Appendix

Description of a new species of ammonite, *Kepplerites tenuifasciculatus* n. sp., from the Middle Jurassic, Lower Callovian of East Greenland

John H. Callomon

A new species of ammonite, *Kepplerites tenuifasciculatus* n. sp., is described. Its type locality is at Fossilbjerget in central Jameson Land, East Greenland and its type horizon lies in the Apertum Zone, the lowest zone in the Lower Callovian Stage of the Middle Jurassic. It has a narrow stratigraphical range and hence makes a good guide-fossil for stratigraphical time correlation.

Keywords: ammonite, East Greenland, Fossilbjerget, Jameson Land, *Kepplerites tenuifasciculatus* n. sp., Middle Jurassic

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The revision of the biostratigraphy and biochronology of the ammonite faunas of the Middle Jurassic of East Greenland has revealed a number of hitherto unknown species that characterize very narrow chronostratigraphic intervals and hence make excellent guide-fossils for time correlations (Callomon 1993). One of these is now described. It represents a transient – chronospecies of some authors – in the evolution of one of the two evolutionary lineages, the Kosmoceratidae, whose members inhabited East Greenland during the Late Bathonian and Callovian, the other being the much longer-ranging Cardioceratidae.

Superfamily Stephanocerataceae Neumayr 1875
Family Kosmoceratidae Haug 1887

Genus *Kepplerites* Neumayr & Uhlig 1892

Type species. Amm. keppleri Oppel 1862.

***Kepplerites tenuifasciculatus* n. sp.**
Plate 1, figs 1–2

1993 *Kepplerites* sp. nov. J [*tenuifasciculatus* MS] Callomon, p. 103.

Holotype. Plate 1, fig. 1, MGUH 25310 from GGU 185614a (T. Birkelund and C. Heinberg collection 1974) Jameson Land, Fossilbjerget, section 43, bed 14, horizon J27 (Figs 1, 2).

Other material. Paratypes I, II, MGUH 25311–312 from GGU 185614b, c; paratype III, MGUH 25313 from JHC 4475 (Plate 1, fig. 2; T. Birkelund and J.H. Callomon collection 1971), same locality and bed; JHC 4469–4471, section 42, bed 18 (see Fig. 2); GGU 144191–192 from south slopes of mount Mikael Bjerg, section 31 (Birkelund coll. 1971; Fig. 1). Numerous other specimens seen *in situ* were too poorly preserved to be worth collecting.

Stratigraphical horizon. The southern slopes of Fossilbjerget are marked by three ridges, running southwards, on which sections have been recorded, numbered 41–43 from east to west (Callomon 1993, fig. 1).

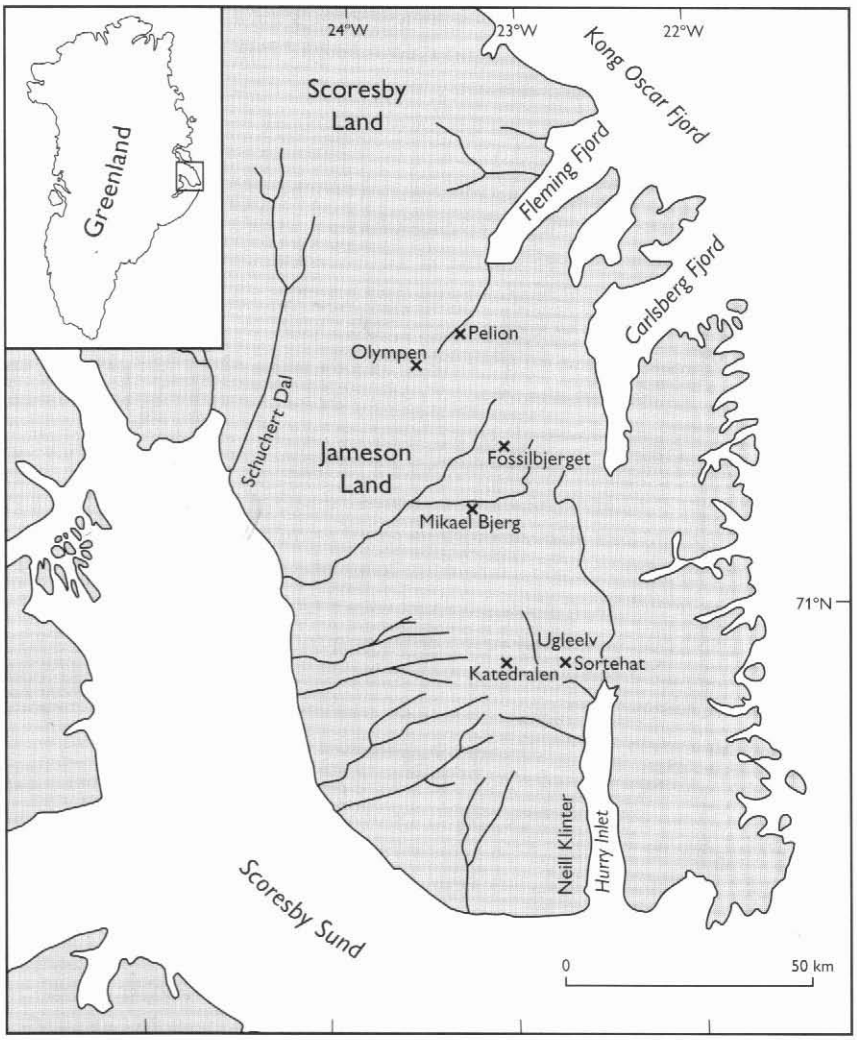


Fig. 1. Sketch-map of the Jameson Land area with place names mentioned in the text.

The sections span the shaly Fossilbjerget Formation underlain by the sandy Pelion Formation and capped by the sandstones and shales of the Olympen Formation (Surlyk *et al.* 1973; Larsen & Surlyk 2003). The three sections differ only in detail. Section 43 is shown in weathering-profile in Figure 2. It was previously shown in outline by Surlyk *et al.* (1973, fig. 23). Lithologically, the sediments consist predominantly of shaly siltstones or very fine-grained sandstones, barely consolidated except in concretionary layers that punctuate the succession as markers or in scattered calcitic or phosphatic concretions. Some of the beds are highly glauconitic, indicating condensed, sediment-starved intervals and comparison with adjacent areas, *e.g.* at the mountains Olympen and Mikael Bjerg (Fig. 1), shows that the succession incorporates numerous hiatuses of variable durations. The age-diagnostic ammonites can be recovered only from the hard beds. Their biostratigraphy in terms of faunal horizons, however, is with only few exceptions as close to complete as present knowledge allows (Callomon 1993, fig. 4). The only horizon in the interval under discussion not so far recognized in the Fossilbjerget–Olympen area is J23, that of *Kepplerites vardekloeftensis*. It may have been lost in a hiatus, marked by a sharp lithological break, under the glauconitic ironstones of beds 9–13 (Fig. 2, Section 43). The type-horizon of *Kepplerites tenuifasciculatus*, J27, is bed 14, an indurated, shaly, non-glauconitic, light brown fine-grained sandstone, 0.2 m thick, lying with sharp contact on the hard, ferruginous and highly glauconitic sandstone marker of bed 13 below (Fig. 2, Section 43). The contact probably marks another hiatus that would account for the considerable break, both in composition and morphologies, between the faunas of beds 13 and 14. The fauna of bed 13 consists predominantly of *Cadoceras* (*apertum*), with only minor *Kepplerites* (cf. *traillensis*). That of bed 14 is dominated by monospecific

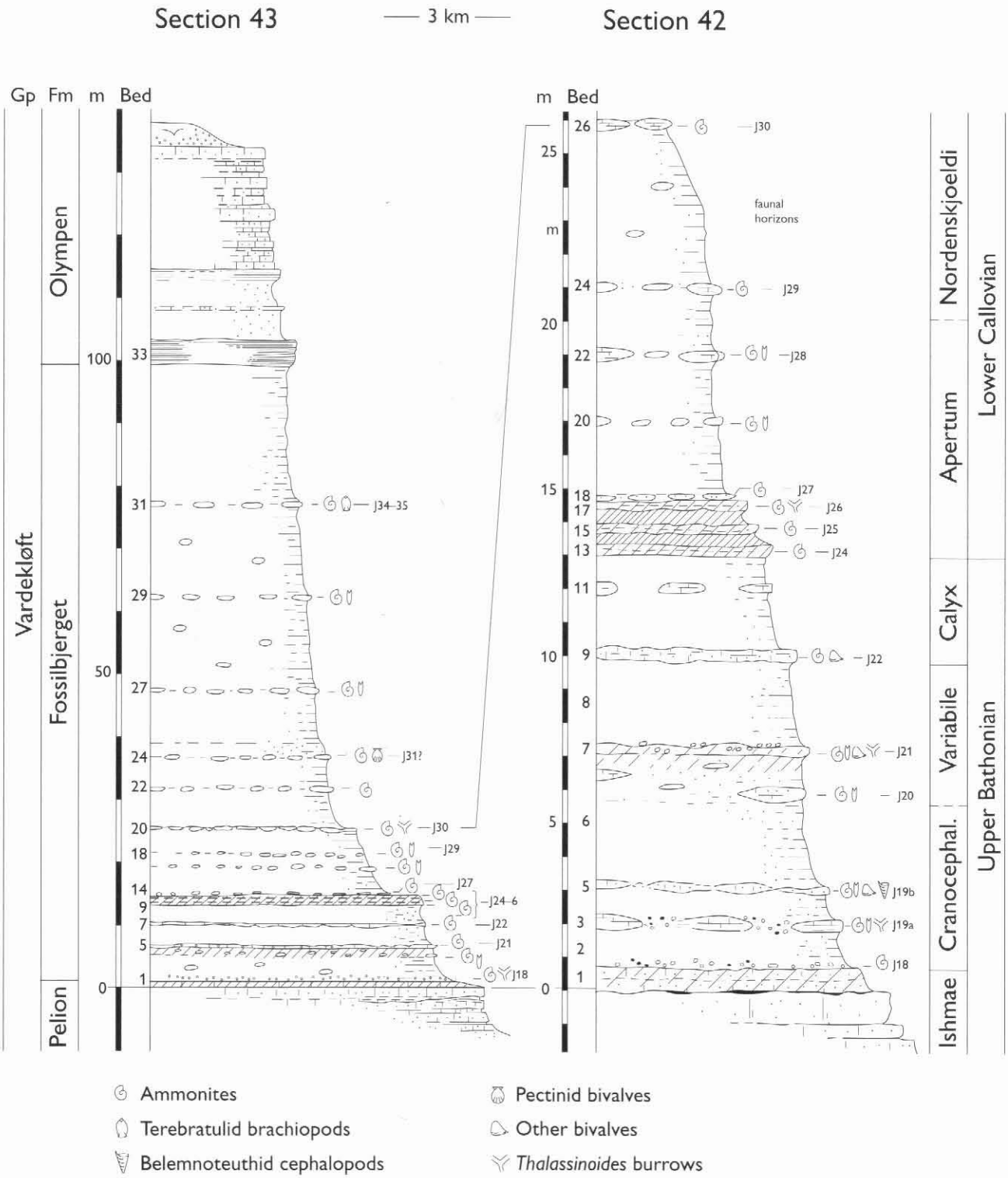


Fig. 2. Diagrammatic sections in weathering profile through the Fossilbjerget Formation at its type locality on the southern slopes of Fossilbjerget, central Jameson Land; section 43 is located 3 km west of section 42. Note that the beds in the two sections are numbered independently – discussion of bed numbers in the text refers to those in Section 43. Lithostratigraphy at left, standard chronostratigraphy – substages and zones – at right. Diagonal hatching: glauconitic. Numbers J18–J35: the ammonite faunal horizons recognized in Jameson Land (see Callomon 1993). The horizon of *Kepplerites tenuifasciculatus* is J27. **Cranocephal.**, Cranocephaloide.

Table 1. Measurement of dimensions

	Holotype	Paratype III
Maximum diameter	137 mm	140 mm
Septate to	c. 100 mm	c. 90 mm
Length of bodychamber, whorl	0.70	0.75
Fractional umbilical width at last septum	0.23	0.22
Fractional umbilical width at aperture	c. 0.34	c. 0.33
Primary ribs per whorl		
– at diameter 125–130 mm	51	57
– at diameter 85–95 mm	40	46
Ratio of secondaries:primaries around last septum	3.8	3.4

Kepplerites (*tenuifasciculatus*) with only occasional crushed, indeterminate *Cadoceras*.

Description. All the available material consists of crushed internal moulds and measurements of dimensions (Table 1) are of limited value. The figured specimens are typical; both are complete adult macroconchs with strongly uncoiling seams on the last whorl. The microconchs remain unknown. The ribbing is characteristically dense and fine, the primaries rising retroradially on the umbilical wall, then swinging in a strongly forwards-directed curve on the umbilical shoulder into accentuated prorsiradiate ribbing on the whorlside, dividing into fasciculate sheaves (tenuifasciculate) of secondaries at about a third flank-height, rising uncurved to the venter, persisting with little or no loss of strength to the simple, somewhat sinuous peristome. There is no evidence of the lateral accentuation of the primaries into tubercles seen in other species of *Kepplerites*, especially in the younger ones and subsequently in the descendant, *Kosmoceras*. Inner whorls are not seen, so whether the earliest stages already have tabulate venters is not known.

Comparisons. The evolution of major morphological characters in the genus *Kepplerites*, leading to *Kosmoceras* in the Middle Callovian, was very gradual. Differentiation of successive transients relies on relatively minor variations of size and ribbing, often perceptible only by the trained eye in assemblages of more than a single specimen in which the range of intraspecific variability can be assessed. Changes were not continuously orthogenetic: characters could 'progress' and 'regress' with time largely independently, leading to frequent partial homoeomorphies.

In descending order:

1. *Kepplerites traillensis* Donovan 1953 (plate 17, figs 1a, b, holotype; plate 18, figs 1a, b), faunal horizons 24–26, is similar in size, coiling and style of ribbing but significantly less densely ribbed, with only *c*. 31 primaries per whorl (before the onset of the modifications on the final stage of the adult bodychamber found in all the Kosmoceratidae). The type material came from mount Morris Bjerg on Traill Ø, about 5 km north-east of the coast of Kong Oscar Fjord to the south-west. It was found in isolation, both stratigraphically and faunistically, so the position of its faunal horizon in the general succession has to be deduced by correlation with the more continuous successions in Jameson Land. The closest resemblance is to the forms found also on the southern slopes of Fossilbjerget, sections 42 and 43, horizons 24–26, as minor components in faunas dominated by *Cadoceras apertum* (Callomon & Birkelund 1985).

   K. traillensis is also, among all the known faunas of Greenland, the one closest to the type-species *K. keppleri* (Oppel): cf. Buckman (1922, plate 289A, B, lectotype, evolute inflated variant with slightly tabulate venter); Quenstedt (1886, plate 77, figs 1–5, S. Germany); Page (1989, fig. 5.1a, b, England). The resemblance is close but may not be exact, so that both specific names are retained for the time being. It indicates, however, a close time correlation and provides the basis for the assignment of the Apertum Zone already to the Lower Callovian.

2. *Kepplerites vardekloeftensis* Callomon 1993 (p. 102), faunal horizon 23. The holotype (Spath 1932, plate 25, figs 2a, b, complete adult) and paratype (Spath 1932, plate 25, figs 1a, b, complete adult phragmocone) came from the calyx limestone, a prominent concretionary marker-bed in the Fossilbjerget Formation along the length of the outcrops above Neill Klinter, the line of cliffs on the west side of Hurry Inlet and traceable inland as far as Katedralen on Ugleelv (Fig. 1); level 560 m in sections of Rosenkrantz reproduced by Spath (1932, p. 126, fig. 10). The species resembles *K. tenuifasciculatus* in coiling, size and density of primary ribbing but the secondary ribbing is coarser and fades on the

bodychamber. The two species are closely homoeomorphic but stratigraphically separated by the transients described above, which differ appreciably.

3. *Kepplerites svalbardensis* Sokolov & Bodylevsky (1931, p. 79, plate 5, figs 1, 2) resembles *K. tenuifasciculatus* in coiling and finesse of ribbing, but is smaller: adult size 105 mm, septate to 70 mm. The ribbing (45 primaries per whorl) differs, however, on the whorl-side in that, after the initial forwards twist at the umbilical margin, it curves backwards again, the secondaries reaching the venter rectiradially.

The species occurs in Greenland as a minor component in fauna 22, the dominant element of which is *K. peramplus* Spath. The latter is so distinctive, characterised by its great size (adult diameters 200 mm or more), involute and compressed inner whorls (see also Dietl & Callomon 1988, figs 4, 5), that there seems little doubt about the separate biospecific identities of the two taxa. They are not linked by intermediates and represent one of the rare cases in which the specific diversity at one horizon of an evolving generic clade rises above the monospecific. The faunal horizon can be followed from southern Hurry Inlet (types of *K. peramplus*) as far as the mountains Mikael Bjerg and Fossilbjerget, sections 42 and 43 (see above; Fig. 1).

Upwards, the record of *Kepplerites* in Greenland becomes tenuous. Occasional specimens have been found in the Nordenskjoeldi Zone, horizons 28–29, but the preservation is too poor to be able to say much of interest other than that they are still of the general appearance and size of *K. traillensis* or *K. tenuifasciculatus*. The next horizon to yield keppleritids is horizon 32. The forms at this horizon are, however, quite distinct: small, evolute and round-whorled, typical of the chronosubgenus *Gowericeras* that makes an abrupt appearance in much of northern Europe and thereby characterizes the Koenigi Zone.

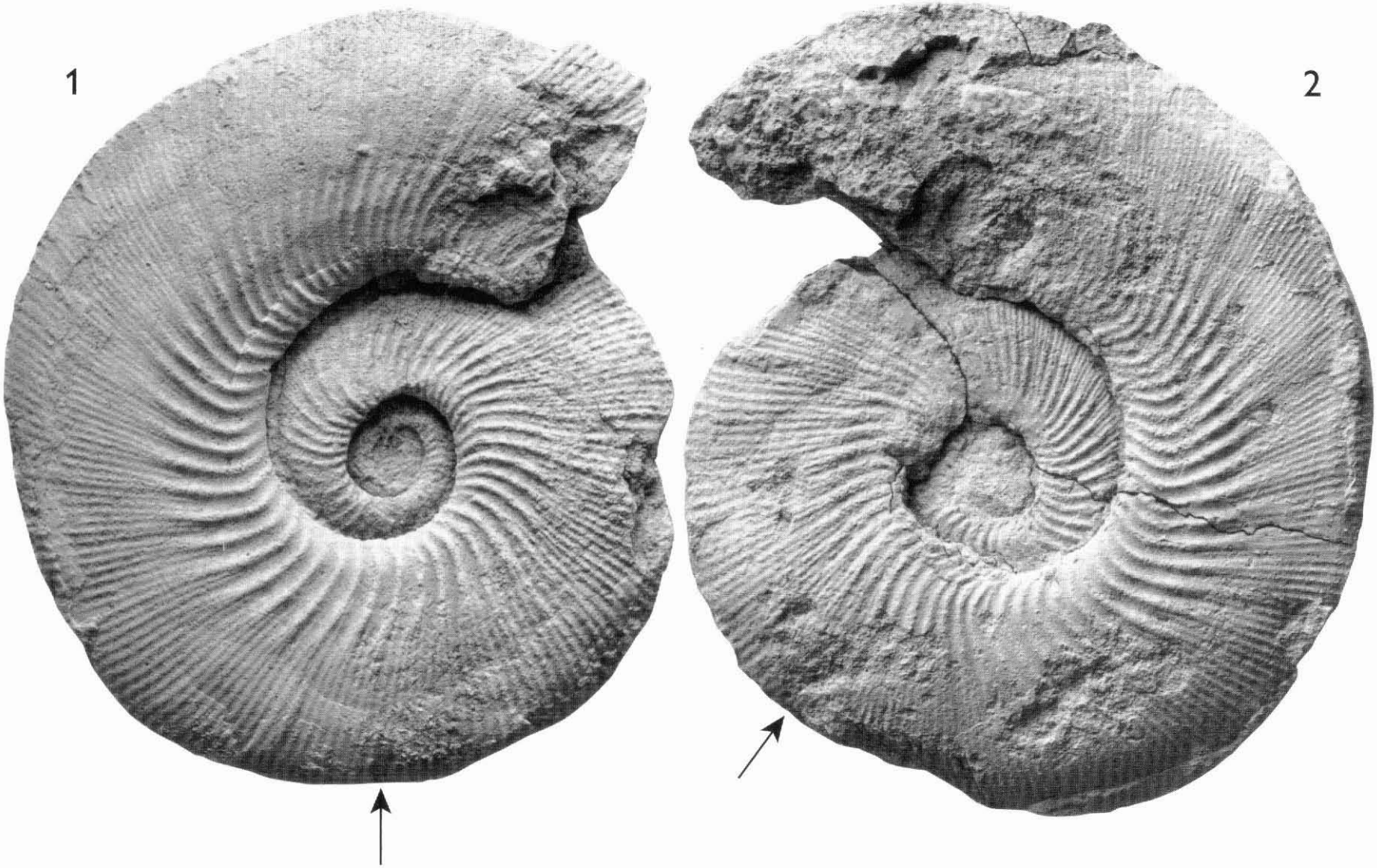
Age and distribution. Lower Callovian, Apertum Zone, faunal horizon 27. Central Jameson Land, southern slopes of Fossilbjerget, sections 42–43, and around Mikael Bjerg (Fig. 1), sections 31, 33.

Plate 1

Complete adults, natural size; arrows mark the position of the last septum at the onset of the adult bodychamber.

Fig. 1. *Kepplerites tenuifasciculatus* n. sp.
Holotype, MGUH 25310 from GGU 185614a.
Fossilbjerget, section 43, bed 14, faunal horizon J27.
Lower Callovian, Apertum Zone.

Fig. 2. *Kepplerites tenuifasciculatus* n. sp.
Paratype III, MGUH 25313 from JHC 4475.
Section, bed and faunal horizon as above.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