THE HOLOTYPE (PLASTOTYPE) OF ?TITANITES OCCIDENTALIS FREBOLD FROM THE KOOTENAY SANDSTONE (UPPER JURASSIC) OF SOUTHERN BRITISH COLUMBIA

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ABSTRACT

The supplementary description of the giant ?*T. occidentalis* is based on the "holo-plasto-type", including the hitherto unknown densely ribbed penultimate whorl. After discussion of affinities and geological age, Freebold's original suggestions are tentatively supported.

The species ?*Titanites occidentalis* Frebold (1957, p. 66, Pls. 42–44) is based on a single incomplete specimen which had not been secured in a type collection because of its gigantic size. Hitherto described was only the ultimate and probably last whorl, which appears to include the complete body chamber. The phragmocone part is preserved as left imprint, the supposed body chamber as natural internal mold. The inner whorls up to approximately 70 cm in diameter were unknown.

The holotype was cast by the author in the summer of 1958, with the assistance of Dr. W. Brown, then employed by Shell Oil Company of Canada Ltd., and with technical aid from this company (see Fig. 1). Strongly oblique light on the plastercast revealed the costation of the last one-third whorl of the penultimate whorl back to a diameter of 55–60 cm, where, because of corrosion, the impressed ornament had become undiscernible in the field. The costation of the inner whorls was distinctly different from that of the ultimate whorl, demanding a reassessment of the affinities of this specimen, particularly also for biostratigraphic reasons since late Upper Jurassic (post-Oxfordian) ammonites are otherwise unknown from the Canadian Cordillera and are very rare in North America.

Because of the Nevadan orogeny, uppermost Jurassic beds are usually absent or nonmarine in at least the eastern and central Cordilleras. In southwestern Canada, the latest well-dated marine beds of the Fernie group are the "Green beds" of Oxfordian and possibly also of early Kimmeridgian age (Frebold *et al.* 1959, pp. 10, 11). They are overlain by "Passage beds" that are partially marine and which lack diagnostic fossils. The overlying Kootenay formation consists of coarse cross-bedded sandstones, shales, and coal seams that extend well into the Cretaceous. The only known marine fossil is the single gigantic ammonite ?*Titanites occidentalis*, which is embedded in the top of the basal Kootenay sandstone and thus the key to the dating of the first major regional uplift.

Frebold referred his new species only tentatively to *Titanites*, a "dust-bin name" for large fine-ribbed evolute Perisphinctids of the uppermost Jurassic, after consultation with Arkell (1956, p. 540, Pl. 26), who, on the basis of

photographs taken in the field, concluded that "it appears to be a giant member of the Dorsoplanitinae" and that it can be compared with some members of "*Titanites* and allied genera" from the Upper Portland stone of southern England rather than with Kimmeridgian forms. Nevertheless, Frebold referred the specimen without hesitation to the Upper Portlandian, probably *Titanites giganteus* zone.

Family PERISPHINCTIDAE Steinmann, 1890
(?) Subfamily DORSOPLANITINAE Arkell, 1950
[including Pavloviidae Spath]
?Genus *Titanites* Buckman, 1921
?*Titanites occidentalis* Frebold, 1957

DESCRIPTION

With a diameter of about 140 mm this specimen is among the largest ammonoids ever found in the Americas. The one-whorl, natural, left-sided impression probably represents the last whorl of the phragmocone, measuring about 120 cm in diameter, and the one-third to two-fifths whorl natural cast probably represents the possibly complete body chamber (the plaster mold of the end of the body chamber was damaged during transport, resulting in flattening and exfoliation of the plaster cast).

The last phragmocone whorl is subcircular, slightly compressed, and probably somewhat ovoid in section. The ovoid form is, however, largely only apparent because of strong lower lateral swelling of the costae. The large umbilical width appears to increase slightly, amounting in average to about 45% of the diameter. The body chamber is similar in shape although somewhat more compressed by lateral flattening. The end of the conch is marked by a broad, smooth, slightly constricted zone followed by collar-like thickening which probably represents the peristome (see Frebold 1957, Pl. 43).

The costation of the penultimate whorl of the conch (visible only in oblique light on the plastercast) consists of densely spaced, rectiradiate, long primaries, approximately 15 per quarter-whorl, which reach up to the umbilical seam of the "riding" body chamber. Corrosion has all but obliterated them, making detailed description impossible. With the last whorl the costation changes rapidly by way of increase in spacing and strength of the primaries, reducing in number to eight or nine per quarter-whorl, by shortening, and by swelling on the lower inner flanks until they become bullae-like on the end of the phragmocone. At the beginning of the last whorl, the primaries bifurcate and trifurcate high up on the flanks, at two-thirds to three-fourths whorl height, into fine secondaries which cross the externside. With strengthening of the costae the point of bifurcation shifts to mid-lateral. Also the secondaries, arising by bifurcation and intercalation, become much stronger and continue to cross straight the externside, suffering, at the most, some median flattening.

Simplification of costation occurs on the last two-thirds to two-fifths whorl, the supposed body chamber. The primaries become blunt and the number of secondaries decreases by omission of intercalatories.

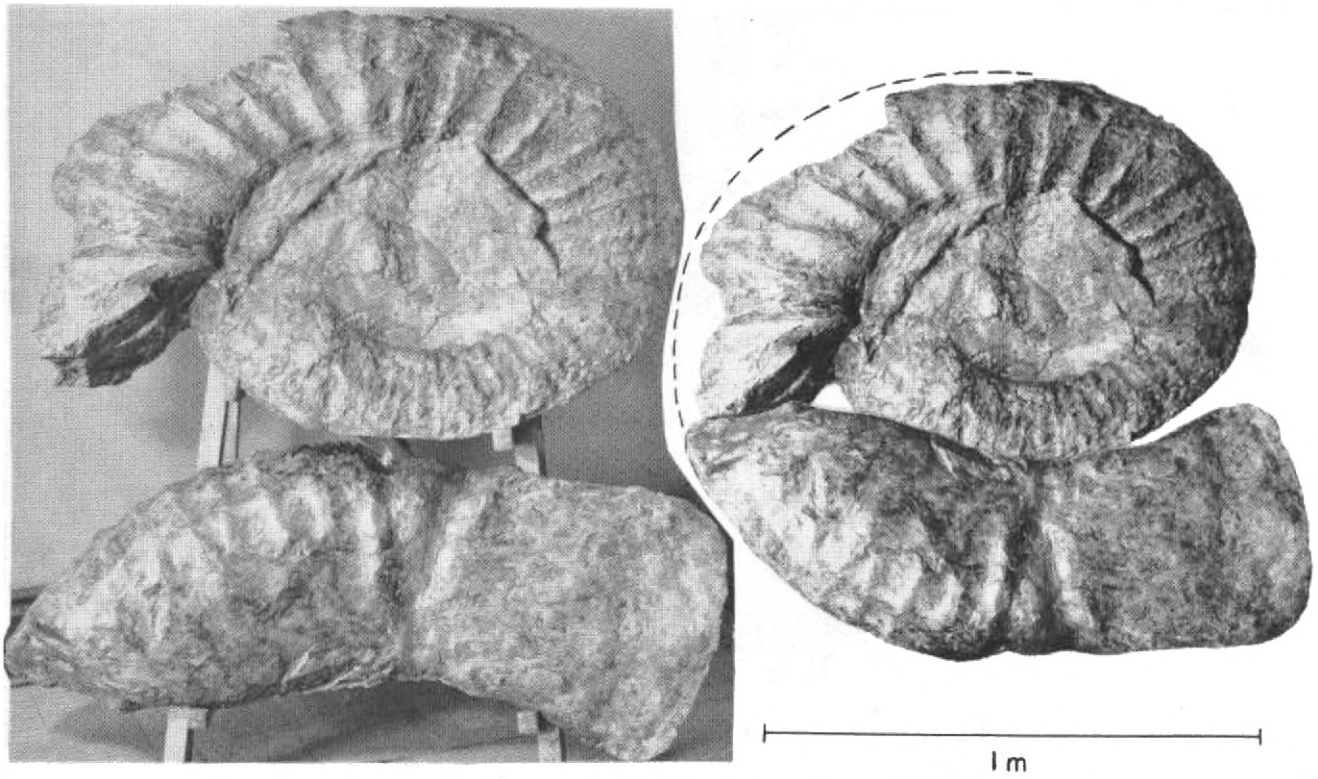

FIG. 1. The "holo-plasto-type" of *?T. occidentalis* Frebold. The left side of the phragmocone is a cast from the natural external mold, the right side of the body chamber (slightly deformed and exfoliated during casting) is the reproduction of the natural internal mold. Left, as displayed in the Department of Geology, McMaster University (catalogue No. J 1132); right, a photomontage with photographically inversed body chamber.

Thus, the coarse costation as described by Frebold (1957) is restricted to the last whorl of the probably complete, very large conch, while the inner whorls are, at least in part, densely costate; that is, the phragmocone is variocostate.

The holo- (plasto-) type is deposited in the Department of Geology, McMaster University, under the catalogue No. J 1132.

AFFINITIES AND AGE

The densely ribbed inner whorls, as suggested by the penultimate whorl at 60–70 cm diameter, show much stronger resemblance to those of *Titanites* such as the type species *T. titan* Buckman than to the only previously known last whorl. The adult modification into a coarsely costate "giant" stage has, however, not yet been figured from the Portlandian/Volgian giants, which are currently lumped(?) into the genus *Titanites* (Arkell 1957, p. L 334). Yet this may be due to collection and reproduction difficulties and the consequent restriction to incomplete or adolescent specimens, rather than to nonexistence. J. Callomon (private communication) pointed out that this type of costae modification is known in perisphinctids of more or less all ages. On the other hand, according to the authoritative diagnosis for *Titanites* by Arkell (1957), the outer whorls develop crowded ribbing and the body chamber becomes finally nearly smooth.

Variocostation is typically present in *Wheatleyites*, which Arkell (1957) placed in the heterogeneous Virgatosphinctinae; but it is there much stronger and earlier developed, the outer whorls are narrower umbilicate, and the adult diameter does not exceed 40 cm (Callomon, private communication). The possibility of closer affinity to other incompletely known late Jurassic genera such as *Glaucolithites* Buckman has to be considered, yet our poorly preserved single specimen does not permit close comparison.

In conclusion, it appears advisable to retain Frebold's tentative placement of *occidentalis* in *Titanites*.

The possible geological age of ?*T. occidentalis* ranges throughout the Volgian stage, that is, Upper Kimmeridgian (English usage) to Lower Berriasian; its probable age is Portlandian (English usage) and very tentatively its upper substage, about the *T. giganteus* zone (Callomon, private communication). This is in tentative agreement with Frebold's original determination.

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