Platyscaphites, a new ammonite from the Lower Campanian (Upper Cretaceous) of the United States Western Interior

by William A. COBBAN, W. James KENNEDY & Neil H. LANDMAN

Abstract

A diminutive genus of scaphite, Platyscaphites gen. nov., probably arose from the Scaphites hippocrepis (DeKay, 1828) stock during early Campanian time in the northern part of the United States Western Interior. Three species, all new, are described; they reveal a trend towards progressive size reduction and recoiling to a planispiral shell morphology, accompanied by a possible reduction in adult size. Platyscaphites groatensis sp. nov., the oldest species, occurs low in the zone of Baculites sp. (smooth), and P. elginensis sp. nov., occurs high in that zone; P. fremontensis sp. nov., is found in the succeeding zone of Baculites sp. (weak flank ribs).

Key-words: Cephalopoda, Ammonoidea, Platyscaphites, Campanian, USA.

Introduction

Recoiling is a widespread evolutionary trend in scaphitid heteromorph ammonites that leads ultimately to planispiral shells in which the body chamber is in contact with the phragmocone throughout ontogeny, rather than separated at maturity. The trend has been recognized in several U.S. Western Interior lineages of scaphitid ammonites that lead to taxa such as Desmoscaphites Reeside, 1927a, Closcaphites COBMAN, 1952, Binneyites Reeside, 1927b, Pontexites WARREN, 1934, and Rhaeboceras MEEK, 1876. Acanthoscaphites NOWAK, 1911, and Indoscaphites SPATH, 1953, are recoiled genera known from western Europe, South India, and Tunisia. We describe below an additional dwarf genus of recoiled scaphite as Platyscaphites gen. nov., that occurs in the lower Campanian in the central and northern parts of the Western Interior in Colorado, Wyoming, South Dakota, and Manitoba. Three species are described, from oldest to youngest, Platyscaphites groatensis sp. nov., P. elginensis sp. nov., and P. fremontensis sp. nov., the last named being the type species. The lineage is believed to be derived from Scaphites (Scaphites) hippocrepis (DeKay, 1828), which immediately predates P. groatensis. The lineage shows progressive recoiling; the microconchs of the two earlier species have body chambers detached from the spire, and dimorphism is obvious. In the last species, P. fremontensis, the whorls are in contact throughout, and macroconchs and microconchs cannot be separated. The lineage also possibly shows progressive size decrease, although the sample sizes of two of the species are too small to demonstrate this conclusively.

These ammonites were originally referred to as Indoscaphites sp. by COBMAN & SCOTT (1964, fig. 2), but are heterochronous homeomorphs of that genus, which is known only from the upper Maastrichtian of Pondicherry, South India, and Tunisia.
Lower Campanian Scaphite Sequence in the Western Interior

The following six ammonite zones were recognized by Gill & Cobban (1966) in rocks of early Campanian age in the Western Interior of the United States (youngest at top):

- *Baculites obtusus*, *Trachyscaphites praespiniger*
- *Baculites* sp. (weak flank ribs), *Trachyscaphites praespiniger*
- *Baculites* sp. (smooth), "Indoscaphites"
- *Haresiceras natronense*, *Scaphites hippocrepis* (fine ribbed)
- *Haresiceras placentiforme*, *Scaphites hippocrepis* (coarse ribbed)
- *Haresiceras montanaense*, *Scaphites hippocrepis* (coarse ribbed)

The "Indoscaphites" is the *Platyscaphites* of the present report. Although shown only in the zone of smooth *baculites* by Gill & Cobban (1966, table 2) as well as in an earlier report by Cobban & Scott (1964, fig. 2), *Platyscaphites* is now known to range up into the overlying zone of *baculites* that have weak flank ribs.

Localities of *Platyscaphites* in the Western Interior

Localities at which *Platyscaphites* has been collected in the Western Interior of the United States are shown in Fig. 1. The USGS Mesozoic locality number, the collector(s), the year of collection, the locality, and the stratigraphic assignment are as follows (prefix D indicates Denver Mesozoic locality numbers; the others are Washington, D.C., Mesozoic locality numbers):

- **D4266. R.E. Burkholder & W.A. Cobban, 1963. Near North Fork oil field, in deep gully in the SE1/4 sec. 26, T. 44 N., R. 82 W., Johnson County, Wyoming. Cody Shale, about 4.6 m below a 0.9 m thick bed of bentonite that underlies the Shannan Sandstone Member.**
- **21762. J.D. Love & Keith Yenne, 1949; J.R. Gill & R.C. Givens, 1964. Near Conant Creek, in the NE1/4 sec. 5, T. 33 N., R. 93 W., Fremont County, Wyoming. Cody Shale, from sandy, limestone concretions 60 m below top.**
- **D4734. J.R. Gill & W.A. Cobban, 1964. Near Muskrat gas field, in the NW1/4SW1/4NE1/4 sec. 27, T. 34 N., R. 92 W., Fremont County, Wyoming. Cody Shale, 53 m below top, from ridge-forming bed of brown-weathering sandy, limestone concretions [same bed as at 23116].**
**SYSTEMATIC PALAEONTOLOGY**

**Superfamily Scaphitaceae Gill, 1871**

**Family Scaphitidae Gill, 1871**

**Subfamily Scaphitinae Gill, 1871**

**Genus Platyscaphites gen. nov.**

**TYP**E SPECIES: *Platyscaphites fremontensis* n. gen. et sp., lower Campanian, Cody Shale, Wyoming.

Derivation of name: *Platys* (Greek), flat and *skaphe* (Greek), a type of boat.

**DIAGNOSIS**

Small, weakly to strongly dimorphic scaphites, recoiled in type species (youngest), but body chambers of microconchs detached from spire in older two species. Flanks are flat and weakly ribbed on adult body chambers; small conical ventrolateral tubercles present on last part of phragmocone and body chamber.

**DISCUSSION**

The type species, *P. fremontensis* n. sp. (Pl. 1, Figs. 25-61) has a planispiral shell in which the whorls are in contact throughout, such that dimorphs cannot be differentiated. The species is a homoeomorph in shell shape and coiling of *Indoscaphites Spath*, 1953 (type species *Ammonites cunliffei* Forbes, 1846, p. 109, pl. 8, fig. 2; lectotype designated by Kennedy & Henderson, 1992, p. 724) from the upper Mastrichtian of Pondicherry, South India, the two differing in the well-developed umbilical bullae of *Indoscaphites*. Similarities of juveniles is, however, striking (compare Pl. 1, Figs. 38-40 and Forbes, 1846, pl. 8, fig. 2c). Flat sides and style of ornament connect *P. fremontensis* to the slightly older *P. elginensis* n. sp. (Pl. 1, Figs. 1-6), where the hook of microconchs is clearly detached from the spire, as it is in the microconch of the oldest species, *P. groatensis* n. sp. (Pl. 1, Figs. 7-24). The origin of *Platyscaphites* seems to lie in the older *Scaphites* (*Scaphites*) *hippocrepis* (DeKay, 1828) lineage described in detail by Cobban (1969). The two genera differ in the tendency to recoil in *Platyscaphites*, which has flat sides and no umbilical and lateral tubercles. *Scaphites* (*S.*) *hippocrepis* has umbilical and ventrolateral tubercles and occasional lateral tubercles.

**OCCURRENCE**

Lower Campanian of Colorado, South Dakota, and Wyoming; southern Manitoba; and possibly northeast Texas and New Jersey.

*Platyscaphites groatensis* n. sp.

(Pl. 1, Figs. 7-24; Fig. 2)

Derivation of name: From the Groat Sandstone Bed of the Gammon Ferruginous Member of the Pierre Shale that yielded the type material.

**TYPES**

Holotype is USNM 481620 (Pl. 1, Figs. 16-18), paratypes are USNM 481621-481626 (Pl. 1, Figs. 6-15, 19-24), from the lower Campanian zone of *Baculites* sp. (smooth). The types are from USGS Mesozoic locality D2503, about 24 km north of Belle Fourche, in the SW1/4 sec. 27, T. 11 N., R. 2 E., Butte County, South Dakota.

**DIAGNOSIS**

*Platyscaphites* that has the body chamber of the microconch markedly detached from the spire, and the body chamber of the macroconch slightly detached from the spire. Inner whorls may have ventrolateral bullae that give rise to groups of flexuous ribs. The flanks of the early body chamber are smooth, but ribbing rejuvenates towards the aperture.

**DESCRIPTION**

The inner whorls are very involute and range from compressed (Pl. 1, Figs. 7, 8, 13-14) to depressed (Pl. 1, Figs. 9-12). The earliest growth stages seen are smooth. At a later growth stage in compressed variants, delicate prorsiradiate ribs are present on the inner flank and branch into pairs or threes on the outer flank, where additional ribs intercalate; all ribs strengthen and sweep forward to cross the venter in a broad convexity (Pl. 1, Figs. 7, 8, 22-24). Some specimens of this type may develop stronger, widely separated primaries on the inner flank (Pl. 1, Fig. 14), although this is a typical feature of depressed, robust individuals (Pl. 1, Figs. 9-12), where the ribs are prorsiradiate and slightly flexuous and terminate in well-developed ventrolateral bullae. The bullae give rise to groups of two or three ribs with others intercalated. Ribs on the depressed specimens cross the venter with less convexity than on the compressed variant.
The holotype (Pl. 1, Figs. 16-18) is an adult macroconch 16.5 mm long. Its last one-half whorl of spire has strong, bullate ventrolateral tubercles that give rise to groups of two or three relatively coarse ribs, with additional intercalated ribs crossing the venter in a broad convexity. Flat, parallel sides characterize the shaft of the body chamber; its umbilical wall follows a straight course when viewed from the side, and has a low convex wall; it is rather worn, but may have borne distant, prorsiradiate ribs. The venter is also abraded, but ornament appears to have been weak. The final hook is barely separated from the spire, and is strongly recurved. Outer flank ornament rejuvenates as long, delicate, distant bullae that weaken towards the adult aperture. Bullae on the first section of the hook give rise to single distant ventral ribs that are slightly concave on the curved sector (Pl. 1, Fig. 18). These break down into groups of weaker ribs that arise in pairs or threes from the bullae (Pl. 1, Fig. 17). The adult aperture is marked by a strong, narrow constriction and a weak ventral rostrum.

USNM 481621 (Pl. 1, Figs. 19-21) is an adult microconch 10.5 mm long. The phragmocone has weak ornament of ventrolateral bullae and ventral ribs. Its body chamber is compressed and flat-sided, but much narrower than that of the macroconch, and has a concave umbilical wall when viewed from the side. Flanks are initially distantly ribbed followed by a smooth sector preceding the final hook. Large, bullate to conical, ventrolateral tubercles give rise to pairs of coarse ventral ribs that loop across the venter to the tubercle on the opposite ventrolateral shoulder. Distant, straight, prorsiradiate flank ribbing rejuvenates on the final hook. Ribs terminate in the conical ventrolateral tubercles that weaken towards the adult aperture; the tubercles are linked over the venter by a weak rib or pair of ribs with some additional intercalated ribs. The adult aperture is not preserved. The very simple suture has a subtrifid first lateral saddle between the ventral and lateral lobes (Fig. 2).

**Discussion**

*Platyscaphites groatensis* sp. nov., most closely resembles *Scaphites hippocrepis* III of Cobban (1969, p. 21, pl. 3, figs. 1-25; pl. 4, figs. 35-39; pl. 5, figs. 36-40; text figs. 2, 4, 10, 11), of which it is believed to be the descendant. The two differ in the much smaller size of *P. groatensis*, the flat sides of the macroconch body chamber, and absence of umbilical and lateral tubercles on the hook.

**Occurrence**

Known with certainty only from USGS Mesozoic locality D2503. A single fragment of a small scaphite from the upper part of the Vermilion River Formation in southwestern Manitoba may represent this species.

**Platyscaphites elginensis** sp. nov. (Pl. 1, Figs. 1-6)

Derivation of name: From the type locality on Elgin Creek, Johnson County, Wyoming.

**Types**

Holotype is USNM 481627 (Pl. 1, Figs. 1-3) from a limestone concretion in a bed of bentonite 222 m below the top of the Cody Shale at USGS Mesozoic locality D3434, at Elgin Creek in the N1/2 sec. 13, T. 49 N., R. 83 W., Johnson County, Wyoming. Paratype USNM 481628 (Pl. 1, figs. 4-6) is from the Cody Shale about 4.6 m below a 0.85 m-thick bed of bentonite that underlies the Shannon Sandstone Member at USGS Mesozoic locality D4266, near the North Fork oil field in a deep gully in the SE1/4NE1/4 sec. 26, T. 44 N., R. 82 W., Johnson County, Wyoming.

**Diagnosis**

*Platyscaphites* that has the body chamber of the macroconch in contact with the spire. Hook of the microconch is widely detached. Conical ventrolateral tubercles on the phragmocone and the body chamber.

**Description**

The holotype (Pl. 1, Figs. 1-3) is a complete macroconch 26 mm long. Its very involute phragmocone has a small, deep umbilicus and a narrowly rounded umbilical shoulder. Whorl section of the phragmocone is equidimensional and has flattened, subparallel flanks and a broadly rounded venter. Distant, relatively coarse, straight, prorsiradiate ribs, 12 per one-half whorl, arise at the umbilical shoulder and extend to well-developed conical ventrolateral tubercles. These tubercles give rise to groups of two or three ribs with an occasional intercalated rib. All ribs strengthen over the venter and cross it in a broad convexity. The body chamber is somewhat crushed but appears to have been in contact with the spire. The umbilicus is only slightly occluded, and the umbilical wall is low and concave. The body chamber is compressed and has flattened.
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flanks and a broadly arched venter. Ornament is of delicate flank ribs that are weaker on the body chamber than on the phragmocone; some arise as mere striae at the umbilical seam. All ribs terminate in conical ventrolateral tubercles that weaken progressively towards the adult aperture. These tubercles give rise to groups of two or three narrow, convex ribs that loop between tubercles across the venter with additional intercalated single ribs.

Paratype USNM 481628 (Pl. 1, Figs. 4-6) is a large adult microconch 23 mm long. Its phragmocone is badly preserved and crushed, but appears to have been similar to that of the macroconch; ornament consists of conical ventrolateral tubercles and ventral ribs. The body chamber has a concave umbilical wall when viewed in profile; the hook is widely separated from the phragmocone. Flanks are ornamented by weak, distant, straight, prorsiradiate primary ribs. The new species is from the Lower Campanian 51

Discussion

The tighter coiling of the macroconch distinguishes this species from *P. groatensis* sp. nov., as does the presence of primary ribs and conical ventrolateral tubercles on the flanks of both spire and body chamber. Large size, coarseness of flank ribs, shape of tubercles, and wide separation of the later part of the body chamber from the phragmocone distinguish it from *P. fremontensis* sp. nov. The holotype (now lost) of *Scaphites similis* Whitfield (1892, p. 267, p. 44, figs. 1, 2) resembles *P. elginensis* but lacks tubercles on the spire.

Occurrence

*Platyscaphites elginensis* is a rare species that has been found high in the zone of *Baculites* sp. (smooth) at localities D4266 and D4287, and in the zone of *Baculites* sp. (weak flank ribs) at locality D3434.

**Platyscaphites fremontensis** sp. nov.
(Pl. 1, Figs. 25-61; Fig. 3)

Derivation of name: From Fremont County, Wyoming.

Types:
Holotype is USNM 481629 (Pl. 1, Figs. 50-52); it and paratypes USNM 481637-481641 (Pl. 1, Figs. 44-49, 53-57) are from a sandstone bed in the Cody Shale, zone of *Baculites* sp. (weak flank ribs) at USGS Mesozoic locality 23116 in sec. 20, T. 34 N., R. 92 W., Fremont County, Wyoming. Paratypes USNM 481630-481636 (Pl. 1, Figs. 25-43) are from the Cody Shale at locality D4734 in sec. 27, T. 34 N., R. 92 W., Fremont County. Paratype USNM 481642 (Pl. 1, Figs. 58, 59) is from the Cody Shale at locality 21762 in sec. 5, T. 33 N., R. 93 W., Fremont County. Paratype USNM 481643 (Pl. 1, Figs. 60, 61) is from the Pierre Shale at locality D3890 in sec. 30, T. 4 N., R. 81 W., Grand County, Colorado.

Diagnosis

Macroconchs planispiral with whorls in contact throughout; the new species is from the Lower Campanian 51

Description

Dimorphism is poorly developed in this recoiled species inasmuch as both macro- and microconchs usually have their whorls in contact throughout growth. They are adult at sizes between 15.5 and 20 mm diameter. Coiling is moderately involute on the phragmocone, but becomes eccentric and progressively more evolute on the outermost whorl. The new species is from the Lower Campanian 51

Figure 3 — Part of the external suture of *Platyscaphites fremontensis* sp. nov., (Pl. 1, Fig. 44, from USGS Mesozoic locality 10459 (Fig. 1). E is the external lobe, L is the lateral lobe, and E/L is the saddle that separates the lobes.
weaken markedly, but ribs may strengthen (Pl. 1, Figs. 53, 54). The relatively simple suture has a broad, subtrifid E/L and narrow L (Fig. 3).

**Discussion**

Planispiral coiling that has the body chamber in contact with the phragmocone throughout growth distinguishes *P. fremontensis* sp. nov., from *P. elginensis* sp. nov., and *P. groatensis* sp. nov., *Platyscaphites fremontensis* most closely resembles *Indoscyphites cunliffei* (Forbes, 1846, p. 109, pl. 8, fig. 2) from the upper Maastrichtian of Pondicherry, South India, of which it is a hetero-chronous homeomorph; they differ in that the Indian species is much larger (the holotype, an adult is 34.5 mm in diameter) and has well-developed umbilical bul-lae.

**Occurrence**

*P. fremontensis*, the most widely distributed species of *Platyscaphites*, occurs at USGS Mesozoic localities D3515, D3890, D4580, D4725, D4734, D1344, 10459, 21762, 23116, and 23121.

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**References**


Plate 1

Figs. 1-6 — *Platyscaphites elginensis* sp. nov. 1-3, holotype USNM 481627, a macroconch, from USGS locality D3434. 4-6, paratype USNM 481628, a microconch, from USGS locality D4266.

Figs. 7-24 — *Platyscaphites groatensis* sp. nov. 7-8, paratype USNM 481622, from USGS locality D2503. 9-10, paratype USNM 481623, from USGS locality D2503. 11-12, paratype USNM 481624, from USGS locality D2503. 13-15, paratype USNM 481625, from USGS locality D2503. 16-18, holotype USNM 481620, a macroconch, from USGS locality D2503. 19-21, paratype USNM 481621, a microconch, from USGS locality D2503. For suture, see text Figure 2. 22-24, paratype USNM 481626, from USGS locality D2503.

Figs. 25-61 — *Platyscaphites fremontensis* sp. nov. 25-28, paratype USNM 481630, a microconch, from USGS locality D4734. 29, 30, paratype USNM 481631, a microconch, from USGS locality D4734. 31-33, paratype USNM 481632, a microconch, from USGS locality D4734. 34, 35, paratype USNM 481633, a microconch, from USGS locality D4734. 36, 37, paratype USNM 481634, a macroconch, from USGS locality D4734. 38-40, paratype USNM 481635, from USGS locality D4734. 41-43, paratype USNM 481636, a microconch, from USGS locality D4734. 44, paratype USNM 481638, a microconch, from USGS locality 10459. For suture, see Fig. 3. 45, 46, paratype USNM 481637, a microconch, from USGS locality 23116. 47-49, paratype USNM 481639, a microconch, from USGS locality 23116. 50-52, holotype USNM 481629, a microconch, from USGS locality 23116. 53, 54, paratype USNM 481640, a macroconch, from USGS locality 23116. 55-57, paratype USNM 481641, a microconch, from USGS locality 23116. 58, 59, paratype USNM 481642, a microconch, from USGS locality 21762. 60, 61, paratype USNM 481643, from USGS locality D3890.

Figures 1-6, 19-21, 25-37, are x 1. Figures 7-18, 22-24, 38-61 are x 2.