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CENOMANIAN AND TURONIAN FAUNAS IN THE POUCE COUPE DISTRICT, ALBERTA AND BRITISH COLUMBIA

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INTRODUCTION

DURING the summer of 1939, the junior author had occasion to measure a section of the Dunvegan formation and the Smoky River shale along Pouce Coupe River while engaged on oil exploration for John E. Morrow. Fossils were collected carefully and their positions in the section noted. The main interest attached to the results of this work was the finding of ammonites in the Dunvegan sandstone which find permits us to gauge the age of that formation with considerable accuracy. Marine fossils have long been known from the Dunvegan; but they have been of little diagnostic value. The finding of ammonites in this fauna has, naturally, added greatly to the value of the known fauna.

PREVIOUS WORK

The geology of the Peace River Valley has been studied since the early reconnaissance surveys. Many of the formational names were introduced by Dr. G. M. Dawson in 1879 (1). Later study of the geology of Peace and Smoky Rivers has been carried out by Dr. F. H. McLearn and the results published in various reports of the Geological Survey of Canada. A report which included part of the area now under discussion was made by Dr. R. L. Rutherford in 1930 (2). References to previous literature may be obtained from this report. The palaeontology of the formations now under discussion has been subject to study by McLearn (3). Further work has been done by the senior author on the faunas now under discussion (4). Some of the forms found in the Dunvegan formation and Smoky River shale have a wide distribution and have been described from other areas.

CENOMANIAN-TURONIAN BOUNDARY

The formations with which we are mainly interested in our discussion of the Cenomanian-Turonian boundary are the Dunvegan and the overlying Smoky River shale. The lower part of the Smoky River shale has long been known to be Turonian in age with a fauna including *Inoceramus labiatus* Schlotheim, *Prionotropia* and *Watinoceras*. The Dunvegan formation of sandstones and shale has been

known to contain a fauna of marine, brackish and fresh-water forms, none of which is sufficiently diagnostic for accurate age determination. The formation underlying the Dunvegan, however, known as the St. John shale, contains the *Neogastroplites* fauna which McLearn has shown to be Albian in age (5). There has been little doubt, therefore, that the Cenomanian is represented somewhere in the Dunvegan formation.

The first indication of Cenomanian age being represented in this section was the finding of a specimen of *Acanthoceras* type in the basal beds of the Smoky River shale (6). At the time this form was described it was believed to have been accompanied at the same horizon by a Turonian fauna. The section just studied shows that this idea was erroneous and that the Turonian fauna appears just above the "*Acanthoceras*" horizon. As this form is not a true *Acanthoceras*, it is desired at this time to rename the genus *Dunveganoceras*. It is considered to be a typical Upper Cenomanian form. The genus will be discussed elsewhere in this paper.

The horizon from which this species of *Dunveganoceras* was obtained was described as the basal beds of the Smoky River shales. The boundary between the two formations is not clearly cut and the boundary may be placed within a latitude of 100 feet. In the measured section shown in Plate I the boundary was drawn at the top of a sandstone bed locally known as the Doe Creek sandstone. For extended field mapping, a horizon at the top of the Pouce Coupe sandstone member, about 100 feet above the Doe Creek sandstone may be more appropriate. The original species of *Dunveganoceras* was collected, undoubtedly, just above the Pouce Coupe sandstone, and the genus occurs quite commonly in the Pouce Coupe sandstone in this section. No true Turonian fauna was found with it or below it, but it does occur in some areas a very short distance above it. It seems reasonable to assume, therefore, that the Cenomanian-Turonian boundary should be placed just above the Pouce Coupe sandstone member of the Smoky River shale.

Fauna of the Cenomanian

It has been possible, through the occurrence of ammonites, to place the upper boundary of the Cenomanian with considerable accuracy. The lower boundary of the Cenomanian cannot be determined with the same precision. The formation below the Dunvegan sandstone, the St. John shale, contains an Albian fauna. The upper part of the Dunvegan sandstone is Upper Cenomanian in age. It follows, therefore, that we should expect the lower part of the

Dunvegan to be Lower Cenomanian. Whether the boundary between the Albian and Cenomanian corresponds exactly with the boundary between the St. John shale and the Dunvegan sandstone cannot be determined at the present time. The assumption that the two boundaries are synchronous, however, cannot be in much error and for the purpose of this study will be considered so.

The fauna of the Dunvegan sandstone and the lower beds of the Smoky River shale are listed below:

Barbatia micronema (Meek)
Yoldia subelliptica Stanton
Inoceramus corpulentus McLearn
" *dunveganensis* McLearn
" *rutherfordi* Warren
" *mcconnelli* Warren
Ostrea anominoidis Meek
" *dunveganensis* Warren
Exogyra suborbiculata Lamarck
Anomia aurea Warren and Stelck
Modiolus silentiensis McLearn
Brachiodontes multilinigera Meek
Tellina dunveganensis McLearn
" *peaceriverensis* McLearn
Callista orbiculata (H. and M.)
Mactra emmonsi Meek
Corbicula dowlingi McLearn
Corbula pyriformis Meek
" *nematophora* Meek
Psammosolen dunveganensis Warren
Unio dowlingi McLearn
Rhytophorus? caurinus McLearn
Dunveganoceras albertense (Warren)
" *poucecoupense* Warren and Stelck

It is notable that a large percentage of these forms are new species described from this area and their distribution in other areas is not known. The few that enjoy a wider distribution are usually poorly preserved and the determinations, therefore, are attended with some doubt. Until more complete collections from the Dunvegan are at hand, it will be impossible to attempt any correlation of the fauna.

The Fauna of the Turonian

In comparison with the fauna of the Cenomanian, the fauna of the Turonian is rather meagre. This agrees with our findings throughout the foothills region of Alberta. In the case of the Smoky River shales, the position of the boundary between the Turonian and the overlying Emscherian has never been determined; but it is usually

considered that most of the lower, or Kaskapau member, is Turonian in age for a strong Emscherian fauna is known from the Badheart sandstone immediately overlying the Kaskapau. In compiling the following list a few species from the upper beds of the Kaskapau member have been omitted on account of the uncertainty of their stratigraphic horizon.

The following is a list of forms known definitely to be Turonian in age:

Inoceramus allani Warren
" *corpulentus* McLearn
" *labiatus Schlotheim*
" *tenuiumbonatus* Warren
" *tyrrelli* Warren
Scaphites delicatulus Warren
Prionotropis caurinus McLearn
Selwynoceras borealis (Warren)
Watinoceras reesidei Warren
Placenticeras pseudoplacenta Hyatt?

As with the Cenomanian fauna, the Turonian is largely local. The ubiquitous *Inoceramus labiatus* is the only definitely recognized species connecting this fauna with that of other areas. The *Placenticeras* is probably Hyatt's species but the shells are crushed to such an extent that definite determinations could not be made. The genus *Watinoceras* is now known to have a wide distribution in the Turonian being reported by Reeside from Colorado in the same horizon as *I. labiatus* (7). It is quite abundant in the lower beds of the Smoky River shales and it is quite possible that the genus may also occur in the uppermost Cenomanian beds. The genus is undoubtedly represented by more than one species but an exact study of the variations within the genus has not yet been attempted. The genera *Prionotropis* and *Selwynoceras* are both Turonian types but are rare forms in the fauna. The most abundant forms are *Inocerami* which display a remarkable variation and there are still many forms undescribed. It is very evident that a Turonian fauna came into this area from the north through the Mackenzie Valley and that it did not reach areas farther to the south.

Correlation with the Foothills Section

There is little difficulty in correlating the section in the Pouce Coupe district with the section in the foothills further to the south. The Smoky River shales correlate directly with the Alberta, or Colorado shale, in the southern foothills, the Smoky River shales being little more than half the thickness of the Alberta shale, for

the Pouce Coupe area is further from the shoreline from which the sediments were derived to make these formations. The Dunvegan sandstone is not represented in the southern foothills as a distinct formation but it undoubtedly correlates with the upper part of the Blairmore formation. Berry has stated (8) that a Cenomanian flora is present in the upper part of the Blairmore formation at Blairmore. Just how much of the Blairmore is represented by the Dunvegan is impossible to state at the present time as it is not known just where the Albian-Cenomanian boundary lies in the Pouce Coupe area. It may be within the Dunvegan formation.

The Cenomanian-Turonian boundary can be traced into the southern foothills. In setting out the fossil zones in the Alberta, or Colorado shale, Warren and Rutherford placed a barren zone at the base of the formation (9). The fauna from this zone was listed as fish scales and *Inoceramus corpulentus* McLearn. The *Prionotropis woolgari* listed from this zone is now known to be wrongly identified. It has since been shown that, at least in two sections, the fish scales occur at a very definite horizon from 100 to 200 feet above the base of the formation and *Watinoceras* occurs quite commonly in places in this same zone. So far as our present data are concerned it is not known to occur below the fish scale zone, but undoubtedly occurs above it. The lower 100 to 200 feet is usually very barren; but *Inoceramus corpulentus* has been obtained in two localities, and the Upper Cenomanian genus *Dunveganoceras* has been collected at two localities at this horizon. It is considered, therefore, that the lower 100 to 200 feet of the Alberta shale is Cenomanian in age and that the Turonian begins at the fish scale horizon where *Watinoceras* becomes abundant.

It is also interesting to note that Reeside (10) reports the occurrence *Acanthoceras* cf. *rhotomagense* Defrance, an Upper Cenomanian form, in Colorado at two localities, one from a low horizon in the Graneros shale and one from the shale bed at the top of the Dakota (?) sandstone. Both of these horizons correspond stratigraphically to the basal beds of the Alberta shale and show that the marine invasion of the Colorado sea was synchronous throughout the foothills area.

Description of New Species

Genus Anomia Müller

Anomia aurea sp. nov.

Description. Shell of medium size for the genus, a little longer than high, irregular in shape, upper part of shell wide and narrowing

toward the base. Beaks nearly central, curved slightly forward and rising a little above the hinge line. Shell thin and usually exfoliated, shell substance containing fine radiating lines, faintly discernible on the internal moulds. Surface of shell ornamented with fine concentric lines of growth. Adductor scar visible on some specimens, one showing also two byssal scars.

Dimensions of a left valve: length 35 mm., height 31 mm., convexity 5 mm.

Remarks. The assignment of this species to the genus *Anomia* may be attended with some doubt, for the right valve has not been seen. But the thin shell, edentulous hinge line, muscle scar, and general shape of the shell leaves little doubt as to the genus. As is usual with the genus, the species displays a considerable variety of form; but no form so far seen appears to approach any way closely any species known to the writers from this general horizon. As preserved, the specimens are usually internal moulds coated with marcasite, which gives them a very distinctive appearance in the rock.

Horizon. Common in the upper part of the Dunvegan formation on Doe Creek.

Locality. Uppermost bed of Dunvegan sandstone on Doe Creek. Sec. 10, Tp. 81, R. 13, W6th, Alberta.

Paratypes Ct. 825 A, 825 B, and 825 C.

Inoceramus corpulentus McLearn

This species is quite variable and grades from a very narrow and very convex type to a broad type of much less convexity. In the more convex type the flattening on the side of the umbo is more pronounced. As in most species of *Inoceramus*, the variation in size is remarkable. The specimens described by McLearn as *Inoceramus corpulentus* are rather an intermediate type above average size and one that is very poorly represented in our collections.

There is good evidence that variety of shape has some stratigraphic value. The narrow, very convex types, so far as our collections are concerned, occur about 75 feet below the top of the Dunvegan sandstone, whereas the broader less convex type occurs in the Pouce Coupe sandstone in the basal part of the Smoky River shales. McLearn's specimens apparently come from a little higher horizon, for the Pouce Coupe sandstone has usually been considered as the top of the Dunvegan.

It is proposed to consider the narrower, more convex form as *I. corpulentus* var *a*, and the wider less convex form as *I. corpulentus*

var *b*. Further study of fuller collections may demonstrate other varieties of stratigraphic value. Hitherto the species *I. corpulentus* has not been recorded from the Dunvegan ss. Holotype for *I. corpulentus* var *a* Ct. 817 A, paratypes Ct. 817 B and C. Holotype for *I. corpulentus* var *b* Ct. 818 A, paratypes Ct. 818 B and C.

Type of *I. corpulentus* var *a* were collected 70 feet below the top of the Dunvegan sandstone on Doe Creek, Sec. 11, Tp. 81, Rg. 13, W6th—Alberta. Types of *I. corpulentus* var *b* were collected in the Pouce Coupe sandstone near the base of the Smoky River shale on Pouce Coupe River, L. S. D. 1, Sec. 15, Tp. 80, R. 13, W6th—British Columbia.

Genus Dunveganoceras Nov.

In 1930 the senior author described an ammonite from the base of the Smoky River shales as *Acanthoceras albertense* (11). At that time the resemblance of this species to the genus *Mantelliceras* was noted and it was considered that the form was not a true *Acanthoceras*. The finding of another species by the junior author, very similar to *A. albertense* reopened the question as to the generic status of the species. It is decided to erect a new genus to receive these two species.

The new genus, *Dunveganoceras*, genoholotype *Acanthoceras albertense* Warren is erected to receive forms which are to a certain extent intermediate in character between *Acanthoceras* and *Mantelliceras*. It includes ammonites of a large size with wide umbilicus. There are three rows of nodes on either flank on the initial whorls connected by incipient ribs which do not cross the venter but on the ultimate whorl the ribs strengthen, completely incorporate the nodes and cross the venter, being very conspicuous there. The suture line is Acanthoceroid in type and varies quite markedly on different specimens and in the two species which make up the genus.

The genoholotype has already been described. The genus is considered to be Upper Cenomanian in age.

Horizon. Most of the specimens of this genus so far obtained have come from the base of the Smoky River shale in the Pouce Coupe district or from the base of the Alberta shale farther to the south. Two fragments, however, undoubtedly referable to this genus were collected from a horizon 200 feet below the top of the Dunvegan ss. These fragments show a species very similar to *D. albertense* in general shape though much smaller and with certain differences in the suture line. It is probably a distinct species but will be considered as a questionable representative of *D. albertense* until more complete material has been collected for study. These two fragments are

numbered in the University of Alberta collections Ct. 820 and 821. They were collected in L. S. D. 2, Sec. 23, Tp. 80, Rg. 13, W6th—Alberta.

Dunveganoceras poucecoupense sp. nov.

Description. Shell very large, discoidal, of at least five volutions. Whorls quadrangular in section but stoutly rounded toward the venter in the ultimate volution. Impressed area about one-eighth the height of the shell. Umbilicus wide, slightly over 1/3 the total width of the shell. Umbilical shoulder abrupt. Ornament consisting of three rows of nodes on each flank on the younger whorls—a row of elongate nodes on either side of the ventral margin and a row of weakly developed nodes on the umbilical shoulder elongated at right angles to the whorls. Nodes connected by incipient ribs not crossing the venter. On the ultimate whorl ribs become dominant, 18 in number, completely involving the nodes and crossing the venter. Ribs starting at the umbilical shoulder passing straight across the venter horizontally giving the shell a subquadrate section along the ribs.

Suture line with two saddles on the flank. Ratio of width of first lateral saddle to second lateral saddle 3:2. First lateral lobe half as wide as the first lateral saddle and deeper than the ventral lobe. Dimensions of shell, width 29 cms., width of umbilicus 11 cms., height of living chamber 8.5 cms., width of living chamber 9 cms.

Remarks. D. poucecoupense may be distinguished quite easily from *D. albertense* by the stout whorls. The ultimate whorl has a ratio of height to width of 8.5:9 whereas in the ultimate whorl of *D. albertense* the ratio of 11:6. This distinction in the shape of whorl produces a marked contrast on the venter. In *D. albertense* the ribs are ultimately produced to a point whereas in *D. poucecoupense* the venter is flat in the section of the ribs. A difference is also noted in the strength of the umbilical nodes which are strongly developed in *D. albertense* but very weakly developed in the new species. The suture line also displays certain marked differences. In *D. poucecoupense* the first lateral lobe is narrow and the 2nd lateral saddle is wider than in the other species. These differences are probably more than of specific rank and when bigger collections are available for study it is probable that a new genus will have to be erected for the reception of *D. poucecoupense.*

Horizon. In the Pouce Coupe sandstone near the base of the Smoky River shale as defined in this paper, on Pouce Coupe River. *Cenomaniam.* Holotype Ct. 822, paratypes Ct. 823 and 824. Locality L. S. D. 3, Sec. 19, Tp. 79, Rg. 13, W6th—British Columbia.

Genus SELWYNOCERAS Nov.

In 1930, the senior author described a new species from the base of the Smoky River shales, collected from a well in the town of Grimshaw, as *Prionotropis borealis* (12). The distinction between this form and the genoholotype were well delineated. It is now proposed to erect a new genus for the reception of this species and the name *Selwynoceras* is proposed in honour of the first geologist to study the rocks in the Peace River district. *Selwynoceras* is distinguished from *Priontropis* in the presence of a row of nodes instead of a keel on the inner whorls as well as by the strong alternation in the length and strength of the ribs on the earlier whorls. The suture is also quite distinct from *Priontropis*. The ultimate whorl, however, bears a very strong resemblance to that genus. Genoholotype *Prionotropis borealis* Warren from the lower beds of the Smoky River shale, collected from a well in the town of Grimshaw near Peace River.

Horizon. Probably lowermost Turonian.

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EXPLANATION OF PLATES

PLATE I

Section of the Cretaceous formations discussed in this paper.

PLATE II

Dunveganoceras poucecoupense Warren and Stelck

FIGURE 1.—Lateral view of the holotype (×½); Ct. 822.

PLATE III

Dunveganoceras poucecoupense Warren and Stelck

FIGURE 2.—Lateral view of a fragment showing the suture (×½). Paratype, Ct. 823.

FIGURE 5.—Outline of cross-section of the living chamber (×½). Holotype, Ct. 822.

Dunveganoceras albertense Warren

FIGURE 4.—Outline of cross-section of the living chamber (×½). Holotype, Ct. 467. Inserted to show the difference in the shape of the whorl at the living chamber.

Dunveganoceras cf. albertense

FIGURE 3.—Fragment of whorl showing suture. Ct. 820.

PLATE IV

Inoceramus corpulentus McLearn var *b*

FIGURE 1.—Lateral view of a right valve of a large specimen. Ct. 818A.

FIGURE 2.—Lateral view of a right valve of a medium-sized specimen. Ct. 818C. Specimen incomplete.

FIGURE 3.—Lateral view of a right valve of a small specimen. Ct. 818B.

Inoceramus corpulentus McLearn var *a*

FIGURE 6.—Lateral view of a left valve of a large specimen showing the sharp truncation of the anterior end. Ct. 817A.

FIGURE 5.—Anterior view of the same specimen, showing strongly incurved beaks.

FIGURE 4.—Anterior view of a smaller specimen showing the beak not so strongly incurved. Ct. 817D.

Anomia aurea Warren and Stelck

FIGURES 7, 8, and 9.—Left valves showing variety in shapes and sizes. Paratypes, Ct. 825A, 825B, and 825C.

(All specimens are recorded in the Geological Museum, University of Alberta.)

PLATE I

WAPITI ss.

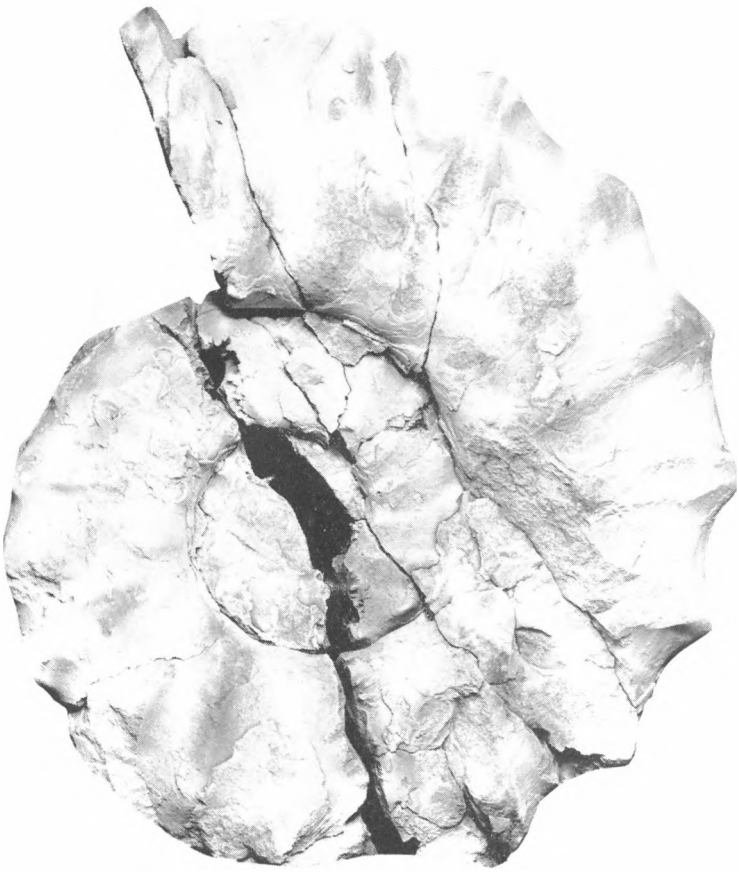
Lower
SMOKY
RIVER
Shales

(Pouce Coupe ss.)

DUNVEGAN
Formation

ST. JOHN Shale

PLATE II



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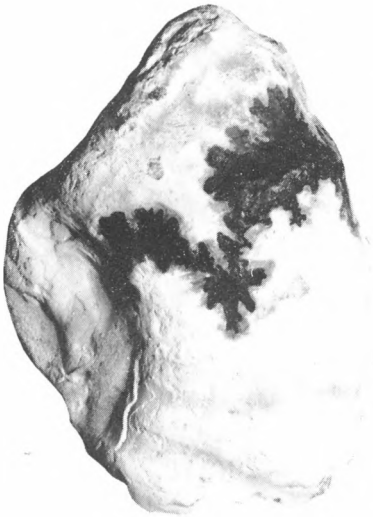

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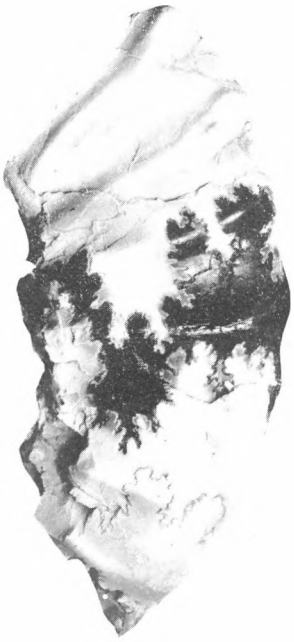

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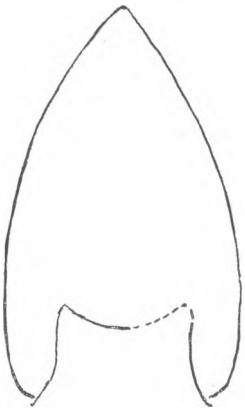

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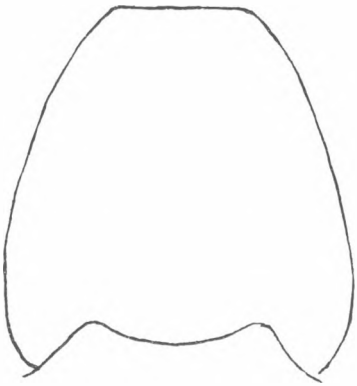

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PLATE IV

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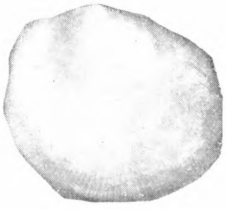

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