

The ammonite subgenus *Pervinquieria* (*Deiradoceras*) van Hoepen, 1931 from the Upper Albian of KwaZulu-Natal, South Africa. Part II

WILLIAM JAMES KENNEDY¹ and HERBERT CHRISTIAN KLINGER²

¹ Oxford University Museum of Natural History, Parks Road, Oxford OX1 3PW, U.K. and Department of Earth Sciences, South Parks Road, Oxford OX1 3AN, U.K.; e-mail: jim.kennedy@oum.ox.ac.uk

² Natural History Collections Department, Iziko South African Museum, P. O. Box 61, Cape Town, 8000 South Africa; e-mail: ingrid45.hk@gmail.com

ABSTRACT:

Kennedy, W.J. and Klinger, H.C. 2023. The ammonite subgenus *Pervinquieria* (*Deiradoceras*) van Hoepen, 1931 from the Upper Albian of KwaZulu-Natal, South Africa. Part II. *Acta Geologica Polonica*, **73** (4), 571–586. Warszawa.

In this contribution we complete the revision of species we refer to *Pervinquieria* (*Deiradoceras*) van Hoepen, 1931, focusing on those assigned by him to his genera *Cechenoceras* and *Mimeloceras*.

Key words: Lower Cretaceous; Albian; Ammonites; KwaZulu-Natal; South Africa.

INTRODUCTION

In this contribution we revise the species referred to *Cechenoceras* van Hoepen, 1941 (p. 61) and *Mimeloceras* van Hoepen, 1944 (p. 196), the latter introduced as *nomen novum* for *Mimoceras* van Hoepen, 1941 (p. 85, *non* Hyatt, 1884, p. 309), both of which we regard as synonyms of *Pervinquieria* (*Deiradoceras*) van Hoepen, 1931 (p. 52), as discussed previously (Kennedy and Klinger 2023b). Table 1 summarises the distribution of ‘species’ of *Mimeloceras* named by van Hoepen at localities along the Mzinene River in KwaZulu-Natal, South Africa.

REPOSITORY OF SPECIMENS

The following abbreviation is used to indicate the repository of specimens cited in the text: SAM – Natural History Collections Department, Iziko, South African Museum, Cape Town, South Africa.

FIELD LOCALITIES

Details of field localities can be found in Kennedy and Klinger (1975, 2023a).

CONVENTIONS

Dimensions are given in millimetres: D = diameter; Wb = whorl breadth; Wh = whorl height; U = umbilicus; c = costal dimension; ic = intercostal dimension. Figures in parentheses are dimensions as a percentage of the diameter. Suture terminology is that of Korn *et al.* (2003): E = external lobe; A = adventive lobe (= lateral lobe of Kullmann and Wiedmann 1970); U = umbilical lobe; I = internal lobe.

Where specimens have been re-catalogued with SAM PCZ numbers, the numbers in the original publications by van Hoepen (1931–1951) are given in parentheses.

Species	10	11	12	13	14	15	WW	ERW	W	624
<i>Mimeloceras binodosum</i>	*									
<i>Mimeloceras obesum</i>			*?	*?			*			
<i>Mimeloceras modestinodosum</i>						*				
<i>Mimeloceras macronodosum</i>							*			
<i>Mimeloceras strigosum</i>							*			
<i>Mimeloceras latiumbilitatum</i>							*			
<i>Mimeloceras agrestis</i>								*		
<i>Mimeloceras auctum</i>								*		

Table 1. Distribution of species of *Cechenoceras* and *Mimeloceras* described by van Hoepen (1931) from his banks at locality 51 of Kennedy and Klinger (1975) and successively stratigraphically higher localities to the east, as cited by van Hoepen (1931–1951). WW: Ridge West of Ridge West of Beacon 624; ERW: Extension of Ridge West of Beacon 624, to the West into the valley and gradually higher westward; W: Ridge West of Beacon 624; 624: Beacon 624.

SYSTEMATIC PALAEOLOGY

Order Ammonoidea von Zittel, 1884

Suborder Ammonitina Hyatt, 1889

Superfamily Acanthoceratoidea von Zittel, 1884

Family Brancoceratidae Spath, 1934

Subfamily Pervinquieriinae Spath, 1926

Genus *Pervinquieria* Böhm, 1910

TYPE SPECIES: *Ammonites inflatus* J. Sowerby, 1817 (p. 170, pl. 178), by the original designation of Böhm (1910, p. 152).

Subgenus *Deiradoceras* van Hoepen, 1931

(= *Cechenoceras* van Hoepen, 1941, p. 61;

Mimeloceras van Hoepen, 1944, p. 196, introduced as *nomen novum* for *Mimoceras* van Hoepen, 1941, p. 85, *non* Hyatt, 1884, p. 309)

TYPE SPECIES: *Subschloenbachia prerostrata* Spath, 1921 (p. 284, pl. 24, fig. 10), by the original designation of van Hoepen (1931, p. 52).

Pervinquieria (Deiradoceras) reversa

(van Hoepen, 1941)

(Text-figs 1–3)

1941. *Cechenoceras reversum* van Hoepen, p. 62, text-figs 9–12.

1941. *Cechenoceras magnum* van Hoepen, p. 63, text-fig. 13; pl. 8.

1951. *Cechenoceras reversum* van Hoepen; van Hoepen, p. 275, text-fig. 277.

2018. *Dipoloceras (Dipoloceras) magnum*; Klein, p. 56.

2018. *Dipoloceras (Dipoloceras) reversum* (van Hoepen, 1941); Klein, pp. 86, 94.

TYPE: The holotype of *Cechenoceras reversum*, by original designation, is SAM PCZ 19103 (*ex* D.2362),

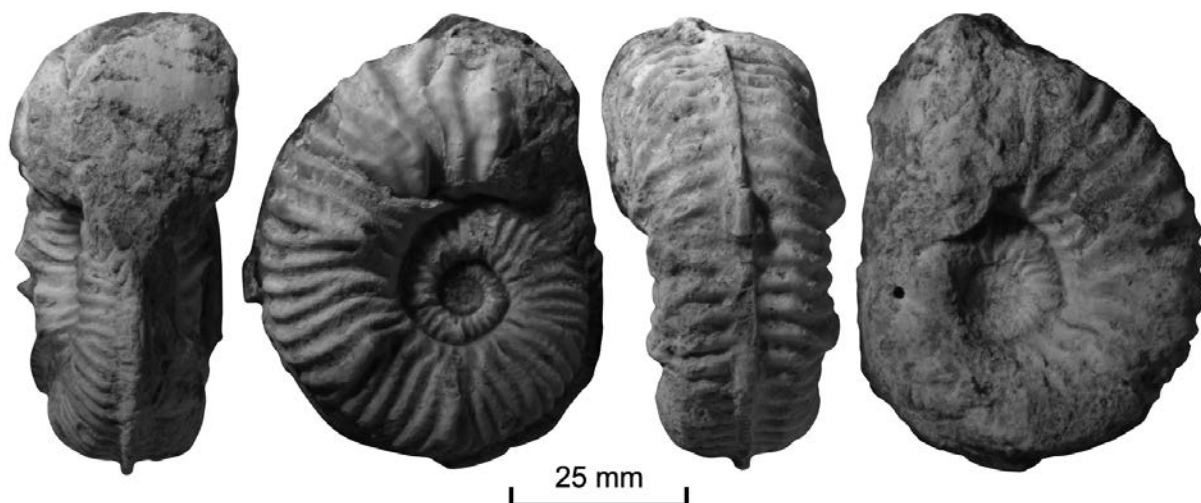
erroneously cited as D.2363 by van Hoepen (1941, p. 63), the original of van Hoepen (1941, text-figs 9, 10), from bank 8 at locality 51.

MATERIAL: SAM PCZ 19099 (*ex* D.376) from bank 7; SAM PCZ 19100 (*ex* D.420), from bank 8; SAM PCZ 19101, 19102, 19104 and 19188 (all *ex* D.419), from bank 8 at locality 51, all cited by van Hoepen (1941, p. 63). SAM PCZ 19136 (*ex* D.2356), the holotype, by monotypy, of *Cechenoceras magnum*, the original of van Hoepen (1941, p. 63, pl. 8, text-fig. 13), from bank 9 at locality 51.

DESCRIPTION: The holotype (Text-fig. 1) is a well-preserved juvenile 61.9 mm in diameter, retaining shell material. The dimensions are as follows:

	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19103 c	61.9 (100)	– (–)	25.4 (41.0)	– 1.26	21.3 (34.4)
SAM PCZ 19103 at costal	53.9 (100)	29.3 (54.3)	23.3 (43.2)		16.4 (30.4)

Coiling is very evolute, the deep umbilicus comprising around 32% of the diameter, the umbilical wall high, feebly convex and outwardly inclined. The whorl section is depressed oval in intercostal section and depressed rounded-trapezoidal in costal section, with the greatest breadth at the umbilical bullae. Primary ribs, 30–32 per whorl, arise at the umbilical seam, and pass straight up the umbilical wall, where they are feebly concave and strengthen progressively. The majority are only weakly to non-bullate, flex back, and are convex on the innermost flank, feebly concave on the outer flank, then flexing forwards on the ventrolateral shoulders, and near-transverse on the venter, where they bear tiny bullae, from which a transverse rib extends to the strong siphonal keel. Nine ribs on the outer whorl develop into a marked flare, bearing a stronger bulla than the other ribs,



Text-fig. 1. *Pervinquieria (Deiradoceras) reversa* van Hoepen, 1941 from KwaZulu-Natal, South Africa; SAM PCZ 19103 (ex D.2362, erroneously cited as D.2636 by van Hoepen 1941, p. 63), the holotype of *Cechenoceras reversum*, the original of van Hoepen (1941, text-figs 9, 10), from his bank 8 at locality 51.

that gives rise to a single rib or a pair of ribs, some of which may branch a second time on the ventrolateral shoulder. Spiral ridges are well-developed on ventrolateral shoulders and venter.

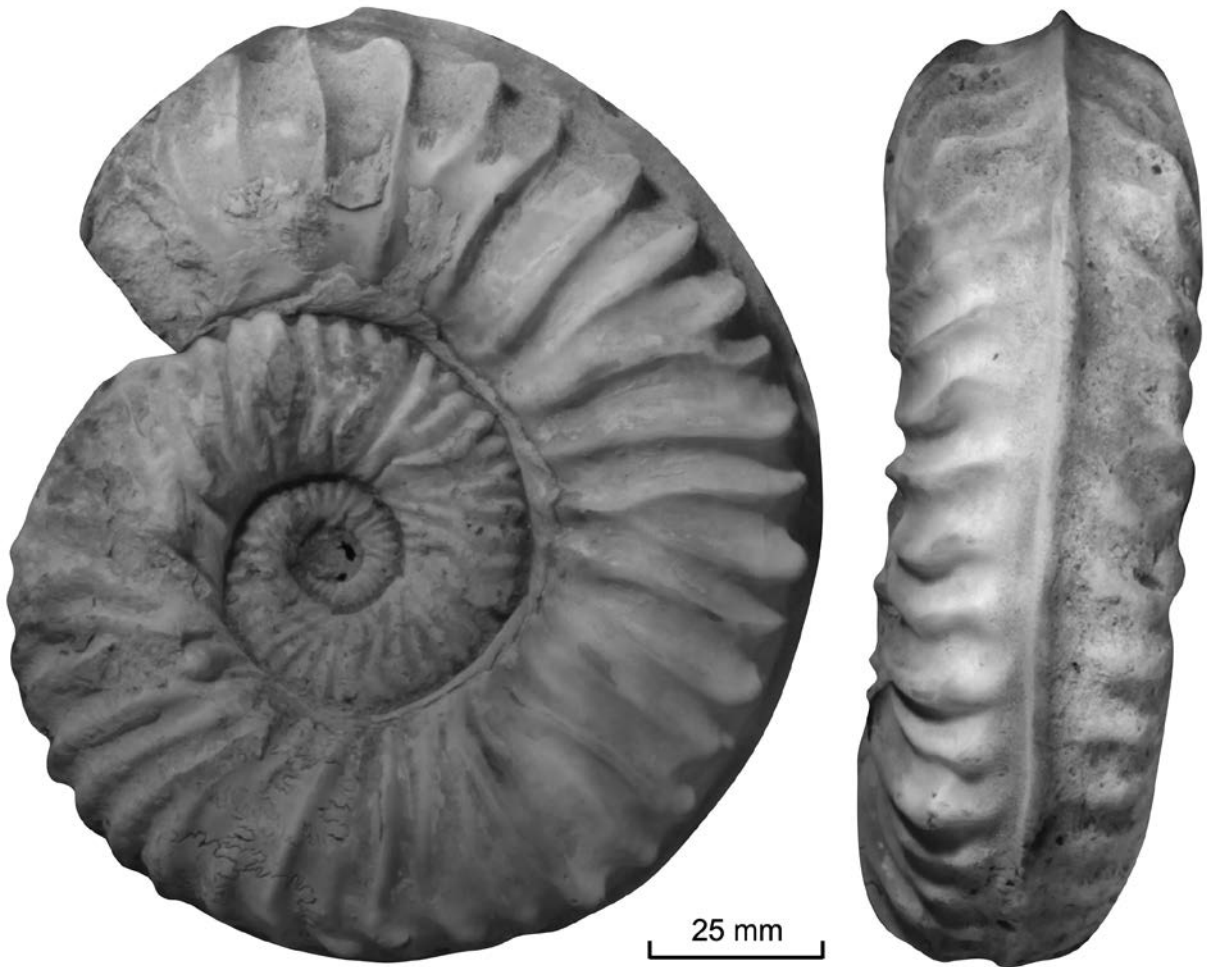
Van Hoepen's 'eksemplaar A' (1941, text-figs 11, 12) is SAM PCZ 19104 (ex D.419) (Text-fig. 2). It is a complete adult microconch with the following dimensions:

	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19104 c	136.6 (100)	– (–)	45.9 (33.6)	–	57.3 (41.9)
at c	120.9 (100)	40.5 (33.5)	44.7 (37.0)	0.91	46.6 (38.5)

The phragmocone extends to an estimated diameter of 94 mm. Coiling is very evolute, the umbilicus broad and of moderate depth with a feebly convex, outwardly inclined umbilical wall and broadly rounded umbilical shoulder. The whorl section is slightly compressed, with broadly convex flanks, the greatest breadth at the umbilical bullae, the ventrolateral shoulders broadly rounded, the broad venter flattened, with a strong siphonal keel. On the penultimate whorl, 24 ribs arise at the umbilical seam and are of variable strength, some bifurcating at the seam. The ribs sweep back across the umbilical wall, and some strengthen into umbilicolateral bullae. They are single, with or without umbilical bullae, or bifurcate from bullae or at an umbilicolateral position, to give a total of an estimated 30 ribs that vary from recti- to markedly rursiradiate and are coarse, rounded and crowded. Some bifurcate

at mid-flank and/or on the outer flank to produce a complex ribbing pattern with a total of 48–50 ribs per whorl on the outer flanks at the contact with the umbilical seam of the succeeding whorl. The ribbing becomes more widely spaced on the adapertural part of the phragmocone and adapical part of adult body chamber, which extends to 270°. Strong primary ribs arise at the umbilical seam, sweep back across the umbilical wall and are straight to feebly flexed, recti- to rursiradiate across the flanks. They are single, or may bifurcate low or high on the flanks, and are accompanied by long or short intercalated ribs. Towards the adult aperture, widely separated progressively weakening ribs predominate. The ribs are near-transverse on the venter and develop strong ventrolateral bullae on the body chamber, the ribs effacing before meeting the strong siphonal keel. Parts of the adult apertural margin survive. It is markedly concave on the inner flank and convex at mid-flank. Spiral ridges are well-developed on the surface of the shell, but are weaker on the internal mould. The external suture (van Hoepen 1941, text-fig. 11) is moderately incised, with a broad, asymmetrically bifid E/A with a minor median incision, a narrow E/A, and broad asymmetrically bifid A/U2.

The holotype, by monotypy, of *Cechenoceras magnum* is SAM PCZ 19136 (ex D.2356), the original of van Hoepen (1941, p. 63, pl. 8, text-fig. 13), from bank 9 at locality 51. It is a complete adult macroconch, with shell preserved (Text-fig. 3). Dimensions are as follows:



Text-fig. 2. *Pervinquieria (Deiradoceras) reversa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19104 (ex D.419), van Hoepen's 'eksemplaar A' (1941, text-figs 11, 12), from his bank 8 at locality 51.

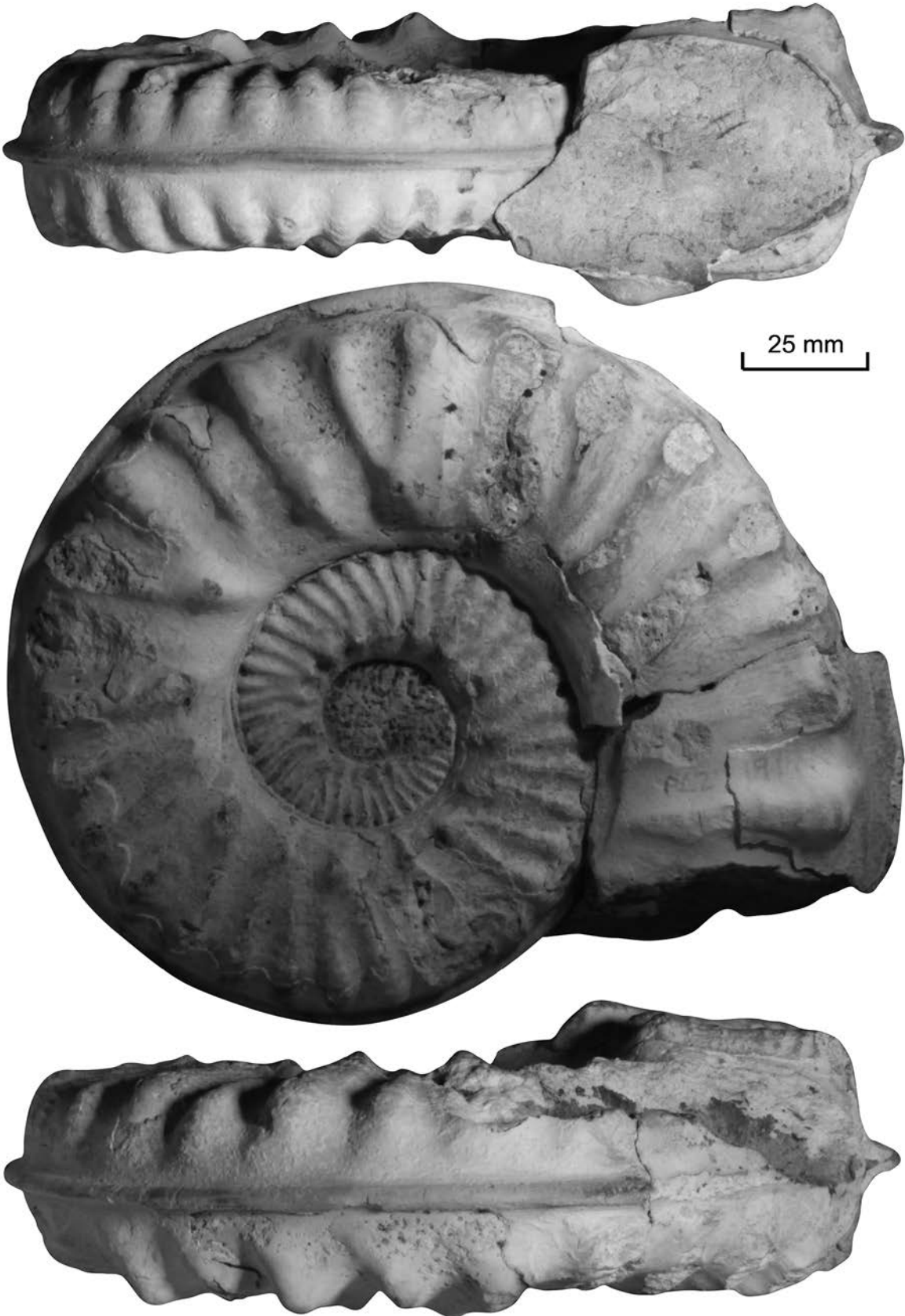
	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19136	194.0 (100)	52.9 (27.3)	63.7 (32.8)	0.83	87.1 (44.8)

Coiling is very evolute, the broad umbilicus, of moderate depth, comprising 44.8% of diameter. The umbilical wall is feebly convex, outwardly inclined, the umbilical shoulder broadly rounded. The whorl section is compressed, rounded-rectangular in intercostal section and rounded-trapezoidal in costal section, with the greatest breadth at the umbilical bullae. There is a strong siphonal keel. On the penultimate whorl, coarse ribs, 11 per half whorl, arise at the umbilical seam and strengthen across the umbilical shoulder. They give rise to pairs of straight, rursiradiate ribs, or a single rib that bifurcates on the flank. There are also occasional long interca-

lated ribs. The ribs are crowded on the adapical half of the outer whorl, but become more widely spaced on the adapertural half. Twenty-six primary ribs arise at the umbilical seam or on the umbilical wall of the outer whorl. The ribs strengthen across the umbilical wall, and on the adapical part of the whorl, some develop into strong, coarse umbilical bullae. These give rise to pairs of ribs or a single rib that bifurcates on the flank; other ribs are single, and lack a bulla. On the adapertural half of the outer whorl the primary ribs alternate irregularly between strongly to weakly to non-bullate, and are near-transverse on the venter, with well-developed ventrolateral bullae. A smooth zone separates the rib terminations from the siphonal keel. The last few ribs before the adult aperture weaken, and are feebly flexuous, with weakening ventrolateral clavi.



Text-fig. 3. *Pervinquiera (Deiradoceras) reversa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19136 (ex D.2356), the holotype of *Cechenoceras magnum* van Hoepen, 1941 (p. 63, pl. 8, text-fig. 13), from his bank 10 at locality 51.



Spiral ridges are strong on the ribs and tubercles, but weak on the interspaces, and are particularly well-developed on the adapical face of the ribs in the ventrolateral region.

DISCUSSION: The body chamber ornament of these specimens closely recalls that of coarsely ornamented variants of *Rhytidoceras elegans* van Hoepen, 1931 (see revision in Kennedy and Klinger 2023a, text-figs 15–26, 27A–E, 28A–M and 29), specifically individuals referred to var. *crassicostatum* by van Hoepen (1931, text-figs 5, 6; 1941, p. 67, text-figs 19, 20; pls 9, 10). The markedly convex inner whorls and flattened sides of the body chamber give a comparable overall shape to the shell, while phragmocone rib pattern and direction are similar. *Rhytidoceras* lacks, however, the well-developed ventrolateral tubercles of the present species. *Pervinquieria (Deiradoceras) pre-rostrata* (Spath, 1921) (see revision in Kennedy and Klinger 2023b, text-figs 1–14) has more even ribbing on the early whorls, and has coarse bullae displaced out to an umbilicolateral position on later whorls.

OCCURRENCE: Lower Upper Albian of northern KwaZulu-Natal, South Africa.

Pervinquieria (Deiradoceras) binodosa (van Hoepen, 1941)
(Text-figs 4–11)

1941. *Mimoceras binodosum* van Hoepen, p. 86, pl. 16, text-figs 51–53.
 1941. *Mimoceras? obesum* van Hoepen, p. 86, pl. 19, text-fig. 54.
 1946. *Mimeloceras modestinodosum* van Hoepen, p. 205, text-figs 182–184.
 1946. *Mimeloceras obesum* v. Hp. sp.; van Hoepen, p. 207, text-fig. 185.
 1946. *Mimeloceras macronodosum* van Hoepen, p. 207, text-figs 186–188.
 1946. *Mimeloceras strigosum* van Hoepen, p. 208, text-figs 189–192.
 1946. *Mimeloceras latiumbilicatum* van Hoepen, p. 211, text-figs 193–195.
 1946. *Mimeloceras agrestis* van Hoepen, p. 213, text-figs 196, 197.
 1946. *Mimeloceras auctum* van Hoepen, p. 214, text-figs 198, 199.
 1979. *M. (Drepanoceras) undatum* van Hoepen; Collignon, p. 28, pl. 11, fig. 3.

2018. *Mortoniceras (Deiradoceras) agrestis* (van Hoepen, 1946); Klein, pp. 129, 130.
 2018. *Mortoniceras (Deiradoceras) auctum* (van Hoepen, 1946); Klein, pp. 129, 131.
 2018. *Mortoniceras (Deiradoceras) binodosum* (van Hoepen, 1946); Klein, pp. 129, 131.
 2018. *Mortoniceras (Deiradoceras) latiumbilicatum* (van Hoepen, 1946); Klein, pp. 130, 135.
 2018. *Mortoniceras (Deiradoceras) obesum* (van Hoepen, 1941); Klein, pp. 130, 135.
 2018. *Mortoniceras (Deiradoceras) strigosum* (van Hoepen, 1946); Klein, pp. 130, 136.
 2018. *Mortoniceras (Deiradoceras) undatum* (van Hoepen, 1946); Klein, pp. 130, 136.

TYPE: The holotype, by original designation, of *Mimoceras binodosum* is SAM PCZ 19191 (ex D.2388), the original of van Hoepen (1941, p. 86, pl. 18, text-figs 51–53), from bank 10 at locality 51.

MATERIAL: SAM PCZ 19192 (ex D.626), the holotype of *Mimoceras? obesum* van Hoepen, 1941 (p. 86, pl. 19, text-fig. 54), from bed 13 at locality 51. Van Hoepen referred further specimens to *Mimeloceras obesum* in 1946 (p. 207), including SAM PCZ 19460 (ex D.2575), the original of van Hoepen (1946, text-fig. 185), from banks 11–12 at locality 51, and SAM PCZ 19380 (ex D.2577), from Beacon 624/locality 54. Three additional fragments numbered D.2577 were mentioned, one of which, SAM PCZ 19458 has been recognised. SAM PCZ 19459 (ex D.2576) is from the “Ridge West of the Ridge which is West of Beacon 624.” SAM PCZ 19379 (ex D.2629), the holotype of *Mimeloceras auctum* van Hoepen, 1946, the original of van Hoepen (1946, p. 214, text-figs 198, 199), from the “Extension of Ridge West of Beacon 624 to the West into the valley and gradually higher westward.” SAM PCZ 19125 (ex D.2585), the holotype of *Mimeloceras latiumbilicatum* van Hoepen, 1946 (p. 211, text-figs 193–195), from the “Extension of Ridge West of Beacon 624 to the west into the valley and gradually higher westward.” SAM PCZ 19124 (ex D.2586), the holotype of *Mimeloceras agrestis* van Hoepen, 1946 (p. 213, text-fig. 196), from the “Extension of Ridge West of Beacon 624 to the West into the valley and gradually higher westward.” SAM PCZ 19456 (ex D.2582), the holotype of *Mimeloceras macronodosum* van Hoepen, 1946 (p. 207, text-figs 186–188), from the “Ridge West of Ridge West Beacon 624.”

← Text-fig. 4. *Pervinquieria (Deiradoceras) binodosa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19191 (ex D.2388), the holotype of *Mimeloceras binodosum* van Hoepen, 1941 (p. 86, pl. 18, text-figs 51–53), from his bank 10 at locality 51.

DESCRIPTION: As can be seen from the synonymy, we regard all of the species assigned to *Mimeloceras* by van Hoepen (1944) as a single variable species, characterised by a first growth stage with pairs of rursiradiate ribs arising from umbilical/umbilicolateral bullae and occasional intercalated ribs followed by one with coarse bullate single ribs and pairs of ribs, simplifying to single ribs on the adapertural part of the adult body chamber.

The holotype of *Mimeloceras binodosum* (Text-fig. 4) is an incomplete adult, the maximum preserved diameter 170 mm, the phragmocone 137 mm in diameter, the last few septa approximated. It retains traces of shell material. The dimensions are as follows:

	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19191 costal	170.0 (100)	51.2 (30.1)	58.5 (34.4)	0.88	70.1 (41.2)

Coiling is very evolute, the umbilicus broad and shallow, comprising 41.2% of the diameter, the umbilical wall low, feebly convex and outwardly inclined. The intercostal whorl section is compressed trapezoidal with the greatest breadth at the umbilical shoulder, the costal section subrectangular, the ribs concave between the umbilical bullae and ventrolateral shoulder. Ten ribs arise at the umbilical seam of the adapertural half of the penultimate whorl. They are low and broad on the umbilical wall, and strengthen into conical bullae, perched on the umbilical shoulder. The bullae give rise to pairs of rursiradiate ribs, the adapical rib straight, the adapertural one convex on the inner flanks and straight on the middle to outer flanks. There are occasional non-bullate long ribs and short intercalated ribs to give a total of 22 ribs per half whorl on the outer flank. This pattern of pairs of ribs arising from sharp umbilical bullae and occasional intercalated ribs extends onto the adapical half of the outer whorl, where nine conical bullae correspond to 20 ribs that strengthen into incipient bullae on the ventrolateral shoulder, then broadening, weakening, and effacing before reaching the coarse siphonal keel. The ribs on the body chamber are coarse and widely spaced, and there is a change from coarsely bullate single ribs and pairs of ribs to predominantly single recti- to feebly rursiradiate ribs with progressively effacing umbilical bullae and progressively differentiating and strengthening ventrolateral bullae. Spiral ridges extend across the flanks, and are especially conspicuous on ventrolateral shoulders and venter. The ribs change from opposite to alternate on either side of the venter.

The holotype of *Mimoceras? obesum* van Hoepen,

1941 (p. 86, pl. 19, text-fig. 54) is SAM PCZ 19192 (ex D.626). The dimensions are as follows:

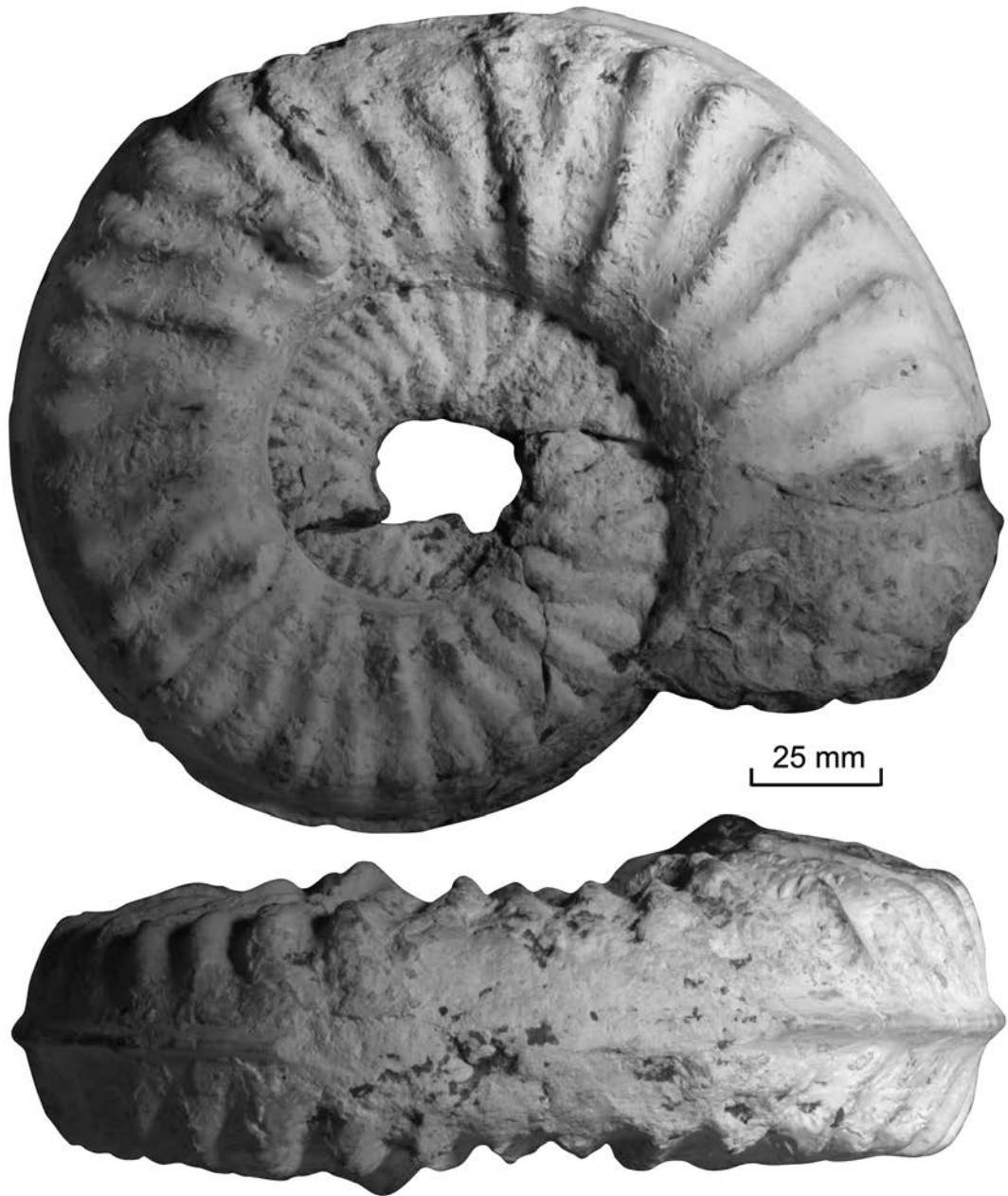
	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19192 costal	180.0 (100)	59.9 (33.3)	64.7 (35.9)	0.93	75.1 (41.7)

It is a battered individual (Text-fig. 5) that is almost wholly septate. Coiling is very evolute, the broad umbilicus of moderate depth and comprising 41.7% of the diameter, with a low, feebly convex, outwardly inclined wall. Ornament on the penultimate whorl is badly worn and incomplete, consisting of crowded umbilical bullae that give rise to pairs of straight rursiradiate ribs, as in the holotype of *binodosum*. This pattern of ribbing continues for much of the outer whorl, conical umbilical bullae giving rise to pairs of rursiradiate ribs with occasional long non-bullate ribs and short intercalated ribs. There are 13 bullate and non-bullate ribs on the umbilical shoulder of the adapical half of the outer whorl, and 19 ribs at the ventrolateral shoulder. The ribs are markedly rursiradiate and straight, and develop well-differentiated conical ventrolateral tubercles. These give rise to a broad, feebly prorsiradiate rib that declines and effaces before reaching the strong siphonal keel. On the adapertural 120° sector of the outer whorl the ribs are predominantly long non-bullate primaries and long and short intercalated ribs that are rursiradiate and very feebly flexuous. Spiral ridges are prominent on the ventrolateral region of the ribs.

SAM PCZ 19460 (ex D.2575), the original of *Mimeloceras obesum* van Hoepen, 1946 (his text-fig. 185; Text-fig. 6 herein), has the following dimensions:

	D	Wb	Wh	Wb:Wh	U
SAM PCZ19460 costal	193.0 (100)	60.4 (31.3)	60.0 (31.1)	1.0	87.1 (45.1)
SAM PCZ19460 intercostal		51.2 (26.9)	60.0 (31.1)	0.85	

There are 11 ribs on the umbilical wall of the adapertural half of the outer whorl, all but one of which gives rise to a sharp umbilical bulla. Most of the bullae give rise to pairs of ribs, the adapical one rursiradiate, the adapertural one rectiradiate and straight, to give a total of 19 ribs on the outer flank of the half whorl. On the outer whorl there is a rapid transition to regularly alternating bullate straight primaries, non-bullate primaries and short intercalated ribs, to give a total of 32 ribs at the ventrolateral shoulder. Conical ventrolateral tubercles are well-developed. When compared to the holotype of *obesum*, the ribs on the inner whorls are a little more a markedly rursiradiate, but the differences are slight.



Text-fig. 5. *Pervinquieria (Deiradoceras) binodosa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19192 (ex D.626), the holotype of *Mimoceras? obesum* van Hoepen, 1941 (p. 86, pl. 19, text-fig. 54), from his bank 13 at locality 51.

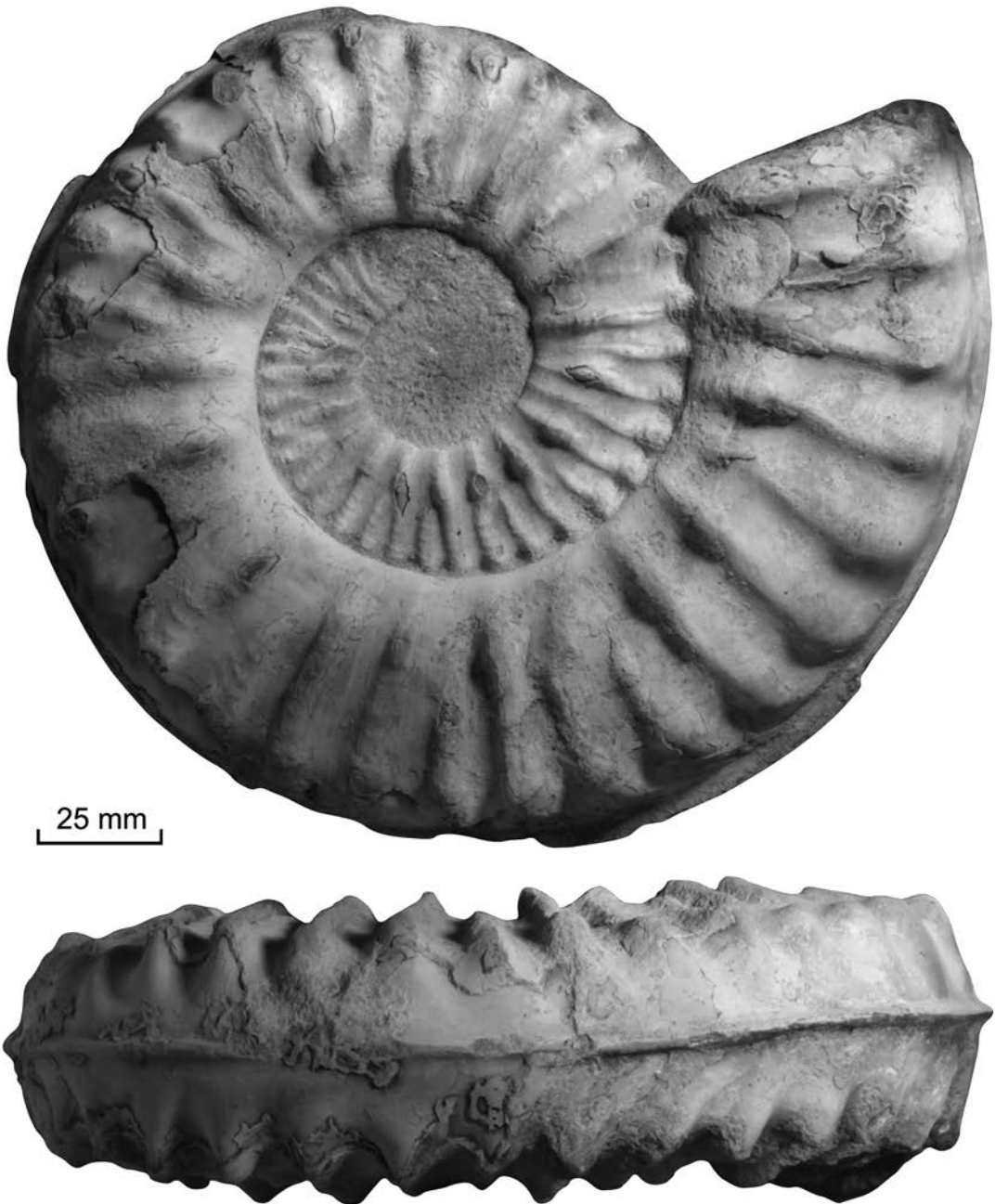
SAM PCZ 19380 (ex D.2577) (Text-fig. 7) is a worn fragment of the body chamber and parts of the two preceding whorls of a variant with a very coarsely ornamented penultimate whorl. The body chamber fragment has predominantly single ribs with effacing umbilical bullae.

The holotype of *Mimeloceras auctum* is SAM PCZ 19379 (ex D.2629), the original of van Hoepen (1946, p.

214, text-figs 198, 199; Text-fig. 8 herein) is a well-preserved phragmocone with the following dimensions:

	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19379 costal	39.2 (100)	15.5 (39.5)	16.7 (42.6)	0.93	14.2 (36.2)

Coiling is very evolute, the broad umbilicus comprising 36.2% of the diameter, of moderate depth, with



Text-fig. 6. *Pervinquieria (Deiradoceras) binodosa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19460 (ex D.2575), the original of *Mimeloceras obesum* of van Hoepen (1946, text-fig. 185), from his banks 11–12 at locality 51.

a feebly convex umbilical wall and broadly rounded umbilical shoulder. The whorl section is rectangular in intercostal section. The costal whorl section is rectangular to feebly trapezoidal with the greatest breadth at the umbilical bullae; there is a strong siphonal keel. Twenty-two ribs arise at the umbilical seam on the outer whorl and strengthen into crowded bullae, perched on

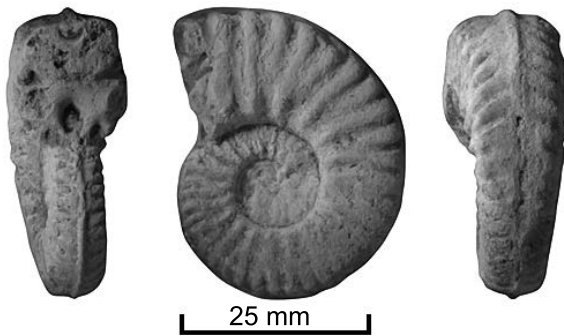
the umbilical shoulder. These give rise to single ribs or pairs of ribs, and there are occasional intercalated ribs. The ribs are feebly rursiradiate, straight on the inner flank, flexed back and feebly concave on the outer flank, strengthening progressively and developing into blunt ventrolateral bullae that give rise to broad ribs that weaken and decline across the venter and do not



Text-fig. 7. *Pervinquieria (Deiradoceras) binodosa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19380 (ex D.2577), the original of *Mimeloceras obesum* of van Hoepen (1946, p. 207), from the “Ridge West of the Ridge which is West of Beacon 624”/locality 54.

extend to the well-developed siphonal keel. There are 35 ribs at the ventrolateral shoulder.

The holotype of *Mimeloceras latiumblicatum* van Hoepen, 1946, SAM PCZ 19125 (ex D.2585) is



Text-fig. 8. *Pervinquieria (Deiradoceras) binodosa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19379 (ex D.2629), the holotype of *Mimeloceras auctum* van Hoepen, 1946 (p. 214, text-figs 198–199), from the “Extension of Ridge West of Beacon 624 to the West into the valley and gradually higher westward”.

the original of van Hoepen (1946, p. 211, text-figs 193–195). The dimensions are as follows:

	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19125 costal	150 (100)	50.5 (33.7)	50.2 (33.5)	1.0	67.4 (44.9)
SAM PCZ 19125 intercostal		46.3 (30.9)	50.2 (33.5)	0.92	

The holotype (Text-fig. 9) is a corroded specimen with extensive portions of silicified shell, lacking the inner whorls. Coiling is very evolute, with 28% of the previous whorl covered. The umbilicus comprises 44.9% of the diameter and is of moderate depth, with a feebly convex outwardly inclined umbilical wall and a broadly rounded umbilical shoulder. The intercostal whorl section is slightly compressed trapezoidal, with the greatest breadth low on the flanks, the costal section more markedly trapezoidal, with the greatest breadth at the umbilical bullae. The ventrolateral shoulders are broadly rounded, the venter flattened. There is a strong siphonal keel. On the adapertural half of the penultimate whorl, nine strong pointed bullae perch on the umbilical shoulder. They give rise to pairs of coarse, rounded rursiradiate ribs, the adapical of each pair more markedly rursiradiate than the adapertural one. There are occasional intercalated ribs, to give a total of 22 ribs on the outer flank at the umbilical seam of the succeeding whorl. Eighteen ribs arise at the umbilical seam of the outer whorl and strengthen into strong pointed umbilical bullae that give rise to pairs of ribs, as on the penul-

timate whorl, together with occasional long and short intercalated ribs and non-bullate primaries to give a total of 37–38 ribs at the ventrolateral shoulder, where the ribs strengthen into a coarse ventrolateral bulla, from which a broad, expanding and weakening rib effaces before reaching the siphonal keel.

The holotype of *Mimeloceras agrestis* van Hoepen, 1946 is SAM PCZ 19124 (ex D.2586), the original of van Hoepen (1946, p. 213, text-fig. 196). The adapical fragment is lost. What survives (Text-fig. 10) are two fragments of a very battered outer phragmocone whorl retaining a 30° sector of body chamber and a short sector of the penultimate whorl. The specimen retains very corroded silicified shell. Approximate dimensions are:

	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19124 costal	210 (100)	55.3 (26.3)	64.2 (30.6)	0.86	102.3 (48.7)

Coiling is very evolute, the umbilicus shallow, with a low, outwardly inclined umbilical wall and broadly rounded umbilical shoulder. The whorl section is compressed-trapezoidal in intercostal section with the greatest breadth close to the umbilical shoulder, the flanks feebly convex, the outer flanks converging to broadly rounded ventrolateral shoulders, the venter flattened, with a strong siphonal keel. The greatest breadth is at the umbilical bullae in costal section. On the short sector of inner whorl umbilical bullae give rise to pairs of coarse ribs arising from umbilical bullae. They are straight, crowded, feebly rursiradiate, the adapical more markedly rursiradiate than the adapertural. On the outer whorl, pairs of ribs arise from blunt bullae at the adapical end of the fragment, but over most of the fragment, ornament consists of single variably but always feebly bullate primary ribs that are straight and recti- to feebly rursiradiate, strengthening and broadening across the flanks and linking to a blunt, coarse ventrolateral bulla, the bullae giving rise to a low, broad, near-transverse rib that declines, not extending to the siphonal keel. Two ribs at the adapertural end of the smaller fragment bear ill-defined blunt lateral bullae.

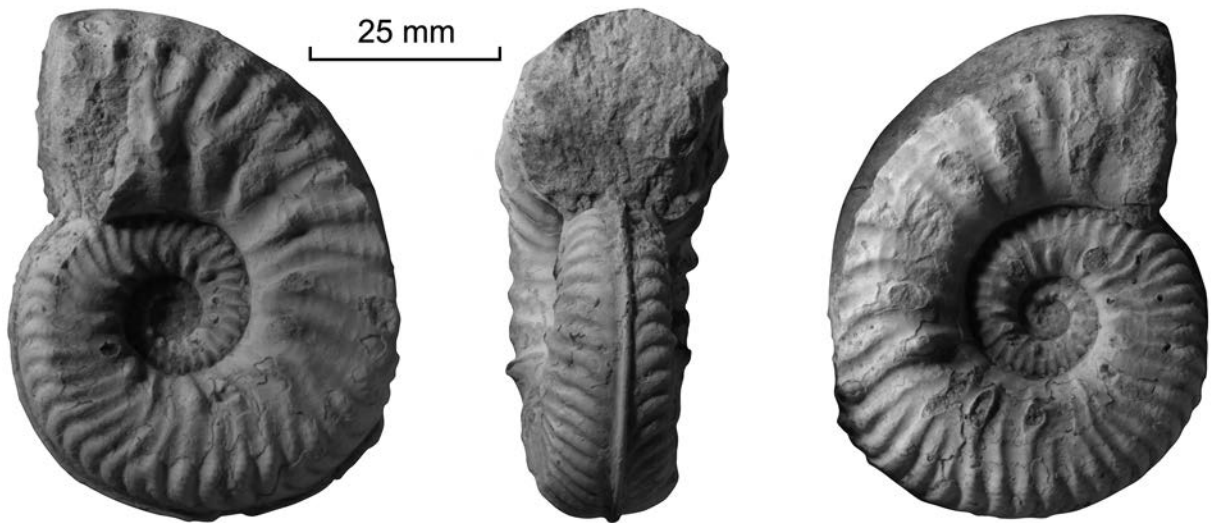
The holotype of *Mimeloceras macronodosum* van Hoepen, 1946, is SAM PCZ 19456 (ex D.2582), the original of van Hoepen (1946, p. 207, text-figs 186–188; Text-fig. 11). It had an estimated maximum diameter of 67 mm, is complete to 52.7 mm, and retains

Text-fig. 9. *Pervinquieria (Deiradoceras) binodosa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19125 (ex D.2585), the holotype of *Mimeloceras latiumbilitatum* van Hoepen, 1946 (p. 211, text-figs 193–195), from the “Extension of Ridge West of Beacon 624 to the West into the valley and gradually higher westward”.





Text-fig. 10. *Pervinquieria* (*Deiradoceras*) *binodosa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19124 (ex D.2586), the surviving fragments of the holotype of *Mimeloceras agrestis* van Hoepen, 1946 (p. 213, text-fig. 196), from the "Extension of Ridge West of Beacon 624 to the West into the valley and gradually higher westward".



Text-fig. 11. *Pervinquieria (Deiradoceras) binodosa* (van Hoepen, 1941) from KwaZulu-Natal, South Africa; SAM PCZ 19456 (ex D.2582), the holotype of *Mimeloceras macronodosum* van Hoepen, 1946 (p. 207, text-figs 186–188), from the “Ridge West of Ridge West of Beacon 624”.

extensive areas of limonitised shell. Dimensions are as follows:

	D	Wb	Wh	Wb:Wh	U
SAM PCZ 19456	52.7 (100)	25.9 (49.1)	23.4 (44.4)	1.1	16.2 (30.7)

Coiling is very evolute, the umbilicus of moderate depth, and comprising 30.7% of the diameter. The umbilical wall is convex, outwardly inclined, the umbilical shoulder broadly rounded. The whorl section is slightly depressed, rectangular in intercostal section with broadly rounded ventrolateral shoulders and a broad, flattened venter with a strong siphonal keel. Seventeen to eighteen ribs arise at the umbilical seam of the outer whorl, sweep forwards across the umbilical wall, strengthen, and link to bullae that become progressively stronger as size increases and migrate outwards to an umbilicolateral position at the largest preserved diameter. The bullae give rise to pairs of ribs, some of which bifurcate on the outer flank, while there are occasional intercalated ribs to give a total of 38–40 at the ventrolateral shoulder. The ribs are strongly rursiradiate, flexing back and convex across the flanks and linking to a feeble inner ventrolateral bulla from which they flex forwards and are concave on the ventrolateral shoulder, projecting strongly forwards, weakening and narrowing, and almost extending to the siphonal keel. There are delicate spiral ridges on flanks, ventrolateral shoulders and venter. Ornament is comparable on both flanks, suggesting that the specimen is not pathological.

The suture (van Hoepen 1941, text-fig. 53) is moderately incised, with an asymmetrically bifid E/A, the median incision deep, a narrow A, and relatively large asymmetrically bifid A/U2.

DISCUSSION: The first growth stage of *binodosa* is particularly distinctive, and readily separates it from co-occurring *Pervinquieria (Deiradoceras) pre-rostrata* (Spath, 1921) (compare Kennedy and Klinger 2023b, text-fig. 1A, B and Text-fig. 11 herein) and *P. (D.) reversa* (compare Text-figs 1 and 11 herein).

OCCURRENCE: Lower Upper Albian of northern KwaZulu-Natal (South Africa) and Angola.

Acknowledgements

WJK acknowledges the support of the staff of the Earth Collections of the Oxford University Museum of Natural History and David Sansom of the Department of Earth Sciences, Oxford. His field work in KwaZulu-Natal and museum studies in Cape Town were supported by the Sir Henry Strakosch Bequest and the Oppenheimer Foundation. HCK acknowledges the technical support from the staff of the Natural History Collections, Iziko, South African Museum and financial support from the NRF, South Africa. We thank reviewers F. Amédéo, J.W.M. Jagt, N.L. Landman and M. Wilmsen for their comments on a previous version of this manuscript, E.E. Rice for advice on nomenclature, and A. Żylińska for her meticulous editing of the manuscript.

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Manuscript submitted: 29th August 2022

Revised version accepted: 25th October 2022