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Corbinites (Subfamily Lithacoceratinae), a new genus for the giant western Canadian Late Kimmeridgian or Tithonian (Late Jurassic) ammonite *Titanites occidentalis* Frebold

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Key words: ammonite, Kimmeridgian–Tithonian, *Corbinites*, Lithacoceratinae, ataxioceratoid-ribbing, Canada.

Abstract. The finding of two new specimens and a reappraisal of the single original specimen of the problematic giant Canadian Late Jurassic ammonite *Titanites occidentalis* Frebold results in the creation of *Corbinites*, n. gen. It is assigned to the ataxioceratid subfamily Lithacoceratinae largely because of the presence of variocostate and previously unrecognized ataxioceratoid ribbing in middle and late growth stages. With enigmatic ancestry and geographically removed other forms with similar characteristics, the species may have been endemic in the relatively isolated early Alberta foreland basin of western interior Canada.

INTRODUCTION

The affinities and age of the western Canadian giant ammonite *Titanites occidentalis* have been controversial since it was named and illustrated by Frebold (1954, 1957), and referred, with qualifications, to the English Portlandian (Tithonian) group that includes *Titanites*, now assigned to the Dorsoplanitidae. He and contemporary colleagues (Jeletzky *in* Newmarch, 1953; Arkell, 1956; Westermann, 1966) commented on the taxonomic issues, which still continue within that "*Titanites*" group, and the lack of defining characteristics visible on the single poorly preserved large Canadian holotype. However, Newmarch (1953), Frebold (1954, 1957) and the other workers recognized that the Upper Portlandian age of that group was (and remains) generally consistent with the coarsely defined age based on the stratigraphy in which it occurs.

Based on previously published dimensions, this ammonite has been recognized as the 12th largest ammonite in the world (Wikipedia https://en.wikipedia.org/wiki/Cephalopod_size).

Two additional, smaller but still sizable specimens are described here, found more recently on the same stratigraphic surface in the Teck Resources Coal Mountain Mine 26 km to the east of the large original's (holotype) location at Coal Creek, southeastern British Columbia, western Canada (Fig. 1). These growth stages were not preserved on the original large specimen (holotype), which hindered previous taxonomic attribution. The presence of several specimens illustrating different overlapping growth stages, argues for a resident endemic population within the basin in the latest Jurassic, not identified elsewhere so far. Additional fragments of a large ammonite were reported, but not described or identified, at Tent Mountain, about 23 km ENE of the Coal Creek locality, possibly of the inner whorls of the same species according to Westermann (*in* Hamblin, Walker, 1979).

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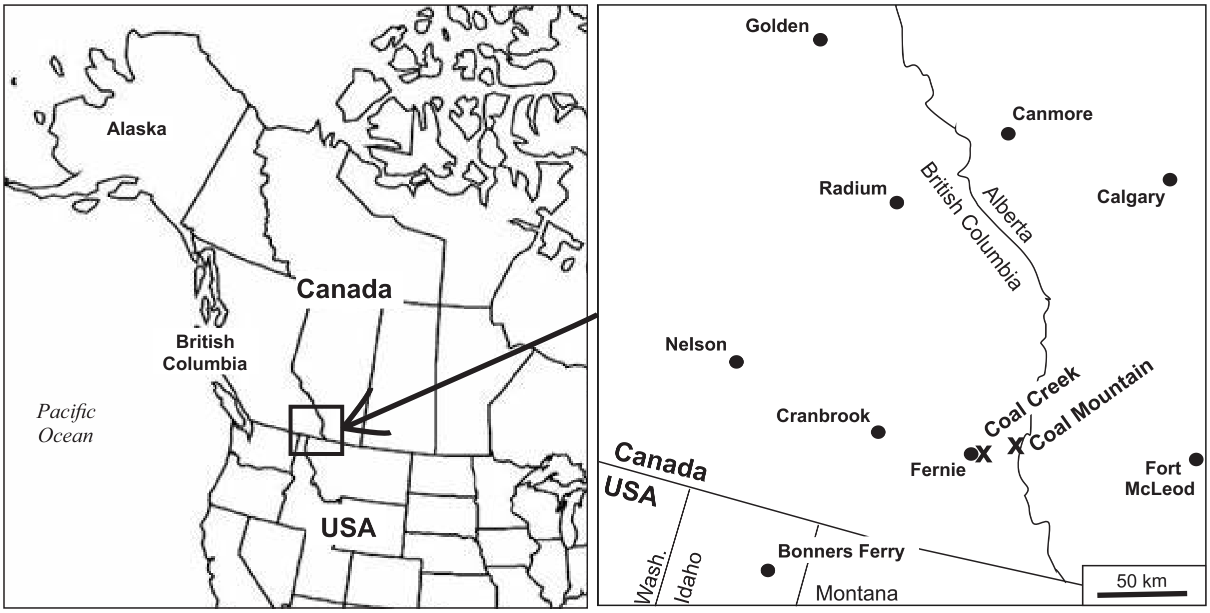

Fig. 1. Location map, showing the Coal Creek and Coal Mountain areas, southeastern British Columbia

Iterative homeomorphy in different Perisphinctoidea lineages within multiple regional basins characterized the late Jurassic world. Reviewing this common and widespread Jurassic ammonite superfamily, Callomon (1981, p. 126) stated that “Almost every basin of deposition had its local specialty”. Extreme faunal provincialism and strictly morphological classifications have long hindered phylogenetic understanding and ammonite-based correlations in the latest Jurassic (Énay, Howarth, 2019).

Recognition of ataxioceratoid ribbing and paleobiogeographic separation from Eurasia and the southern Pacific, as well as intra-basinal speciation globally in the latest Jurassic, encourage the definition of a new genus for these ammonites. This eliminates the need to deal with the age and distribution implications of its being lumped with the significantly smaller ammonites *Titanites* or other forms that appear to be endemic to the sub-boreal Northwest European basins, from England to the Russian Platform (Wimbledon, 1974, Wimbledon, Cope 1978; Kiselev, 2015; Kiselev, Rogov, 2018).

STRATIGRAPHY AND PALEOGEOGRAPHY

The original giant holotype (Newmarch, 1953; Frebold, 1954, 1957) lies on the top surface of the Morrissey Formation, the basal sandstone of the Kootenay Group (Fig. 2; Gibson, 1985), too large and awkwardly located to remove. It is directly overlain by soft paludal deposits of the shaley and coal-bearing Mist Mountain Formation. The additional specimens described here were found on the same formation surface in the Coal Mountain coal mine about 26 km to the east, near the small historic mining town of Corbin, British Columbia. The distance was likely double that, or more, in Late Jurassic time, after many folds and thrust faults due to later Rocky Mountains contraction are palinspastically restored.

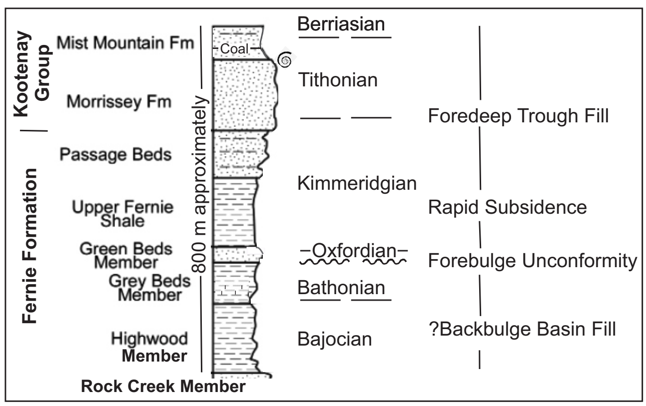

Fig. 2. The Upper Jurassic formations of the early flexural foredeep trough, Fernie area, southeastern British Columbia, showing the location of *Corbinites* specimens on the top surface of the Morrissey foreshore sandstone formation. Most of the unit boundaries are poorly dated and some are gradational. Thicknesses of the units are variable, and those of the glauconitic/tuffaceous Green Beds forebulge-transgressive unit and the Morrissey Formation are not as great as illustrated in most places

The top of the Morrissey sandstone on which these ammonites were preserved is laminated and, in places, displays low-angle cross-bedding consistent with shoreface deposition and post-mortem drifting of the ammonites into position. The laminated sand fills the body chamber of the original giant ammonite and may have also partially penetrated the phragmocones of the additional specimens where the shell appears to have been broken or corroded.

Together with the underlying upper Fernie Formation, the Morrissey and overlying Mist Mountain formations comprise the oldest units in a series of prograded clastic wedges that filled the tectonic flexural Rocky Mountains Foreland Trough (Fig. 3; Poulton *et al.*, 1994) in eastern British Columbia and western Alberta. This is the narrow, rapidly subsiding, Late Jurassic foredeep phase of the more extensive Alberta foreland basin system east of the early Rocky Mountains contractional tectonic load that persisted until Paleogene time (Cycle 1 of Leckie, Smith, 1992; Pană *et al.*, 2018a). This system is itself a component of the larger Western Canada Sedimentary Basin (WCSB) which is contiguous with the western interior basin of the United States, the two comprising a large North American Western Interior Basin through the Phanerozoic (*e.g.*, Sloss, 1988). The Morrissey Formation is considered to represent shoreface facies, and it is overlain by marine-influenced coal-bearing swamp facies of the Mist Mountain Formation, in the lower part of which profuse burrowing and occasional belemnites are present locally, scattered on pebbly bedding surfaces.

The Late Jurassic strata were deposited above an unconformity encompassing the Callovian (fig. 2), which marks the transition from an earlier, entirely marine and relatively passive foreland system, east of a broad area of accreting offshore pericratonic terranes on North America's west coast, to a more rapidly subsiding initially marine foredeep trough (*e.g.*, Evenchick *et al.*, 2007; Pană *et al.*, 2018a). The generally fossil-poor Late Jurassic broad trough was filled by sediment input from the south and south-southeast by a large river system or systems, and from the developing western highlands, the early Rocky Mountains to the west (Hamblin, Walker, 1979; Leckie, Smith, 1992; Raines *et al.*, 2013). Marine influences persisted in the trough to about the end of the Jurassic in southeastern British Columbia, within the Mist Mountain Formation, and to at least the Valanginian in northeastern B.C.

At the time that several "*Titanites*" specimens were beached on shoreface sands, the early Rocky Mountains barrier to the Pacific extended apparently continuously about the length of the currently preserved trough, and the length of British Columbia (Fig. 3). Therefore the location of the opening to the northeast Pacific must have lain in far northern British Columbia or Yukon Territory, where Boreal faunas dominated since the Oxfordian. To the south, the trough terminated in western interior U.S., where the time-equivalent unit is the nonmarine Morrison Formation (Turner, Peterson, 2004).

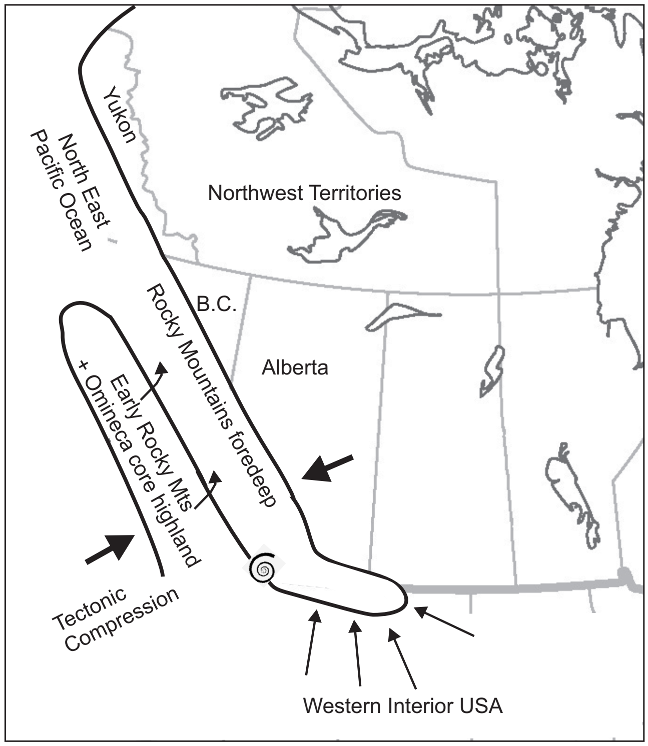

Fig. 3. Paleogeographic conceptual sketch, illustrating latest Jurassic early stages of the Rocky Mountains tectonic foredeep trough and the approximate position of *Corbinites* specimens (spiral symbol) within the foredeep east of compressionally uplifted loads of the Omineca magmatic core and the early Rocky Mountains fold-and-thrust belt (see also Turner, Peterson, 2004; Evenchick *et al.*, 2007; Raines *et al.*, 2013; Pană *et al.*, 2018a)

Thin arrows show sediment transport directions; thick arrows tectonic compression. Western parts are deliberately generalized and not to scale east-west, highlighting they are still not perfectly understood

AGE

Rejecting close relationship of the large Canadian ammonite with the Portland Stone *Titanites* group/complex, its age implications cannot be maintained from its morphology (Callomon, 1984; Rogov, Zakharov, 2009). Hillebrandt *et al.* (1993a, table 12.3) suggested the possibility of a latest Kimmeridgian age.

Bracketing age data from the regional stratigraphy in the southwestern WCSB is sparse and imprecise. It includes two Early and Middle Oxfordian *Cardioceras* species and a giant peltoceratinid as well as Late Oxfordian or Early Kimmeridgian *Buchia concentrica* in the Green Beds Member of the Fernie Formation well below the Morrissey (Fig. 2; Frebold, 1957; Poulton, 1989; Pană *et al.*, 2018b). Late Oxfordian to Early Kimmeridgian *Buchia concentrica* and *Amoeboceras* spp. occur sporadically in the upper Fernie shale (or Passage Beds) farther north in west central Alberta where they underlie the Nikanassin Formation. However, the northward progradational component of the Morrissey-Nikanassin-Monteith foreshore facies means that that sequence is likely somewhat younger than that in the south where "*Titanites*" occurs. A poorly preserved "*Pavlovia* s. lato?" tentatively identified but not described nor illustrated by J. Jeletzky (in Stott, 1967, p. 30) offers the possibility of another "*Titanites*" specimen in northeastern British Columbia.

The younger limit to the age of the Morrissey Formation is provided by macroplants and nonmarine palynomorphs. Newmarch (1953, p. 46) commented on early macroplant identifications by W.A. Bell and others which dated the "Kootenay Formation" or "Kootenay s. lato" as either Early Cretaceous or Late Jurassic. Jansa (1972) and Gibson (1977) reviewed the limited age-pertinent evidence available to them, which added nothing new. Nonmarine palynological data from the Kootenay Group, also very limited, were summarized by Ricketts and Sweet (1986), who inferred an Early Cretaceous age for the uppermost part of the Mist Mountain Formation, and explicitly did not contradict previous suggestions of a Late Jurassic age for lower parts of the Mist Mountain, thereby implying that the Jurassic–Cretaceous boundary falls within the Mist Mountain Formation.

Detrital zircon grains do not constrain the age of the Morrissey Formation, having all been redeposited from older units; the youngest grains in samples from the base of the formation fall within the time span of the ash-bearing Oxfordian–Kimmeridgian Green Beds (Pană *et al.*, 2018a, b).

SYSTEMATIC PALEONTOLOGY

Order **Ammonitida** Haeckel, 1866

Suborder **Ammonitina** Fischer, 1882

Superfamily **Perisphinctoidea** Steinmann, 1890

Family **Ataxioceratidae** Buckman, 1921

Subfamily **Lithacoceratinae** Zeiss, 1968

Genus ***Corbinites*** new genus

Etymology. From the small former coal-mining community of Corbin near the Coal Mountain coal mine 25 km east of Fernie, southeastern British Columbia, in which the two new specimens were found.

Type species. *Corbinites occidentalis* Frebold 1957, monotypic.

Diagnosis. Gigantic, very evolute, with three distinct growth stages with abrupt changes in rib spacing. In early growth, with dense fine ribs, including single, intercalated, bifid, biplicate, triplicate and subpolyplocoid ribs, crossing the venter transversely; in middle growth stage, ribs become distant, much narrower than the interspaces; in maturity the ribs are single, very distant, strongest across the venter, weak on the flank and last part of the body chamber.

Discussion. This genus is distinguished by the combination of its variocostate and ataxioceratoid ribbing, enormous size, and paleobiogeographic isolation from other forms with some similarities. The new taxon highlights affinities other than what is implied by its continued designation as *Titanites*, as Callomon (1984) had suggested. The introduction of *Corbinites*, n. gen. recognizes the probability of intrabasinal origination in the latest Jurassic, as is characteristic for the latest Jurassic Perisphinctoidea elsewhere (Callomon, 1981, 1984; Kiselev, 2015; Énay, Howarth, 2019).

Corbinites occidentalis (Frebold, 1957)
Figures 4–6

Largest specimen (GSCC holotype GSC 143339, and with data from reproductions). The original largest specimen (Figs. 4, 6A, B), the holotype by monotypy, was discovered by a British Columbia Geological Survey mapping party in 1947 and a photograph (or photographs?) taken by W.A. Bell in 1949 was examined by J.A. Jeletzky (in Newmarch, 1953). The assignment to *Titanites* and the new species name assigned by Frebold (1954) created a *nomen nudum* until its eventual published description by Frebold (1957). Westermann (1966) illustrated a plaster cast of the holotype (Fig. 4B) which better showing the ribbing of the penultimate whorl, and added to previous commentary on its similarities with English "*Titanites*" and its age. That cast is now in the Royal Ontario Museum, Toronto, and was said by Westermann (1966) to be distorted. In the meantime Arkell (1956, p. 540) had also examined and published a photograph of the holotype with similar comments.

Too large and difficult to extract and transport, the holotype still lies in its original location in a narrow canyon tributary to Coal Creek, on a mountainside west of Fernie in southeastern British Columbia (Figs. 4D, 6A, B). Another mould has been produced, and fiberglass casts made from it are stored in the Royal Tyrrell Museum of Paleontology (RTMP in Drumheller, Alberta, and in the Geological

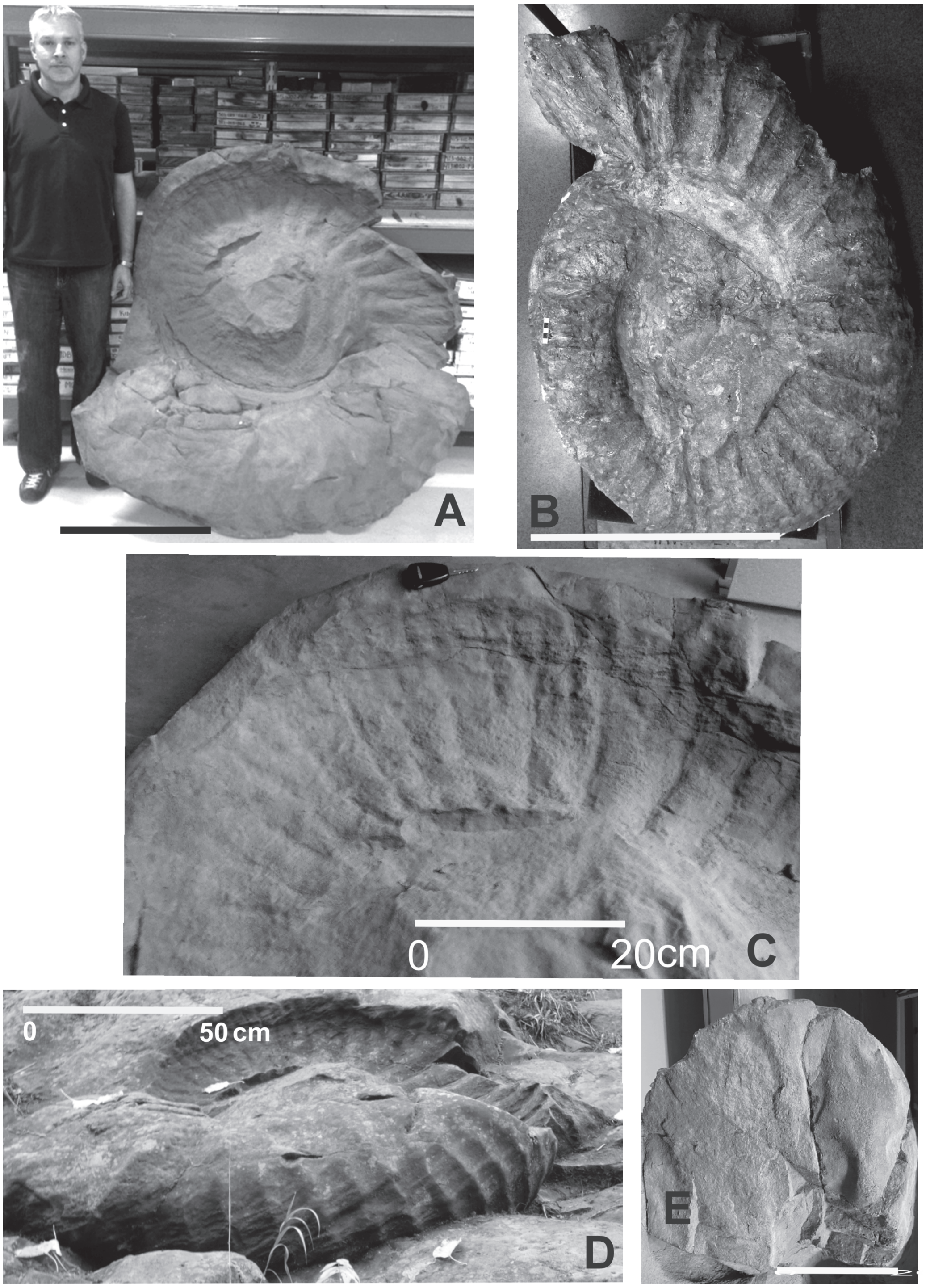

Fig. 4. Large original specimen of *Corbinites occidentalis* (Frebold), from Coal Creek tributary (Holotype GSC 143339 and reproductions)

A. Fibreglass cast of the phragmocone impression and the body chamber natural cast, stored at Geological Survey of Canada, Calgary. **B.** "Holo-plastotype" phragmocone cast produced for G. Westermann, stored in the Royal Ontario Museum, highlighting rib bifurcation near the beginning of the body chamber near an apparent constriction. **C.** Part of intermediate whorl of the phragmocone impression, showing variations of ataxioceratoid ribbing. **D.** Ventrolateral view of the specimen *in situ* in a Coal Creek tributary, showing ventral ornament on the early part of the interpreted body chamber, with bifurcating coarse ribs fading adorally and toward the umbilicus. **E.** Profile at broken surface about at the interpreted beginning of the body chamber of the fiberglass cast.
A, B, D: scale bar 50 cm. C, E: scale bar 20 cm

Survey of Canada, Calgary. When this mould was created from the outcrop in 2000, the ammonite was essentially unchanged from when it was originally illustrated (Newmarch, 1953, pl. 4; Frebold, 1957, pls. XLII–XLIV) and it remains in similar condition although vulnerable to erosion or burial by slide debris, at least until recently.

Only the most salient or previously under-reported features of the much-discussed holotype are repeated here, together with new photographs illustrating different perspectives. The holotype is an imprint of a phragmocone, not preserved, embedded into the upper surface of the Morrissey sandstone, together with a natural cast of the relatively short body chamber that was likely preserved by being filled early with sand, and on which Westermann (1966) perceived a probable crushed peristome.

The dimensions, with the venter of the phragmocone missing, measured on the fibreglass cast stored at GSC Calgary (Fig. 4A): maximum preserved diameter 1.32 m, minimum 1.13 m; penultimate whorl height 25+ cm (venter missing), at beginning of body chamber 49 cm (Fig. 4E); body chamber half width from central plane at likely peristome (somewhat crushed) 16 cm (total 32–33 cm). Newmarch (1953, p. 46) stated that the specimen is 5 1/2 feet [1.7 m] in diameter; Frebold (1957) stated the maximum diameter to be 137 cm, Westermann (1966) 140 mm [sic], and Callomon (1984) 147 cm. The discrepancies may indicate that: some are estimates rather than measurements; some are estimates of initial conch size rather than preserved size of the existing impression with its broken edges; distortion of the mould acquired by Westermann (1966); more of its outer edges were preserved when it was first seen.

The dense fine ribbing on the innermost available partial whorl, with about 60 ribs per whorl, abruptly changes at about the supposed body chamber to coarse strong ribbing with less than 30 ribs per whorl (Callomon, 1984). The adoralmost portion preserved as an imprint immediately behind the body chamber has about eighteen (Frebold, 1957; Fig. 4A, B). Most if not all primary ribs bifurcate mid-way up the flank, some slightly enlarged at that position, others bifurcate higher on the flank and many at the umbilical margin (Fig. 4B, C). Approaching the beginning of the body chamber, there appears to be a previously unmentioned constriction on Westermann's (1966) cast (Fig. 4B) but it may be a result of damage to his mould, as it is not conspicuous on the GSCC cast. A forward bend of the ribs reported by Frebold (1957) is not well developed.

The part of the last whorl that is preserved as a cast, comprising slightly less than 1/3 of a whorl in length and perhaps encompassing the entire body chamber with a peristome interpreted by Westermann (1966), has about sixteen rounded but perhaps worn secondary ribs on the venter with wide rounded interspaces. They weaken on the flanks and toward the aperture (Fig. 4D). Cross-section profiles are shown in Figure 4E and by Frebold (1957, pl. XLIV).

Intermediate Specimen. A specimen exceeding 1 m in diameter (Fig. 5A–C) was excavated by large shovel operators from the digging face of the 1896 bench, at the Coal Mountain Mine of Teck Resources Limited (then Fording Coal). The specimen occurred within a low-angle cross-bedded, laminated shoreface sandstone, like that of the large specimen at Coal Creek and, as with the body chamber of that one, the matrix appears to have invaded the conch where it was broken or corroded.

It is currently in the Courtenay Museum and Palaeontology Centre, British Columbia, where it was examined in 2018 with the assistance of curator Pat Trask. A cast is also on display at the Visitor Information Centre in Sparwood, north of Fernie, B.C. The combination of the poorly preserved "inner" whorls and the outermost coarsely ribbed outer whorl of this specimen, together with the horizon on which it was found, provides the critical connection to both the holotype and the smaller specimen described below.

The maximum preserved diameter of this intermediate-sized specimen is 107 cm; in the minimum direction 82 cm. Maximum diameter of the "inner' whorl cast 79 cm, minimum diameter 56 cm; whorl width 13–15 cm (broken; likely crushed); whorl height 25.4–30.5 cm (broken; venter missing). The whorl height of the partial outer whorl preserved as an external mould exceeded 30.5 cm; only this amount of flank is available, much of the ventral portion missing. Whorl width (inflation) of that outer preserved portion must have been about 36 cm, judged by doubling the approximate half thickness available (Fig. 5C).

The umbilical wall of the earliest available growth stage (diameter 56 cm), and where the outer whorl of this inner available part of the phragmocone overlaps the "inner" whorl, is steep; the umbilical edge at this growth stage is relatively deep.

These innermost preserved whorls lack ribs, septae or other distinctive features, likely due to poor preservation, the phragmocone seeming to have been filled with sand at some stage of preservation and the surface being badly corroded or abraded. A ventral groove, with slightly raised margins along part of its extent, seems to follow the trace of the siphuncle, and does not appear to reflect any surface ornament. Where a probable break in the shell lies parallel to the plane of the ammonite, it simulates a ventral radial ornament, as does the lamination of the sandstone weakly perceptible on the cast in places.

The large outermost whorl, representing the last part of the phragmocone, is greatly inflated, particularly with respect to the preceding whorls and, as in the holotype, the umbilical wall is high and vertical to gently overhanging (Fig. 5C). This portion exhibits 6–7 coarse ribs per quarter

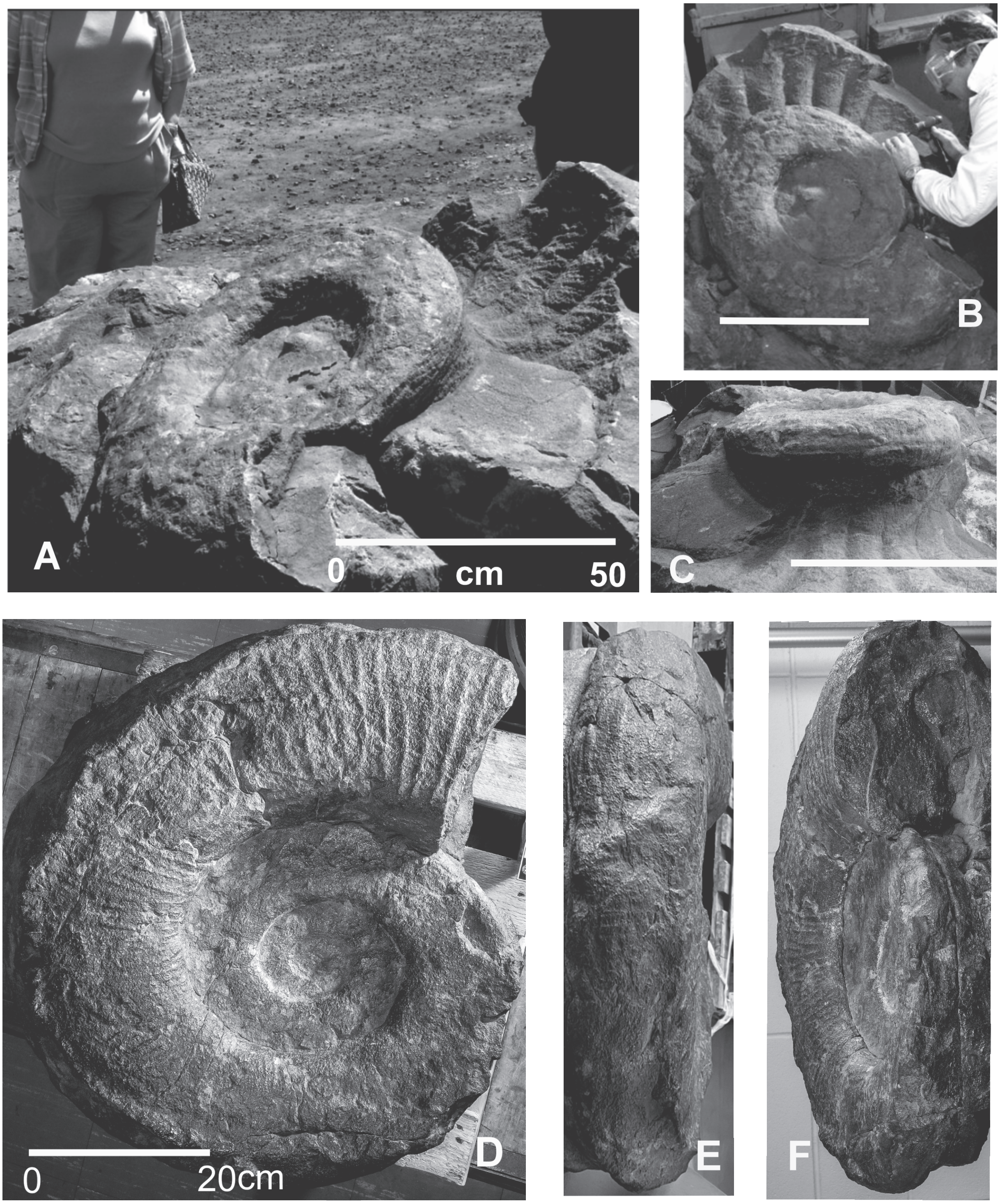

Fig. 5. *Corbinites occidentalis* from the Coal Mountain Mine, British Columbia – newly figured intermediate and small specimens

A–C. The intermediate-sized specimen from the Coal Mountain coal mine, Corbin B.C. Scale bar 50 cm. A. The specimen awaiting disposition at the coal mine office. B. The same undergoing curation at the Courtenay Museum and Palaeontology Centre, Courtenay. C. Ventral view of the poorly preserved phragmocone, showing crush fractures simulating radial ornament and umbilical edge profile of succeeding larger whorl. **D–F.** The smallest specimen (GSC 143340), also from the Coal Mountain Mine. Scale bar 20 cm. D. Lateral view, stored at the Geological Survey of Canada, Calgary. E. Ventral view showing nearly smooth (abraded) and crushed venter. F. Slightly oblique ventral view showing profile of broken cross-section of phragmocone

Fig. 6. A tribute to other late Jurassic giants

A. Arnold Zeiss (left) and George Jeletzky at the holotype specimen in 1985; Poulton at bottom. **B.** John Callomon in 1981

whorl, with only a hint of bifurcation low on the flank on some of them, the ventrad half, or more, of the flank not being available. The ribs are narrow and high-standing, with much broader rounded spaces between them.

Smallest Specimen (GSC 143340). The smallest specimen (Fig. 5D–F) was also found by workers in the Coal Mountain Mine; it is now with the Geological Survey of Canada, Calgary. The flanks are relatively flat, which may result from crushing, but the broken adoralmost end is rounded, oval, somewhat higher than wide, preserved by early sediment infill and perhaps indicative of the profile of the earlier whorls. No suture lines have been observed.

Dimensions. Maximum diameter 64 cm, minimum diameter 58 cm; whorl height at maximum preserved growth stage 22 cm, width (inflation) at same growth stage 13 cm (right side crushed). Its size and form are similar to the inner preserved whorl of the intermediate-sized specimen collected from the same level in the same mine.

It is finely ribbed, slightly coarser adorally, from about 35 primaries per ¼ whorl to 14 per 1/6 whorl (equiv. 21 per ¼ whorl) on the portion available for counting. Ribbing is slightly prorsiradiate, variocostate, with slightly flexuous single, biplicate, triplicate and subpolyplocoidal ribs on the adoralmost portion preserved (Fig. 5D). Bifurcation, if present, cannot be clearly seen on the significantly more finely ribbed earlier whorls. The umbilical walls are not particularly high, although they appear to become more so with growth.

AFFINITIES

The previous discussions regarding the "perisphinctid" affinities of the large holotype specimen are summarized below, followed by a new interpretation based primarily on the recognition of variocostate ataxioceratoid ribbing on it and on the smallest phragmocone specimen.

Arkell (1956), Frebold (1957), Westermann (1966) and Callomon (1984) compared the ribbing of the holotype with that of the large English "perisphinctids" of the Portland Stone, which were subsequently revised significantly by Wimbledon (1974) and Wimbledon and Cope (1978), and more recently discussed by Kiselev and Rogov (2018) and Rogov (2021). *Titanites* itself is currently accommodated within the Dorsoplanitidae (Pavloviinae) (Énay, Howarth, 2019).

Although the densely ribbed inner whorls of *Corbinites* resemble those of the English and French "*Titanites* group", coarse biplicate ribbing in maturity does not appear on those commonly referred to or similar to *Titanites*. Although some Kimmeridgian Dorsoplanitidae *e.g.*, *Wheatleyites/Shotoverites* and *Pallasiceras*, exhibit similar variocostation and coarsely ribbed body chamber, none attain the size of the Canadian species (M. Cooper, pers. com.). Re-examination of reproductions of the holotype and the discovery of smaller specimens newly described here reveals ataxioceratoid ribbing, which remove it from the Dorsoplanitidae as currently understood.

The Portland giants reach a maximum diameter of 1 metre (*T. anguiformis* Wimbledon) and exhibit gerontic features in the apertural area (W.A. Wimbledon, pers. com.). Their ribs become increasingly crowded toward the aperture, unlike those of *Corbinites*, and the body chamber becomes nearly smooth near its terminus (Arkell *et al.*, 1957). Considering that the Northwest European and Russian platform Dorsoplanitinae and Pavloviinae (*e.g.*, Callomon, 1984; Kiselev, 2015; Kiselev, Rogov, 2018) are morphologically if not taxonomically well known, it is unlikely that the largest Canadian specimen is simply a large sexual or other morphotype of one of these that has not appeared elsewhere.

Tithonian forms across the Arctic including *Taimyrosphinctes, Dorsoplanite*s, *Pavlovia*(?), and *Subcraspedites* in northeastern Sverdrup Basin of Arctic Canada (Jeletzky, 1984; Rogov, Zakharov, 2009; Schneider *et al.*, 2020; Rogov, 2021; Poulton, 2022), as well as *Titanites*-like ammonites across Siberia (Rogov, Zakharov, 2009) are each distinct from *Corbinites* in its defining characteristics.

Together with the morphological characteristics, biogeographic concerns caused Callomon (1984) to conclude that, most likely, "*T*". *occidentalis* does not belong to Dorsoplanitidae, but rather is a homeomorphic descendant of Oxfordian perisphinctids and its age could fall within a long range limited only by the regional stratigraphic constraints. The scarcity of perisphinctoid species during the Late Jurassic and earliest Cretaceous in the Western Interior Basin of Canada and United States, and the absence of any other very large ammonites except a giant peltoceratinid (Poulton, 1989), have also encouraged other (unpublished) speculations about the origin and affinities of this giant ammonite.

Likely progenitors are scarce in other nearby basins as well, which were not, in any case, in very close connection with the Western Interior Basin. Oxfordian *Dichotomosphinctes, Perisphinctes* and *Prososphinctes*? as well as Kimmeridgian and Tithonian *Discosphinctoides*?, *Lithacoceras*?, and *Subplanites*? have been identified in the more westerly of the Pacific accreted terranes (Imlay, 1981; Poulton *et al.*, 1988, 1993). The western terranes had been largely emplaced against North America by the Jurassic but were perhaps displaced considerable distances from their Late Jurassic locations in the eastern Pacific during later tectonics so that their significance for the paleolatitudinal distribution of the ammonites is unclear. The accreted terranes were largely separated from the interior foredeep trough during the Late Jurassic by early Rocky Mountains fold-and-thrust highlands, except at their north end (Fig. 3).

The continental paleoenvironments of the US western interior separated the trough from other ammonite-bearing basins to the south such as in Mexico and the Caribbean during most of the Late Jurassic (*e.g.*, Imlay, 1980; Callomon, 1984; Turner, Peterson, 2004).

Here it is proposed that *Corbinites*, n. gen. is the local product of the relative isolation of the Western Interior Basin from the Pacific, resulting in endemism discontinuously since the Bathonian (*i.e.*, certain Eurycephalitinae genera; *e.g.*, Frebold, 1957; Imlay, 1980; Callomon, 1984).

In its finely ribbed early whorls, varying abruptly with growth to its coarsely ribbed adult body chamber, and its ataxioceratoid ribbing that includes single, bifid, biplicate, triplicate and subpolyplocoid ribs, *Corbinites*, n. gen. most closely approaches members of the ataxioceratid subfamily Lithacoceratinae Zeiss, 1968, to which it is assigned in this report, but without an obvious antecedent. Early Tithonian ataxioceratids such as *Tolvericeras* and *Pseudogravesia*, are much smaller, more evolute, and with simple distant primary ribs from at least the middle growth stages (M. Cooper, pers. com.).

The Ataxioceratinae and Lithacoceratinae (sometimes raised to family level) are Submediterranean and (southern and central) East Pacific in distribution (Callomon, in: Hillebrandt *et al.*, 1993b; Parent, 2003), a result of connectivity through the Caribbean and Mexico. Mid-Tithonian *Kawhiasphinctes*, which G. Schweigert made me aware of during manuscript review, has close similarities to the inner whorls of *Corbinites* (Fig. 5D), but a southwestern Pacific and southern Asian distribution (Énay, Howarth, 2019).

In spite of the original large specimen (holotype) having been much discussed and illustrated, and the current description of new smaller specimens, the taxonomic affinities and precise age of *Corbinites* remain somewhat tentative; it is biogeographically far removed from what may be its closest kin.

Acknowledgements. This report benefits from comments made long ago by John Callomon who had seen some of the specimens. George Jeletzky and Arnold Zeiss also offered suggestions, having seen the largest specimens (Fig. 6A, B). More recently Bill Wimbledon offered useful information, and most recently and most generously, Michael Cooper has shared his knowledge of perisphinctoid taxonomy and characteristics, Late Jurassic endemism, and his views on the affinities of *Corbinites*, many of which are incorporated in this report. Together with a most valuable early editing, his input was critical to the completion of this report. Insightful and informative reviews by Günter Schweigert and Horacio Parent improved this report significantly, and Jacek Grabowski's attention to the processing of the manuscript is particularly appreciated.

Brad Pisony informed me of new finds of many kinds in the Coal Mountain mine, and hosted me at the mine site several times. He and Teck Resources staff at the mine enabled the acquisition of the small and intermediate-sized specimens for secure curation. Pat Trask assisted me in providing access to the intermediate-sized specimen at the Courtenay Museum, and Jim Haggart provided a photograph. Phil Currie and Art Sweet assisted with the preparation of a rubber mould of the original large specimen in the field, and Currie arranged for production of the fiberglass cast by staff of the Tyrrell Museum of Paleontology. Dave Rudkin provided photographs of the Westermann cast stored at the Royal Ontario Museum; Richard Fontaine (shown in Fig. 4A) and Glen Edwards assisted with photography of the materials stored at the Geological Survey of Canada.

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