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Two Species of *Placenticer* (Ammonitina) from the Upper Cretaceous (Campanian) of the Western Interior of the United States

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ABSTRACT

Two species of the ammonite genus *Placenticer* are described from rocks of Campanian age in the Western Interior of the United States. *Placenticer* *costatum* Hyatt, 1903, occurs in the *Baculites cuneatus* and *B. reesidei* zones of Colo-

rado and South Dakota, the *B. cuneatus* zone of Montana, and the *B. reesidei* zone of New Mexico. *Placenticer* *pingue*, n. sp., occurs in the *B. reduncus* and *B. scotti* zones of Wyoming and South Dakota.

INTRODUCTION

Ammonites of the genus *Placenticer* Meek, 1876, are among the most spectacular fossils from the Campanian Pierre Shale of the Western Interior of the United States. Their iridescent sheen and complex sutures make them valuable collector's items. Most specimens have been referred to the smooth, oxyconic species *Placenticer* *meekei* Böhm, 1898, or the ribbed and tuberculate *Placen-*

ticer *intercalare* Meek, 1876. We describe below two additional species of the genus: *Placenticer* *costatum* Hyatt, 1903, from the *Baculites cuneatus* and *B. reesidei* zones of Colorado and South Dakota, the *B. cuneatus* zone of Montana, and the *B. reesidei* zone of New Mexico, and *Placenticer* *pingue*, n. sp., from the *B. reduncus* and *B. scotti* zones of Wyoming and South Dakota.

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CONVENTIONS

All specimens described here are deposited in the U.S. National Museum of Natural History (USNM) in Washington, D.C., the Museum of Comparative Zoology (MCZ) in Cambridge, Massachusetts, and the Black Hills Museum of Natural History (BHI), Hill City, South Dakota. Casts of some specimens are retained in the U.S. Geological Survey Collections in Denver, Colorado. Suture terminology is that of Kullman and Wiedmann (1970), with E = external lobe, L = lateral lobe, U = umbilical lobe, and I = internal lobe. All dimensions are expressed in millimeters, where D = diameter, Wb = whorl breadth, Wh = whorl height, and U = umbilical diameter. Figures in parentheses are dimensions as a percentage of diameter. Specimens are photographed in the customary position with the aperture on top although the authors recognize that the animal would have been oriented differently in life.

LOCALITIES OF FIGURED SPECIMENS

The following localities are referred to in the text:

USGS Mesozoic locality D1285, Pierre Shale, *Baculites cuneatus* zone, SW $\frac{1}{4}$ sec. 17, T3N, R80W, Grand County, Colorado.

USGS Mesozoic locality D1349, Pierre Shale, *Baculites compressus* zone, SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 18, T3N, R80W, Grand County, Colorado.

USGS Mesozoic locality D1351, Pierre Shale, *Baculites compressus* zone, NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 17, T3N, R80W, Grand County, Colorado.

USGS Mesozoic locality D1353, Pierre Shale, *Baculites cuneatus* zone, NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 17, T3N, R80W, Grand County, Colorado.

USGS Mesozoic locality D1393, Rock River Formation, *Baculites reduncus* zone, southeast of Rock River in the NE $\frac{1}{4}$ sec. 9, T20N, R76W, Albany County, Wyoming.

USGS Mesozoic locality D1411, Pierre Shale, *Baculites scotti* zone, northeast of Oral in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 26, T7S, R7E, Fall River County, South Dakota.

USGS Mesozoic locality D1785, Pierre Shale, *Baculites cuneatus* zone, SW $\frac{1}{4}$ sec. 17, T3N, R80W, Grand County, Colorado.

USGS Mesozoic locality D5057, Pierre Shale, *Baculites cuneatus* zone, brown sandstone concretions above conspicuous bed of concretions with *Inoceramus vanuxemi* Meek and Hayden, SE $\frac{1}{4}$

SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, T3N, R81W, Grand County, Colorado.

SYSTEMATIC PALEONTOLOGY

ORDER AMMONOIDEA ZITTEL, 1884

SUBORDER AMMONITINA HYATT, 1889

SUPERFAMILY HOPLITACEAE DOUVILLÉ, 1890

FAMILY PLACENTICERATIDAE HYATT, 1900

GENUS PLACENTICERAS MEEK, 1876

TYPE SPECIES: *Ammonites placenta* DeKay, 1828, p. 278, by original designation by Meek, 1876, p. 462.

Placenticeras costatum Hyatt, 1903
Figures 1–3, 9–24

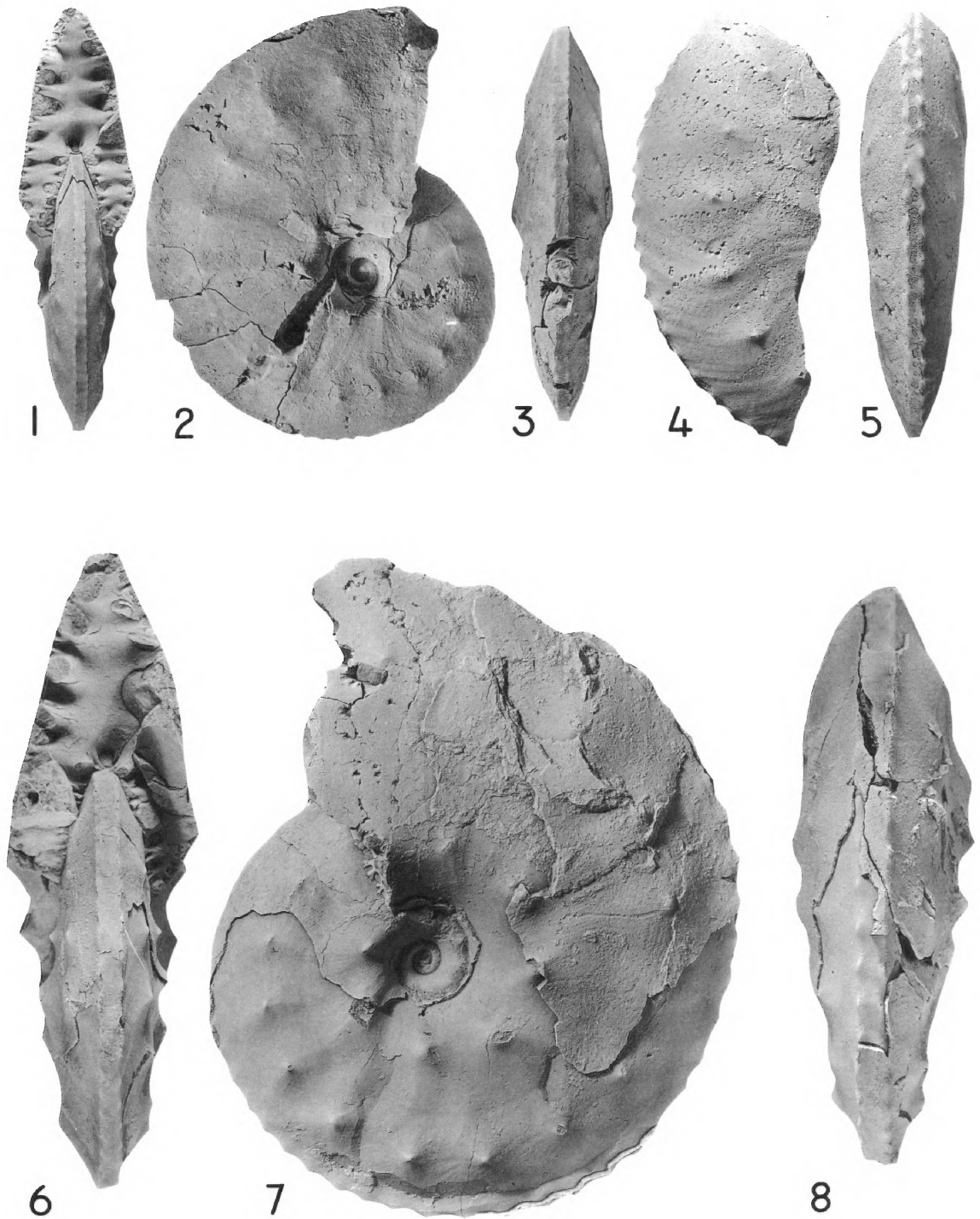
Placenticeras intercalare var. *costatum* Hyatt, 1903: pl. 38, fig. 2; pl. 39, figs. 1, 2.

TYPE: Holotype, by monotypy, is MCZ 10822, the original figured specimen of Hyatt (1903: pl. 38, fig. 2; pl. 39, figs. 1, 2); probably from the Black Hills, South Dakota.

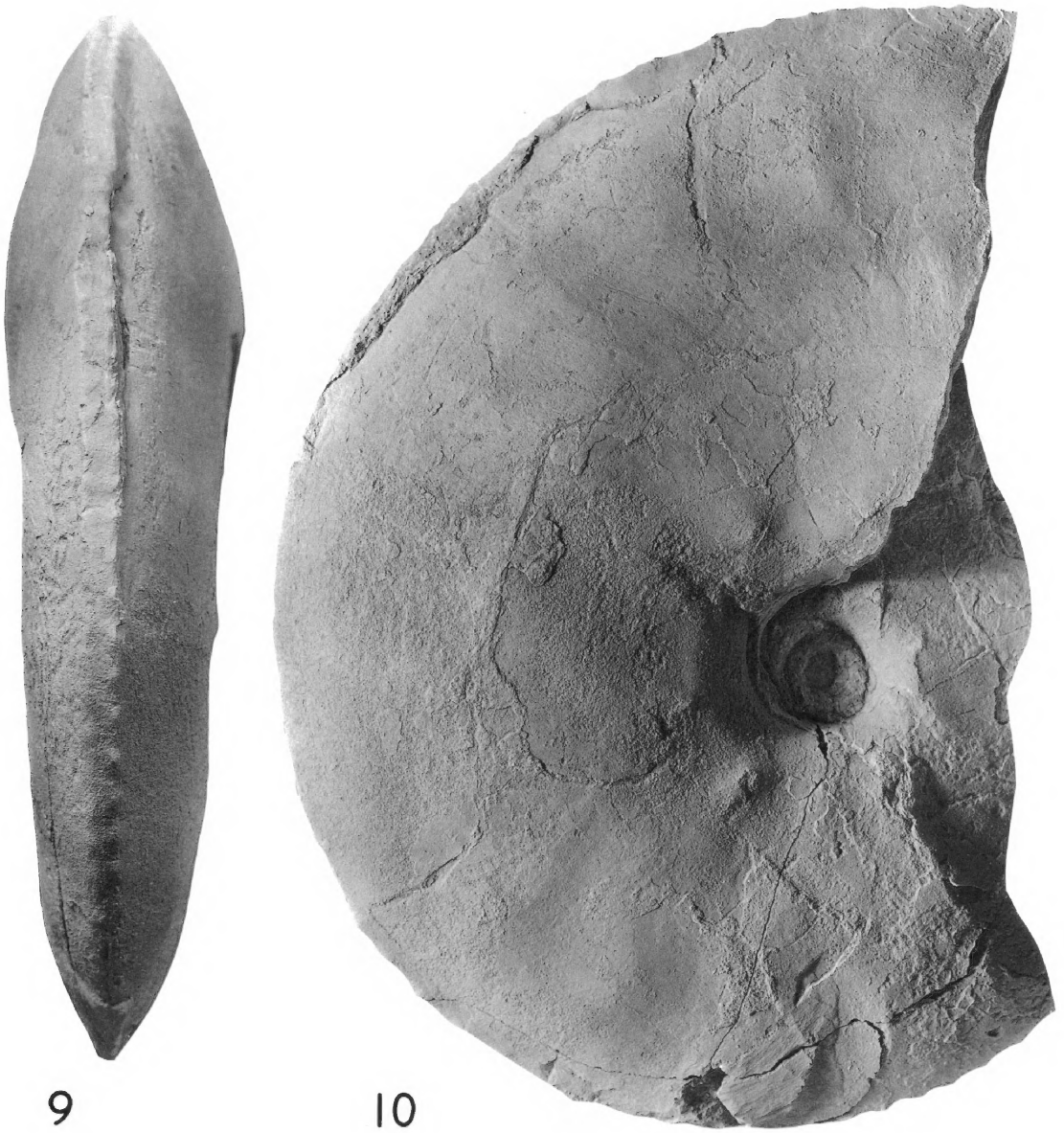
MATERIAL: USNM 486610–486613 from USGS Mesozoic locality D1785; USNM 486614–486623 from USGS Mesozoic locality D1353; USNM 486624, 486625, and 486626 from USGS Mesozoic localities D1285, D5057, and D1351, respectively.

DIAGNOSIS: A compressed species of *Placenticeras* with umbilical bullae and outer lateral tubercles in early and middle growth stages; each outer lateral tubercle corresponds to five or more small, ventral clavi.

DESCRIPTION: Microconchs range from 145 to 162 mm in diameter at the last septum, and up to 230 mm in diameter at the adult aperture. Macroconchs, which are more common than microconchs in the field, range up to 500 mm in diameter at the adult aperture. The inner whorls of both dimorphs are very compressed, with whorl breadth-to-height ratios of approximately 0.5:1 (table 1). Coiling is very involute with a small umbilicus comprising approximately 15% of the diameter. The umbilical wall is flattened and inclined outward and the umbilical shoulder is narrowly rounded, producing a sharp rim



Figs. 1–8. *Placenticerus costatum* Hyatt, 1903, and *Placenticerus intercalare* Meek, 1876. 1–3. *Placenticerus costatum* Hyatt, 1903, USNM 486620, USGS Mesozoic locality D1353. 1, Apertural; 2, left lateral; 3, ventral. 4–8. *Placenticerus intercalare* Meek, 1876. 4, 5. USNM 486627, USGS Mesozoic locality D1351. 4, Left lateral; 5, ventral. 6–8. USNM 486628, USGS Mesozoic locality D1349. 6, Apertural; 7, right lateral; 8, ventral. All figures are natural size.

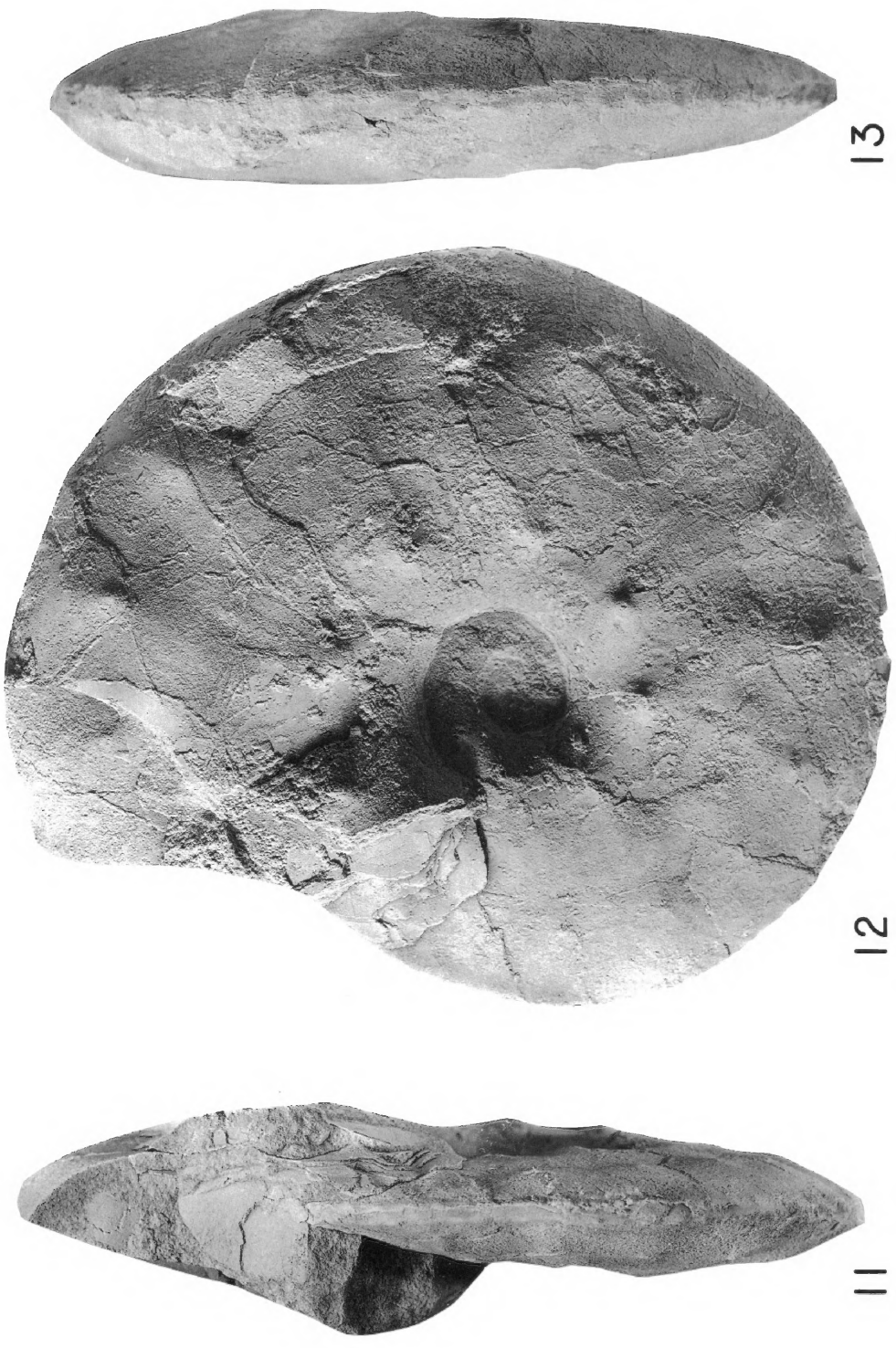


Figs. 9, 10. *Placenticerias costatum* Hyatt, 1903, USNM 486610, USGS Mesozoic locality D1785. 9, Ventral; 10, left lateral. All figures are natural size.

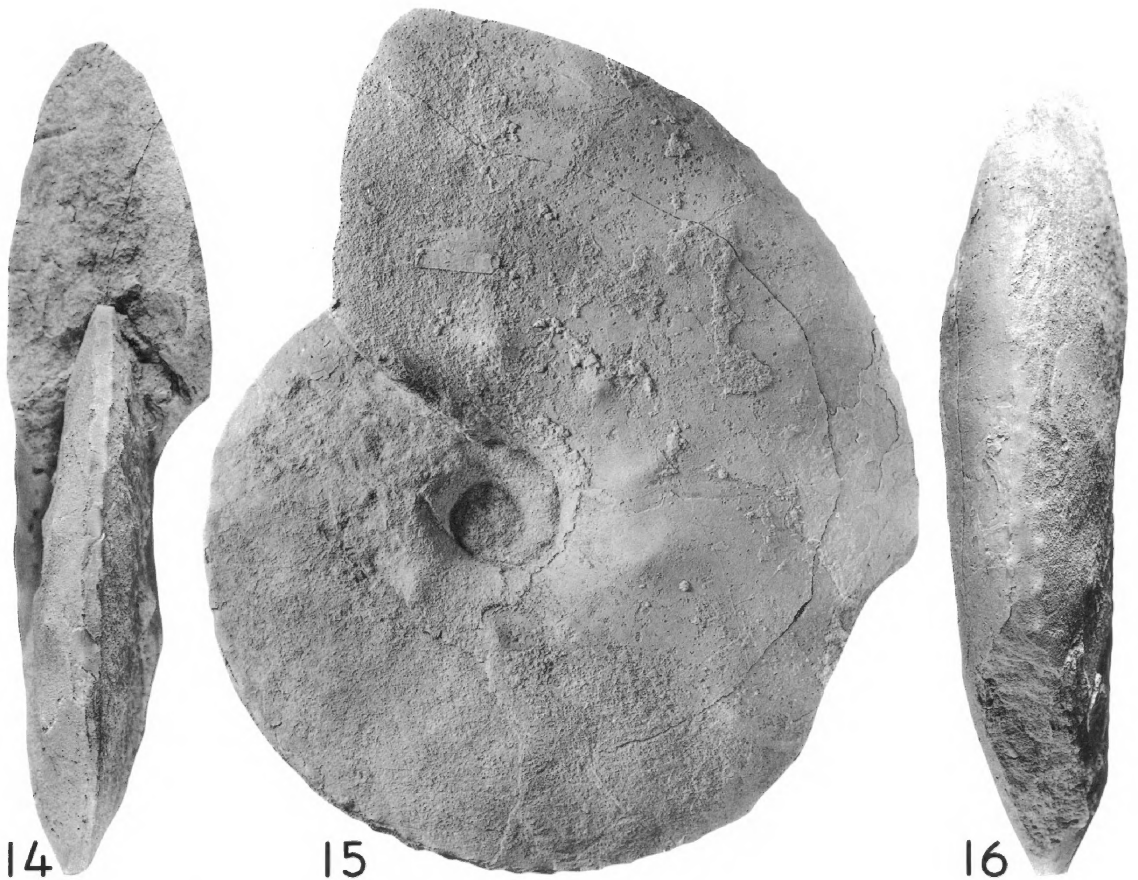
at the umbilicus. The greatest whorl breadth is just outside the umbilical shoulder.

The degree of ornamentation is variable. In strongly ornamented individuals such as USNM 486620 (figs. 1–3), there are 9–11 small umbilical bullae per whorl. Each of these bullae gives rise to a pair of low, flexuous ribs that broaden and strengthen across the flanks.

These ribs flex forward across the inner flanks, then backward across the midflanks to small, conical outer lateral tubercles, then forward again, breaking down into delicate concave riblets that connect to very small ventral clavi. These clavi usually, but not invariably, alternate in position on either side of the narrow, concave venter; they number 35–53 per



Figs. 11–13. *Placenticeras costatum* Hyatt, 1903, USNM 486613, USGS Mesozoic locality D1785. 11, Apertural; 12, right lateral; 13, ventral. All figures are natural size.



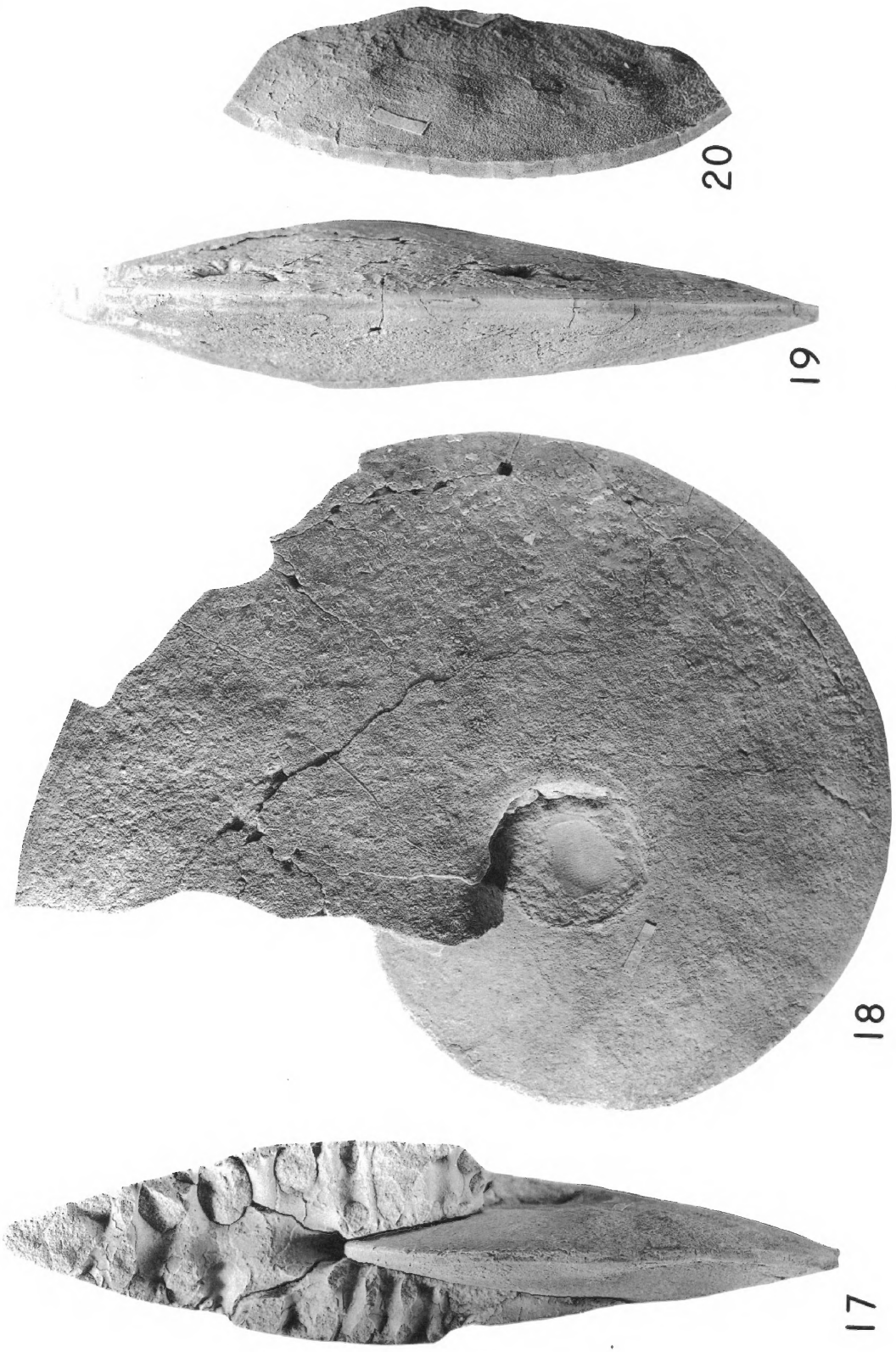
Figs. 14–16. *Placenticeras costatum* Hyatt, 1903, USNM 486624, USGS Mesozoic locality D1285. 14, Apertural; 15, right lateral; 16, ventral. All figures are natural size.

half whorl. A maximum of five clavi occur between successive, outer lateral tubercles. As shell size increases, the umbilical bullae coarsen and migrate outward to an inner flank position, while the outer lateral tubercles disappear altogether and are replaced by low, broad, concave to sickle-shaped ribs (figs. 9–16).

Specimens such as USNM 486624 (figs. 14–16) provided a morphological link to weakly ornamented variants such as USNM 486617 (figs. 17–19) and USNM 486619. These specimens do not show any umbilical bullae or ribs, or show only very weak, crescentic ribs on the outer flanks (figs. 17–19), but possess the abundant, minute ventral clavi characteristic of more robustly ornamented forms.

The whorl section of the adult body chamber is much more inflated than that of the phragmocone and has more broadly rounded flanks (figs. 21–23). The venter of the adult body chamber is initially narrow and tabulate, but rounds toward the adult aperture. The ornamentation of the adult body chamber weakens progressively. The umbilical bullae disappear and only low, broad, concave, crescentic undulations persist on the outer flanks. Ventral clavi disappear some distance adapical of the adult aperture.

Sutures are rather poorly preserved in most specimens; a suture of a juvenile at a whorl height of 28 mm is illustrated in figure 24. It shows the typical placenticeratid pattern (for comparison, see Klinger and Kennedy, 1989, figs. 1B, 5D, 7C, 90, 94).



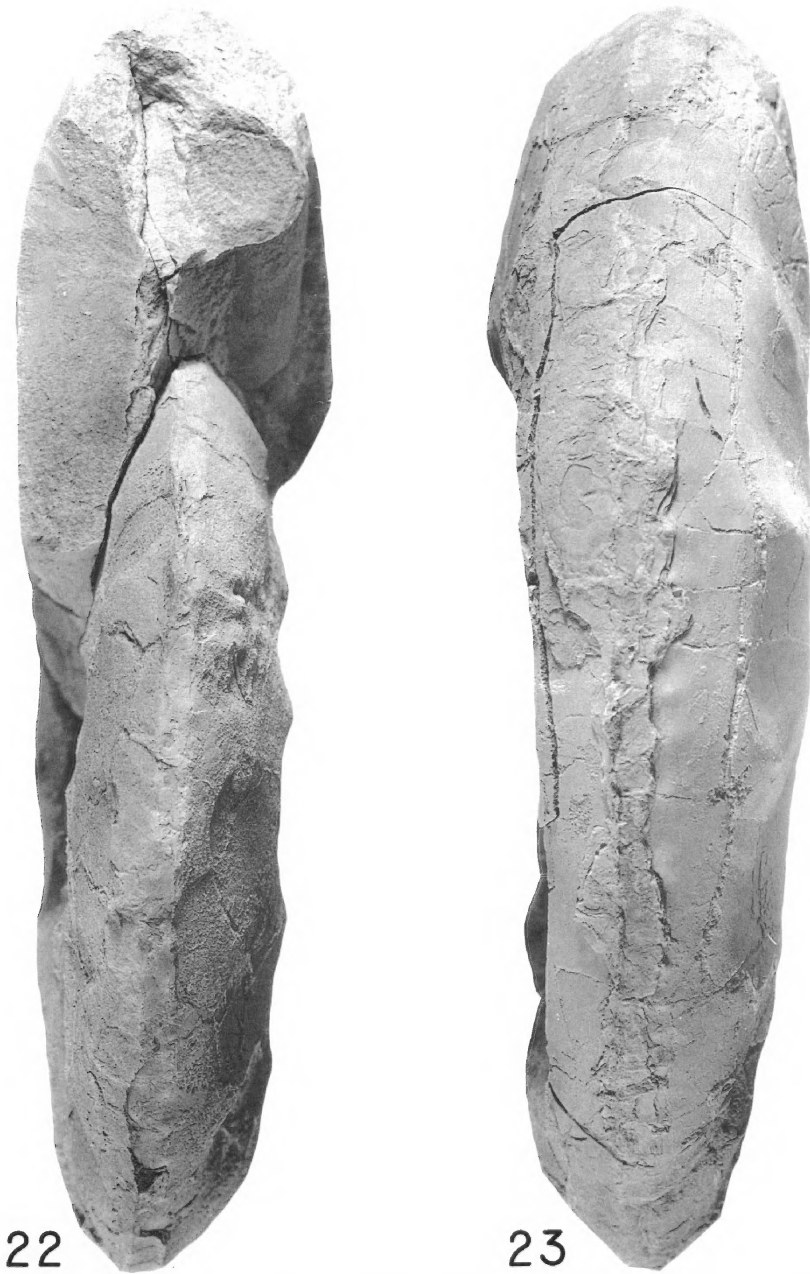
Figs. 17-20. *Placenticeras costatum* Hyatt, 1903. 17-19. USNM 486617, USGS Mesozoic locality D1353. 17, Apertural; 18, right lateral; 19, ventral. 20. USNM 486621, USGS Mesozoic locality D1353, left lateral. All figures $\times 0.97$.



Fig. 21. *Placenticerus costatum* Hyatt, 1903, USNM 486612, USGS Mesozoic locality D1785, left lateral. Figure is natural size.

DISCUSSION: *Placenticerus costatum* Hyatt, 1903, is only likely to be confused with *Placenticerus intercalare* Meek, 1876 (p. 468, pl. 23, figs. 1a–c), examples of which are shown for comparison in figures 4–8. *P. intercalare*

occurs in the *Baculites compressus* zone and is presumed to be ancestral to *P. costatum*. Both species share the same basic pattern of ornamentation on the flanks, but can be immediately distinguished by the number of



Figs. 22, 23. *Placenticerias costatum* Hyatt, 1903, USNM 486612, USGS Mesozoic locality D1785. 22, Apertural; 23, ventral. All figures are natural size.

ventral clavi. In *P. intercalare*, there are only three clavi between each pair of outer lateral tubercles, whereas in *P. costatum* there are five or more.

OCCURRENCE: Pierre Shale, *Baculites cu-*

neatus and *B. reesidei* zones, Grand County, Colorado and Meade and Pennington counties, South Dakota, *B. cuneatus* zone, Rosebud County, Montana, and *B. reesidei* zone, Colfax County, New Mexico.

TABLE 1
Dimensions (mm) of Six Specimens of *Placenticerus costatum* Hyatt, 1903^a

USNM no.	D	Wb	Wh	Wb:Wh	U
486620	68.5 (100)	19.0 (29.9)	35.5 (55.9)	0.53	9.7 (15.3)
486611	98.2 (100)	23.0 (23.4)	51.0 (51.9)	0.45	14.5 (14.8)
486614	128.0 (100)	33.8 (26.4)	64.1 (50.0)	0.52	20.3 (15.9)
486619	140.0 (100)	40.8 (29.1)	78.5 (56.0)	0.52	15.4 (11.1)
486625	185.0 (100)	47.2 (24.5)	86.2 (46.6)	0.54	33.5 (18.1)
486616	230.0 (100)	— (—)	115.5 (50.2)	—	35.5 (15.4)

^a Figures in parentheses are percentage of diameter.

Placenticerus pingue, new species

Figures 25–28

TYPES: Holotype USNM 486629 (fig. 25) from USGS Mesozoic locality D1393; paratype USNM 486630 (figs. 26, 27) (H. Mendenryk Collection) from USGS Mesozoic locality D1411; paratype BHI 4644 (fig. 28) from the *Baculites scotti* zone, near Oral, Fall River County, South Dakota.

DERIVATION OF NAME: Latin, *pinguis*, “fat,” from the form of the whorl section.

DIAGNOSIS: A relatively inflated species of *Placenticerus* with conical umbilicolateral and outer lateral tubercles that persist to maturity.

DESCRIPTION: The holotype is a complete adult 275 mm in diameter; more than 270° of the last whorl is body chamber; the dimensions are Wb = 69.5 mm (25.3), Wh = 125 mm (45.5), and U = 58 mm (21.1). Coiling is moderately involute on the phragmone, becoming progressively more evolute toward the adoral end of the adult body chamber. The umbilical wall is flattened and inclined outward, producing a large, conical

circumbilical pit. The whorl section is compressed, with the greatest breadth well below midflank. The inner flanks are broadly rounded and the outer flanks are flattened and convergent. The ventrolateral shoulders are narrowly rounded. The venter is tabulate but broadens toward the adoral end of the adult body chamber.

Ten small conical umbilicolateral tubercles are present on the outer whorl of the holotype. Each of these gives rise to one or two low, broad, flat, flexuous prorsiradiate ribs. The ribs are straight on the inner flanks, convex on the midflanks, and concave on the outer flanks. Each rib strengthens into a small, conical outer lateral tubercle, which gives rise in turn to a low, broad, strongly prorsiradiate rib that effaces before reaching the venter. Small ventral clavi, twice as numerous as the outer lateral tubercles, alternate in position on either side of the venter. These clavi weaken markedly toward the adoral end of the adult body chamber.

Where well-preserved, the shell surface and mold are covered by dense, crowded, coarse growth lines, riblets, and striae, which are particularly conspicuous toward the adoral end of the adult body chamber. These growth lines, riblets, and striae are strongly concave on the innermost part of the umbilical wall and are slightly convex on the outer part of the umbilical wall and umbilical shoulder. They cross the inner flanks with a strong forward projection, then flex backward on the outer flanks, then forward again to the ventrolateral shoulder. They cross the venter with a very shallow convexity.

The external suture of BHI 4644 is illustrated in fig. 28.

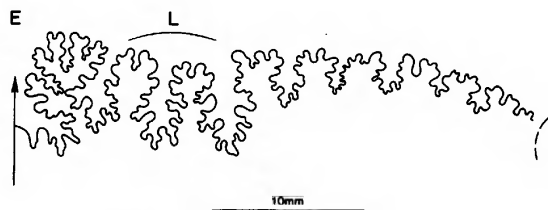


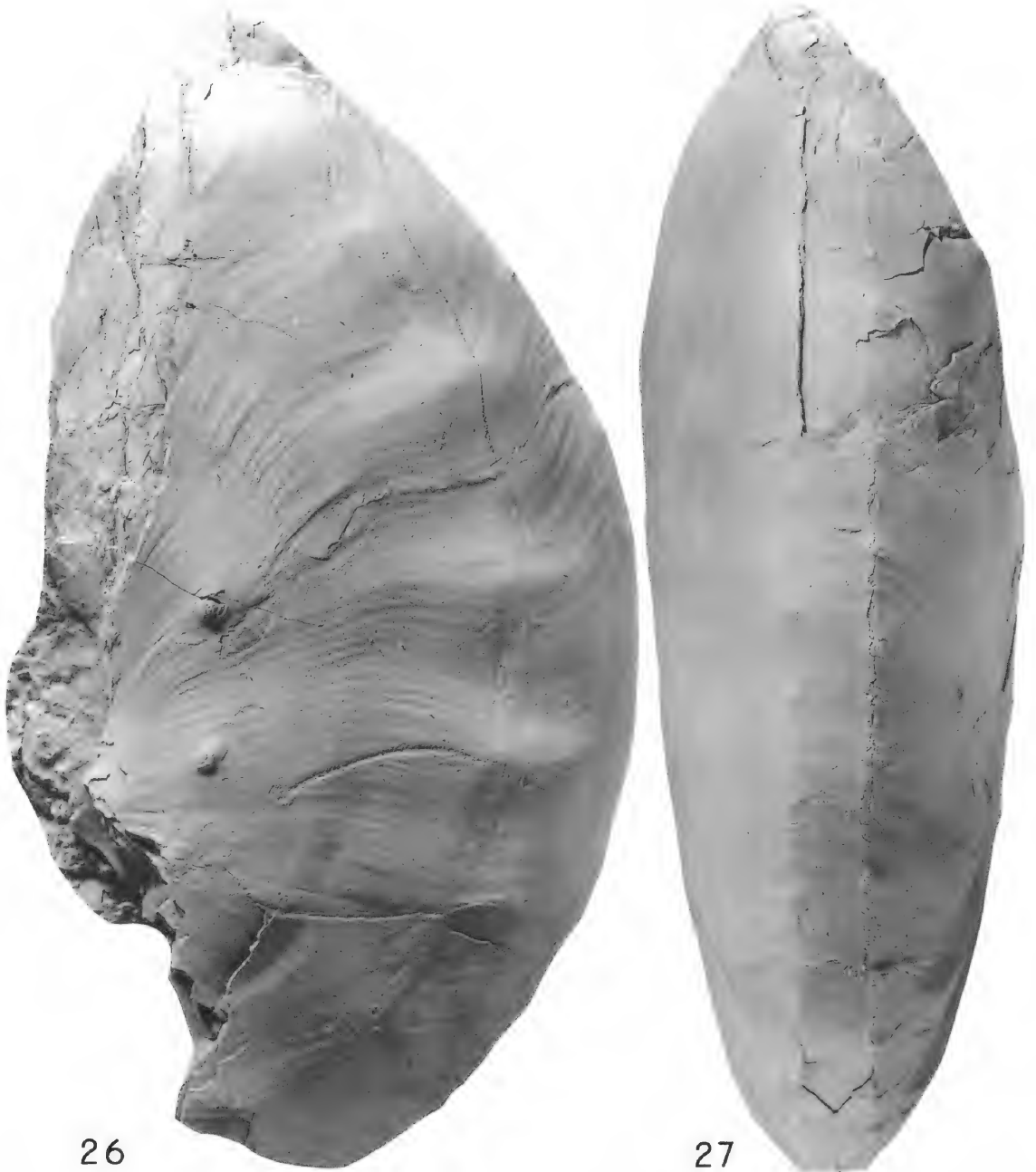
Fig. 24. *Placenticerus costatum* Hyatt, 1903. Composite suture based on USNM 486622, USGS Mesozoic locality D1353.



Fig. 25. *Placenticerias pingue*, n. sp., holotype, USNM 486629, USGS Mesozoic locality D1393, right lateral. Figure is reduced $\times 0.80$

DISCUSSION: *Placenticerias pingue*, n. sp., most closely resembles *P. intercalare* Meek, 1876, and is presumed to be ancestral to it. The two species show comparable umbilico-

lateral and ventral ornamentation. However, in *P. intercalare*, the outer lateral tubercles do not persist to maturity, whereas they do in *P. pingue*. The whorl section of *P. pingue*



Figs. 26, 27. *Placenticerus pingue*, n. sp., paratype, USNM 486630, USGS Mesozoic locality D1411. 26, Right lateral; 27, ventral. Figures are reduced $\times 0.79$.

is also much more inflated than that of *P. intercalare*. In this respect, *P. pingue* resembles *P. syrtale*, which occurs in the *Scaphites hippocrepis* zone.

OCCURRENCE: Rock River Formation,

Baculites reduncus zone, southeast of Rock River in the NE $\frac{1}{4}$ sec. 9, T20N, R76W, Albany County, Wyoming, and the Pierre Shale, *B. scotti* zone, northeast of Oral, Fall River County, South Dakota.

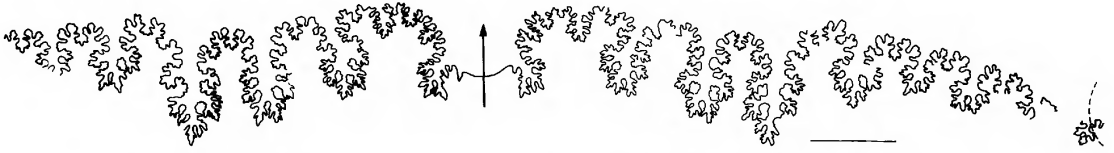


Fig. 28. *Placenticerias pingue*, n. sp., paratype BHI 4644 from the *Baculites scotti* zone, near Oral, Fall River County, South Dakota. Fourth to last suture at Wh = 71.5 mm. Scale bar = 10 mm.

ACKNOWLEDGMENTS

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