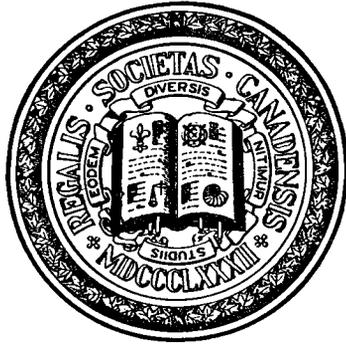


TRANSACTIONS OF  
THE ROYAL SOCIETY  
OF CANADA

SECTION IV  
GEOLOGICAL SCIENCES  
INCLUDING MINERALOGY



THIRD SERIES—VOLUME XXI—PART II—SECTION IV  
MAY, 1927

OTTAWA  
THE ROYAL SOCIETY OF CANADA  
1927

*Some Canadian Jurassic Faunas\**

F. H. McLEARN, F.R.S.C.

At the present time too little is known of our Canadian Jurassic faunas to permit offering anything like a comprehensive treatment of them. Gradually, however, more is being learned. To this increasing knowledge the writer has endeavoured to contribute, and in the last few years, in time available, has attempted a study of some Jurassic Ammonoidea with the advice and guidance of Mr. S. S. Buckman, F.G.S., an English authority on this group of fossils. His help has been very considerable, and is gratefully acknowledged, but he should not be held responsible for any mis-statements in the following pages. Particular attention has been given to the Jurassic Ammonoidea of Skidegate inlet, Queen Charlotte Islands, and a report on two of the most important families is now ready for publication as the first of a series of Contributions to the Stratigraphy and Palaeontology of Skidegate inlet. The Ammonoidea and Pelecypoda of the Hazelton group of Hudson Bay mountain, collected by G. Hanson, have been studied<sup>1</sup>, as have also, in a preliminary way, some of the faunas of the Fernie Jurassic formation of the Rocky Mountains.

*English Jurassic Chronology*

At the very outset of our study of Canadian Jurassic faunas, an important difficulty is met with. Although there are a number of faunas, for the most part only one or two are known at each locality and in each section. Thus arises the difficulty of establishing their order of succession. With increasing knowledge this situation may improve, but at present the only way out of the difficulty is comparison with foreign established sections. As a beginning it has been found convenient to compare with the English Jurassic, the stratigraphy and chronology of which has been worked out in great detail, chiefly through the faunal studies of S. S. Buckman, based principally on the Ammonoidea<sup>2</sup> and subordinately on the Brachiopoda<sup>3</sup>.

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<sup>1</sup>Geol. Surv. Can., Bull. 44, pp. 89-99, pls. 19-25 (1926).

<sup>2</sup>Buckman, S. S.: Type Ammonites, IV, pt. 34, pp. 5-18 (1922).

<sup>3</sup>Buckman, S. S.: Quart. Jour. Geol. Soc. London, 83, pt. 1, pp. 1-37, pl. 1 (1927).

The study of the English Jurassic dates from almost the beginning of the study of Stratigraphy itself. Much of William Smith's pioneer work, at the end of the eighteenth and beginning of the nineteenth century, was on English Jurassic strata and faunas. Many of the English formation names are his, Combrash, Coral Rag, etc. By the time of the publication of Conybeare and Phillip's *Geology of England and Wales*, in 1822, the principal lithological units had been distinguished and named, their succession established, and much was known of their contained faunas. Later arose a classification in which the names end in "ian", e.g. Bajocian, Callovian, Argovian, etc. Buckman's chronology of the Jurassic period embraces 43 ages, and each age includes a number of hemeras. These time terms are based on the duration of certain ammonoid genera, etc., and are named after them. The ages end in "an", e.g. Sonninian, Stepheoceratan, Proplanulitan, etc. The Middle Jurassic begins with the Sonninian age<sup>4</sup>, and the Upper Jurassic is provisionally assumed to begin with the Macrocephalitan age.

#### *Skidegate inlet (Section 1)*

MacKenzie<sup>5</sup> grouped the Jurassic strata of Skidegate inlet in two formations, the Yakoun and Maude, the former approximately the equivalent of the Agglomerates and the latter approximately of the Lower Sandstones of Dawson's report<sup>6</sup>. The typical Maude consists of argillites overlain by volcanic breccias made up partly of fragments of sedimentary rocks and interbedded with argillites and tuffaceous rocks. The Yakoun overlies the Maude conformably and consists of thinbedded tuffaceous sediments, followed by a great thickness of tuff and coarse massive agglomerate, which at the top passes from tuff, through bedded tuffaceous sediments, to sandstone and shale. The Cretaceous (late Lower) Haida formation overlies the Yakoun with angular unconformity.

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<sup>4</sup>The most satisfactory, and probably the most favoured general division of the Jurassic, based on the Ammonoidea, is a two-fold one, into Lower and Upper. However, for the use of geologists, not familiar with the more elaborate chronologies, a three-fold division is, for the time being, retained and defined as in the text above. No claim is, or can be, made that equal lengths of time are represented. In terms of Buckman's ages they are not by any means equal.

<sup>5</sup>MacKenzie, J. D.: *Geol. Surv. Can. Mem.* 88, p. 11 (1916).

<sup>6</sup>Dawson, G. M.: *Geol. Surv. Can., Rept. Prog.*, 1878-79, pp. 1B-239B (1880).

The Maude was dated by Stanton as probably Lower Jurassic<sup>7</sup>. It contains several faunas not as yet studied in detail. One fauna in the argillites on the south shore of the inlet, just west of Alliford bay, contains several species of "*Harpoceras*" and "*Dactylioceras*" of Harpoceratan or Hildoceratan age, i.e. early upper Lias time. Below it, and, therefore, also in the argillites, is a fauna with "*Sequinziceras*" of somewhat earlier date. Another Lower Jurassic fauna occurs in the argillites on the southeast shore of Maude island and is the one described by Whiteaves<sup>8</sup> from the lower sandstones. It includes "*Oxynoticeras*", *Pecten carlottensis* Whiteaves, etc.

Stanton has correlated the Yakoun with a part of the Middle Jurassic Tuxedni sandstone of Alaska<sup>9</sup>. The basal sedimentary part of the Yakoun is fossiliferous at Mackenzie and Richardson bays, on opposite sides of Maude island. At Mackenzie bay, on the northwest shore, the following ammonoids have been found: *Zemistephanus richardsoni* (Whiteaves), *Z. funteri* n. sp., *Z. vancouveri* n. sp., *Kanastephanus crickmayi* n. sp., *K. mackenzii* n. sp., *K. altus* n. sp., and *K. canadensis* n. sp. *Teloceras itinsae* n. sp. was found in the talus. At Richardson bay on the southeast shore the following ammonoids were found: *Defonticeras colnetti* n. sp., and *D. elli* n. sp.; *Defonticeras defontii* n. sp., *D. maudense* n. sp., and *D. marchandi* n. sp. were found in talus on the basal Yakoun ledges at this locality. It is probable that *Defonticeras oblatum* (Whiteaves) came from this horizon and locality. The *Zemistephanus* and *Defonticeras* faunas have affinities with those of late Sonninian age in the English Jurassic. The *Teloceras* may be of a third fauna. In the English Jurassic it is of middle Stepheoceratan age. The faunas are therefore of about middle Bajocian, or lower Middle Jurassic time, and the beds containing them are to be correlated with the middle part of the Middle Inferior Oolite of England. The fauna in the Yakoun of the southernmost of the Channel islands is of about the same date as that of the faunas at Richardson and Mackenzie bays; it includes *Itinsaites itinsae* n. sp.

Near the top of the formation, above the volcanic ash and coarse agglomerate, in the top sedimentary beds, is a much later fauna of early Upper Jurassic age. The strata containing this fauna occur at the east end of Maude island and at Alliford bay. The fauna includes the following ammonoids: *Yakounites plenus* n. sp., *Y. multus*

<sup>7</sup>MacKenzie, J. D.: Geol. Surv. Can. Mem. 88, p. 46 (1916).

<sup>8</sup>Geol. Surv. Can. Mesozoic Foss. I, pt. 3, pp. 247-253, pl. 33 (1884).

<sup>9</sup>MacKenzie, J. D.: Geol. Surv. Can. Mem. 88, p. 50 (1916).

n. sp., *Yakounoceras gitinsi* n. sp., *Yr. abruptus* n. sp., *Yr. torrensi* n. sp. and *Galilacites ? penderi* n. sp. The ammonoids *Yr. ingrahami* n. sp. and *Yakounites loganius* (Whiteaves) were collected at Alliford bay by G. M. Dawson and probably are from this faunal zone. *Toricelliceras newcombi* (Whiteaves) was collected at Alliford bay by Dr. Newcombe and is probably from somewhere in this upper sedimentary part of the Yakoun. The affinities of the ammonoids, with the exception of the *Toricelliceras*, are with those of early<sup>10</sup> Proplanulitan age in England. *Toricelliceras* in the English Jurassic is of late Macrocephalitan age. These highest Yakoun fossiliferous sedimentary strata therefore are of Upper Jurassic time.

The range of the Yakoun formation is thus from late Sonnian to early Proplanulitan, or early Middle to early Upper Jurassic. The volcanic activity resulting in the thick accumulation of tuff and coarse agglomerate was in the Middle Jurassic, probably sometime between middle Stepheoceratan and late Macrocephalitan, in Buckman's chronology. Some of the ash and agglomerate may have accumulated quite rapidly. In the Maude island section along the shore northeast of Richardson bay there is evidence of at least one decided halt in the accumulation. By early Upper Jurassic time, volcanic activity appears to have ceased, at least temporarily and locally. The earlier stage of volcanic activity in late Maude and probably late Lower Jurassic time resulted in the shattering of sedimentary rocks, fragments of which are found in the fine breccias formed at that time.

A long time is represented by the break between the Yakoun and overlying Cretaceous Haida formation, equal to much of the Upper Jurassic and much of the Lower Cretaceous. It is not possible, therefore, to date accurately the earth movements and batholithic intrusion which took place at some time in this long interval.

#### *Hudson Bay and Babine Mountains (Section 2)*

Hudson Bay and Babine mountains are in west central British Columbia and are on the east side of the Coast Range batholith, whereas Skidegate inlet is on the west side. The stratigraphy has been worked out by Hanson<sup>11</sup>. The Hazelton group consists of the

<sup>10</sup>Buckman, S. S.: Personal communication.

<sup>11</sup>Hanson, G.: Geol. Surv. Can. Summ. Rept. 1924, A, pp. 24A-27A (1925).

Hanson, G.: Geol. Surv. Can. Summ. Rept. 1925, A, pp. 104A-107A (1926).

Jones, R. H. B.: Geol. Surv. Can. Summ. Rept. 1925, A, pp. 122A-124A (1926).

following four divisions:

Upper sedimentary division.

Upper volcanic division.

Middle sedimentary division

Lower volcanic division.

The base is not known, but there are Triassic sediments<sup>12</sup> in the western part of the area, on which they may directly rest. The lower volcanic division consists of stratified red tuffs above, and of tuffs, breccias and lava flows below. The middle sedimentary division consists of argillites, quartzites and argillaceous quartzites. The upper volcanic division is made up of tuffs, coarse breccias, lava flows, etc. The upper sedimentary division contains argillites, argillaceous quartzites, etc. The Hazelton group is overlain unconformably by the Cretaceous Skeena formation. Fossils from the middle sedimentary member on Babine mountain include *Sonninia propinquans* Bayle, identified by S. S. Buckman. The date of this species in the English Jurassic is the *sauzei* hemera of the later part of the Sonninian age. Fossils from the middle sedimentary division near Silver lake, Hudson Bay mountain, include *Sonninia hansonii*, *Sonninites silveria*, *S. skawahi*, *Guhsania bella*, *G. ramata*, *Ctenostreon gikshanensis*, *Lima tizglensis*, *Plagiostoma hazzeltonense*, *Trigonia guhsani*, *Serpula socialis* Goldfuss, etc.<sup>13</sup> The affinities of this fauna are with the faunas of the *sauzei* to *Epalxites* hemeras in the English Jurassic time scale, i.e. late Sonninian to early Stepheoceratan or middle Bajocian or early Middle Jurassic. The rocks containing this fauna are to be correlated with the middle part of the Middle Inferior Oolite of England.

It is interesting to compare this with the Skidegate section. In both there is a fossiliferous sedimentary horizon of early Middle Jurassic age but thinner and more tuffaceous in composition at Skidegate inlet. In both sections this sedimentary division is followed by tuffs and coarse massive agglomerates, which, however, are somewhat more basic at Skidegate inlet. Similarly also the volcanic rocks are succeeded by sediments in both sections, but on Hudson Bay and Babine mountains they are not fossiliferous, and therefore the date of the cessation of volcanic activity is not known there as at Skidegate inlet.

The early Middle Jurassic marine sedimentary beds at both localities are preceded by rocks which have resulted from volcanic

<sup>12</sup>Hanson, G.: Geol. Surv. Can. Summ. Rept. 1925, A, p. 103A (1926).

<sup>13</sup>McLearn, F. H.: Geol. Surv. Can. Bull. 44, pp. 89-99, pls. 19-25 (1926).

action, but at Skidegate inlet they are much thinner, consist chiefly of fine breccias, which contain many fragments of sedimentary rocks, chiefly argillites, are interbedded with argillite, etc., and are preceded by a considerable thickness of argillite containing marine faunas of Lower Jurassic age. The Coast Range batholith is intrusive into the Hazelton group, but not into the Cretaceous (probably lower) Skeena<sup>14</sup>; but as the age of the upper part of the Hazelton group is not known, and the exact age of the Skeena has not been determined, the intrusion cannot now be accurately dated.

*Big Creek, Chilcotin River, B.C. (Section 3)*

Another ammonoid-bearing fauna, the age of which has been determined, is that found on the head of Big creek, Chilcotin river, northwest of Lillooet, B.C.<sup>15</sup> Unfortunately its position in the local formations is not known. The ammonoids have been described by Reeside, who records the following: *Cardioceras canadense*, Whiteaves, *C. lillooetense* Reeside, and *C. whiteavsi* Reeside<sup>16</sup>. He dates this fauna as Argovian. The writer has not studied this fauna, but the genus *Cardioceras* is of Cardioceratan or middle Upper Jurassic age in the English Jurassic. Reeside finds in the same collection *Aucella* cf. *bronni* Quenstedt, which he considers to be of somewhat later date, or Kimmeridgian. This is the youngest Jurassic fauna now known in British Columbia, and it is very important that its stratal position be determined. As the neighboring district contains also early Cretaceous *Aucella* bearing strata<sup>17</sup> (in the Eldorado series) this general area should be a good one for dating intrusions and earth movements of late Jurassic and early Cretaceous time.

In the Rocky mountains, the Fernie includes all of the known Jurassic strata. As pointed out by the writer<sup>18</sup> some time ago, this formation contains a number of Jurassic faunas representing a long time range.

*Near Fernie, B.C. (Section 4)*

Another middle Upper Jurassic fauna is represented by a specimen of *Cardioceras canadense* Whiteaves<sup>19</sup> found by McEvoy in the Fernie

<sup>14</sup>Hanson, G.: Geol. Surv. Can. Sum. Rept. 1924, A, p. 41A (1925).

<sup>15</sup>Reeside, J. B., Jr.: U.S.G.S., Prof. Pap. 118, p. 9 (1919).

<sup>16</sup>Ibid, p. 9.

<sup>17</sup>McCann, W. S.: Geol. Surv. Can., Mem. 130, p. 35 (1922).

<sup>18</sup>Geol. Surv. Canada, Summ. Rep. for 1922, B, p. 6B (1923).

<sup>19</sup>Whiteaves, J.: Ottawa Nat., 17, pp. 65-67, Figs. 1, 1a.

Reeside, J. B., Jr.: U.S.G.S., Prof. Pap., 118, p. 20, pl. 17, Figs. 5-11 (1911).

formation near Fernie, B.C., in southeastern British Columbia. It is the youngest of the Jurassic or Fernie faunas in the Rocky mountains, but its stratigraphic position in the formation is not known. An ichthyosaur skeleton has also been collected in the Fernie of this area.

*Blairmore, Alta. (Section 5)*

The Fernie formation has the following section in the Blairmore and Southfork areas, but the Lille member has only been found in the north and the green bed in the centre and south.

180' thin bedded sandstone and shale (passage beds).

50' and less, green (glauconitic ?) sandstone and shale.

600'-700' greenish and light and dark gray shale with thin layers of fossiliferous calcareous fine sandstone.

6' fossiliferous calcareous grit (Lille member).

100' dark gray sandstone.

1' conglomerate.

The basal conglomerate<sup>20</sup> rests disconformably on a Palaeozoic formation (the Permian Rocky Mountain quartzite ?). The passage beds, at the top, pass into the basal thick sandstone of the Kootenay formation without any apparent break. The Lille member carries the *Chlamys mcconnelli* faunule containing the following pelecypod species: *Chlamys mcconnelli*, *Alectryonia informis*, *A. mcevoyi*, *Camptonectes* sp., *Lima stantoni*, *L. whitearsi*, *L. dowlingi*, *Plagiostoma blairmorensis*<sup>21</sup> and numerous small immature shells of *Ostrea* and *Gryphaea*. All the species of this fauna are new and no Ammonoidea are present, so that its correlation is difficult. Of the eight species, six are entirely unlike anything in the succeeding or *Corbula munda* faunule, but two show some resemblance. The difference in age between the two faunules may not be as great as the unlikeness in composition suggest, however, for there is evidence of very different environmental conditions: the grain of the sediment of the Lille or *C. mcconnelli* bottom is much coarser than that of the *C. munda* bottom; *Gryphaea* spat were able to settle in abundance on the Lille bottom, but some factor inhibited their growth beyond 10 mm. there, whereas on the *C. munda* bottom they grew to adult size; *Camptonectes* grew to a large size on the Lille bottom and only to a small size on the *C. munda* bottom. The *C. munda* faunule can be dated fairly

<sup>20</sup>Geol. Surv. Can. Summ. Rept. 1915, p. 111 (1916).

<sup>21</sup>For descriptions of these species see Trans. Roy. Soc. Can. Section IV, 1924, pp. 39-61, pls. 1-9.

accurately. In the Grassy mountain section it occurs in the upper middle beds of the formation, in the fine calcareous sandstone lenses, approximately from 450 to 595 feet above the Lille member. It is the most prolific of the faunules and contains 25 species of pelecypods, including *Gervillia ferrieri*, *Inoceramus obliquiformis*, *Oxytoma blairmorensis*, *Pseudomonotis ferrieri*, *Gryphaea impressimarginata*, *Trigonia ferrieri*, *Lima albertensis*, *Modiolus rosii*, *Thracia canadensis*, *Corbula munda*<sup>22</sup>, etc. It contains also species of the ammonoids *Miccocephalites* S. Buckman Mss., *Metacephalites* S. Buckman Mss. and *Paracephalites* S. Buckman Mss. The Ammonoidea of this fauna are compared by Buckman with those of the *Catacephalites* hemera of the Proplanulitan age in the English Jurassic. It is thus another early Upper Jurassic fauna. The green beds carry *Belemnites*, ichthyosaur bones, etc., and cannot now be correlated. The passage beds contain indeterminate pelecypods, fish bones, fin rays, fish scales, shark and other fish teeth and a vertebra of a herbivorous dinosaur, as identified by C. M. Sternberg. This fauna is marine with the exception of the dinosaur bone, which must have been washed into the sea from the land.

#### *Sheep River, Alta. (Section 6)*

An interesting fauna has been collected by J. R. Marshall from the base of the Fernie formation on the upper part of Sheep river. Professor Allan also has furnished an ammonoid specimen from this bed. It includes the ammonoids *Stemmatoceras albertense* n. sp., *Saxitoniceras allani* n. sp., and *Saxitoniceras marshalli* n. sp., numerous pelecypods and a few brachiopods and gastropods. The affinities of the ammonoids are with those of early Stepheoceratan age in the English Jurassic, i.e. with faunas of slightly later date than those with which the *Defonticeras* and *Zemistephanus* faunas of the lower Yakoun show affinities. All, however, are of early Middle Jurassic age. This fossiliferous bed at the base of the Sheep River, Fernie section, is underlain<sup>23</sup> by Triassic shales and is followed by 200 feet of shale, 150 feet of shale with sandstone layers and 100 feet of sandstone and shale, which grade into the basal sandstone of the Kootenay formation<sup>24</sup>. The age of the beds above the fossiliferous

<sup>22</sup>For description of these species see Trans. Roy. Soc. Can. Section IV, 1924, pp. 39-61, pls. 1-9.

<sup>23</sup>J. R. Marshall: Personal communication.

<sup>24</sup>Marshall, J. R.: Personal communication.

layer, and therefore the greater part of the Fernie of this locality, is not known.

*Kananaskis River, B.C.* (Section 7)

In 1908 McEvoy collected an ammonoid on Ribbon creek, Kananaskis river, south of Banff, and presumably from the Fernie formation, but the horizon is not known. This ammonoid *Yakounites mcevoyi* n. sp. is interesting because it is generically identical with species in the upper Yakoun formation at Skidegate inlet, and is of the same age. It is important that its stratigraphic position in the formation be determined.

*Minnewanka Lake, Alta.* (Section 8)

The fauna collected by McConnell at Minnewanka lake many years ago contains Sonniniines, including at least one new genus to which *Schloenbachia gracilis* Whiteaves<sup>25</sup> belongs. A few years ago this fauna was dated by the writer as Bajocian (near *Witchellia*)<sup>26</sup> and no further work has been done on it. In England the subfamily Sonniniinae dates from the *concauum* hemera of the late Ludwiglian age to about the Epalxites hemera of the Stepheoceratan age, i.e., from very latest Lower Jurassic to early Middle Jurassic. C. H. Crickmay has announced the discovery of a Lower Jurassic fauna in the Rocky mountains<sup>27</sup>. If he is referring to this locality and fauna, and if his correlation of Lower Jurassic is correct, the part containing the Sonniniinae can only be of very late Lower Jurassic date or there is more than one Jurassic fauna at this locality.

*Mountain Park, Alta.*

In the Mountain Park area a fauna has been found in the lower part of the Fernie formation, 200 feet above the base, by B. R. McKay and others. This fauna has not yet been studied in detail. It is certainly Jurassic and may be another Middle Inferior Oolite or early Middle Jurassic fauna.

*Peace River, Alta.*

The Pine River Shales on Pine river are probably Jurassic, as Spicker suggests, and are probably a northern extension of the Fernie

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<sup>25</sup>Geol. Surv. Can., Contrs. Can. Pal. I, pt. 4, p. 171, pl. 23 (1889).

<sup>26</sup>Geol. Surv. Can. Summ. Rept. 1922, B, p. 6B (1923).

<sup>27</sup>Bull. Geol. Soc. Amer. 36, p. 231 (1925).

formation. On Peace river there are black shales between the Triassic Schooler Creek formation and the Bull Head Mountain Formation, which contain poor marine pelecypods. They are presumably the Pine River shales. A few marine pelecypods also occur at the very base of the Bull Head Mountain formation. No ammonoids were found and no correlation can be made. The underlying Schooler Creek formation consists of limestone, calcareous quartzites, etc., and has the following fossil zones, all of Upper Triassic age:

1. *Pseudomonotis subcircularis*. Noric.
2. The Ammonoids *Drepanites*, "*Ceratites*" n. gen. and sp., *Polychus* ? *Eutomoceras*, *Sagenites*, *Anatomites*, *Juvavites* (*Griesbachites* ?), and pelecypods, Noric ? (Probably more than one zone).
3. The Terebratula beds. *Terebratula*, *Spiriferina*, *Nathorstites* ? etc., Karnic ?
4. *Dawsonites canadensis*, *Nathorstites mcconnelli*, *Lobites* n. sp. "*Isculites*" n. gen. and sp., "*Steinmannites*" ? n. sps. (new gen.), *Nautilus* sp., Karnic.

Comparing the Jurassic of the Canadian Rocky mountains, i.e., the Fernie formation, with the Jurassic terranes of western British Columbia and the Pacific coast, the deposits are much thinner, they include no volcanic products, and their known faunas have a shorter range, from early Middle Jurassic, or at best the very latest, Lower Jurassic to middle Upper Jurassic (about Sonninian to Cardioceratan in Buckman's chronology). Two faunas are very similar: the *Cardioceras* fauna of Big creek, Chilcotin river, B.C., according to Reesides identifications<sup>28</sup>, has a species in common with the fauna of the Fernie formation near Fernie, B.C., *Cardioceras canadense* Whitcaves; the upper Yakoun fauna of Skidegate inlet has the genus *Yakounites* in common with a Fernie fauna on Kananaskis river.

It is difficult to explain why the Fernie formation carries faunas of different age or composition at almost every locality. Two faunas that can be dated have not so far been found in any one section and locality. Was the Fernie a shifting sea or a sea in which the site of deposition shifted from one place to another, i.e., do the Fernie strata represent different ranges of time in different localities; or have the strata of all localities approximately the same, and a long, time range, and is it by chance that a fauna of only one horizon and age has been preserved or found at any locality? This problem will be more easily

<sup>28</sup>Reeside, J. B., Jr.: U.S.G.S., Prof. Pap. 118, p. 21 (1919).

# 2. HUDSON BAY, BABINE MTS.

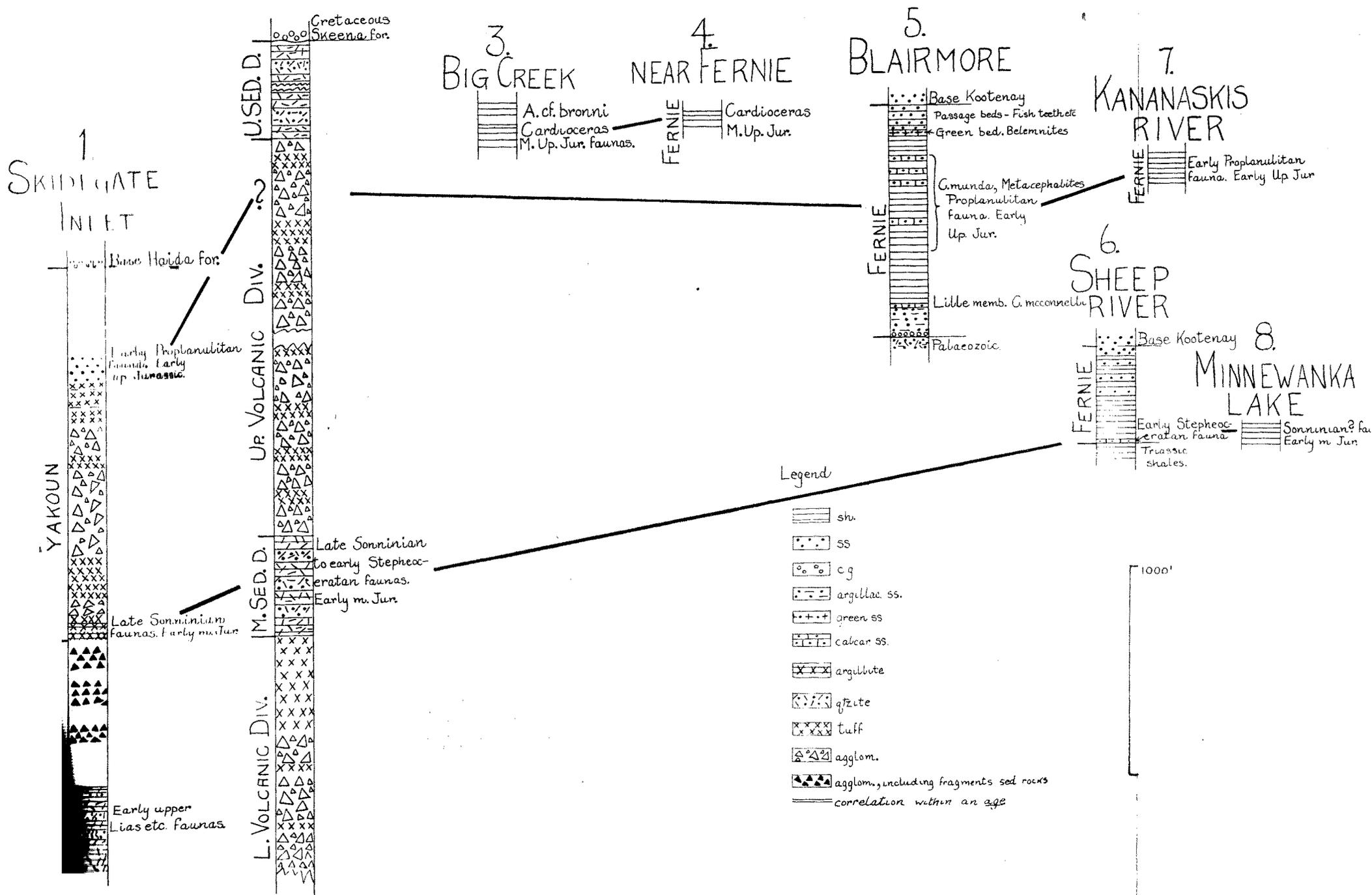


Fig. 1. Stratigraphic Relations of some Canadian Jurassic Faunas.

solved when the exact stratigraphic ranges of the known faunas in the Fernie are better known and when more faunas are found and their horizons determined. To establish the second hypothesis it will be necessary to find two or more dateable faunas at each locality.

Reviewing the faunas as a whole, it is very noticeable how common those of early Middle Jurassic, i.e. of the Sonninian and Stepheoceratan ages, are; e.g., the lower Yakoun faunas, the faunas of the middle sedimentary division of the Hazelton group, the fauna at the base of the Fernie formation on Sheep river, probably a part at least of the fauna or faunas at Minnewanka lake, and possibly the Fernie fauna at Mountain Park. They are not all exactly of the same date, and some are characterized by the ammonoid families Shepheoceratidae and Sphaeroceratidae, and others by the sub family Sonnininae. Early Upper Jurassic faunas, of Proplanulitan age, are next of importance and are found at several places, e.g. the Upper Yakoun fauna at Skidegate inlet, the *C. munda* or *Metacephalites* fauna at Blairmore and the *Yakounites* fauna on Kananaskis river.

#### *Palaontology*

The Jurassic Ammonoidea of the families Sphaeroceratidae and Gowericeratidae will be described and figured in a report now completed. In the meantime a brief description is herein given of each new genus and also of each genotype if new. The writer is much indebted to Mr. S. S. Buckman, F.G.S., for valuable advice, but accepts full responsibility for the interpretations offered.

*Yakounites* n. gen. Abrupt umbilical enlargement on the outer whorl produces almost a scaphiticone. Single row of lateral tubercles. The suture line is deeply cut. L1 is narrower and longer than EL, not shorter than, as in the tuberculate genera *Galilaeanus* S. Buckman, *Gowericeras* S. Buckman, and *Galilaeiceras* S. Buckman. A long accessory lobe is present on the inner side of ES. Genotype, *Yakounites plenus* n. sp.

*Yakounites plenus* n. sp. (Plate 1, Fig. 1). 117,50, 57.4, 18.5. It is somewhat larger and has stouter whorls than *Yakounites loganianus* (Whiteaves). There are 4 secondary, narrow elevated ribs to each primary and a total of about 135 on the outer whorl. Nat. Mus. of Canada; holotype, Cat. No. 9000.

*Yakounoceras* n. gen. Some umbilical contraction, followed on outer whorl by abrupt umbilical enlargement. An outer whorl passes from about sphaeroconic to about scaphiticonic. Compared with

*Yakounites* has a simpler, less deeply cut, suture line, a shorter accessory lobe on the inner part of ES, L1 equal to EL, not longer, and longer and narrower lobes. Genotype, *Yakounoceras gitinsi* n. sp.

*Yakounoceras gitinsi* n. sp. (Plate 1, Fig. 2). 105, 44.7, 46.5, 23.5. Differs not only in suture line from *Yakounites plenus* n. sp., but has thinner and lower whorls and a larger umbilicus. There are about 33 angular primary ribs and 130 secondary narrow, elevated ribs. National Museum of Canada; holotype, Cat. No. 9002.

*Zemistephanus* n. gen. The cone shape recalls that of the cadicone stage of *Emileia*, i.e., *E. crater* S. Buckman, but falling off to serpenticone on outer whorl. Tubercles at end of primary ribs. Suture line moderately complex. L1 is as long as EL. L2 is much smaller than L1 and simple and cruciform with rather long terminal lobule. Tubercle position is about on border between L2 and S2. Genotype, *Ammonites richardsoni* Whiteaves.

*Defonticeras* n. gen. Inner whorls are sphaeroconic; there is abrupt umbilical enlargement on outer whorl. Mouth border has sulcus behind the lip, and behind that in some species a ridge of low relief. Primary ribs fairly stout, recalling *Emileia*, but not so pronouncedly club-shaped as in that genus. Suture line fairly complex, but not so intricate as in typical *Emileia*<sup>29</sup>. Broad L2. Furcation of ribs on outer part of L2. Umbilication differs from *Emileia*. *Chondroceras* Mascke differs in ribbing, mouth border, etc. Genotype, *Defonticeras defontii* n. sp.

*Defonticeras defontii* n. sp. (Plate 1, Fig. 3). 62.4, 40, 62.3, 22.4. Whorls are thick, high and stout, with somewhat flattened sides. The venter is broad and rounded. National Museum of Canada; holotype, Cat. No. 9009.

*Saxitoniceras* n. gen. Differs from *Defonticeras* in more regular umbilicus and simpler suture line. Tending to a two-ridged mouth border, not three-ridged as in *Chondroceras Mascke*. Has broader and coarser primary ribs than *Chondroceras*, not markedly inclined forward at the anterior end.

*Saxitoniceras allani* n. sp. (Plate 1, Fig. 4). 43, 41.8, 55.8, 19. Whorls of moderate height and thickness for the genus. Primary ribs coarse and a little inclined, about 17 on the last whorl. National Museum of Canada; holotype, Cat. No. 9021.

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<sup>29</sup>Buckman, S. S.: Personal communication.

*Kanastephanus* n. gen. Cadicone becoming serpenticone. Lappets lateral in position. Suture line rather simple. L2 narrow and short. Tubercle on border between S1 and L2. May be close to *Germanites* Mascke. Resembles *Otoites* Mascke and some undescribed forms of *sauzei* and earlier date in the British Jurassic<sup>30</sup>. Genotype, *Kanastephanus crickmayi* n. sp.

*Kanastephanus crickmayi* n. sp. (Plate 1, Figs. 5, 6). 52, 30, 40.9, 48.2. There are 19 primary and 50 secondary ribs on outer whorl. National Museum of Canada; holotype, Cat. No. 9016.

*Itinsaites* n. gen. Differs from *Kanastephanus* in a more complex suture line and more numerous secondary ribs. The tubercle is slightly more ventral in position. Genotype, *Itinsaites itinsae* n. sp.

*Itinsaites itinsae* n. sp. (Plate 1, Fig. 7). 51, 27.6, 38.9, 49.6. There are 23 primary and 71 secondary ribs on the outer whorl. Ribs narrow and of considerable relief. National Museum of Canada; holotype, Cat. No. 9020.

#### EXPLANATION OF PLATE I

Fig. 1. *Yakounites plenus* n. sp. Note suture line, umbilical enlargement, ribbing. Holotype, Nat. Mus. Can., Cat. No. 9000.

Fig. 2. *Yakounoceras gitinsi* n. sp. Ventral view of posterior part outer whorl. Note suture line and ribbing. Holotype, Nat. Mus. Can., Cat. No. 9002.

Fig. 3. *Defonticeras defontii* n. sp. View at an angle. Note suture line, umbilicus, etc. Holotype, Nat. Mus. Can., Cat. No. 9009.

Fig. 4. *Saxitoniceras allani* n. sp. View at an angle. Note suture line, umbilicus, mouth border, ribbing. Holotype, Nat. Mus. Can., Cat. No. 9021.

Fig. 5. *Kanastephanus crickmayi* n. sp. Side view. Note falling off to serpticone, ribbing and suture line. Holotype, Nat. Mus. Can., Cat. No. 9016.

Fig. 6. The same specimen as in Fig. 5. Ventral view to show suture line and ribbing.

Fig. 7. *Itinsaites itinsae* n. sp. Ventral view to show suture line, ribbing, etc. Holotype, Nat. Mus. Can., Cat. No. 9020.

PLATE I

