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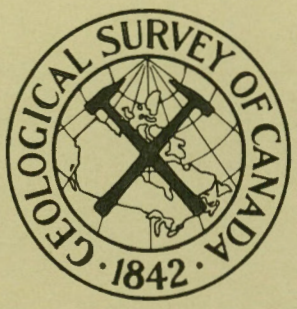


GEOLOGICAL SURVEY OF CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

PAPER 69-23

# LOWER JURASSIC ROCKS AND FAUNA NEAR ASHCROFT, BRITISH COLUMBIA AND THEIR RELATION TO SOME GRANITIC PLUTONS (92-I)



(Report, 2 figures and 1 plate)

Hans Frebold and H. W. Tipper


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Price: $1.50 Catalogue No. M44-69-23

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The Queen's Printer
Ottawa, Canada
1969

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## ABSTRACT

The oldest fossiliferous Jurassic rocks near Ashcroft, British Columbia, contain the pelecypod genus Weyla J. Böhm. This genus is known to be restricted to the Lower Jurassic and the age of the rocks is accordingly not Middle Bajocian, to which they had been assigned previously, but Early Jurassic. Detailed age determination is difficult but Sinemurian is considered probable. The underlying conglomeratic beds resting unconformably on the Upper Triassic Nicola Group are believed to be Hettangian in age. The Guichon Batholith, which supplied detritus to these conglomerates, is believed to be Rhaetian in age, dated isotopically at 200 million years.

# LOWER JURASSIC ROCKS AND FAUNA NEAR ASHCROFT, BRITISH COLUMBIA AND THEIR RELATION TO SOME GRANITIC PLUTONS

## INTRODUCTION

The Nicola Group is an assemblage of marine volcanic and sedimentary rocks, in part at least, of Late Triassic age (Duffell and McTaggart, 1952, pp. 29-31). However, Dawson (1896, pp. 112B, 115B) collected fossils near Ashcroft from the group as originally mapped that were believed by Hyatt (in Dawson, loc. cit) to be Early Jurassic in age. Drysdale (1914, pp. 134-135) collected fossils from the same or new localities and these also suggested a Jurassic age, possibly Early Jurassic. Crickmay (1930) disputed the Early Jurassic age on the basis of a fragmentary ammonite, identified by him as Fontannesia cf. carinata Buckman of Bajocian (Middle Jurassic) age. Duffell and McTaggart (1952) accepted Crickmay's identification and apparently excluded most of the disputed Jurassic strata from the Nicola Group which was then considered to be entirely Late Triassic. Unfortunately all strata believed by Dawson to be Lower Jurassic were not excluded from the group and whether or not the Nicola Group as mapped near Ashcroft includes Lower Jurassic beds has not been satisfactorily resolved.

Six small collections by Drysdale, one by Dawson, and one by Frebold in the collections of the Geological Survey of Canada were recently re-examined. Crickmay's collections are not available to the writers and Duffell and McTaggart made no significant collections from the beds in question.

## STRATIGRAPHY

In the type area near Nicola Lake south of Kamloops the Nicola Group consists "principally of volcanic rocks, with which are associated minor amounts of limestone, argillite, and conglomerate. The volcanic rocks may very largely be grouped under the general term greenstones, but include green, red, or grey lavas with breccia, tuffs, and agglomerates. The lavas are mostly andesites and basalts, and vary from fine-grained types to coarse porphyritic rocks. In places thin bands of argillite, lenses of limestone, and, more rarely, thin beds of conglomerate are present" (Duffell and McTaggart, 1952, p. 29). Seven or eight small areas of Nicola Group rocks have been mapped by Duffell and McTaggart (Fig. 1) and from three of these fossils have been reported.

Measured sections by Dawson and Crickmay are reproduced in the following discussion to illustrate a presumably typical lithology. They are presented, without interpretation and without a personal knowledge of their accuracy.

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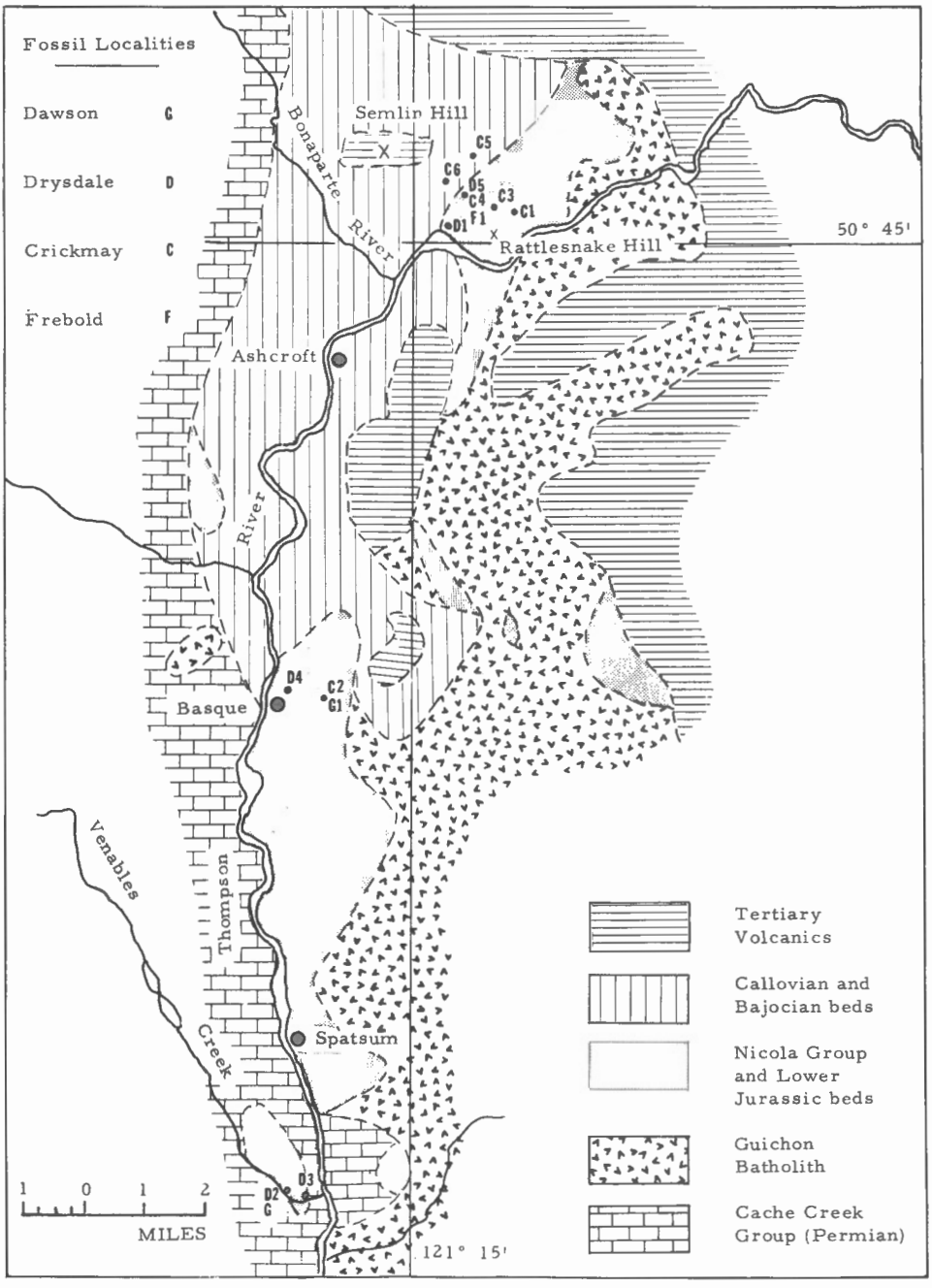



Figure 1. Geology of Thompson River valley near Ashcroft, British Columbia (Modified after Duffell and McTaggart, 1952, Map 1010A).

## Venables Creek area

The area north of Venables Creek and south of Spatsum is underlain by "a bed of massive, blue-grey limestone, containing chert stringers and nodules" (Duffell and McTaggart, 1952, p. 50). From this limestone Dawson collected fossils that were described by Professor A. Hyatt "as including a Terebratula, two species of Entolium and a Pecten, all closely resembling forms found by him in beds of Lower Jurassic age at Taylorville, California" (Dawson, 1896, p. 115B). Drysdale's fossils from this area (GSC locs. 325 and 318) were reported by Dr. T.W. Stanton, Washington, D. C. as containing abundant large Terebratula, a section of an ammonite, Rhynchonella? sp., undetermined pelecypod and gastropod casts, Pecten sp., Entolium? sp., and fragments of Gervillia sp. These were considered to be probably Jurassic possibly Lower Jurassic, but the evidence was not considered adequate for a definitive determination (Drysdale, 1914, p. 135). Duffell and McTaggart obtained from this limestone "a belemnite cast, indicating a Mesozoic age" (Duffell and McTaggart, 1952, p. 30). This was re-examined by J.A. Jeletzky who concluded it was not definitely recognizable as a belemnite.

## Basque-Spatsum area

The Nicola Group east of Thompson River at Basque and Spatsum was first examined by Dawson (1896, p. 113B) who summarized the section, beginning at the top, as follows:

| | | Feet |
|---|---|---|
| " (1) | Gray limestone, of which at least 20 feet was seen. It often contains numerous small angular fragments of siliceous rocks and is foetid, when struck. Contains fossils believed to be Lower Jurassic ..... | 20 |
| (2) | Chiefly bluish and gray or greenish gray fine-grained felsite or petrosilex, apparently passing into fine-grained decomposed diabases. Some agglomerate, composed of similar materials, is included in this part of the section, but nearly all the rocks break with a homogeneous sub-conchoidal fracture..... | 1,800 |
| (3) | Chiefly purplish and gray rather fine-grained agglomerates, occasionally greenish and often with spots of epidote ..... | 1,300 |
| (4) | This part of the section is represented by few exposures, but appears to consist chiefly of bluish and greenish gray fine-grained felsites, occasionally somewhat porphyritic ..... | 2,000 |

| | | Feet |
|---|---|---|
| (5) | Chiefly agglomerates, which are often fine grained and pass into moderately well bedded greywacke or arkose sandstones, generally indurated and often calcareous. Usual colour greyish. With these are associated (Particularly toward the base) blackish argillite-like rocks and some thin beds of limestone and of fine felsite-like rocks ..... | 2,900 |
| (6) | The upper half of this member of the section is composed of gray felsites with interbedded limestones, of which the thickest observed is about 20 feet. Lower half not exposed ..... | 1,550 |
| (7) | Chiefly green diabase-agglomerates, often coarse..... | 2,100 |
| (8) | Chiefly green rather fine-grained diabase-agglomerates with interbedded blue-gray limestone. In one cliff showing about 500 feet of beds, one-third of the whole appeared to be limestone. The limestones are best developed in the upper part of this division and Triassic fossils were found about the middle ..... | 1,300 |
| (9) | Chiefly gray and blackish fine-grained felsites ... | 539 |
| | Total ..... | 13,590 " |

The Jurassic fossils of unit 1 recognized by Hyatt were Lima parva Hyatt, M.S., Entolium like E. equabilis Hyatt, M.S., Pecten like P. acutiplicatus Gabb, and two species of Rhynchonella, one like R. gnathophora. Dawson's conclusion was that Triassic and Lower Jurassic rocks were present in the Nicola Group but in the section described it is impossible to say which is the age of units 2 to 7. Drysdale did not describe this area of rocks specifically but collected a few fossils east of Basque, namely a Terebratula sp., large Pecten sp., possibly Inoceramus or a large Lima (GSC loc. 335) (Drysdale, 1914, p. 135).

Crickmay described a section 1 1/4 miles east of Basque as follows (1930, p. 27):

| " Bed | | Thickness in feet |
|---|---|---|
| --- | Top of section near the Ashcroft-Highland Valley Wagon road, 1 1/4 miles E N E from Basque Station (C. P. R.) | |
| 19 | Conglomerate - well rounded pebbles of porphyry, tuff, argillite, etc., with a sandy matrix ..... | 100+ |

| Bed | | Thickness in feet |
|---|---|---|
| --- | Concealed, including a fault?..... | 40 |
| 3 | Crinoidal limestone with Isocrinus californicus Clark..... | 10 |
| 2 | Agglomerate of sharply angular fragments of lava and tuff in a limestone matrix, with Parapecten ntlakapamuxanus Crickmay. Fossil locality no. 2..... | 33 |
| --- | Concealed, and interrupted by a small intrusive and several outcrops of Triassic rocks (3/4 mile in horizontal distance)..... | 100+ |
| 1 | Conglomerate of slightly rounded fragments of volcanic rocks, argillites, quartzite, and quartz diorite. Sandy matrix. Lying unconformably upon an ancient, altered lava which makes the top of the Nicola Series at this place..... | 10+ |
| --- | Base of section 1 mile S S W of the top of it, and 1 1/4 miles S E of Basque Station." | |

This section is reported by Crickmay to overlie Dawson's measured section which is here considered to be mainly Triassic, the lower part contained Karnian ammonites (Crickmay, 1930, p. 26) and the unfossiliferous upper part was thought to be Norian. Presumably Crickmay's section is the upper part of Dawson's section and the bed with "Parapecten" ntlakapamuxanus Crickmay of Crickmay's section (unit 2) correlates with the bed containing Pecten acutiplicatus Gabb (unit 1) of Dawson's section. Crickmay argued for a Middle Jurassic (Bajocian) age whereas Dawson believed his unit to be Early Jurassic. Crickmay stated his section rests unconformably on the Upper Triassic Nicola Group and hence was not part of that group.

Duffell and McTaggart found Karnian fossils east of Basque (Duffell and McTaggart, 1952, p. 30) but none of the coarse-ribbed pectens found by Dawson and Crickmay. They considered the Nicola Group to be entirely of Late Triassic age and discounted the possibility of any of it being Jurassic (loc. cit., p. 31). Jurassic rocks were mapped separately and were marked at the base by coarse conglomerates containing boulders and cobbles of granitic rocks from Guichon Batholith (loc. cit., pp. 31-32).

## Rattlesnake Hill area

Dawson included these rocks with the Nicola Group on the basis of lithology and described them as "greenish, greyish, blackish and often purplish fine-grained diabases and felsite-like materials" (Dawson, 1896, p. 117B). Apparently he saw only that part subsequently believed by Crickmay to be Triassic.

Drysdale similarly mapped these rocks as Nicola Group but did not describe them. According to his field notes he collected "very large, coarsely-ribbed Pectens sp., Lima? sp., and an obscure fragment of an ammonite" (GSC locs. 324 and 327) from the west side of Rattlesnake Hill.

Crickmay measured a section easterly across Rattlesnake Hill as follows:

| " Bed | | Thickness in feet |
|---|---|---|
| --- | Top of section on south side of Semlin Hill, 2 1/4 miles from Ashcroft Bridge, bearing N 14° E | |
| 22 | Black shale, etc., dipping to southwest at 30° | 600± |
| 21 | Light grey sandstone with black shale interbeds | 360 |
| 20 | Black shale cropping out along the south side of Semlin Hill and in a large ravine on southeast slope of same | 1,000 |
| 19 | Conglomerate, forming southeast ridge of Semlin Hill. Well rounded pebbles. | |
| | Per cent: Porphyry 69; Argillites 23; Tuffs 8 | |
| | Ill sorted, little sandy matrix | 510 |
| --- | Concealed | 40 |
| 19 | Conglomerate | 10 |
| --- | Concealed | 40 |
| 19 | Conglomerate | 20 |
| --- | Concealed, descending east slope of Semlin Hill | 500 |
| 18 | Hard grey sandstone, dip to west at 40° | 10 |
| 17 | Conglomerate, similar to bed 19 | 2.6 in. |
| 16 | "Black" shale with many thin beds of hard grey, platy sandstone | 70 |
| 15 | "Black" shale with fossil locality no. 6 45 feet above its base | 80 |

| Bed | | Thickness in feet |
|---|---|---|
| 14 | "Black" shale with some beds of grey sandstone | 70 |
| --- | Concealed where section crosses the small valley between Semlin and Rattlesnake hills (400 yards horizontal distance) | 1,160 |
| 5 | Calcareous arkose with some pebble beds, and including fossil locality no. 4, ascending west slope of Rattlesnake Hill | 60 |
| --- | Concealed, and interrupted by an upfaulted block of Triassic lava (500 yards horizontal distance but of very little thickness, perhaps --) | 10 |
| 4 | Calcareous arkose occurring in a shallow syncline 300 yards wide and exposed only very discontinuously, containing fossil locality no. 3 | 50 |
| --- | Concealed 200 yards in horizontal distance which brings the section to the ridge of Rattlesnake Hill. | 40 |
| 1 | Conglomerate, from ridge, descending east slope of hill; coarse with sandy matrix below, fine with calcareous matrix above. Uppermost bed contains fossil locality no. 1 | 227 |
| --- | Unconformable contact | |
| --- | Green tuff, forming the uppermost bed of the volcanics which are included tentatively in the Nicola Series and referred to the Triassic | 397 |
| --- | Red tuff | 40 |
| --- | Green tuff | 45 |
| --- | Pale grey limestone | 28 |
| --- | Green arkose | 45 |
| --- | Green tuff | 51 |
| --- | Red tuff with green beds | 125 |
| --- | Green agglomerate | 23 |
| --- | Red tuff | 17 |
| --- | Green agglomerate | 12 |

| Bed | | Thickness in feet |
|---|---|---|
| --- | Red agglomerate..... | 95 |
| --- | Lava flow..... | 250 |
| --- | Base of section at top of talus slope which runs down to Thompson River 5 miles above Ashcroft" | |

The lower part of the section, below bed 1, was considered to be Upper Triassic and presumably is the section seen by Dawson. Beds 1 to 5 inclusive apparently yielded the fossils collected by Drysdale and beds 14 to 22 on Semlin Hill are those mapped by Dawson and Drysdale as Cretaceous. On the basis of the contained fossils Crickmay considered all beds from 1 to 16 as Middle Jurassic (middle Bajocian) (Crickmay, 1930, p. 37). Beds 1 to 5 formed the Ntlakapamux Formation, 6 to 16 the Opuntia Formation and the two constituted the Thompson Series. The base of Crickmay's Thompson Series, unit 1, is a coarse conglomerate reportedly containing pebbles and cobbles of light-coloured plutonic rock, presumably of local derivation. Crickmay stressed the importance of this conglomerate as the base of the Jurassic.

Duffell and McTaggart accepted Crickmay's interpretation and apparently included the beds with the coarse-ribbed pectens (Crickmay's Ntlakapamux Formation) in a map-unit of Bajocian and Callovian age (Duffell and McTaggart, 1952, p. 33). Crickmay's formation names were not retained. The dominantly volcanic lower part of the section was mapped as Nicola Group.

## Summary

The Nicola Group rocks are dominantly volcanic with interbedded shale and limestone. Dawson and Drysdale believed that the group included Lower Jurassic rocks but Crickmay and Duffell and McTaggart believed it was only Upper Triassic and excluded the dated Jurassic beds. The base of the Jurassic is a coarse, granitic-pebble-bearing conglomerate marking the unconformable contact of Jurassic on Triassic rocks.

The rocks of main interest in this report are Crickmay's Ntlakapamux Formation or those beds that have yielded large, coarse-ribbed pectenid pelecypods, Middle Jurassic "Parapecten" ntlakapamuxanus of Crickmay or Lower Jurassic Pecten acutiplicatus of Dawson. The descriptions by Dawson indicate that volcanic rocks as well as limestones and other sedimentary rocks are included in the section. Crickmay's descriptions suggest the unit is mainly sedimentary and records only one volcanic unit in the section east of Basque (Crickmay, 1930, p. 27); all other volcanic rocks encountered in the sections are interpreted as up-faulted Triassic Nicola Group rocks.

## FOSSIL LOCALITIES

### Localities near Ashcroft

SC loc. 324 (Fig. 1 – D1)

Locality: West shore of Thompson River, opposite Lowell Ranch, 1 mile north of old mill and mouth of Bonaparte River. Collected by C.W. Drysdale, July 14th, 1912.

Lithology: Buff grey, calcareous arenite; medium grained, rounded, irregular grains of chert, quartz, and feldspar in a calcareous matrix; matrix comprises 50 per cent of rock.

Fauna: Weyla sp. indet. ex aff. W. bodenbenderi (Behrendsen) large left valve.

Age: Early Jurassic.

GSC loc. 318 (Fig. 1 – D2)

Locality: In Venables Creek ravine near 89 mile post, Cariboo Road between Spatsum and Spences Bridge. Collected by C.W. Drysdale, August 14th, 1912.

Lithology: Grey to dark blue-grey, silty, limestone.

Fauna: Weyla sp. indet. ex aff. W. bodenbenderi (Behrendsen)
Small specimen. Left and right valve.
Entolium cf. E. semlini Crickmay
Pecten sp. indet.
Lima (Plagiostoma?) sp. indet.
"Terebratulids"

Age: Early Jurassic.

GSC loc. 325 (Fig. 1 – D3)

Locality: Near mouth of Venables Creek. 89 mile post, Cariboo Road. Collected by C.W. Drysdale, August 9th, 1912.

Lithology: Grey to dark blue-grey silty limestone (like rock at GSC loc. 318).

Fauna: Entolium semlini Crickmay
"Terebratulids"

Age: Early Jurassic.

GSC loc. 335 (Fig. 1 – D4)

Locality: East side of river at Basque, B.C. Collected by C.W. Drysdale, July 31st, 1912.

Lithology: Buff-grey to grey calcareous arenite; coarse-grained slightly arkosic, calcareous matrix comprises 50 per cent of rock; rounded to subangular grains of chert, quartz, feldspar, and dark grey lithic fragments; similar to rock at GSC loc. 324 but coarser.

Fauna: Weyla sp. indet.
one large left and one fragmentary right valve.
"Terebratulids"

Age: Early Jurassic.

GSC loc. 327 (Fig. 1 - D5)

Locality: West slope of Rattlesnake Hill in ravine. Collected by C.W. Drysdale, July 15th, 1912.

Lithology: Similar to rock of GSC locs. 324 and 335 but much coarser with a greater percentage of lithic fragments.

Fauna: Weyla sp. indet. Large right valve.

Age: Early Jurassic.

GSC loc. 83373 (Fig. 1 - G1)

Locality: East of Black Canyon. Collected by G. M. Dawson, July 25, 1894.

Lithology: Dark grey, gritty limestone.

Fauna: Weyla sp. indet. aff. W. acutiplicata (Meek), small left valves
Pecten (Entolium) sp.
Lima sp.
"Rhynchonella" sp.

Age: Early Jurassic

GSC loc. 25605 (Fig. 1 - F1)

Locality: West slope of Rattlesnake Hill. Collected by H. Frebold, July 18th, 1955.

Lithology: Light buff rock like that at GSC loc. 335 but weathered and friable.

Fauna: Gryphaea minutula Crickmay
Weyla sp. indet.
Chlamys paideios Crickmay
"Rhynchonellids"
"Terebratulids"

Age: Early Jurassic.

"Parapecten" ntlakapamuxanus Crickmay is listed by Crickmay (1930, p. 34) from his fossil localities 1, 3, 4 on Rattlesnake Hill and 2, near Basque. Crickmay's locality 4 yielded also other pelecypods, some brachiopods and one ammonite fragment (see Crickmay, loc. cit., p. 34).

## Localities between Ashcroft and Quesnel

In addition to the localities near and south of Ashcroft some others that lie to the north of Ashcroft are here described. They provide a broader basis for discussion of the Lower Jurassic beds in the Ashcroft area.

GSC loc. 40779

Locality: Dragon Mountain. Forestry road, 1/2 mile north of lookout. Quesnel map-area. Collected by H.W. Tipper, 1959.

Lithology: Calcareous greywacke.

Fauna: Weyla sp. indet. ex aff. bodenbenderi (Behrendsen)
Fragment of large left valve.

Age: Early Jurassic.

GSC locs. 19580, 19578, 19579, 40019

Locality: Morehead Creek, 1 mile above junction with Quesnel River. Collected by J.B. Hobson, 1895, W.E. Cockfield, 1930, 1931, and R.B. Campbell, 1959.

Lithology: Calcareous gritty, pebble conglomerate.

Fauna: Psiloceras canadense Frebold
Psiloceras sp. indet. aff. P. columbiae Frebold
Paracaloceras sp.
Ammonites indet.
Weyla sp. indet.

Age: Early Jurassic. Hettangian.

GSC loc. 40018

Locality: Morehead Creek. Priority Placer Mine pit, 2 1/4 miles upstream from Quesnel River. Float, not found in place. Collected by R.B. Campbell, 1959.

Lithology: Greywacke.

Fauna: Asteroceras cf. A. stellare (J. Sowerby).

Age: Early Jurassic. Earliest late Sinemurian.

GSC loc. 68604

Locality: Windy Mountain, Bonaparte River. South slope, 1/2 mile south of top. Collected by H.W. Tipper, 1965.

Lithology: Greywacke.

Fauna: Small fragments of ammonites, possibly arnioceratids.

Age: Probably Sinemurian.

## COMMENTS ON THE FAUNA

The pelecypod fauna collected in the immediate neighbourhood of Ashcroft, i.e. at Bonaparte River and on the west slope of Rattlesnake Hill and to the south of Ashcroft, i.e. at Basque and in Venables Creek is, with the exception of the pectinid genus Weyla, not indicative of any certain age. Crickmay (1930) has described most of these pelecypods. A Lima (Plagiostoma?) that remained undescribed is illustrated in this report (Pl. 1, Fig. 5). Unfortunately the few ammonite fragments mentioned in the literature have not been seen in the collections or are not available.

### Genus Weyla Joh. Böhm

The genus Weyla Joh. Böhm (1922, p. 138) comprises large well-inflated pectinids, previously described as "Pecten" (Behrendsen, 1891; Möricke, 1894 and others) or Vola (Jaworski, 1914). Weyla alata (von Buch) is a typical species of this genus. As already suggested by Hayami (1961, p. 319) Parapecten ntlakapamuxanus Crickmay described from Rattlesnake Hill near Ashcroft (Crickmay, 1930, p. 55, Pl. 5, f, g) belongs to this group.

#### Stratigraphic and regional distribution

The genus Weyla is a guide-fossil of the Lower Jurassic and well-known from South America, California and Canada. In Canada it occurs on the mainland of southern British Columbia (Taseko Lakes, Smithers, Quesnel, Morehead Creek and near Ashcroft), Vancouver Island and Queen Charlotte Islands. It has been found in Hettangian and Sinemurian beds the age of which is in most cases determined by guide ammonites. The distribution of the genus in these parts of British Columbia is illustrated in Figure 2. Weyla is also present in northwestern British Columbia, where it is associated with Pliensbachian ammonites. The genus has not been found in the Lower Jurassic part of the Fernie Group of the Rocky Mountains and Foothills. It is also unknown in the Toarcian of British Columbia.

#### Species identification

Species of Weyla are distinguished according to general outline and sculpture. The right valve is generally strongly inflated, the left is either convex or slightly concave or more or less flat. The ribs are strong. They can be divided or undivided, more or less flat-topped or acute. Finer ribs may be intercalated between the main ribs or may be absent. It is obvious that identification of species is restricted to well-preserved specimens in which all characteristic parts are clearly recognizable. A corroded specimen with flat-topped ribs may actually have been "acutiplicate" before the ribs were worn down. Fine intermediary ribs and fine biplication may also have disappeared secondarily by corrosion and originally convex or concave left valves may have become more or less flat by secondary pressure. Intermediary ribs and biplication may not yet be visible in the upper part of

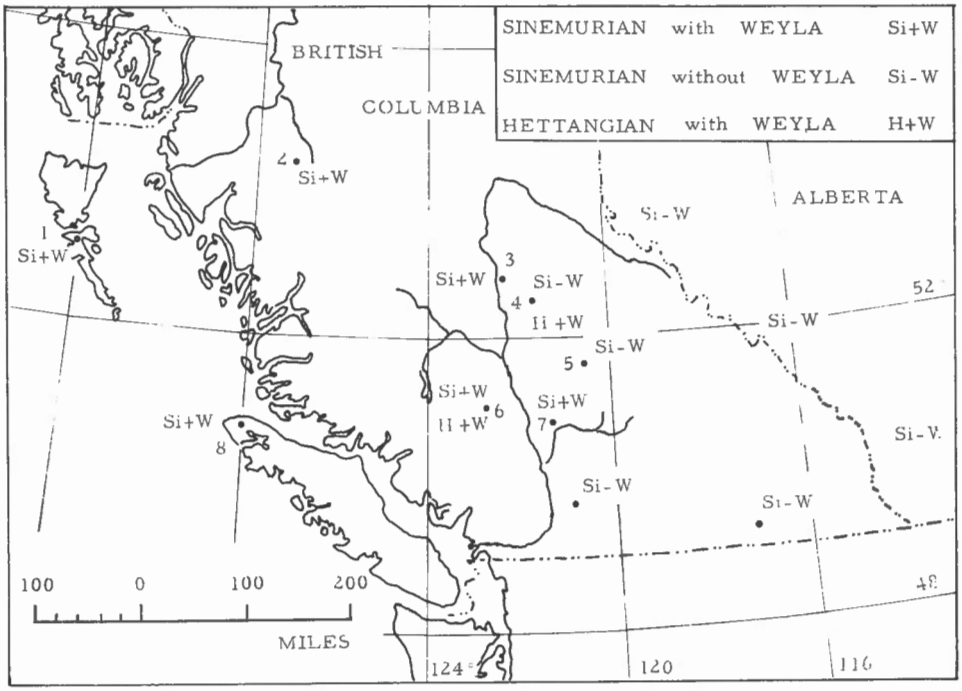



Figure 2. Distribution of the genus Weyla in the Sinemurian and Hettangian of the southern Canadian Cordillera.

the shell. Accordingly if only this part is preserved identification of the species is difficult or impossible.

## Description of specimens

None of the specimens is well preserved and assignment to one or another known species would be uncertain.

The large right valve of Weyla sp. indet., GSC No. 24039 from Rattlesnake Hill, GSC loc. 327, illustrated in Plate I, Figure 1 has no shell preserved and the umbo is broken off. The visible sculpture is the cast of the inside of the shell. The ribs are considerably worn down and appear now to be flat-topped. Originally they may or may not have been acute. A subdivision of some of the ribs is very faintly visible, the presence or absence of median ribs between two main ribs cannot be ascertained because of the worn state of preservation. In this specimen the sculpture of the outside of the shell of the right valve is unknown.

The small specimen, GSC No. 24041, illustrated in Plate I, Figures 3 and 4 with parts of both valves preserved, is from Venables Creek ravine, GSC loc. 318. The strongly inflated right valve has part of the shell

## PLATE I

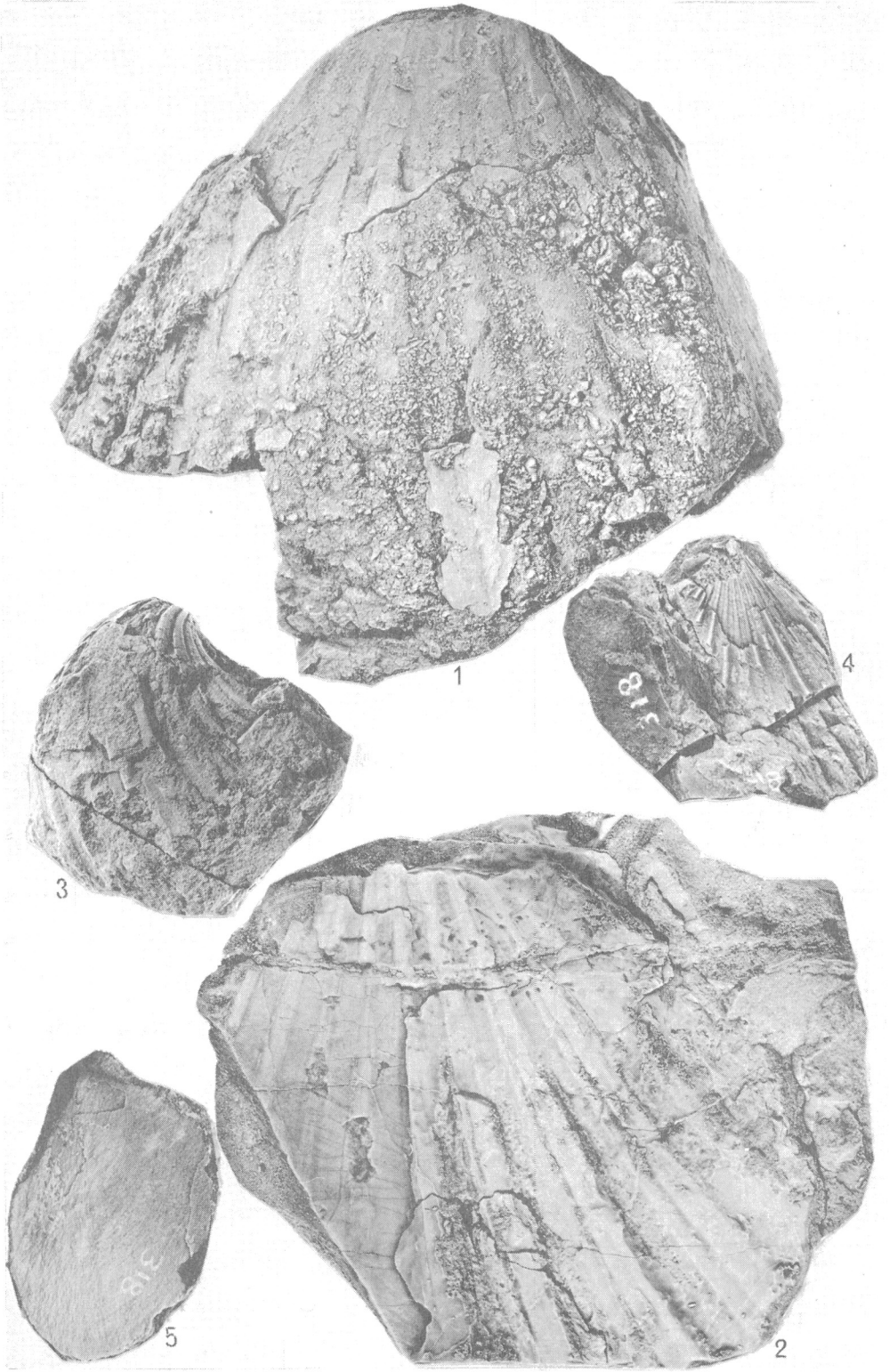
All figures in natural size

Figure 1. *Weyla* sp. indet. Figured specimen GSC No. 24039. Right valve. GSC loc. 327.

Figure 2. *Weyla* sp. indet. aff. *W. bodenbenderi* (Behrendsen). Figured specimen GSC No. 24040. Left valve. GSC loc. 324.

Figures 3,4. *Weyla* sp. indet. aff. *W. bodenbenderi* (Behrendsen). Figured specimen GSC No. 24041. Figure 3 right, Figure 4 left valve. GSC loc. 318.

Figure 5. *Lima* (*Plagiostoma*?) sp. indet. Figured specimen GSC No. 24042. GSC loc. 318.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preserved. The ribs have narrowly rounded tops and most are subdivided. The left valve is flat and has very narrowly rounded to almost acute ribs some of which seem to be subdivided. This specimen shows in the type of the ribs some resemblance to W. bodenbenderi (Behrendsen) but is too small and incompletely preserved to warrant identification.

The fragment of a large left slightly concave valve, GSC No. 24040, from Bonaparte River, GSC loc. 324 (Pl. I, Fig. 2), has clearly dichotome ribs that join the main ribs in the upper part of the valve. The ribs are somewhat worn but do not appear to have been acute. The specimen may be related to W. bodenbenderi but is too poorly preserved for identification.

A large very poorly preserved left valve collected by Drysdale in 1912 at Basque, GSC loc. 335 shows, apparently, some of the inside sculpture, which consists of strong ribs becoming thinner towards the umbo. Some very fine lines accompanying the flanks of the ribs may indicate that they were subdivided.

The "Pecten" acutiplicatus Meek mentioned by Dawson (loc. cit.) from the locality east of Black Canyon (GSC No. 83373), is in Dawson's collection represented by several small apparently flat left valves that have undivided ribs. The acute shape of the ribs characteristic of the species is not clear and the specimens are here referred to as Weyla sp. indet. aff. acutiplicata (Meek).

## AGE-DETERMINATION OF THE WEYLA BEDS NEAR ASHCROFT

The above description of the Weyla-containing beds near Ashcroft shows that the lithological facies and fauna at most localities are similar. Also, Crickmay (1930, p. 24) stated that all the "large pecten" localities of the area are closely correlative. It is concluded that all these Weyla beds near Ashcroft are of the same age and, considering the vertical range of the genus Weyla, belong to the Lower Jurassic.

Crickmay (1930) determined the age of these beds as Sonninian, i.e. part of the middle Bajocian. This mistake was caused by Crickmay's failure in recognizing the large pectinids as representatives of the typically Lower Jurassic genus Weyla. He described them as a new genus "Parapecten". Another reason for Crickmay's age determination as Sonninian was a small ammonite fragment described (Crickmay, loc. cit., p. 60) as "seemingly identical" with Fontannesia cf. carinata Buckman. "The fragment is insufficient for taking dimensions" and was not illustrated probably because of poor preservation. According to all experience Fontannesia and Weyla cannot be expected to be normally associated with each other and consequently an error in identification of the ammonite fragment is suspected.

An Early Jurassic age of the Weyla beds near Ashcroft was already suggested by Hyatt (in Dawson, 1896) and Stanton (in Drysdale, 1914), but unfortunately some of these rocks were mapped as Cretaceous, an error already corrected by Crickmay (1930) who showed that the rocks in this area near Ashcroft, previously mapped as Cretaceous, actually are Jurassic in age.

Due to the lack of well-preserved specifically identifiable specimens of Weyla or ammonites it is difficult to offer a more detailed age-determination of the Weyla beds near Ashcroft on paleontological evidence.

However, as Weyla has not been found anywhere in Canada in Toarcian beds it seems unlikely that they can belong to that stage. Lower Pliensbachian beds containing Weyla are present in northwestern British Columbia but hitherto no trace of this substage has been found in south-central British Columbia. Accordingly, a Sinemurian or Hettangian age of the Weyla beds in this area would appear possible. This possibility seems also to be supported by the fact that Lower Jurassic beds north of Ashcroft belong to these two stages as evidenced by the presence of guide ammonites. Weyla with such subdivided ribs as those present in several of the Ashcroft specimens are not known to occur in the Hettangian, however, and thus it seems most likely that the age of the Weyla beds near Ashcroft is Sinemurian. This conclusion can only be considered as probable. Better material, preferably including some guide ammonites, has to be found before a definite detailed age determination can be made. Until then the only safe age determination of the Weyla beds near Ashcroft is Early Jurassic.

## STRATIGRAPHIC SIGNIFICANCE

The establishment of an Early Jurassic age for rocks near Ashcroft, defines the unconformity at the base of the Jurassic sequence more closely. That this Jurassic succession is unconformable on Triassic rocks was recognized by Crickmay (1930, p. 30) and by Duffell and McTaggart (1952, p. 32) and the coarse basal conglomerate was observed to have locally derived granitic pebbles and boulders from Guichon Batholith (Guichon Creek Batholith of Cockfield, 1948, p. 16). This batholith is confidently believed to intrude Upper Triassic Nicola Group rocks in Ashcroft area and hence is no older than Karnian, probably no older than Norian if Crickmay's interpretation is correct (Crickmay, 1930, p. 26); elsewhere the Nicola Group does include Norian beds (Cockfield, 1948, p. 14). Because of the granitic clasts contained in the Lower Jurassic conglomerate, the batholith cannot be younger than Early Jurassic, probably no younger than Sinemurian. The basal conglomerate is overlain by beds containing the Lower Jurassic fauna described in this report and hence it is probably Sinemurian or earlier, certainly not younger than Early Jurassic.

In Bonaparte River map-area to the northeast a similar relationship exists. West of Little Fort in North Thompson Valley a granitic batholith, Thuya Batholith (Campbell and Tipper, in preparation) is intrusive into Upper Triassic (Karnian and probably Norian) Nicola Group rocks. A coarse boulder conglomerate, with boulders from the batholith and the Triassic rocks, contains poorly preserved, probably Sinemurian ammonites at the top. The batholith is therefore of probable Rhaetian or Hettangian age (Campbell and Tipper, in press).

The Triassic period ended with the emplacement of a significant number of granitic plutons accompanied by uplift and erosion. The angular discordance between the Jurassic and Triassic beds appears slight but the base of the Jurassic sequence is characterized by a granite-pebble-bearing conglomerate unit of varying thickness. Crickmay stated that the Jurassic assemblage rests unconformably on the Nicola Group, presumably because of the basal conglomerate and its contained clasts. In the Basque-Spatsum area the Jurassic conglomerate overlies dated Triassic rocks and in the Rattlesnake Hill area rocks that, on lithology, are assumed to be Triassic

(Crickmay, 1930, pp. 27, 30). Duffell and McTaggart found the basal conglomerate of the Jurassic sequence resting on the Guichon Batholith and on the Nicola Group (Duffell and McTaggart, 1952, pp. 31-32) but as the conglomerate was not dated as Early Jurassic the evidence is not conclusive. The granitic clasts in the basal conglomerate were assumed by Duffell and McTaggart (1952, p. 31) to come from the Guichon Batholith and by Crickmay to come from granitic masses to the east (Crickmay, 1931, p. 37; see also Frebold, 1957, p. 41).

The age of the basal conglomerate may be established more accurately. In Quesnel Lake map-area fossils from a conglomeratic unit in Morehead Creek obtained by Cockfield and Walker (1933, p. 82A) and by Campbell (1961) indicate a Hettangian age. These beds are probably overlain by argillaceous Sinemurian beds. In Taseko Lakes map-area beds with the same Hettangian fauna are in part conglomeratic, overlie a conglomeratic sequence, and are overlain by Sinemurian shales and fine greywacke (Frebold, 1967, pp. 3-9). In Bonaparte River and Ashcroft map-areas probably Sinemurian faunas are above or at the top of conglomerate beds. It is conceivable that the conglomerates are nonfossiliferous or nonmarine equivalents of the marine, fossiliferous conglomerates of Quesnel Lake and Taseko Lakes map-areas. Thus the age of the Jurassic basal conglomerate near Ashcroft could be mainly, or in part, Hettangian.

In the Ashcroft area the Lower Jurassic rocks are sedimentary whereas the Upper Triassic rocks are dominantly volcanic. This lithologic difference, as well as the unconformable relation, is sufficient reason to exclude the Lower Jurassic rocks from the Nicola Group as was done by Duffell and McTaggart. The age of the Nicola Group would therefore be Late Triassic (Karnian and Norian). Until more is known of the Lower Jurassic rocks, the use of a formational name is inadvisable.

## ISOTOPIC AGE SIGNIFICANCE

The potassium-argon laboratory of the University of British Columbia conducted an intensive program of dating of samples from Guichon Batholith and the "arithmetic mean age of 24 samples is 200 m.y. with a standard error of the mean of $\pm$ 5 m.y." (White, et al., 1967, p. 685). This age date indicates the batholith "originated during a short interval of geologic time centered on 200 m.y. ago" which, according to the geologic time-scale (Geological Society Phanerozoic time-scale, 1964), indicates a Late Triassic age (Karnian to Rhaetian).

If the ages suggested for the rock units discussed in this report are accepted as valid, i.e. the Nicola Group is Karnian and Norian, the Jurassic rocks are Sinemurian and upper Hettangian, then the Triassic-Jurassic unconformity spans the Rhaetian and lower Hettangian and the Guichon Batholith was emplaced during Rhaetian and/or early Hettangian time. The batholith was emplaced, uplifted, and unroofed by late Hettangian or Sinemurian time to supply granitic clasts to the basal conglomerates. If the uplift and unroofing of the batholith were considered as occurring during early Hettangian time, the emplacement of the batholith most likely occurred in Rhaetian time.

The remarkable uniformity of isotopic ages of all rock types of the Guichon Batholith obtained by the University of British Columbia's

laboratory lends confidence to the result, an arithmetic mean age of 200 ± 5 m.y. The stratigraphic age suggested in the preceding paragraph narrows the span of time within which the Triassic-Jurassic boundary must be established on the radiometric time-scale. Greater precision is required in the stratigraphic dating of the Guichon Batholith to define the boundary further and it would appear that in the Ashcroft area a detailed structural and stratigraphic study of the Nicola Group and the Lower Jurassic beds may permit a closer correlation of stratigraphic and potassium-argon ages.

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