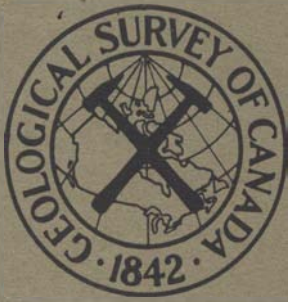


H. Frebold



**GEOLOGICAL
SURVEY
OF
CANADA**

**DEPARTMENT OF MINES
AND TECHNICAL SURVEYS**

PAPER 66-27

**UPPER PLIENSBACHIAN BEDS
IN THE FERNIE GROUP OF ALBERTA**

(Report, figure and plate)

Hans Frebold



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ABSTRACT

Describes the first specimens of the ammonite genus Amaltheus to be collected from the Jurassic Fernie Group in the Rocky Mountains and Foothills. The fossils clearly establish the presence of rocks of Upper Pliensbachian age

UPPER PLIENSCHACHIAN BEDS IN THE
FERNIE GROUP OF ALBERTA

Introduction

In 1959 the author received from Dr. K. O. Parsch an Amaltheus that had been found loose in the Limestone Mountain area, Alberta, by Mr. R. R. Baekeland. This ammonite genus had never been found before in the Jurassic Fernie Group of the Rocky Mountains and Foothills. As this specimen was not found in place, it was merely mentioned without comment by the writer (Friebold, 1960, 1964).

More collections, this time from beds in situ, were made in 1964 in the same area by Dr. N. C. Ollerenshaw of the Geological Survey of Canada. The material is interesting both from a stratigraphical and palaeogeographical point of view.

The Fossil Localities in the
Limestone Mountain Area, Alberta

The specimens of Amaltheus described here are from the Limestone Mountain area of Alberta. They come from the lower part of the Fernie Group that represents most of the Jurassic System in the Canadian Rocky Mountains and Foothills. No other occurrences of Amaltheus are at present known in the Fernie Group.

The Limestone Mountain area lies north of the headwaters of Red Deer River (see insert map of Fig. 1). The fossil localities are just north of Lat. 51°55'N and west and east respectively of Long. 115°25'W. Their position is indicated in Figure 1. In this map No. 1 (GSC loc. 70650) is the locality where Dr. Parsch's loose specimen of Amaltheus was collected. From No. 2 (GSC loc. 65058) came Dr. Ollerenshaw's material of Amaltheus. It is labelled "Limestone Mountain, east side of Forestry Road to look-out; Lsd. 2, sec. 24, tp. 34, rge. 11, W5. Lat. 51°55'38"N, Long. 115°25'30"W." GSC loc. 65058.

The rocks that contain the ammonites are according to Dr. Ollerenshaw (personal communication) platy, calcareous siltstones with chert.

Close by ("Limestone Mountain, west side of Forestry Road, in gully; Lsd. 9, sec. 13, tp. 34, rge. 11, W5. Lat. 51°55'10"N, Long. 115°25'30"W. GSC loc. 65057, No. 3 in Fig. 1") a collection of poorly preserved brachiopods and pelecypods was made by Dr. Ollerenshaw. The collection contains: Oxytoma cf. cygnipes Phillips, Oxytoma sp.,

Trigonia sp., Ostrea sp., Pectinids and "Terebratula" sp.

The specimens of the guide fossil Oxytoma cygnipes contained in this collection are too poorly preserved for illustration. Some specimens from adjoining areas previously figured are illustrated (see Pl. 1, Figs. 5, 6).

Description of Ammonites

Family Amaltheidae Hyatt, 1867

Genus Amaltheus de Montfort, 1808

Amaltheus cf. A. stokesi (J. Sowerby)

Plate I, Figures 1-4

Material: Numerous specimens collected in situ at GSC loc. 65058. Specimens GSC Cat. 20351, 20352, and 20353 of this collection are illustrated. A single specimen (GSC Cat. 19923, illustrated) was found loose at GSC loc. 70650.

Description: The specimens are flattened and the shape of the cross-section cannot be determined. The ribs are sigmoidal and subdivided in the outer part of the whorl. The secondary ribs are finer than the primaries and are very faintly visible in some specimens. The ventral keel has fairly strong chevrons. No tubercles are present and spiral striae are not visible.

Comparisons: The specimens are typical Amaltheidae and as far as the poor preservation permits comparison agree well with Amaltheus stokesi (Sowerby) as described by Howarth (1958, p. 3, Pl. 1, Figs. 5, 7, 12-14; Pl. 2, Figs 1, 3, 10; Text-Figs. 4, 5) with the specimens described by the author (Friebold, 1964, pp. 9, 10, Pl. 2, Figs. 2-6) from the Telegraph Creek and Tulsequah areas in northwestern British Columbia and from the Whitehorse area in southern Yukon, and with specimens from northern Yukon.

Age Determinations

The collections made in the lower Fernie Group of the Limestone Mountain area are from two beds, each of different age. The fossils collected at GSC loc. 65057 (No. 3 in Fig. 1) which include Oxytoma cf. cygnipes Phillips, other pelecypods and some brachiopods belong to the Oxytoma bed that tops the Nordegg Member sensu stricto of the Fernie Group. The age of this Oxytoma bed was determined as lower Sinemurian (Friebold, 1957),

on account of the occurrence of Arietitidae at localities in the Snake Indian Valley and adjoining areas. These ammonites have not yet been found in the Oxytoma bed of the Limestone Mountain and adjoining areas, but as the pelecypods and brachiopods are the same as farther north, it is concluded that the age of this bed with Oxytoma cygnipes is the same wherever it is present in the Fernie.

Fossils are rare in the underlying cherty beds of the Nordegg Member sensu stricto, but it is also considered to be of early Sinemurian age (Frebold, 1957). No fossils have yet been found in the Nordegg Member sensu stricto of the Limestone Mountain and adjoining areas.

The bed with Amaltheus cf. A. stokesi (J. Sowerby) is younger than the lower Sinemurian Oxytoma bed. Amaltheus stokesi is characteristic of the lowermost subzone of the Upper Pliensbachian as shown in the chart given by Dean, Donovan, and Howarth (1961) part of which is quoted here:

| Substage | Zone | Subzone |
|---------------------|-------------------------------|--------------------------------|
| | <u>Pleuroceras spinatum</u> | <u>Pleuroceras hawskerense</u> |
| Upper Pliensbachian | | <u>Pleuroceras apyrenum</u> |
| or | | <u>Amaltheus gibbosus</u> |
| Domerian | <u>Amaltheus margaritatus</u> | <u>Amaltheus subnodosus</u> |
| | | <u>Amaltheus stokesi</u> |

The presence of the lowermost part of the Upper Pliensbachian hitherto unknown in the Fernie Group is thus established by the occurrence of Amaltheus cf. A. stokesi (J. Sowerby).

Stratigraphy

According to Dr. Ollerenshaw (personal communication) the outcrops of the lower Fernie in the Limestone Mountain area are very poor and the stratigraphic relationship of the Oxytoma bed to the Amaltheus bed could not be established. However, as the Amaltheus bed is lowermost upper Pliensbachian and the Oxytoma bed lower Sinemurian, the Amaltheus bed should overlie the Oxytoma bed.

Hitherto it was thought that the succession of the beds of the lower Fernie in areas north of the Red Deer River was as follows: at the bottom of the Nordegg Member *sensu stricto*, consisting of dark, cherty and phosphatic dolomite or limestone with some shales and siltstones. Overlying the Nordegg Member *sensu stricto*, is the Oxytoma bed with its characteristic fauna, and on top of the Oxytoma bed there follows immediately the Toarcian Paper shale with Dactylioceratids and Harpoceratids (Friebold, 1957) which is equivalent to Spivak's (1949) Poker Chip shale. The thickness of the Nordegg Member *sensu stricto* (i.e. in the definition by Spivak) and the Oxytoma bed is between 50 and 150 feet. The Oxytoma bed has not been found everywhere in the Fernie Group, but it is present for instance in the Limestone Mountain area (this report), the Tay River area (Henderson, 1945), Fall Creek area (Henderson, 1946), Snake Indian Valley (Friebold, 1957) and areas farther north. It seems also to be present in the Marble Mountain area east of Limestone Mountain, where it is overlying dark cherty limestones (Beach, 1942) that probably represent the Nordegg Member *sensu stricto* and that apparently erroneously were placed by Beach in the Triassic Spray River Formation.

The best consecutive sections seen by the author are in the Snake Indian Valley. A characteristic section is illustrated on Plate I, Figure 7. It shows the main features of the sequence, particularly the sharp lithological break between the lower Sinemurian Oxytoma bed and the Paper shale. This break indicates also the considerable gap, i.e. the absence of at least the upper Sinemurian and lower Pliensbachian.

As far as can be concluded from the rather poorly exposed strata in the Limestone Mountain and adjoining areas, the same stratigraphic conditions as in the Snake Indian Valley are present in these more southerly regions, however, here a place for the now established lower part of the upper Pliensbachian, i.e., the subzone of Amaltheus stokesi has to be accommodated. As the Oxytoma bed is Sinemurian this Pliensbachian subzone can only be higher in the section, i.e. between the Oxytoma bed and the Toarcian Paper shale. It is desirable to have this supposed stratigraphic position confirmed by direct observation.

As already mentioned, Pliensbachian fossils are not known from any localities other than the Limestone Mountain area. However, it is possible that they occur in other sections but have escaped discovery because of poor exposure.

Subdivision of the lower Fernie Group

Now that the presence of upper Pliensbachian rocks has been demonstrated, the subdivision of the lower Fernie Group in the area north of the headwaters of the Red Deer River has to be revised as follows:

| Rock Units | Stages | Guide Fossils |
|---------------------------------|--|--|
| Paper shale or Poker Chip shale | Toarcian | <u>Dactyloceras</u> spp. <u>Harpoceras</u> cf. <u>H. exaratum</u> (Young and Bird) |
| Unknown | Upper part of upper Pliensbachian | None |
| Base of Paper shale? | Lower part of upper Pliensbachian. Subzone of <u>Amaltheus stokesi</u> | <u>Amaltheus</u> cf. <u>A. stokesi</u> (J. Sowerby). Only found in Limestone Mountain area. |
| Absent | Lower Pliensbachian and upper Sinemurian | None |
| Nordegg Member (sensu lato) | <u>Oxytoma</u> bed | Arietitids, <u>Oxytoma cygnipes</u> Phillips, <u>Trigonia</u> sp., <u>Lima</u> spp., <u>Pleuromya</u> sp., Pectinids, <u>Ostrea</u> sp., <u>Pleurotomaria</u> sp. Brachiopods |
| | Nordegg Member sensu stricto | Arietitids(?) |
| Absent | Hettangian | None |

Triassic or Upper Palaeozoic

The facies of the Nordegg Member is unknown south of the Red Deer River.

Palaeogeography

The extent of the upper Pliensbachian sea that invaded the region of present day Rocky Mountains is not yet known, the only proof of its presence being found in the Limestone Mountain area. However, it seems to be unlikely that this sea transgressed much farther to the south. There is no Lower Jurassic at all in the western Interior of the United States

while north of the International border, for instance, in the Adanac Mine district, Livingstone Range and Moose Mountain areas, the Toarcian follows almost immediately on top of rocks older than Jurassic and separated only by a thin bed of possibly Sinemurian age. The presence of upper Pliensbachian deposits in northwestern British Columbia and southern Yukon (Frebald, 1964), indicates the probable route of transgression from the northwest.

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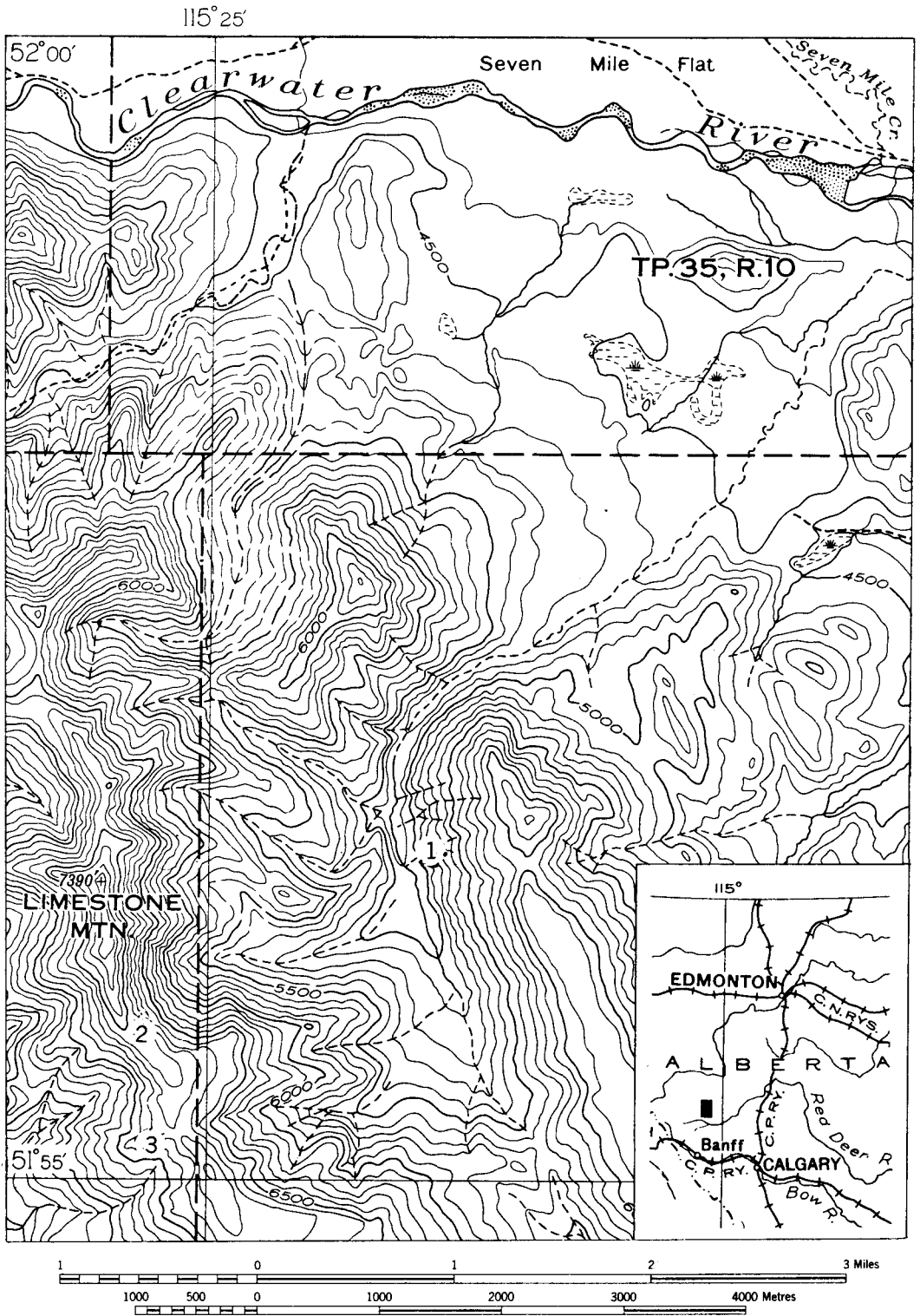


Figure 1. Jurassic fossil localities in Limestone Mountain area.

1 = GSC loc. 70650; 2 = GSC loc. 65058; 3 = GSC loc. 65057

PLATE I

All figures in natural size.

- Figure 1. Amaltheus cf. A. stokesi (J. Sowerby). GSC Cat. No. 19923. GSC loc. 70650. Limestone Mountain area. Upper Pliensbachian.
- Figures 2-4. Amaltheus cf. A. stokesi (J. Sowerby). GSC Cat. Nos. 20351, 20352, 20355. GSC loc. 65058. Limestone Mountain area. Upper Pliensbachian.
- Figure 5. Oxytoma cygnipes Phillips. GSC Cat. No. 12872. GSC loc. 14270. Marble Mountain area. Refigured from Frebold, 1957, pl. 16, fig. 1a. Lower Sinemurian.
- Figure 6. Oxytoma cygnipes Phillips. GSC Cat. 12876. GSC loc. 23015. Fall Creek area. Refigured from Frebold, 1957, pl. 16, fig. 5. Lower Sinemurian.
- Figure 7. Section of lower Fernie Group in Snake Indian Valley. About 1.5 miles west of Snake Indian River bridge. (Repeated by faulting.)

P = Toarcian Paper shale;
O = Oxytoma bed, lower Sinemurian;
N = Nordegg Member (sensu stricto), lower Sinemurian.

This section is chosen to illustrate the succession of the lower Fernie beds in Alberta.

