. (16875) Philonthus claudus.
2. (16877) Cryptobium detectum.
3. (16878) Cryptobium cinctum.
4. (16891) Acidota crenata Fabr., var. nigra.
5. (16892) Olophrum celatum.
6. (16894) Olophrum arcanum.
7. (16895) Olophrum dejectum.

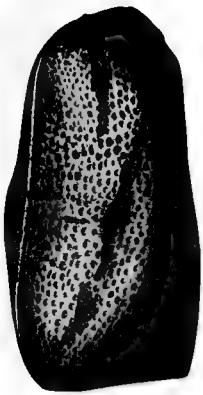

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PLATE XIII.

Curculionidae.

All the figures are by J. Henry Blake and are magnified twenty diameters.

Fig. 1. (16866) Erycus consumptus (head).
2. (16850) Erycus consumptus (elytron).
3. (16865) Centrinus disjunctus.
4. (16867) Orchestes avus.
5. (16861) Anthonomus lapsus.
6. (16852) Anthonomus eversus.
7. (16844) Anthonomus fossilis.

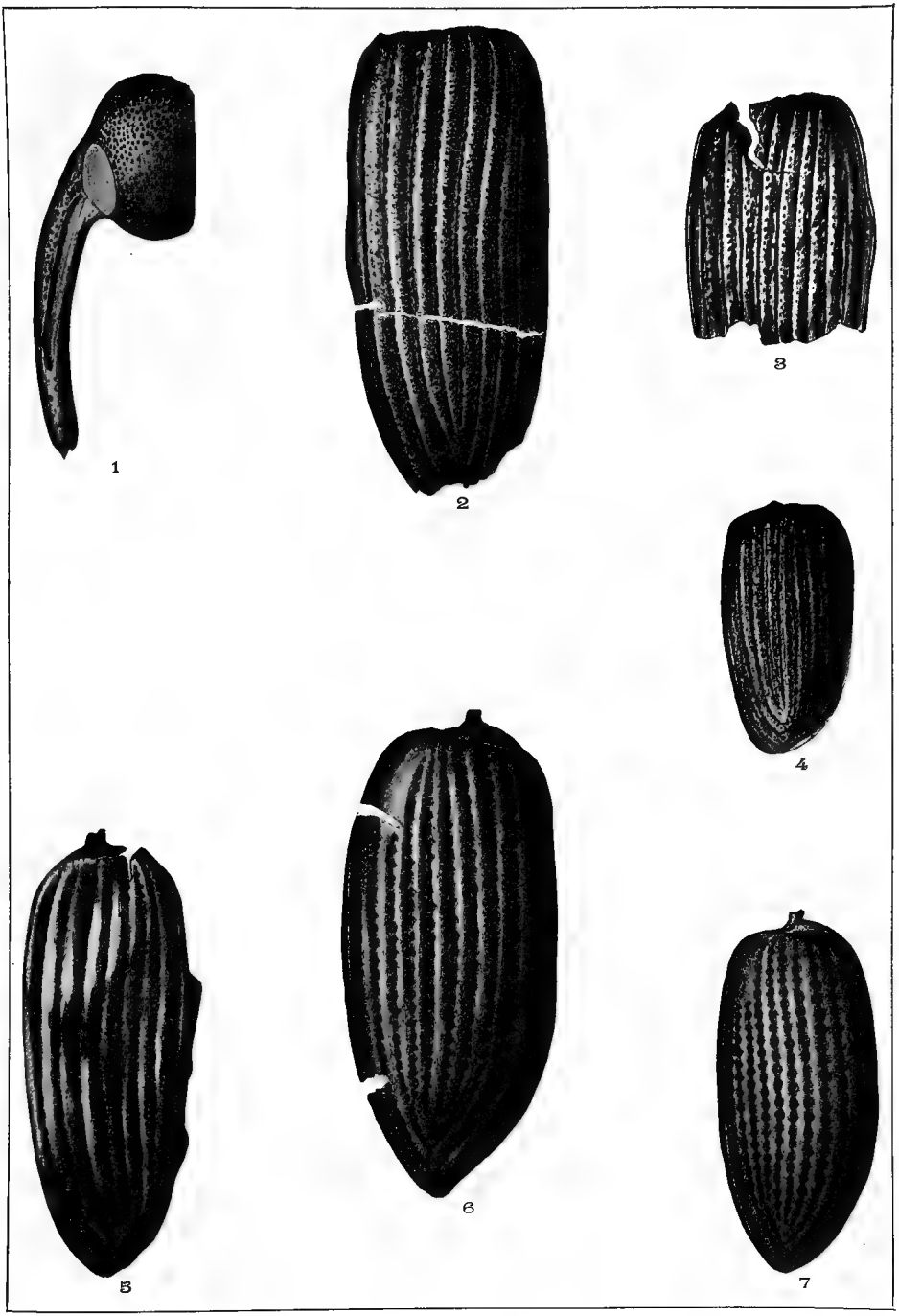
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PLATE XIV.

Borings of Scolytidae.

Drawn by A. D. Hopkins.

Fig. 1. Phloeosinus squalidens, in Juniperus or Thuja, from interglacial clays. Natural size; the outlines of the galleries on the right are slightly enlarged.

Fig. 2. Transverse section of 1, showing position of pith and indicating that the flattened condition is at least partially due to a more rapid growth of wood on one side than on the other.

Fig. 3. Galleries of Phloeosinus punctatus in Chamaecyparis lawsoniana.

Fig. 4, 4. Abnormal forms of nuptial chambers of Phloeosinus dentatus in Thuja plicata.

Fig. 5. Normal form of nuptial chamber of same in same.

Fig. 6, 6. Normal forms of nuptial chambers of Phloeosinus punctatus in Juniperus virginiana.

Fig. 7. Abnormal form of nuptial chamber of same in same.

Fig. 8. Normal form of nuptial chamber of Phloeosinus cristatus in Sequoia.

Fig. 9. Abnormal form of nuptial chamber of same in same.

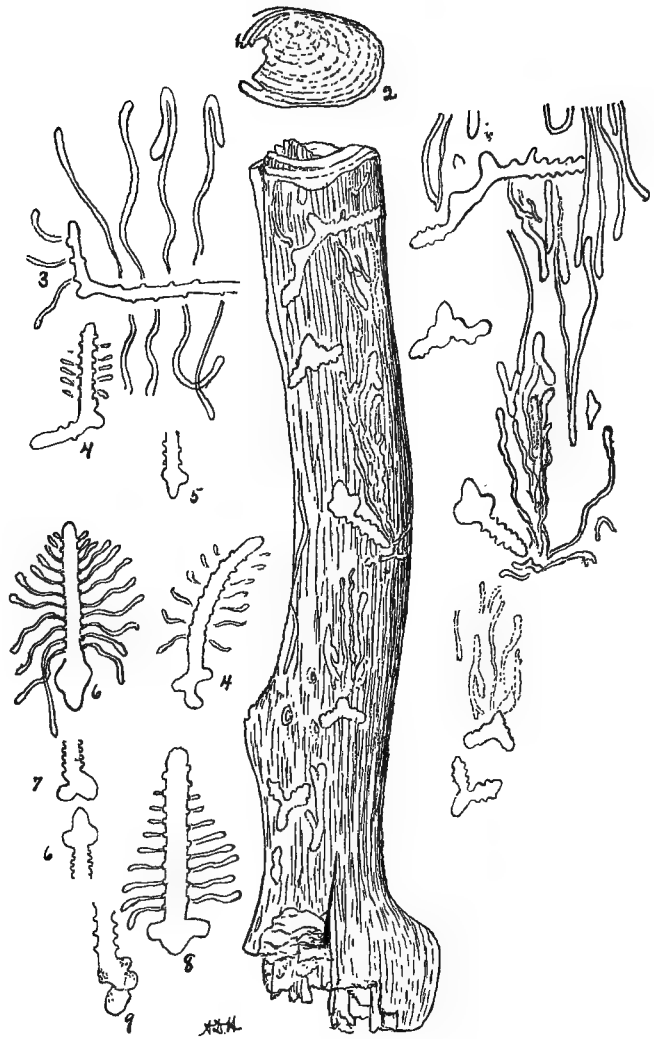
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PLATE XV.

PHLOEOSINUS SQUALIDENS.

Borings in Juniperus or Thuja. *After a photograph by A. D. Hopkins*

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

CONTRIBUTIONS

TO

CANADIAN PALÆONTOLOGY

VOLUME II.

PART II.

CANADIAN FOSSIL INSECTS

BY

SAMUEL H. SCUDDER

4. Additions to the Coleopterous fauna of the interglacial clays of the Toronto district. With an Appendix by A. D. Hopkins on the Scolytid borings from the same deposits.

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST EXCELLENT MAJESTY
1900

No. 710.

The present publication forms the second part of Volume II., "Contributions to Canadian Palæcntology." It consists of a report by Dr. S. H. Scudder of Cambridge, Mass., upon the Coleoptera of the interglacial beds of the vicinity of Toronto, to which is added an appendix by Dr. A. P. Hopkins of Morgantown, W. Va., on Scolytid borings from the same deposits.

The Survey is greatly indebted to both of these gentlemen for their gratuitous work upon this contribution to the literature of fossil entomology.

GEORGE M. DAWSON.

GEOLOGICAL SURVEY OF CANADA,
OTTAWA, December, 1900.

CANADA

DEPARTMENT OF MINES

GEOLOGICAL SURVEY BRANCH.

Hon. W. Templeman, Minister; A. P. Low, Deputy Minister;
R. W. Brock, Director.

MEMOIR No. 12—P.

CONTRIBUTIONS

TO

CANADIAN PALÆONTOLOGY

VOLUME II.

PART III.

CANADIAN FOSSIL INSECTS

BY

ANTON HANDLIRSCH

Adjunct Curator of the Royal Imperial Natural History Museum, Vienna, Austria

5. Insects from the Tertiary Lake Deposits of the southern interior of British Columbia, collected by Mr. Lawrence M. Lambe, in 1906.

OTTAWA

GOVERNMENT PRINTING BUREAU

1910

3337—1

No. 1141

INTRODUCTORY.

The Tertiary insects described in this memoir were collected by Mr. Lawrence M. Lambe, in 1906, from Tertiary lake deposits in southern British Columbia. Dr. Anton Handlirsch, Adjunct Curator of the Royal Imperial Natural History Museum, Vienna, very kindly undertook the investigation of this material. The results of his investigation, together with 36 drawings of the fossils examined, are embodied in the present report, submitted by Dr. Handlirsch, and translated by Miss Lucy P. Bush, New Haven, Connecticut, U.S.A.

(Signed) R. W. Brock.

Ottawa, June 6, 1910.

CONTENTS.

ILLUSTRATIONS.

CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY.

VOLUME II.

CANADIAN FOSSIL INSECTS

By Anton Handlirsch.

5. Insects from the Tertiary Lake Deposits of the southern interior of British Columbia, collected by Mr. Lawrence M. Lambe, in 1906.[1]

In the year 1906, during geological explorations in the southern interior of British Columbia, Mr. Lawrence M. Lambe, of the Geological Survey, collected a number of remains of Tertiary insects, which were entrusted to me for investigation by Dr. A. P. Low, then Director of the Geological Survey. In presenting the result of my study of these specimens—which have proved to be of unusual scientific interest—I have, at the same time, to express my appreciation of the confidence implied by the placing of this work in my hands.

The entire collection comprises 73 examples: chiefly represented by obverse and reverse impressions; these forms being distributed among the systematic groups as follows:—

Orthoptera (Acridioidea), 1; *Coleoptera*, 4; *Hymenoptera*: Ichneumonidæ, 1; Rhaphidioidea, 1; *Diptera:* Bibionidæ, 54; Ptychopteridæ, 1; Tipulidæ, 2; Empidæ, 1; *Hemiptera*: Pentatomidæ, 1; Gerridæ, 1; *Homoptera*: Cercopidæ, 3; *Insecta incertæ sedis*, 6.

The number of species determined in these groups is: 1, 4, 1, 1, 20, 1, 2, 1, 1, 1, 2, 6, respectively. It is thus seen that in the majority of species only one example of each is present, which is always the case in so comparatively small a collection of fossil insects. Regarding the preservation of this material, it is to be noted that, in relatively many examples the body and extremities are still in association; hence it may be concluded that the insects were entombed at the spot where they met death, and that no transportation by water took place. It is likewise noteworthy that with the exception of one species of Gerris—which is not here considered as a water-strider—all the specimens pertain to species furnished with wings;

[1] Translated by Miss Lucy P. Bush, of New Haven, Connecticut, U.S.A.

that no apterous larval form of any kind is present, and not a single species living under the water. The question, therefore, is probably, whether the deposits from which the insects come were laid down tolerably far from shore, rather than whether they represent distinctly littoral sediments.

Including the Tertiary insects previously made known from British Columbia—which for the sake of completeness are inserted in my list—the species may be systematically divided in the following manner:—

Orthoptera: Acridioidea. ? Mastacinæ, 1.

Coleoptera: Carabidæ, 1; Elateridæ, 5; Buprestidæ, 3; Hydrophilidæ, 1; Nitidulidæ, 1; Tenebrionidæ, 1; Chrysomelidæ, 3; Scarabæidæ, 1. (Coleoptera incertæ sedis, 3.)

Hymenoptera: Ichneumonidæ.—Pimplinæ, 4; Braconidæ, 2; Formicidæ, 3.

? *Odonata*: ? Libellulidæ, 1.

Raphidioidea: 1.

Neuroptera: Hemerobiidæ, 1.

Diptera: *Orthorrhapha nematocera.*—Mycetophilidæ, 5; Bibionidæ, about 35; Ptychopteridæ, 1; Chironomidæ (several); Tipulidæ, 2. *Orthorrhapha brachycera.*—Asilidæ, 1; Empidæ 1; Dolichopodidæ, 1. *Cyclorrhapha.*—Borboridæ (=Acalyptrate Muscidæ), 5; Anthomyinæ, 2.

Hemiptera: Gerridæ, 2; Pentatomidæ, 2.

Homoptera: Fulgoridæ, 1 (? 2); Cercopidæ, 12; Aphididæ, 2 (incertæ sedis, 1).

Insecta incertæ sedis, 7.

It must necessarily prove difficult to judge of the age of given deposits containing insect material, which comprises scarcely one hundred species: many of which, at best, are inaccurately determined, and are in need of critical revision. However, some definite clues have already been obtained. Thus, it has been rendered conspicuous that hitherto no representatives of the latest and most highly specialized groups of insects have been found. The aphids, muscids *sensu strictu*, syrphids, rhynchophores, cecidomyids, lepidopters, physopods, termites, forficulids, tarsids, chalcidids, etc., are either absent or are only very feebly represented: as the lamellicorns, formicids, etc. All these groups have doubtless persisted since the

Cretaceous; nevertheless in the early Tertiary they did not for a long time attain that pre-eminence for which they were noted in the late Tertiary, the Quaternary, and especially in recent times, where they are distinctly dominant forms. In the early Tertiary they were certainly also well represented in British Columbia; and if they are lacking in the collections, this fact must in part be attributed to accident, and in part to their still meagre numerical development at that time. Moreover, this datum may also be accepted as proof of the relatively high age of the beds in question. A further argument, of perhaps greater significance, rests on the relatively strong representation of groups of Old-world forms: as the elaters, buprestids (which were numerous even in the Lias); the pimplids, belonging to the most primitive apocrite hymenopters; the cercopids, which are also of Jurassic age; also a form of Acrididæ, which does not strictly coincide with any of the recent subgroups; a rhaphidian in which are found characters of both existing genera of this order, and finally, a very primitive phycopterid, the representative of a family existing to-day in a few surviving forms.

The Diptera clearly furnish the most reliable data. Of these forms, the nematocerous Orthorrhapha with encephalous larvæ; also the above-mentioned phycopterid, as well as the chironomids, mycetophilids, and bibionids, have a relatively strong representation, and outnumber all other dipters threefold; while, to-day, these conditions are exactly reversed. The bibionids were especially prominent, and appear to have formed the principal element of the fauna of that time. They are exclusively represented by the genus Penthetria (=Plecia), which throughout the world, at present, includes but few more species than are comprised in the small collection under discussion. We shall, therefore, consider this group more carefully.

Forty-one examples (including those of Scudder) unquestionably belong to the genus Penthetria, while 18 other imperfectly preserved specimens—judging from their structure—may also be included here. The number of species into which these 59 specimens are divided, cannot be regarded as excessive if estimated at about 35; 20 species having been determined from 30 very well-preserved examples. Through the degeneration of one branch of the sector radii, the closely allied genus Bibio is proved to be a form of later derivation, which, however, appears to be entirely wanting. Which of these genera is the older may be inferred from their geological distribu-

tion in the European Tertiary; for there occur in the early Tertiary 73 species of Penthetria, with only 23 in the late Tertiary. Bibio, on the other hand, has only 20 species in the early Tertiary, and 29 in the late Tertiary. The latter genus has not been found in the American Tertiary, and with the exception of the form from British Columbia, mentioned by Scudder—which may well be separated into several species—Penthetria has hitherto been represented by only one other early Tertiary species. Only 36 recent species of Penthetria are known, while of Bibio there are 95. The occurrence of so disproportionately large a number of Penthetrias in the Tertiary of British Columbia contemporaneous with the absence of Bibio also indicates that the beds in question belong to the early Tertiary, and are at least Oligocene in age. The supposition is obvious that the genus Bibio originated in the East, probably in Europe, and later found its way to North America, the present geographical distribution of these two genera being about as follows:—

Penthetria: Europe, 1; eastern Asia and Japan, 3; East India and Malay Archipelago, 7; Australia, 5; South Africa, 1; North America, 2; Central America, 8, and South America, 16 species.

Bibio: Europe, 37; eastern Asia, 2; East India, etc., 2; Australia, 6; Africa, 10; North America, 28; Central America, 7, and South America, 8 species.

From these figures it will be seen that Penthetria, to-day, exists principally in tropical and sub-tropical countries; and in temperate zones survives only in individual forms: one of these being the single dwarf European species, *Penthetria holosericea*. Bibio, on the contrary, is especially abundant in the temperate regions of North America and Europe, but is sparingly represented in the south. So much the more interesting, then, is the occurrence of such a large series of fossil Penthetrias—the representatives of existing thermophilous forms—in a latitude so high as is the region of the Similkameen river.

Not only in the Penthetrias, however, but also in Promastax, in the numerous cercopids, and particularly in the huge *Aphrophora angusta* mihi, Ricania, Scudder, etc., are found proofs of a warm climate at that time.

These data, therefore, taken together, lead to the safe conclusion that the Similkameen deposits are, at least, Oligocene in age.

ORTHOPTERA. Acridioidea.

Promastox archaicus, gen. et. sp. nov. Fig. 1.

Locality: Horsefly mine, British Columbia, (July 20, 1906). L.M.L.)

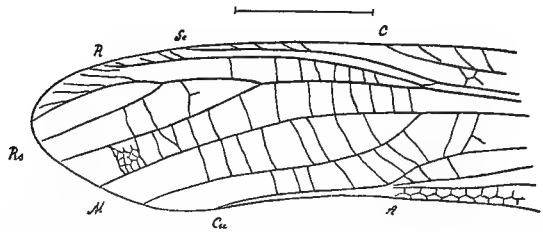

Fig. 1.—*Promastax archaicus*, Handlirsch. (*C*=Costa, *Sc*=Subcosta, *R*=Radius, *Rs*=Sector radii, *M*=Media, *Cu*=Cubitus, *A*=Anal.)

The apical portion of a front wing 18mm long, the entire length of which may have been about 25mm. The breadth is about one-fourth the length. The apical border is rounded off obliquely. The anal area reaches scarcely more than half the length of the wing. The precostal and costal areas are rather broad: the former extending about half the length of the wing. The subcosta lies near the radius, and ends in the last quarter of the length of the wing. The sector radii—which arises somewhat anterior to the middle of the wing—draws toward the upper portion of the apical border; sends off about four small twigs toward the anterior margin, and two straight branches obliquely backward to the apical margin. The media is separated from the radius by a rather broad space, and sends off only one long curved branch to the posterior end of the apical margin. The cubitus is likewise far removed from the media; remains unbranched; makes a short curve toward the end of the anal area, then follows close to the posterior margin almost to the apical border. Between the cubitus and media no intercalary vein is to be seen. Below the cubitus two simple veins are visible, which reach only to the end of the anal area. From the radius to the first anal vein, all interspaces are bridged over by distinct, rather irregularly arranged cross-veins, between which a very delicate irregular network may be made out.

This wing unquestionably belongs to a rather primitive acridioid form. Similar venation is found in existing representatives of the sub-family Acridiinæ, yet here the cubitus is always branched and

the anal area is much longer. In its short anal area, this interesting fossil best agrees with the Mastacinæ (s.l.), in which the cubitus also remains unbranched. The existing mastacines, however, exhibit throughout much narrower precostal and costal areas, and a much more regular intercalary venation, closer cross-veins, or only a compact polygonal network; and nearly always an acutely truncated apical margin. It is a noteworthy fact that the fossil form is especially distinguished from the recent mastacines by its more primitive characters.

COLEOPTERA.

Of this order of insects, which, as far as the trustworthiness of the identifications is concerned, is distinctly a discredit to paleoentomology, a series of forms from British Columbia has been brought to light, the interpretation of which lacks adequate support.

Carabidæ:—

Nebria paleomelas, Scudder. (Nicola river.)

Elateridæ:—

Cryptohypnus ?terrestris, Scudder. (Nicola river.)
Limonius impunctus, Scudder. (Similkameen.)
Elaterites, sp., Scudder. (Similkameen.)
Elateridæ —— Scudder. (Nicola river.)

Among the present fossils is also found an elater from Tulameen river, right branch, 1½ miles above Princeton. (Aug. 7, 1906.—L.M.L.) A more accurate determination seems impossible.

Buprestidæ:—

Buprestis sepulta, Scudder. (Nicola river.)
Buprestis saxigena, Scudder. (Nicola river.)
Buprestis tertiaria, Scudder. (Nicola river.)

Hydrophilidæ:—

Cercyon ? terrigena, Scudder. (Nicola river.)

Nitidulidæ:—

Prometopia depilis, Scudder. (Quesnel.)

Tenebrionidæ:—

Tenebrio primigenius, Scudder. (Ninemile creek.)

Chrysomelidæ:—

Cryptocephalus punctatus, Scudder. (Similkameen.)
Galerucella picea, Scudder. (Ninemile creek.)
Microrhopala, sp., Chagnon. (Vancouver island.)

Scarabœidæ:—

Trox oustaleti, Scudder. (Ninemile creek.)

In the material under consideration, there are three species of coleopters: not one of which have I been able to place in any family. One from Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.); one from Tulameen river, right branch, 1½ miles above Princeton—(August 7, 1906. L.M.L.); and one from Horsefly mine —July 20, 1906. L.M.L.).

HYMENOPTERA.

Ichneumonidæ (*Pimplaria*):—

Xylonomus lambei, sp. nov. Fig. 2.

Locality: Tranquille river—(July 5, 1906. L.M.L.).

A rather incompletely preserved female, which, without the antennæ, but including the distinctly well-marked ovipositor, is 18mm long; and whose front wings exhibit a length of only 10mm. The abdomen is one and one-half times as long as the thorax; measured from its base, the ovipositor is only a little more than two-thirds the length of the abdomen, while its free projecting portion is less than

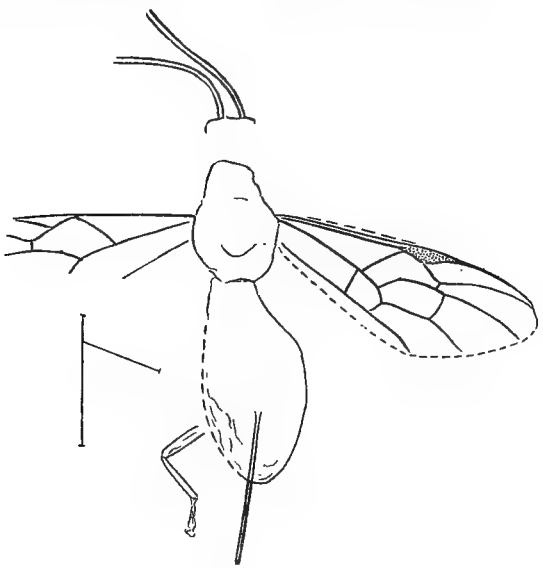

Fig. 2.—*Xylonomus lambei*, Handlirsch.

half the length of the abdomen: the latter joins the thorax with a broad base. The front wings are relatively broad, and only a little shorter than the thorax and abdomen together. The pterostigma is very distinct, and tapers gradually; while the radial cell is subcrescentic in shape, terminating just above the apex of the wing, and is nearly as long as the medial cell. The first discoidal and the first cubital cells fuse in the normal way. The second (small) cubital cell is open toward the third, that is, not shut off by a cross-vein. The second discoidal cell is large, almost twice as broad as it is high, and is separated from the third by a distinctly curved cross-vein. The first of the submedial cells is twice as long as the second, and equals the third in length. The vein which separates the first two is distinctly oblique. The antennæ are relatively robust, but are not preserved in their entirety. Only one of the legs is to be seen: its length indicating a front or middle member.

Scudder cites three Pimplas from British Columbia:—

Pimpla saxea, Scudder. (Quesnel.) Probably a Xylonomus.
Pimpla senecta, Scudder. (Quesnel.)
Pimpla decessa, Scudder. (Quesnel.)

Braconidæ:—

Calyptites antediluvianus, Scudder. (Quesnel.)
Bracon —— Scudder. (Similkameen.)

Formicidæ:—

Formica arcana, Scudder. (Quesnel.)
Dolichoderus obliteratus, Scudder. (Quesnel.)
Aphænogaster longæva, Scudder. (Quesnel.)

ODONATA.

Of this group, only one specimen from Quesnel has been brought to light. This was doubtfully regarded by Scudder as the head of a libellid—? Diplax.

RHAPHIDIOIDEA.

Archiinocellia oligoneura, gen. et sp. nov. Figs. 3, 4, and 5.
Locality: Opposite Horsefly mine—(July 21, 1906. L.M.L.).

Only the superimposed apical portions of a front and hind wing are distinctly preserved: and not without considerable pains was success attained in making out what pertains to each wing. This

analysis shows, with great probability, that the fossil indicates a new genus.

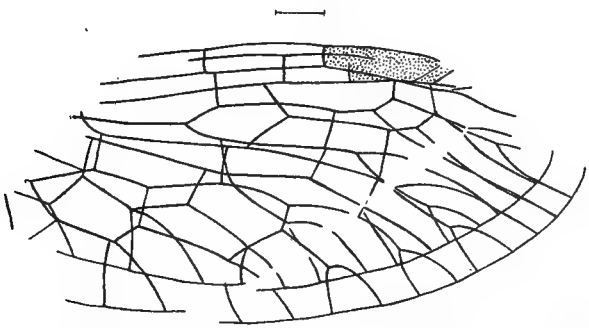

Fig. 3.—*Archiinocellia oligoneura*, Handlirsch. Front and hind wings *in situ*.

This well-preserved specimen is about 7^{mm} long, and permits the assumption that the total length of the wing was from 12 to 14^{mm}. The costal area is not preserved. The pterostigma, together with the apex of the wing, are injured, and it cannot be determined with certainty whether cross-veins were present in the former. In the subcostal area of each wing there lies proximally from the stigma a cross-vein, which, judging from its position, cannot correspond to the cross-vein occurring near the base of the wing in recent species of Rhaphidia; but to the more distally situated cross-vein in the wing of the genus Inocellia. The sector radii arises rather near the base of the wing, and forms a large fork, the branches of which again divide into three branchlets. Between the sector and radius there are only two cross-veins; the first of which lies just below the furcation, and the second directly posterior to the second branching; while in all known recent species of Inocellia three cross-veins are present, the first of which is placed proximally from the large fork. As in most species of the genus Rhaphidia, only two closed cells lie between the radius and its sector. In the large fork of the sector there is also a cross-vein. The media is connected with the sector radii by three cross-veins, the second of which in the front wing is situated distally from the large furcation of the sector, but in the hind wing is anterior to this fork. The trunk of the media terminates in a short bifurcation, the branches of which always dichotomize only once. The second long main branch of the media, which originates just

above the origin of the sector radii, is connected with the trunk by only two cross-veins; so that only two closed cells are developed—as in many species of the genus Raphidia. In recent species of Inocellia there is always one more cross-vein here, and, therefore, one more cell also present. In general, these two main branches of the media divide into two secondary branches only, each of which terminates in a fork. Behind these two cells, which lie between the two main branches of the media, that is, behind the first one, and posterior to the second main branch, there is still another cell; but I am unable to state with certainty whether this lies between the second and a third branch of the media, or between the latter and the cubitus. The former case is characteristic of Inocellia; the latter of Raphidia.

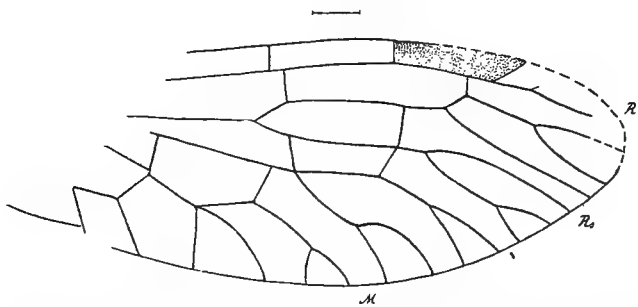

Fig. 4.—*Archiinocellia oligoneura*, Handlirsch; front wing. (*R*= Radius, *Rs*=Sector radii, *M*=Media.)

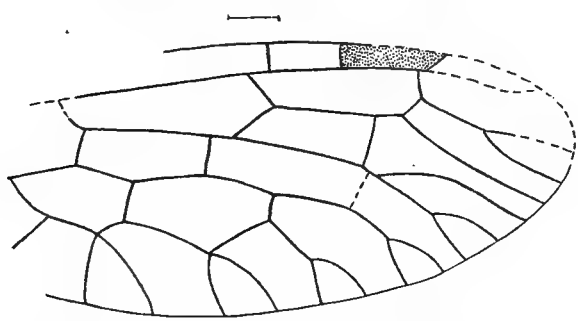

Fig. 5.—*Archiinocellia oligoneura*, Handlirsch; hind wing.

Since there is nothing to be seen of the head, it cannot be determined whether or not ocelli were present. Nevertheless, if I were to

place this interesting fossil in the genus Inocellia, this course would be suggested chiefly by the presence of the distal subcostal cross-vein. In any event, it should be noted that here characters of both recent raphidian genera are mingled. This fact will probably warrant the establishment of a new genus; especially as the fossil form described by Scudder cannot be admitted in the recent genera.

'Raphidia' erigena, Hazen, from the lower Oligocene of Europe (amber), is a typical Inocellia. On the other hand, it seems to me that *'Inocellia' veterana*, Scudder, from the Miocene of Florissant, represents a distinct genus, which is characterized by the much greater development and ramification of the sector radii, by the much more numerous cross-veins, and consequently by the far greater number of cells; hence, for this genus I propose the name Dictyoraphidia. *'Inocellia' tumulata*, Scudder, from Florissant, appears to be most closely allied to the new form above described; but is distinguished by a somewhat more profuse branching of the sector and by three cells between the radius and sector. *'Raphidia?' tranquilla*, Scudder, from Florissant, may also be a form most nearly related to *tumulata*; for it distinctly shows the distal cross-vein in the subcostal area, and likewise three cells anterior to the sector.

Regarding *'Inocellia' somnolenta*, Scudder, from Florissant, I can express no opinion without having seen the original; for in the drawing the venation of the superimposed wing is not sharply defined. A definite opinion concerning the unfigured *'Inocellia' eventa*, Scudder, from Florissant, must likewise be withheld; yet from Scudder's statements relative to its great similarity to *tumulata*, Scudder, one may conclude that it also belongs to the same group as the latter form.

Should these views be confirmed, it will probably become necessary to establish new genera for these complex extinct species, which are intermediate between the two recent genera; hence, for the form above described I propose the name Archiinocellia, and for the others mentioned I suggest the name Archiraphidia.

In addition to the foregoing forms and a larva from the amber, only one other has become known—*Megaraphidia elegans*, Cockerell, from Florissant, which is undoubtedly a well-founded genus. Present knowledge of the fossil raphidians may, therefore, be expressed as follows:—

Megaraphidia elegans, Cockerell.
Dictyoraphidia veterana, Scudder.
Archiinocellia oligoneura, Handlirsch.
Archiraphidia tumulata, Scudder.
?*Archiraphidia tranquilla*, Scudder.
?*Archiraphidia eventa*, Scudder.
Inocellia erigena, Scudder.
?*Inocellia somnolenta*, Scudder.
?*Raphidia* (larva), Menge.

Thus, it may be seen that in organization as well as in number of forms the raphidians were far more fully developed in the Tertiary than at present, which shows that this group has become decidedly retrogressive.

NEUROPTERA.

Hemerobiidæ:—

Bothromicromus lachlani, Scudder. (Quesnel.)

DIPTERA.

Mycetophilidæ:—

Sciara deperdita, Scudder. (Quesnel.)
Boletina sepulta, Scudder. (Quesnel.)
Brachypeza abita, Scudder. (Quesnel.)
Brachypeza procera, Scudder. (Quesnel.)
Trichonta dawsoni, Scudder. (Quesnel.)

Bibionidæ:—

Penthetria angustipennis sp. nov. Fig. 6.
Locality: Horsefly mine—(July 20, 1906. L.M.L.).

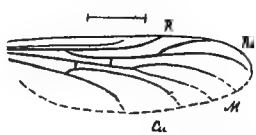

Fig. 6.—*Penthetria angustipennis*, Handlirsch. (*R*=Radius, *Rs*=Sector radii, *M*=Media, *Cu*=Cubitus.

Only one wing is distinctly preserved. This has a length of 8^{mm}, and is three and two-tenths times as long as broad, with a nearly straight costal border. At scarcely more than six-tenths the length of the wing, the radius fuses in the anterior margin in a gentle

curve. The sector arises at one-fourth the length of the wing, and in half its own length bifurcates almost exactly below the termination of the radius; the anterior branch is arcuate, and fuses in the anterior margin equidistant from the radius and the posterior branch. The radiomedial cross-vein stands midway between the origin and bifurcation of the sector. The media forks almost exactly in the centre of the wing. The cubitus furcates just below the first fourth of the length of the wing; its posterior branch reaching nearly to the centre, and its anterior member extending two-thirds the length of the wing. The radiomedial cross-vein is situated only a little nearer to the fork of the media than to the mediocubital cross-vein.

Penthetria pulla, sp. nov. Fig. 7.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

Fig. 7.—*Penthetria pulla,* Handlirsch.

Both wings are well preserved, 8^{mm} long—three times as long as broad—and with a distinctly curved anterior margin. The radius extends seven-tenths the length of the wing, its sector arising at about one-third of the wing's length, and forking just above half its own length directly anterior to the termination of the radius; its anterior branch is slightly arcuate, and fuses immediately below the first third of the distance, between the radius and the posterior branch. The radiomedial cross-vein is situated distinctly nearer to the furcation than to the origin of the sector. The media dichotomizes just below (distally) the middle of the wing, its branches being very much extended and strongly divergent. The cubitus forks at about the first fourth of the length of the wing, its posterior gently curved branch reaching nearly half the length of the wing, and its anterior branch extending about three-fourths the length. The

radiomedial cross-vein is more than twice as far removed from the mediocubital cross-vein as from the bifurcation of the media.

Close to the specimen here described lies a second, the wings of which are too indistinct to permit of identification. They correspond in size.

Penthetria brevipes, sp. nov. Fig. 8.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

Fig. 8.—*Penthetria brevipes*, Handlirsch.

An imperfectly preserved specimen, with superimposed wings—about 7·5^{mm} in length—which exhibit a rather strongly curved anterior margin, and are about two and eight-tenths times as long as broad. The radius extends more than six-tenths the length of the wing, and its sector bifurcates directly above the termination of the radius; its anterior branch does not approach so near to the radius as in *P. pulla*, and fuses about midway between the radius and the second branch of the sector.

The legs appear to have been very short.

Penthetria pictipennis, sp. nov. Figs. 9, 10, and 11.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

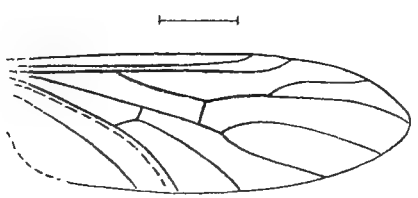

Fig. 9.—*Penthetria pictipennis*, Handlirsch.

A beautifully preserved wing, 12mm in length, three times as long as broad, with opaque borders along the veins. The apex of the wing is sub-acute, the anterior and posterior margins being about equally curved. At about seven-tenths the length of the wing, the radius fuses in the margin in a rather strong curve. The sector originates at about one-fourth the length of the wing and bifurcates at about half its own length, and directly above the termination of the radius. The superior branch presents a nearly sigmoid curve, fusing in the margin midway between the posterior branch and the radius. The radiomedial cross-vein is situated distinctly nearer to the bifurcation than to the origin of the sector. The media divides in the apical half of the wing, its branches being strongly arcuate but not widely divergent. The cubitus draws toward the posterior margin in a relatively steep but gentle curve, its anterior branch fusing somewhat distally from the middle of the wing, while its posterior branch meets the margin at just two-fifths the length of the wing. Close behind the cubitus, and nearly parallel with it, runs a distinct fold, and farther on is a simple anal vein. The mediocubital vein lies more than twice as far above the radiomedial vein as the latter is anterior to the bifurcation of the media.

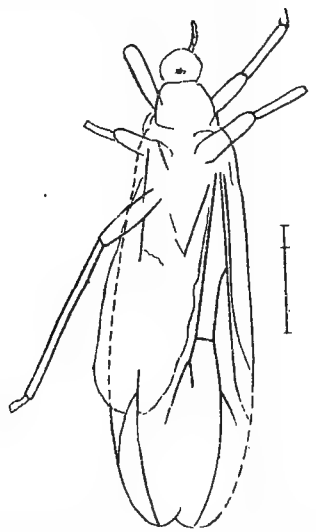

Fig. 10.—*Penthetria ? pictipennis*, Handlirsch.

To this species probably belongs a second specimen from the right branch of the Tulameen river, 1½ miles above Princeton (August 7,

1906). There is also an example from Quilchena (July 31, 1906), in which slight differences in detail may be recognized; but which probably cannot be separated specifically from *P. pictipennis*. Both specimens are quite too imperfectly preserved to admit of exact identification. The form from Quilchena exhibits a stout body greatly overhung by the wings, relatively short robust femora, but in the hind legs very long tibiæ.

Fig. 11.—*Penthetria ? pictipennis*, Handlirsch.

Penthetria elatior, sp. nov. Fig. 12.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A remarkably large form, with wings 14^{mm} in length, slightly cambered in shape, and about three times as long as broad. The radius proceeds toward the anterior margin in a gentle curve and extends about seven-tenths the length of the wing. The sector originates at about one-fourth the length of the wing, and dichotomizes somewhat below half its own length, and directly above the termination of the radius. The anterior branch is strongly arcuate, long, and fuses in the anterior margin midway between the radius and the posterior branch of the sector. The radiomedial cross-vein is situated exactly between the origin and the furcation of the sector, immediately above the middle of the wing. The media bifurcates exactly in the centre of the wing. The cubitus takes a relatively oblique course toward the posterior margin, so that its posterior branch scarcely reaches beyond two-fifths the length of the wing. The mediocubital cross-vein is situated twice as far above the radio-

medial cross-vein as the latter is anterior to the branching of the media.

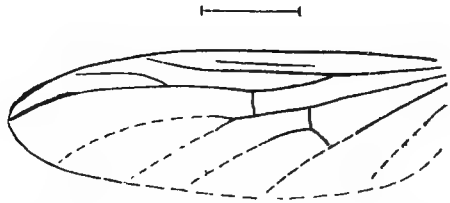

Fig. 12.—*Penthetria elatior*, Handlirsch.

In addition to the wing, there is an abdomen preserved, which is about 9mm in length and from 4 to 5mm in width. There are also a few fragments of legs, indicating that these organs were moderately long and relatively slender.

Penthetria reducta, sp. nov. Fig. 13.
Locality: Horsefly mine—(July 20, 1906. L.M.L.).

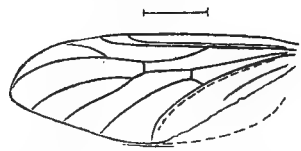

Fig. 13.—*Penthetria reducta*, Handlirsch.

A wing 8·5mm in length, with fairly straight anterior border and arcuate posterior margin. The breadth compared to the length is as 1:2·7. The radius extends seven-tenths the length of the wing; its sector originates at about the first third of the length of the wing, bifurcates at exactly half its own length, and is very markedly sigmoid in curvature. The anterior branch is long, and fuses in the margin at the first third of the distance between the radius and the posterior branch of the sector. The radiomedial cross-vein is situated about at the termination of the middle third of the distance between the origin and bifurcation of the sector, immediately below the middle of the wing. The media dichotomizes quite a distance posterior to the centre of the wing, its branches being distinctly divergent. The cubitus bifurcates at one-third the length of the wing, and its posterior member proceeds in a strong curve to the lower margin, which it meets at half the length of the wing. The

mediocubital cross-vein is situated more than three times as far above the radiomedial cross-vein as is the latter anterior to the furcation of the media. Directly below the cubitus and parallel with it runs a distinct fold. Still farther below may be seen the basal portion of a strongly curved anal vein.

A second wing lies on the same slab. It is not so well preserved as the specimen here described, yet undoubtedly belongs to the same individual.

Penthetria falcatula, sp. nov. Fig. 14.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

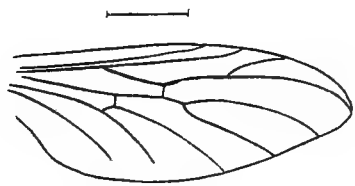

Fig. 14.—*Penthetria falcatula,* Handlirsch.

A distinctly cambered wing 11^{mm} in length, the breadth and the length being in the proportion of 1:2·6. The radius stretches seven-tenths the length of the wing, and is but slightly curved; its sector springs off anterior to the first third of the length of the wing, bifurcates at half its own length, and is distinctly arcuate. Its anterior branch is moderately long, curved, and fuses in the margin directly below the first third of the space between the radius and the posterior branch of the sector. The radiomedial cross-vein is situated midway between the origin and bifurcation of the sector, and immediately above the centre of the wing. The media dichotomizes a short distance below the middle of the wing, and forms two widely diverging branches. The cubitus forks at one-third the length of the wing, and its posterior branch proceeds in a broad curve toward the lower margin, where it fuses somewhat anterior to half the length of the wing. A distinctly curved anal vein is present. The mediocubital cross-vein is twice as far from the radiomedial cross-vein as is the latter from the furcation of the media.

Penthetria fragmentum, sp. nov. Fig. 15.
Locality: Horsefly mine—(July 20, 1906. L.M.L.).

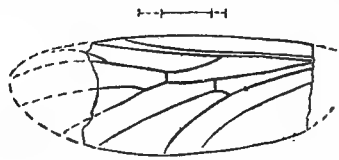

Fig. 15.—*Penthetria fragmentum,* Handlirsch.

A portion 7^{mm} long from the middle of a wing about 11^{mm} in length, the form of which was apparently rather elliptical; its breadth and length were about in the proportion of 1:2·8. The radius is nearly straight, and appears to extend somewhat beyond seven-tenths the length of the wing. The sector arises immediately posterior to the first third of the length of the wing and is distinctly arcuate. The radiomedial cross-vein is situated about the middle of the length of the wing and also midway between the origin and bifurcation of the sector. Quite a distance distally beyond the centre of the wing, the media divides into two apparently widely divergent branches. The moderately curved posterior branch of the cubitus reaches beyond half the length of the wing, while the anterior branch is remarkably straight. The mediocubital cross-vein is situated twice as far above the radiomedial cross-vein as is the latter anterior to the bifurcation of the media. The first anal vein is nearly parallel with the cubitus.

Penthetria nana, sp. nov. Figs. 16 and 17.
Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

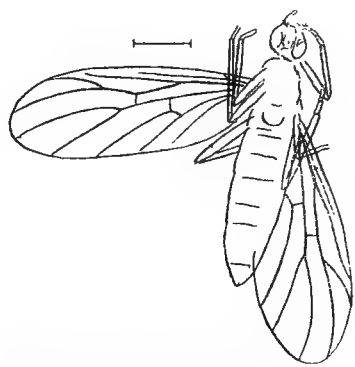

Fig. 16.—*Penthetria nana,* Handlirsch.

An insect 8mm in length, with rather long, slender legs and a relatively large head. The length of the wing is 8mm; its form is subelliptical, with very broadly rounded apical margin. The ratio of the breadth to the length is as 1:2·8. The radius extends rather more than seven-tenths the length of the wing, and terminates in a gentle curve. The sector radii arises within the first third of the length of the wing and dichotomizes directly above half its own length. Its anterior branch is relatively short, strongly curved, very widely divergent, and fuses in the margin at one-third the distance between the radius and the second branch of the sector. The media branches distally below the middle of the wing into two widely divergent members. The cubitus is much curved at the beginning, but its two branches slope without marked curvature to the posterior margin. The mediocubital cross-vein is situated one and one-half times as far above the radiomedial cross-vein as is the latter anterior to the bifurcation of the media.

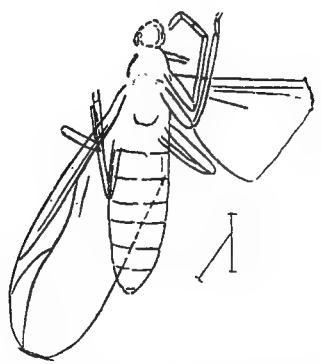

Fig. 17.—*Penthetria nana*, Handlirsch.

A second, less well-preserved specimen from the same locality undoubtedly also belongs to this species.

Penthetria separanda, sp. nov. Fig. 18.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

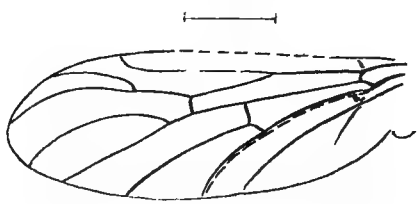

Fig. 18.—*Penthetria separanda*, Handlirsch.

A wing 12mm in length, whose breadth to the length is in the proportion of 1:2·7. The greatest width is somewhat distal to the middle of the length of the wing. At its beginning the anterior margin runs off straight, but bends sharply downward in the terminal third. The posterior border is symmetrically curved. The radius extends slightly beyond seven-tenths the length of the wing, and terminates in a strong retroflex forward curve. The sector springs forth close to the first third of the length of the wing, and is distinctly arcuate. Its bifurcation takes place at half its own length, and the strongly curved anterior branch follows in the same direction as the posterior branch, reaching the anterior border exactly midway between the radius and the posterior branch. The radiomedial cross-vein is situated somewhat nearer to the furcation than to the origin of the sector, and just distal to the middle of the wing. The media divides quite a distance below the middle of the wing; its anterior branch is symmetrically curved, and at the end converges toward the nearly straight posterior branch. The trunk of the cubitus and its posterior branch proceed in a gentle uniform curve toward the posterior margin, which they meet at half the length of the wing. The anterior branch is slightly curved. The mediocubital cross-vein is situated not quite twice as far above the radiomedial cross-vein as is the latter anterior to the bifurcation of the media. The fold follows close to the cubitus. The first anal vein is slightly divergent, and at its base the remnant of a second anal vein may be seen.

This wing is especially well preserved, the base, with the typical cross-veins between the costa, radius, and media being distinctly visible. An anal lobe, with opaque borders along the veins, is also to be seen.

Penthetria pulchra, sp. nov. Fig. 19.

Locality: Tulameen river, right bank, one mile above Princeton—(August 7, 1906. L.M.L.).

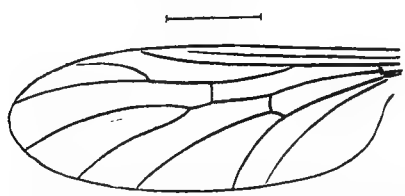

Fig. 19.—*Penthetria pulchra*, Handlirsch.

This wing is 13mm in length. The ratio of the breadth to the length is as 1:2·7. In form, it departs slightly from *P. separanda*, since the greatest width lies in the middle of the wing, the anterior margin is not so strongly curved downward, and the basal portion is not so much reduced. The radius extends scarcely seven-tenths the length of the wing, and at the end shows only a very slight curvature. The sector arises just above the first third of the length of the wing and is very gently curved, bifurcating somewhat beyond half its own length; its anterior branch is strongly arcuate, rather long, and fuses in the margin rather nearer to the posterior branch than to the end of the radius. The radiomedial cross-vein lies nearer to the forking than to the origin of the sector, and exactly in the middle of the wing. A little below the middle of the wing, the media separates into two distinctly curved divergent branches. The cubitus with its two branches, which curve strongly downward, does not reach quite half the length of the wing. The mediocubital cross-vein is situated rather more than twice as far above the radiomedial cross-vein as the latter is above the forking of the media. The simple anal vein is slightly less curved than the cubitus. The wing appears to have been very opaque in the costal region.

Penthetria avunculus, sp. nov. Figs. 20 and 21.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

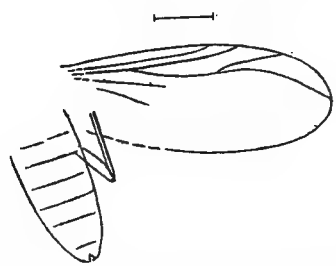

Fig. 20.—*Penthetria avunculus, Handlirsch.*

There are two examples of this species, both rather imperfectly preserved. This form appears to be rather similar to *P. nana*; but seems to have had a more robust body and a smaller head, differences that perhaps may be interpreted as sexual. If the forms were to be separated, the distinction would rest solely on a difference in the

neuration of the wings. The latter are 8·5mm long, broadly rounded at the apex, and somewhat narrower in the basal than in the apical portion. The breadth is to the length as 1:2·6. In the apical half of the wing, the anterior margin curves strongly downward. The radius runs out nearly straight, and extends scarcely seven-tenths the length of the wing. The sector arises immediately above the first third of the length of the wing, and at about half its own length divides into two branches, the anterior of which bends upward in a nearly sigmoid curve, while the posterior is broadly arcuate, so that both branches are strongly divergent, and take quite different directions.

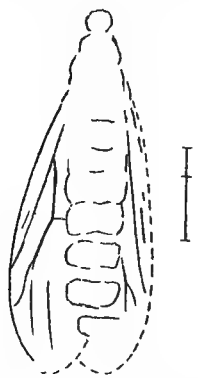

Fig. 21.—*Penthetria avunculus*, Handlirsch.

Penthetria avus, sp. nov. Fig. 22.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

This wing is 10mm long, the breadth to the length being about as 1:2·6. The anterior margin is strongly curved, the apex not broadly rounded. Toward the end the radius is slightly bent, and reaches seven-tenths the length of the wing; its sector issues just below the first quarter of the length of the wing, is distinctly sigmoid, and forks quite a distance above half its own length. Its rather long anterior branch is not widely divergent, and follows a course similar to that of the posterior branch, fusing about midway between the radius and the posterior branch of the sector. The radiomedial cross-vein is about twice as far removed from the origin as from the furcation of the sector, and lies somewhat above half the length of the wing.

Somewhat distally below the middle of the wing, the media furcates into two slightly divergent branches. The posterior branch of the cubitus passes to the lower margin in a steep curve, not reaching the centre. The mediocubital cross-vein is situated two and a half times as far above the radiomedial cross-vein as is the latter above the fork

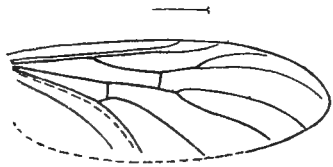

Fig. 22.—*Penthetria avus*, Handlirsch.

of the media. Directly below the cubitus and parallel with it runs a fold. The first simple anal vein diverges moderately from the cubitus.

Penthetria lambei, sp. nov. Fig. 23.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A subelliptical wing 11^{mm} long, whose breadth is to its length in the ratio of 1:2·5. The radius is nearly straight, and stretches quite beyond seven-tenths the length of the wing. Its sector springs off at one-fourth the length of the wing, is strongly sigmoid, and bifurcates in half its own length. Its anterior branch is distinctly curved, and fuses in the margin midway between the radius and the posterior branch of the sector. The radiomedial cross-vein is farther removed from the origin than from the fork of the sector, and lies almost precisely in the middle of the wing. Just below half the length of the wing, the media separates into two moderately divergent branches. The cubitus with its posterior branch forms a gentle

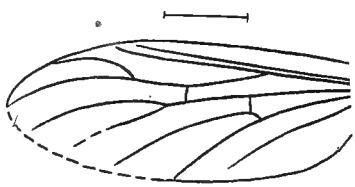

Fig. 23.—*Penthetria lambei*, Handlirsch.

curve, and strikes the posterior margin at half its length. The mediocubital vein lies three times as far above the radiomedial cross-vein

as does the latter above the forking of the media. The first anal vein runs nearly parallel with the cubitus.

Penthetria ovalis, sp. nov. Fig. 24.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A subelliptical wing 10^{mm} long, the breadth and length of which are in the proportion of 1:2·4. The radius takes a nearly straight course, and reaches seven-tenths the length of the wing. Its sector originates at one-fourth the length of the wing, and is very gently arcuate. It dichotomizes in half its own length, and the anterior branch makes a strong curve, is widely divergent, and fuses in the margin midway between the radius and the posterior branch of the sector. The radiomedial cross-vein is situated much nearer to the

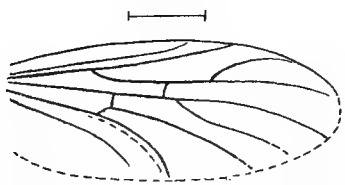

Fig. 24.—*Penthetria ovalis,* Handlirsch.

bifurcation than to the origin of the sector and is directly above the middle of the wing. Exactly in the centre of the wing the media separates into two long moderately divergent branches. The posterior branch of the cubitus is very much curved, and strikes the posterior border in the centre. The mediocubital cross-vein is more than three times as far removed from the radiomedial cross-vein as is the latter from the forking of the media. Immediately below the cubitus and parallel with it runs a fold, and farther below a divergent anal vein is clearly seen. The entire wing appears to have been uniformly opaque.

Penthetria transitoria, sp. nov. Fig. 25.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

This specimen exhibits an entire insect, the body of which is very much crushed, yet it is possible to make out that the thorax and abdomen were relatively robust, while the legs were slender. The wings are 10^{mm} long, and are well preserved. They show a rather

strongly-curved anterior margin, and a still more arched posterior border. Their breadth and length are in the ratio of 1:2·3. The

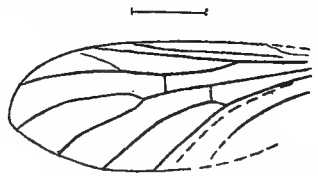

Fig. 25.—*Penthetria transitoria,* Handlirsch.

radius is nearly straight, and reaches more than seven-tenths the length of the wing. The sector arises immediately below the first fourth of the length of the wing, is gently arcuate, and just distal to half its own length sends off an oblique indistinct anterior branch toward the end of the radius. The radiomedial cross-vein lies in the centre of the wing, and nearly twice as far from the origin as from the bifurcation of the sector. Quite a distance below the middle of the wing, the media separates into two strongly divergent branches. The cubitus is relatively gently curved, and with its posterior branch reaches the middle of the posterior margin. Behind it may be seen a distinct divergent fold and an equally divergent anal vein. The mediocubital vein is situated twice as far above the radiomedial vein as is the latter above the furcation of the media. In the costal region the wing was very opaque.

Penthetria canadensis, sp. nov. Fig. 26.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

This form consists of two wings pertaining to one individual. The wings are 10^{mm} long, with slightly arched anterior border, and strongly curved posterior margin. The breadth and the length are in the proportion of 1:2·2. The radius curves gently toward the anterior margin, and extends seven-tenths the length of the wing. Its sector springs forth just below the first fourth of the length of the wing, and separates into two branches directly above half its own length; the anterior of these is strongly and simply curved, is widely divergent, and strikes the margin decidedly nearer to the radius than to the posterior branch. The latter is strongly curved. The radiomedial cross-vein lies somewhat above the centre of the wing, and only half as far from the furcation as from the origin of the sector. Just below the middle of the wing the media divides into two

strongly divergent branches. With its posterior branch the cubitus forms a steep downward-trending curve, which strikes the posterior margin above the centre. Immediately behind the cubitus and

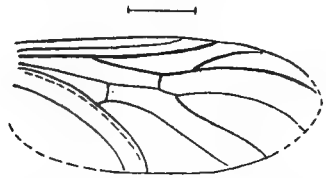

Fig. 26.—*Penthetria canadensis*, Handlirsch.

parallel with it runs a fold; and farther on, but likewise parallel with the cubitus, the anal vein proceeds to the posterior margin. The mediocubital vein is situated fully twice as far above the radiocubital cross-vein as is the latter above the fork of the media. In the costal region this wing also shows very strong pigmentation.

Penthetria curtula, sp. nov. Fig. 27.

Locality: Horsefly mine—(July 20, 1906. L.M.L.).

A wing 8^{mm} long, whose breadth and length are in the proportion of 1:2. The anterior margin is gently curved, while the posterior border is strongly arcuate. The nearly straight radius extends not quite seven-tenths the length of the wing. The sector issues just above the first third of the length of the wing; while above its bifurcation—which occurs in half its own length—it forms an obtuse angle, and then a flat curve. The anterior branch is remarkably short, widely divergent, and fuses in the margin nearer to the radius than to the posterior branch. The radiomedial cross-vein is equidistant from the forking and the origin of the sector, and lies somewhat above the middle of the wing. Somewhat below the middle of the

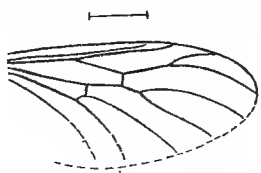

Fig. 27.—*Penthetria curtula*, Handlirsch.

wing, the media separates into two moderately divergent branches. The cubitus slopes downward in a fairly steep curve, and with its

posterior branch strikes the lower margin about in the centre. The first anal vein is strongly divergent. The mediocubital cross-vein is only one and one-half times as far removed from the radiomedial cross-vein as this is from the bifurcation of the media. The wing appears uniformly transparent, and only on the anterior border somewhat opaque.

Penthetria dilatata, sp. nov. Fig. 28.

Locality: Horsefly mine—(July 20, 1906. L.M.L.).

A remarkably broad wing 10^{mm} long, with slightly curved anterior margin and strongly arcuate posterior border. The breadth to the length is as 1:1·9. The radius, which bends slightly forward at the end, extends beyond seven-tenths the length of the wing. The sector arises just above the end of the first third of the wing's length, and is strongly sigmoid in curvature. It dichotomizes in half its length into widely divergent branches: the anterior of which is gently curved, and fuses in the margin midway between the radius and the

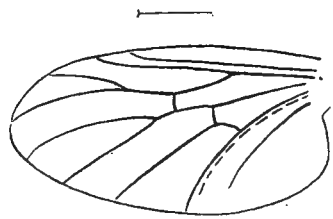

Fig. 28.—*Penthetria dilatata*, Handlirsch.

posterior branch of the sector. The radiomedial cross-vein lies somewhat farther from the origin than from the furcation of the sector and just above the middle of the wing. Somewhat below the centre of the wing the media divides into two strongly divergent branches. The cubitus with its posterior branch falls off abruptly but in a gentle curve toward the posterior border, which it strikes some distance above the centre. Behind the cubitus runs a parallel fold, and farther on a simple slightly divergent anal vein. The mediocubital vein lies one and one-half times as far above the radiomedial cross-vein as is the latter above the forking of the media. The costal region is densely opaque.

Penthetria platyptera, sp. nov. Fig. 29.

Locality: Horsefly mine—(July 20, 1906. L.M.L.).

A large very heavily built insect, with broad wings of subelliptical form, slightly curved anterior margin, and strongly arched posterior border, and with broadly rounded off apex. The radius extends seven-tenths the length of the wing and is only very gently curved. Its sector issues at the termination of the first third of the length of the wing, is very gently arcuate, and bifurcates in half its own length. The anterior branch is not widely divergent, although it is strongly curved and relatively long, and fuses in the margin equidistant from the radius and the posterior branch. The radiomedial cross-vein is situated some distance below the centre of the wing and three times as far from the base as from the fork of the sector. The media forms a relatively short but widely divergent bifurcation. The cubitus is very strongly curved, but fuses in the posterior margin just below the middle. The anal vein dichotomizes in half its own length. The mediocubital cross-vein is somewhat more than twice as far removed from the radiomedial cross-vein as is the latter from the furcation of the media. The entire wing is strongly pigmented, and is especially opaque toward the anterior margin.

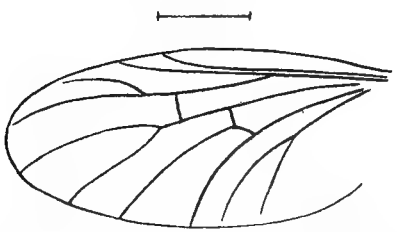

Fig. 29.—*Penthetria platyptera,* Handlirsch.

In addition to the foregoing species, which comprise 24 examples in all, there are 12 other specimens in the collection that undoubtedly belong in the genus Penthetria, yet are too imperfectly preserved to render the species sufficiently characteristic for identification. Eighteen other examples are certainly bibionids, and it is highly probable that all belong to the genus Penthetria, so that of the whole number of 73 insects, 54 may pertain to this bibionid genus. Only one form belonging to this family was hitherto known from this region, namely, *Penthetria similkameena,* Scudder, from

the Similkameen river. It is thought, however, from what is revealed by the description and illustration, that several species are included under this name.

Ptychoptevid :—

Etoptychoptera tertiaria, gen. et sp. nov. Fig. 30.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A portion of a wing 12^{mm} long, the entire length of which may have been about 14^{mm}. The anterior border is nearly straight, while the apical and posterior margins are distinctly rounded. The costa, subcosta, and radius lie very close to each other and are nearly parallel. The subcosta extends almost two-thirds the length of the wing and fuses in the costa. The radius continues nearly to the apex of the wing and fuses unbranched in the apical margin. Its sector originates quite near the base of the wing, and at one-third the length of the wing it separates into two widely divergent trunks, the anterior of which forms a long terminal fork, while the posterior branch divides into two short twigs, so that four branchlets are present. The media takes its course nearly through the centre of

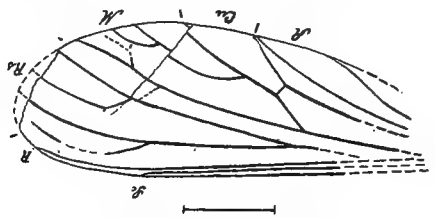

Fig. 30.—*Etoptychoptera tertiaria,* Handlirsch. (*Sc*=Subcosta, *R*=Radius, *Rs*=Sector radii. *M*=Media, *Cu*=Cubitus, *A*=Anal.)

the wing, and at one-third the wing's length it furcates into two main branches, the anterior of which is slightly arcuate and is parallel with the posterior branch of the sector; it fuses at the end of the posterior margin, and, if I mistake not, forms a short terminal fork. The posterior branch of the media, however, isues obliquely toward the anterior branch of the cubitus, with which it unites nearly at right angles; after a short common course these again separate, the posterior branch of the media curving toward the posterior margin and forming a short bifurcation, while the anterior

branch of the cubitus proceeds in its original direction. The posterior branch of the cubitus bends at an obtuse angle above the furcation, and fuses close to the first anal vein, which is gently curved. The second anal vein is slightly sigmoid in curvature. To all appearance this wing was transparent, the veins having opaque borders.

This fossil is of the greatest interest, since it departs essentially from all known recent and extinct ptychopterids, and exhibits very primitive characters. Thus, the radius with its sector is especially conspicuous, being still at the same stage as is found in the Liassic eoptychopterid *Eolimnobia geinitzi*, Handlirsch. Notwithstanding its transient fusion, the media, also, is much more primitive than in the recent genera Ptychoptera and Bittacomorpha; yet not more so than in *Macrochile spectrum*, Löw, from the amber, or in the recent but also very ancient forms, Tanyderus and Protoplasa. The media agrees best with the Liassic *Proptychoptera liasina*, Handlirsch. The development of the two anal veins is likewise very primitive.

Chironomidæ:—

In the year 1877, Scudder mentioned some chironomids from Quesnel without describing them.

Tipulidæ:—

Tipula tulameena, sp. nov. Fig. 31.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A wing at least 9^{mm} in length, about three times as long as broad, with a rather obliquely truncate apical border. The sector radii

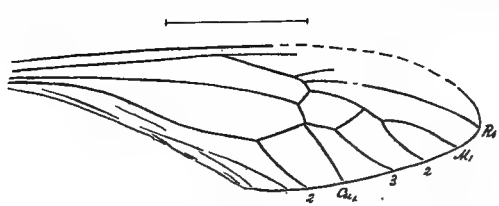

Fig. 31.—*Tipula tulameena*, Handlirsch. (Rs=Sector radii, M 1, 2, 3=Media, Cu 1, 2=Cubitus.)

arises about the middle of the length of the wing, and forms two normal branches. The media bifurcates in the usual way: its anterior branch is divided, and above the forking it unites with the

simple posterior branch by means of an oblique cross-vein, so that the typical irregularly pentagonal cell results. With its anterior branch—which is bent almost at right angles—the long, nearly sigmoid cubitus comes in contact with the posterior branch of the media, and with its own posterior branch extends close to the first anal vein. The normal opaque spot in the radial region is very large, and other more opaque places appear to have been present in the medial and cubital regions.

Of the species of Tipula from Florissant made known by Scudder, *T. maclurei* and *T. tartari* approach the nearest to similar marking; yet the correspondence is not so close that an identification could be attempted.

In addition to the foregoing species, there is in the collection an indeterminable tipulid from Tulameen river.

Asilidæ:—

In 1879, a form belonging to this family was cited by Scudder from British Columbia, but was not characterized.

Empidæ:—

Microphorus defunctus, sp. nov. Figs. 32 and 33.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A very small form, the body of which is scarcely more than 4^{mm} in length, with wings 4^{mm} long, the breadth and length being in the proportion of 1:2·3. The neuration can be made out only with great difficulty, but with the exception of the cubitus, which is not yet so strongly reduced, it appears to be rather similar to that of recent species of Microphorus.

The radius stretches about three-fourths the length of the wing; its sector arises very near the base, and just below its origin separates into two characteristic nearly straight branches. The media bifurcates approximately at the same distance as the sector; its anterior branch takes a nearly straight course, while the posterior branch slopes obliquely downward to unite with the anterior branch of the cubitus, then separating from the latter it proceeds obliquely toward the anterior branch of the media, with which it is connected by a cross-vein, finally bending at an obtuse angle toward the apical border. Thus is formed the characteristic medial cell, which extends two-fifths the length of the wing, is irregularly pentagonal, and

whose length is more than three times its height. The trunk of the cubitus reaches not quite a third the length of the wing; its branches diverge in opposite directions, so that they form an angle of 180° with the trunk. The posterior branch slopes obliquely backward toward the base of the wing, is somewhat shorter than the free portion of the anterior branch, and strikes the nearly straight anal vein about in the middle.

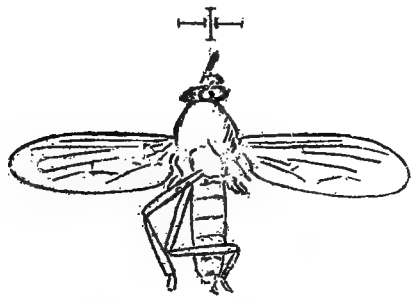

Fig. 32.—*Microphorus defunctus*, Handlirsch.

The abdomen is much narrower than the robust, highly arched thorax, and at most is half as long again as the latter. The head is short and broad, but is not easily made out. Two legs are preserved (? hind legs). Their femora are normal, have a little more than two-thirds the length of the abdomen, and are only slightly longer than the somewhat terminally expanded tibiæ. The tarsi also appear to have been somewhat expanded.

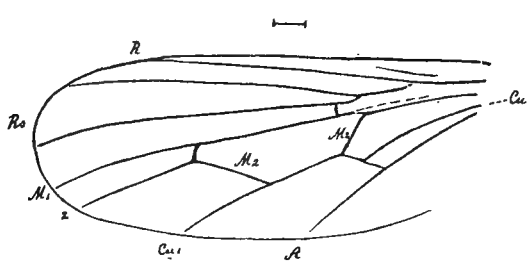

Fig. 33.—*Microphorus defunctus*, Handlirsch. (*R*=Radius, *Rs*=Sector radii, *M 1, 2*=Media, *Cu*=Cubitus, *A*=Anal.)

Dolichopodidæ:—

Dolichopus? sp., Scudder. (Quesnel.)

Borboridæ:—

Heteromyza senilis, Scudder. (Quesnel.)
Sciomyza revelata, Scudder. (Quesnel.)
Lonchaea senescens, Scudder. (Quesnel.)
Palloptera morticina, Scudder. (Quesnel.)
Lithortalis picta, Scudder. (Quesnel.)

Anthomyidæ:—

Anthomyia burgessi, Scudder. (Quesnel.)
Anthomyia inanimata, Scudder. (Quesnel.)

All these species mentioned by Scudder are in need of critical revision.

HEMIPTERA.

Gerridæ:—

Gerris stål̊i, Scudder. (Similkameen.)

The genus Telmatrechus established by Scudder on this species is not well founded.

Gerris defuncta sp. nov. Figs. 34 and 35.

Locality: Quilchena—(July 31, 1906. L.M.L.).

An entire insect without wings, which doubtless represents an apterous form, the body, including the head, measuring 15^{mm} in

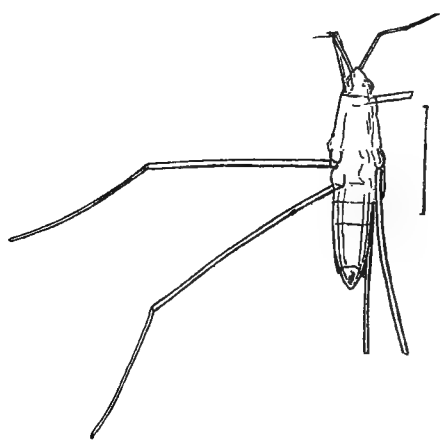

Fig. 34.—*Gerris defuncta,* Handlirsch.

length. The head is almost equilaterally triangular, with very slightly bulging eyes. The first and third joints of the antennæ are nearly equal in length, and singly are about a third longer than the second. The first is much longer than the head. The head and thorax taken together are somewhat longer than the abdomen, the thorax alone being somewhat shorter. The abdomen is nearly two and one-half times as long as it is broad at the base, and exhibits the slightly projecting corners of the preanal (7th) segment. The thorax is only a little wider than the abdomen and not more than one and one-half times as long as broad. The femora of the front legs are somewhat longer than their tibiæ, and reach scarcely one-third the length of the femora of the middle legs. The latter joints are distinctly shorter than those of the hind legs, and are as long as the thorax and abdomen taken together. The femora of the hind legs are as long as the head and body taken together. The length of the tibiæ of the middle legs is about five-sixths that of their femora, while the tibiæ of the hind legs are scarcely two-thirds as long as the femora.

These dimensions sufficiently characterize the species, and prove it to be distinct from *G. stali*.

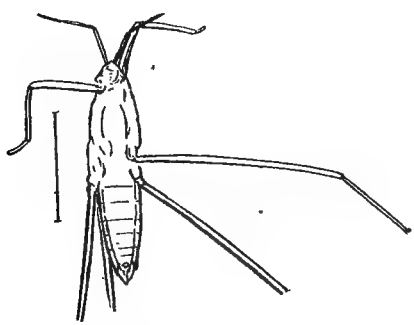

Fig. 35.—*Gerris defuncta*, Handlirsch

Pentatomidæ:—

Teleoschistus antiquus, Scudder. (Quesnel.)

In the present collection is found only one pentatomid form, and this does not permit of an exact identification.

HOMOPTERA.

Fulgoridæ:—

(*?Ricania antiquata*, Scudder. (Similkameen.)

(*??Enchophora*) sp., Scudder. (Similkameen.)

The latter fossil is of a most doubtful nature.

Cercopidæ:—

The following have been previously recorded from this region:—

Aphrophora, sp., Scudder. (Similkameen.)
Cercopis grandescens, Scudder. (Similkameen.)
Cercopis selwyni, Scudder. (Ninemile creek.)
?Cercopites torpescens, Scudder. (Similkameen.)
?Palecphora, sp., Scudder. (Similkameen.)
Stenolocris venosa, Scudder. (Similkameen.)
Stenecphora punctulata, Scudder. (Similkameen.)
Dawsonites veter, Scudder. (Similkameen.)
Palaphrodes sp., Scudder. (Similkameen.)
Palaphrodes, sp. Scudder. (Similkameen.)
Palæoptysma venosa, Scudder. (Similkameen.)
Ptysmaphora fletcheri, Scudder. (Similkameen.)

All these species need a thorough revision

In the material at hand is found a beautiful hind wing belonging to a very large species, which apparently agrees with none of the many forms described from the Tertiary:—

Aphrophora angusta sp. nov. Fig. 36.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

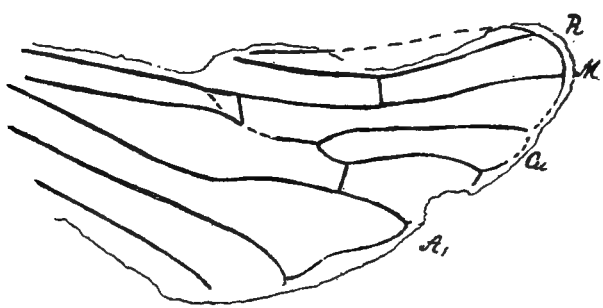

Fig. 36.—*Aphrophora angusta*, Handlirsch. (*R*=Radius, *M*=Media, *Cu*=Cubitus, *A*=Anal.)

The portion preserved measures 17mm in length, and permits the assumption that the total length of the wing may have been more than 20mm.

The radius and media are nearly parallel with each other, and at the first third of the wing are united by a cross-vein. The cubitus is distinctly curved, and in about the middle of the wing is joined to the media by a sloping cross-vein. At half the distance between the latter and the radiomedial cross-vein, the cubitus bifurcates into a large fork, which encloses a somewhat biscuit-shaped cell. The posterior branch of the cubitus is connected with the first anal vein by a cross-vein, the former being very strongly arcuate, while the two succeeding anal veins are straight. Here and there the marginal vein is well preserved, and from the radius to the first anal vein, especially between the two long veins, it forms a simple curve, while between the first and second anal veins, the curve is sigmoid.

There is no doubt that this species belongs in the genus Aphrophora in the strict sense, yet to-day this genus includes only numerous small forms.

An indistinct impression of a front wing (without anal area), likewise 17mm in length, from Tranquille river, may also be referred to the cercopids; as well as a small fragment of a wing from the Horsefly mine, but neither can be accurately determined.

To the auchenorrhynchous homopters also belongs a form identified by Scudder as *Cœlidia columbiana*. (Similkameen.)

Aphididæ:—

Sbenaphis quesneli, Scudder. (Quesnel.)

Lachnus petrorum, Scudder. (Quesnel.)

One wing described by Scudder as *Planophlebia gigantea* (Similkameen), and six fragments from the collection under discussion are so imperfectly preserved that, not even the order in which they belong can be determined with any degree of certainty.

CANADA

DEPARTMENT OF MINES

GEOLOGICAL SURVEY BRANCH

Hon. W. Templeman, Minister; A. P. Low, Deputy Minister;
R. W. Brock, Director.

SELECTED LIST OF REPORTS AND MAPS

(SINCE 1885)

OF SPECIAL ECONOMIC INTEREST

PUBLISHED BY

THE GEOLOGICAL SURVEY.

Reports of the Mines Section:—

No. 245.	Report of Mines Section,	1886.	No. 662.	Report of Mines Section,	1897.
272	"	"	1887.	698	"	"	1898.
*300	"	"	1888.	718	"	"	1899.
301	"	"	1889.	744	"	"	1900.
334	"	"	1890.	800	"	"	1901.
335	"	"	1891.	835	"	"	1902.
360	"	"	1892.	893	"	"	1903.
572	"	"	1893-4.	928	"	"	1904.
602	"	"	1895.	971	"	"	1905.
625	"	"	1896.				

Mineral Production of Canada:—

No. *414.	Year	1886.	No. *422.	Year	1893.	No. 719.	Year	1900.
*415	"	1887.	*555	"	1894.	719a	"	1901.
*416	"	1888.	*577	"	1895.	813	"	1902.
*417	"	1889.	*612	"	1896.	861	"	1903.
*418	"	1890.	623	"	1886-96.	896	"	1904.
*419	"	1891.	640	"	1897.	924	"	1905.
*420	"	1886-91.	671	"	1898.	981	"	1906.
*421	"	1892.	686	"	1899.			

Mineral Resources Bulletins:—

No. *818. Platinum.	No. 860. Zinc.	No. 881. Phosphate.
851. Coal.	869. Mica.	882. Copper.
*854. Asbestos.	872. Molybdenum and Tungsten.	913. Mineral Pigments.
857. Infusorial Earth.	*877. Graphite.	953. Barytes.
858. Manganese.	880. Peat.	984. Mineral Pigments. (French).
859. Salt.		

Reports of the Section of Chemistry and Mineralogy:—

No. *102.	Year	1874-5.	No. 169.	Year	1882-3-4.	No. 580.	Year	1894.
*110	"	1875-6.	222	"	1885.	616	"	1895.
*119	"	1876-7.	246	"	1886.	651	"	1896.
126	"	1877-8.	273	"	1887-8.	695	"	1898.
138	"	1878-9.	299	"	1888-9.	724	"	1899.
148	"	1879-80.	333	"	1890-1.	821	"	1900.
156	"	1880-1-2.	359	"	1892-3.	*958	"	1906.

* Publications marked thus are out of print.

REPORTS.

GENERAL.

745. Altitudes of Canada, by J. White. 1899.
*972. Descriptive Catalogue of Minerals and Rocks, by R. A. A. Johnston and G. A. Young.
1073. Catalogue of Publications: Reports and Maps (1843-1909).
1085. Descriptive Sketch of the Geology and Economic Minerals of Canada, by G. A. Young, and Introductory by R. W. Brock. Maps No. 1084; No. 1042 (second edition), scale 100 m. = 1 in.
1086. French translation of Descriptive Sketch of the Geology and Economic Minerals of Canada, by G. A. Young, and Introductory by R. W. Brock. Maps No. 1084; No. 1042 (second edition), scale 100 m. = 1 in.
1107. Part II. Geological position and character of the oil-shale deposits of Canada, by R. W. Ells.

YUKON.

*260. Yukon district, by G. M. Dawson. 1887. Maps No. 274, scale 60 m. = 1 in.; Nos. 275 and 277, scale 8 m = 1 in.
*295. Yukon and Mackenzie basins, by R. G. McConnell. 1889. Map No. 304, scale 48 m. = 1 in.
687. Klondike gold fields (preliminary), by R. G. McConnell. 1900. Map No. 688, scale 2 m. = 1 in.
884. Klondike gold fields, by R. G. McConnell. 1901. Map No. 772, scale 2 m. = 1 in.
*909. Windy Arm, Tagish lake, by R. G. McConnell. 1906. Map No. 916, scale 2 m. = 1 in.
943. Upper Stewart river, by J. Keele. Map No. 938, scale 8 m. = 1 in.
951. Peel and Wind rivers, by Chas. Camsell. Map No. 942, scale 8 m. = 1 in. } Bound together.
979. Klondike gravels, by R. G. McConnell. Map No. 1011, scale 40 ch. = 1 in.
982. Conrad and Whitehorse mining districts, by D. D. Cairnes. 1901. Map No. 990, scale 2 m. = 1 in.
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ONTARIO.

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NOVA SCOTIA.

243. Guysborough, Antigonish, Pictou, Colchester, and Halifax counties, by Hugh Fletcher and E. R. Faribault. 1886.
331. Pictou and Colchester counties, by H. Fletcher. 1890-1.
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MAPS.

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YUKON.

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894. Sketch Map Kluane Mining district, scale 6 m. = 1 in.
*916. Windy Arm Mining district, Sketch Geological Map, scale 2 m. = 1 in.
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991. Tantalus and Five Fingers coal mines, scale 1 m. = 1 in.
1011. Bonanza and Hunker creeks. Auriferous gravels. Scale 40 chains = 1 in.
1033. Lower Lake Laberge and vicinity, scale 1 m. = 1 in.
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1026, 1044-1049. Whitehorse Copper belt. Details.

BRITISH COLUMBIA.

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890. Nicola coal basin, scale 1 m. = 1 in.
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987. Princeton coal basin and Copper Mountain Mining camp, scale 40 ch. = 1 in.
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1002. Special Map of Rossland. Geological sheet. Scale 400 ft. = 1 in.
1003. Rossland Mining camp. Topographical sheet. Scale 1,200 ft. = 1 in.
1004. Rossland Mining camp. Geological sheet. Scale 1,200 ft. = 1 in.
1068. Sheep Creek Mining camp. Geological sheet. Scale 1 m. = 1 in.
1074. Sheep Creek Mining camp. Topographical sheet. Scale 1 m. = 1 in.
1095. 1A.—Hedley Mining district. Topographical sheet. Scale 1,000 ft. = 1 in.
1096. 2A.—Hedley Mining district. Geological sheet. Scale 1,000 ft. = 1 in.
1105. 4A.—Golden Zone Mining camp. Scale 600 ft. = 1 in.
1106. 3A.—Mineral Claims on Henry creek. Scale 800 ft. = 1 in.
1125. Hedley Mining district: Structure Sections. Scale 1,000 ft. = 1 in.

ALBERTA.

594-596. Peace and Athabaska rivers, scale 10 m. = 1 in.
*808. Blairmore-Frank coal-fields, scale 180 ch. = 1 in.
892. Costigan coal basin, scale 40 ch = 1 in.
929-936. Cascade coal basin. Scale 1 m. = 1 in.
963-966. Moose Mountain region. Coal Areas. Scale 2 m. = 1 in.
1010. Alberta, Saskatchewan, and Manitoba. Coal Areas. Scale 35 m. = 1 in.
1117. 5A.—Edmonton. (Topography). Scale ½ m. = 1 in.
1118. 6A.—Edmonton. (Clover Bar Coal Seam). Scale ½ m. = 1 in.
1132. 7A.—Bighorn Coal-field. Scale 2 m. = 1 in.

SASKATCHEWAN.

1010. Alberta, Saskatchewan, and Manitoba. Coal Areas. Scale 35 m. = 1 in.

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804. Part of Turtle mountain showing coal areas, scale 1½ m. = 1 in.
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*668. Graphite district in Labelle county, scale 40 ch. = 1 in.
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976. The Older Copper-bearing Rocks of the Eastern Townships, scale 8 m. = 1 in.
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833. Pictou coal-field, scale 25 ch. = 1 in.
897. Preliminary Geological Plan of Nictaux and Torbrook Iron district, scale 25 ch. = 1 in.
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