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AMMONITE FAUNAE FROM THE LOWER JURASSIC STANDARD PROFILE AT LÓKÚT, BAKONY MOUNTAINS, HUNGARY

by

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Известняки, вскрытые на легко доступном склоне Локутского холма, представляют собой все ярусы нижнеюрского отдела. Три зоны синемюрского яруса и шесть зон плинсбаха обоснованы фауной. Удивительно, как маломощная толща пород может служить основанием для восстановления продолжительного геоисторического развития района. Хотя в маломощной толще юры и приходится искать содержащие фауну слои, все же корреляционная диаграмма почти полностью заполнена.

Корреляция основывалась, в первую очередь, на присутствии северо-западно – европейских руководящих форм зон или подзон. Можно предположить, что ареалы этих видов расширились в период их расцвета. Следовательно, спорадические находки их в нижнеюрских отложениях Средиземноморской области являются синхронными с их акме. В принципе можно было бы также предположить, что вертикальное распространение этих видов было различным в Северо-Европейской и Средиземноморской зоогеографических провинциях соответственно и что некоторые группы мигрировали в новые районы, покинув свои оригинальные места обитания. Такой гипотезе противоречит факт, что последовательность руководящих видов является одинаковой в обеих зоогеографических провинциях.

Если хронологическое расчленение Локутского разреза правильно, то следует считаться с тем, что ряд представителей родов Protogrammoceras и Fuciniceras появились раньше, чем об этом можно прочесть в известных автору публикациях, по крайней мере, в восточных частях Средиземноморской области.

В количественном отношении обращает на себя внимание обогащение аммонитов на границе между зонами с davoei и stokesi. Зона с obtusum и верх зоны с jamesoni также характеризуются богатой фауной. Однако, зоны с semicostatum, ibex и stokesi отличаются бедной фауной. Зона с oxynotum до сих пор не обоснована фауной. Процентные содержания представителей семейств Phylloceratidae и Lytoceratidae как правило, являются бóльшими, чем в районах, расположенных вблизи подводных поднятий, но меньшими, чем во внутрибассейновых отложениях, более отдаленных от этих поднятий.

В горах Баконь уже Телеги-Рот (1934) установил, что „сколько разрезов лейаса, столько и схем стратиграфической последовательности пластов". Конда (1970) отнес различные разрезы к двум главным группам в зависимости от беспрерывности или невыдержанности осадконакопления. По данным Конды Локутский разрез принадлежит к типу беспрерывных разрезов нижней юры. Исследования фауны могли только подтвердить его мнение. В раннеюрскую эпоху район с. Локут представлял собою, по-видимому, такой участок бассейна, где органический детритовый материал, поступавший из районов подводных поднятий, время от времени изменял характер известняков ammonitico rosso.

Introduction

In the Bakony Mountains – a territory covered for the most part by Pleistocene sediments which have escaped post-depositional denudation – the localities offering comparatively continuous Jurassic sequences are relatively rare. In the northern Bakony Mountains, Lower Jurassic sequences of rather great thickness and good exposure are known to occur in the vicinity of Csernye and Lókút only. The Upper Sinemurian and Pliensbachian are dated in both areas by a rich Ammonite fauna. Whereas at Csernye the Toarcian includes fauna-rich beds too, in the manganiferous Toarcian beds of Lókút no ammonite has been found as of yet. However, at Lókút the Lower Sinemurian too can be subdivided by ammonites, while at Csernye this substage is represented by a thick sequence of cherts devoid of fauna. The two standard profiles provide mutually complementing contributions to the Lower Jurassic of Hungary.

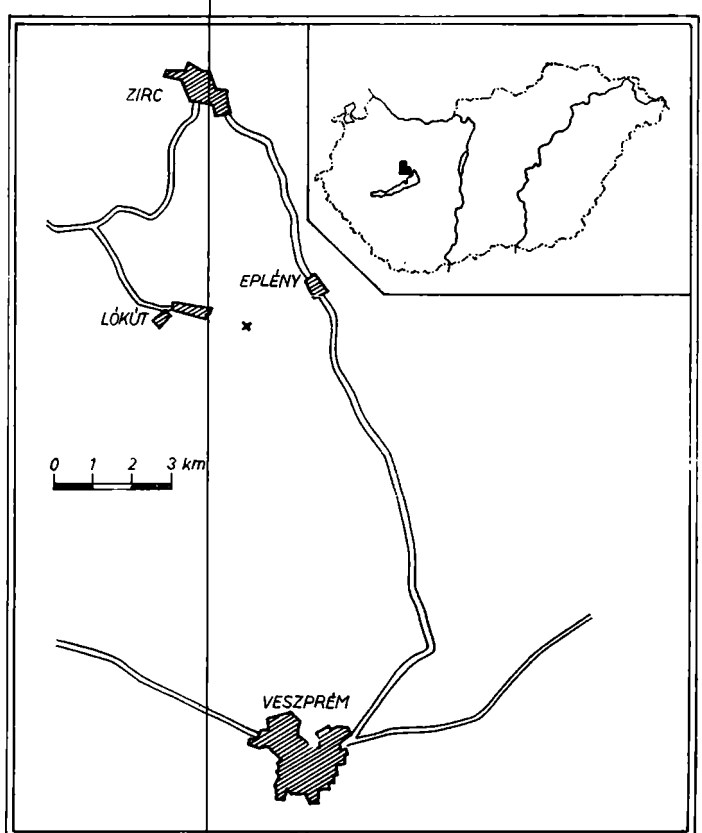

Fig. 1. Topographic sketch of the Lókút standard profile

The Lókút standard profile lies some 2 km to the ESE of Lókút in the vicinity of Zirc, at the SE extremity of the Lókút hill, to the S of Olaszfalu village.

The geological significance of the locality was recognized by Telegdi Roth (1934). The first detailed geological description was published by Kovács (1963). This author distinguished at Lókút two Ammonite faunae by the zones of

Amaltheus margaritatus and
Arietites bucklandi.

According to Noszky (1961), it is solely the Arnioceras semicostatum Zone that can be identified at Lókút by the presence of the zonal index species. Between 1961 and 1970 Konda re-investigated the Lókút profile in detail. New diggings have enabled him to collect an abundant fauna from — this time already continuous — exposure. The surfaces sampled had an average size of 2 m^2. It was Konda who entrusted the present writer with elaborating the fauna. The author whishes to use this opportunity to extend his thanks for it. In 1970 Konda gave a detailed, large-scale, geological map, section und up-to-date description of the locality. In the present paper the biostratigraphical results have been summarized.

Lithologically, in the Lower Jurassic of Lókút three main types of facies can be distinguished:

(3) manganiferous clays and marls;

(2) Ammonitico Rosso limestone and its variant containing crinoids, sponge spicules and *Bositra;*

(1) yellowish-white oölitic limestone.

(1) is exposed at the foot of the hill, in an abandoned quarry. Since the lower part of the overlying pink crinoidal limestone contains Hettangian brachiopods, the oölitic limestone seems to belong to the Lower Hettangian.

(2) The pink to red crinoidal limestone and the subsequent cherty and *Bositra*-bearing limestones, overlying the crinoidal one, represent the thickest formation of the Lókút hill. Ammonites have so far been found in this formation only. The fauna shows a very irregular distribution in the sediments. In the Ammonitico Rosso limestone sequence consisting of a total of 400 beds, as few as 25 beds were found to contain macrofauna. The fossiliferous horizons are typical representatives of the Ammonitico Rosso limestone, the thick unfossiliferous interlayers are characterized by accumulations of biogenic materials. (2) spans the stratigraphic range of the Sinemurian and Pliensbachian Stages. In spite of the temporary lack of the prerequisites for fossilization during the deposition of the afore-mentioned interlayers, the fossiliferous beds provide information about almost all of the zones of the two stages. A comparison of the 25 fossiliferous beds with one another gives insight into Mediterranean faunal evolution.

(3) With a view to the synchronous manganese ore deposition in the adjacent territories and to the fossiliferous Aalenian formations exposed at the top of the Lókút hill, the fauna-free manganiferous clays and marls belong to the Toarcian Stage.

SINEMURIAN

1. Arietites bucklandi Zone

The lowermost Sinemurian was discovered by K o n d a during the preparations for the excursion of the Colloquium on Mediterranean Jurassic Stratigraphy held in 1969 in Budapest. Forming a lens within the pink crinoidal limestone, this ammonitic clayey limestone, hardly attaining some 10 cm in thickness (Bed 100), pinches out still within the quarry in the direction of the Kávashegy. It contains large ammonites: poorly preserved internal moulds which are slightly compressed in many cases. The ammonites belong tho the following species:

Geyeroceras cf. *cylindricum* (S o w e r b y, 1831)
Tragolytoceras cf. *altecinctum* (H a u e r, 1866)
Tragolytoceras sp.
Tragolytoceras ? n. sp. aff. *ferstli* (H a u e r, 1854)
Tragolytoceras ? sp.
Canavarites n. sp. aff. *ligusticus* (C o c c h i in C a n a v a r i, 1882)
Coroniceras (Metophioceras) cf. *conybeari* (S o w e r b y, 1816)
Coroniceras (Metophioceras) cf. *longidomus* (Q u e n s t e d t, 1885)
Coroniceras (Metophioceras) n. sp.
Coroniceras (Metophioceras) sp.
Vermiceras sp.

In the fauna the representatives of Phylloceratidae are rather scarce (4%), Juraphyllitidae are absent, the share of Lytoceratidae is 24%, while Ammonitinae account for 72% of the fauna.

Predominant in the fauna are the representatives of *Coroniceras (Metophioceras)*. In addition, the *Tragolytoceras* are significant. The metophioceratids date the fauna convincingly as corresponding to the basal part of the Bucklandi Zone. According to D e a n, D o n o v a n and H o w a r t h (1961, p. 449), the appearance of the subgenus *Metophioceras* marks the base of the Sinemurian (= Conybeari Subzone). In the southern Bakony Mountains, B ö c k h (1873) recorded the presence of "*Ammonites*" *conybeari* — and, in this connection, that of the Bucklandi Zone — as early as a century ago. The northern Bakony occurrence will support the opinion concerning the distribution of *Metophioceras* and justify the present writer in drawing the following two biostratigraphic conclusions:

1. it is only the part below the ammonitic bed of the pink crinoidal limestone that may belong to the Upper Hettangian,
2. the first traces of the Ammonitico Rosso facies appear in the lowermost Sinemurian already.

Although a thin, pinching-out ammonitic intercalation does not represent a well-mappable change in facies, the break in sedimentation, the concentration of the fauna, the manifestations of subsolution here indicate a difference from the earlier Hettangian sediments showing many features which are still reminiscent of Upper Triassic sedimentation. Even though the Hettangian-Sinemurian boundary is not sharp, yet it does represent a significant change as compared to earlier sedimentation.

2. Arnioceras semicostatum Zone

Up in the profile the crinoidal beds are followed by a new ammonitic bed (Bed 120). This purple-pink to greenish-grey limestone contains scant and poorly preserved ammonite fragments:

Phylloceras ? sp.
Peltolytoceras altiformis (Bonarelli, 1900)
Ectocentries cf. *altus* (Hauer, 1856)
Ectocentrites n. sp. aff. *canavarii* (Bonarelli, 1900)
Ectocentrites ? sp. aff. *contraria* (Fucini, 1901)
Arnioceras sp.
Arnioceras ? sp.
Paracoroniceras ? sp.

On the strength of the presence of *Arnioceras* and the absence of *Asteroceras*, Bed 120 is referred to the Semicostatum Zone interpreted in the broader sense so as to include the Caenisites turneri Zone. In the Semicostatum Zone the number of Phylloceratidae is a little higher (7%). Juraphyllitidae are absent. Lytoceratidae account for 36% of the fauna, especially Ectocentrites is frequent among them. Ammonitinae are predominant (57%) in the fauna.

3. Asteroceras obtusum Zone

Towards the middle stretch of the profile an enrichment of silicosponge spicules and chert nodules can be observed in the crinoidal limestone. A new ammonitic limestone intercalation appears in the cherty crinoidal sediments (Beds 206–209). This intercalation of some 50 cm thickness was recorded by Konda in the Lókút profile as well (Profile A, Bed 3). The ammonites enclosed in the red, compact limestone are internal moulds of medium preservation, showing, in many cases, traces of subsolution on both sides. These limestones of typical Ammonitico Rosso facies contain the following fauna:

Phylloceras oenotrium (Fucini, 1901)
Phylloceras sp.
Geyeroceras cylindricum (Sowerby, 1831)
Partschiceras sp.
Juraphyllites cf. *lunensis* (De Stefani, 1886)
Juraphyllites sp.
Paradasyceras ? n. sp.
Lytoceras sp.

Angulaticeras dumortieri (Fucini, 1903)
Anglaticeras sp.
Arnioceras mendax (Fucini, 1902)
Arnioceras mendax plicatella (Fucini, 1902)
Arnioceras rejectum (Fucini, 1902)
Arnioceras cf. *insigne* (Fucini, 1902)
Arnioceras cf. *speciosum* (Fucini, 1902)
Arnioceras simile (Fucini, 1902)
Arnioceras arnouldi (Dumortier, 1867) ?
Arnioceras sp.
Asteroceras cf. *stellare* (Sowerby, 1815)
Asteroceras saltriense (Parona, 1896)
Asteroceras suevicum (Quenstedt, 1884)
Asteroceras cf. *reynesi* (Fucini, 1903)
Asteroceras sp.
Asteroceras ? sp.
Aegasteroceras cf. *sagittarium* (Blake, 1876)
Aegasteroceras sp.
Eparieties cf. *undaries* (Quenstedt, 1885)
Eparietites sp.
Epophioceras cf. *landrioti* (d'Orbigny, 1850)
Oxynoticeras cf. *soemanni* (Dumortier, 1867)
Oxynoticeras sp.
Xipheroceras sp.

The author takes this opportunity to express his gratitude to professors Dr. Donovan and Dr. Mouterde for the help they were so kind to give to him by identifying the representatives of *Aegasteroceras* and *Epophioceras*. The presence of *Asteroceras*, *Aegasteroceras* and *Eparieties* confirms convincingly that the fauna belongs to the Obtusum Zone.

The fauna is likely to span the whole range of the middle (Stellare Subzone) and upper (Denotatus Subzone) parts of the zone.

20% of the investigated fauna are constituted by Phylloceratidae, 13% by Juraphyllitidae, 9% by Lytoceratidae, and 58% by Ammonitinae. Within the last-mentioned taxon the *Arnioceras* (55%) are predominant. The subfamily Asteroceratinae shares 30% of the fauna.

4. Echioceras raricostatum Zone

The upper part of the cherty crinoidal limestone is characterized by the abundance of *Bositra*. In this member, ammonites were collected from Bed 291. The scarce fauna of very poor preservation comprises the following forms:

Phylloceras sp.
Partschiceras sp.
Juraphyllites sp.
Lytoceras ? sp.
Audaxlytoceras ? sp.
Tropidoceras sp. aff. *actaeon* (d'Orbigny, 1844)

The single *Tropidoceras* specimen is closely related to Hauer's "*Ammonites actaeon*" (1856, Pl. 9, fig. 6, 7), a species which occurs, accord-

ing to Donovan (1958), together with forms belonging to the Raricostatum Zone in the territory of Langeneckgrat, Germany. Parona (1896, Pl. II, fig. 4) recorded the same form from the Sinemurian. Although *Tropidoceras*, as a rule, are characteristic of the lower part of the Ibex Zone, in the Mediterranean areas a larger vertical range of the representatives of *actaeon* should be reckoned with. With a view to the succesive relations of its occurrence, Bed 291 is still referred to the upper part of the Sinemurian.

PLIENSBACHIAN

1. Uptonia jamesoni Zone

The red, crinoidal, cherty, *Bositra*-bearing limestone member grades upwards into a typical Ammonitico Rosso limestone. The lowermost fossiliferous limestone bed (Bed 436) was found to contain a single *Metaderoceras* ? sp. Bed 439, in its turn, is very rich in fauna, with partly shelled ammonite moulds in a good state of preservation:

Phylloceras cf. *hantkeni* (Schloenbach in Prinz, 1904)
Phylloceras sp.
Partschiceras sp.
Calliphylloceras cf. *emeryi* (Bettoni, 1900)
Calliphylloceras cf. *calais* (Meneghini, 1867–1881)
Calliphylloceras sp.
Lytoceras altum Vadász, 1910
Aegolytoceras cf. *czjzekii* (Hauer, 1853)
Juraphyllites libertus (Gemmellaro, 1884)
Juraphyllites sp.
Metoxynoticeras cf. *involutum* (Pompeckj, 1907)
Metaderoceras gemmellaroi (Levi, 1896) ?
Metaderoceras n. sp. aff. *submuticum* (Oppel, 1856)
Metaderoceras n. sp.
Metaderoceras sp.
Metaderoceras beirense Mouterde, 1970
Uptonia cf. *angusta* (Quenstedt, 1849)
Uptonia regnardi (D'Orbigny, 1844) n. subsp.
Uptonia sp.
Tropidoceras sp.
Liparoceras (Becheiceras) sp.
Protogrammoceras n. sp.
Protogrammoceras sp.
Protogrammoceras ? sp.

This fauna is referred to the uppermost Jamesoni Zone. The Jamesoni Zone is indicated by the presence of *Metoxynoticeras involutum* (cf. Futterer, 1893, p. 294; Pompeckj, 1907, p. 284 and Pia 1913, p. 57) and *Uptonia angusta* (cf. Donovan, 1954, p. 42). The single *Tropidoceras* specimen cannot be considered, in se, an evidence of the Ibex Zone, considering all what was written earlier about the *Tropidoceras acteon* group. In Mediterranean areas the representatives of *Metaderoceras* are characteristic of the Ibex Zone (cf. Dubar et al., 1967, p. 831). Their abundance at Lókút indicates the proximity of the Ibex

Zone. As for Arkell (1957, p. 247), he considered, erroneously, the genus *Metaderoceras* (Type: *Ammonites muticus* d'Orbigny, 1844) Spath (1925, p. 363) to be an objective synonym of the genus *Crucilobiceras* (Type: *C. crucilobatum* Buckman, 1920) Buckman, 1920. The inner whorls of the primitive *Metaderoceras* of Lókút are ornamented by strong, widely spaced outer tubercles resembling the ornamentation of the adult whorls of some *Apoderoceras* species (cf. *Apoderoceras ferox* Buckman, 1925, Pl. 451) characterizing the lower part of the Jamesoni Zone. Therefore, *Metaderoceras* are likely to have been produced by the evolution of the *Eoderoceras-Apoderoceras* lineage rather than being derivatives of the bituberculate *Crucilobiceras* confined to the lower part of the Raricostatum Zone. Consequently, the separation of the two genera is justified (Mouterde, 1970).

11.1% of the fauna of Bed 439 are shared by Phylloceratidae, 14,6% by Juraphyllitidae, 1,5% by Lytoceratidae, and 72,8% by Ammonitinae. Most abundant are the representatives of the genus *Juraphyllites* which is succeeded in frequency by *Metaderoceras*, *Calliphylloceras*, *Protogrammoceras* and *Uptonia*, respectively. The genera *Metoxynoticeras*, *Tropidoceras* and *Liparoceras* are represented by one specimen each.

As known presently, the *Protogrammoceras* did not occur anywhere in so old formations as they did in the Lókút profile. Since the first appearance of *Protogrammoceras* places the birth date of the superfamily Hildocerataceae in a new light, it has been found reasonable to figure the most typical ammonites of Bed 439 already before the publication of the monograph on the Lower Jurassic ammonites of the Bakony Mountain (Plates I–VII).

2. Tragophylloceras ibex Zone

The two unfossiliferous limestone beds following above the Jamesoni Zone are overlain again by ammonitic red limestones (Beds 441–460) which, however, contain just sporadical internal moulds of ammonites:

Phylloceras cf. *meneghinii* (Gemmellaro, 1874)
Phylloceras cf. *zetes* (d'Orbigny, 1849)
Phylloceras bonarelli (Bettoni, 1900)
Phylloceras sp.
Partschiceras sp.
Calliphylloceras geyeri (Bonarelli, 1895)
Calliphylloceras cf. *emeryi* (Bettoni, 1900)
Juraphyllites libertus (Gemmellaro, 1884)
Juraphyllites sp.
Harpophylloceras eximium (Hauer, 1854)
Meneghiniceras sp.
Lytoceras cf. *postfimbriatum* (Prinz, 1904)
Tropidoceras sp. (= *Cycloceras actaeon* in Futterer, 1893, Pl. XII fig. 2. non d'Orbigny, 1843)
Coeloceras ? n. sp. aff. *avanzatii* (Fucini, 1905)
Liparoceras sp.
Fuciniceras dubari (Cantaluppi – Montanari, 1968)
Fuciniceras sp. aff. *boscense* (Reynes, 1868)

Protogrammoceras costicillatum (Fucini, 1900) n. subp. (= *F.* cf. *costicillatum* in du Dresnay, 1963)
Protogrammoceras exiguum (Fucini, 1904)
Protogrammoceras sp.

Unfortunately enough, no index species has been found in Bed 441. Beds 442 to 455 are unfossiliferous. It is probable that these beds belong to the lower part of the Ibex Zone (Tropidoceras masseanum Subzone). Beds 456 to 460 seem to correspond to the upper part of the Ibex Zone. One specimen of *Tropidoceras* can still be found and a small number of *Protogrammoceras* and *Fuciniceras* also occur here, but *Prodactylioceras* is still absent.

Fuciniceras dubari was placed by Cantaluppi – Montanari (1968, p. 75) in the Upper Carixian. These authors regard as its synonym the species described from the High Atlas ("*Fuciniceras* sp. B" Dubar, 1961, p. 255, Text-fig. 7) which Dubar considers to belong to the Davoei or Ibex Zone.

In the Ibex Zone, Phylloceratidae are predominant (52.8%). The share of Juraphyllitidae is 24.7% of the fauna, that of Lytoceratidae 5.6% and that of Ammonitinae 16.9%.

In the Ibex Zone all species are represented by a small number of specimens. Comparatively most frequent are the forms related to *Calliphylloceras emeryi*.

3. Prodactylioceras davoei Zone

a) *Lower and middle part*

Having a total thickness as low as 23 cm, Beds 461 and 462 contain a relatively more abundant ammonite fauna. The enclosing rock is a red limestone, locally crinoidal. Let us quote the ammonites found here·

Phylloceras hantkeni (Schloenbach in Prinz, 1904)
Phylloceras zetes (d'Orbigny, 1849)
Phylloceras bonarellii (Bettoni, 1900)
Phylloceras sp.
Partschiceras sp.
Calliphylloceras geyeri (Bonarelli, 1895)
Calliphylloceras emeryi (Bettoni, 1900)
Calliphylloceras microgonium (Gemmellaro, 1884)
Juraphyllites libertus (Gemmellaro, 1874)
Juraphyllites cf. *diopsis* (Gemmellaro, 1884)
Juraphyllites cf. *frechi* (Meister, 1913)
Juraphyllites sp.
Harpophylloceras eximium (Hauer, 1854)
Meneghiniceras sp.
Lytoceras cf. *postfimbriatum* (Prinz, 1904)
Radstockiceras sp.
Tropidoceras cf. *actaeon orientale* (Rremer, 1965)
Coeloceras sp. aff. *pettos* (Quenstedt, 1843) ?
Coeloceras ? *indunense* (Meneghini, 1881)
Coeloceras ? *indunense tardevoluta* (Bettoni, 1900)
Coeloceras ? *incertum* (Fucini, 1905)
Coeloceras ? sp.

Prodactylioceras psiloceroides (Fucini, 1905)
Androgynoceras cf. *maculatum* (Young et Bird, 1822)
Androgynoceras capricornus (Schlotheim, 1820)
Fuciniceras dubari (Cantaluppi, 1968)
Fuciniceras detractum (Fucini, 1900)
Fuciniceras n. sp. (= *F.* cf. *boscense* in Cantaluppi – Montanari, 1968, Pl. 13, fig. 3.)
Fuciniceras sp.

Androgynoceras cf. *maculatum* was collected from Bed 461, *A. capricornus* from Bed 462. For the identification of *A. capricornus*, the author has to extend his sincerest thanks to Professor M. K. Howarth. *A. maculatum* is the index fossil of the lower, *A. capricornus* of the middle subzone of the Davoei Zone (cf. Dean et al. 1961, p. 466, 467). Hence it is probable that the fauna of the two Lókút beds may represent the lower and middle parts of the Davoei Zone.

37.2% of the fauna is constituted by Phylloceratidae, 17.3% by Juraphyllitidae, 1.7% by Lytoceratidae and 43.8% by Ammonitinae. *Calliphylloceras emeryi* and *Juraphyllites libertus* are the most frequent forms.

b) *Upper part*

The richest fauna of the Lókút hill has been yielded by Beds 464 and 465. Either of the two beds is 20 cm thick. Both show an irregular distribution and accumulation of the ammonites. A few ammonites of Bed 465 have preserved their shells; some of the large *Phylloceras* and *Lytoceras* are represented by internal moulds affected by subsolution and thus exhibiting even their septa. These specimens were enclosed parallel to the bedding plane, but fell prey to heavy subsolution together with the upper part of the bed. With a view to the abundance of species, the faunae of the two beds are considered separately.

Bed 464:

Phylloceras hantkeni (Schloenbach in Prinz, 1904)
Phylloceras meneghinii (Gemmellaro, 1874)
Phylloceras cf. *zetes* (d'Orbigny, 1849)
Phylloceras sp.
Calliphylloceras emeryi (Bettoni, 1900)
Calliphylloceras sp.
Partschiceras sp.
Juraphyllites libertus (Gemmellaro, 1884)
Juraphyllites telegdirothi (Kovács, 1934)
Juraphyllites cf. *diopsis* (Gemmellaro, 1884)
Juraphyllites planispira (Reynes, 1868)
Juraphyllites sp.
Harpophylloceras eximium (Hauer, 1854)
Meneghiniceras sp.
Lytoceras cf. *fimbriatoides* (Gemmellaro, 1884)
Lytoceras n. sp. aff. *baconicum* (Vadász, 1910) ?
Aegolytoceras cf. *fuggeri* (Geyer, 1893)
Coeloceras sp. aff. *pettos* (Quenstedt, 1843)
Coeloceras sp.
Prodactylioceras cf. *davoei* (Sowerby, 1822)

Prodactylioceras italicum (Meneghini in Fucini, 1900)
Phricodoceras (Hemiparinodiceras?) urcuticum (Géczy 1959) ?
Protogrammoceras detractum (Fucini, 1900)
Protogrammoceras costicillatum (Fucini, 1900)
Protogrammoceras cf. *pantanellii* (Fucini, 1900)
Fuciniceras cf. *dilectum* (Fucini, 1900)
Fuciniceras sp. aff. *ambiguum* (Fucini, 1900)?
Fuciniceras lavinianum (Meneghini in Fucini, 1900)
Fuciniceras sp.

With the appearance of the typical representatives of *Prodactylioceras* and the higher abundance of the representatives of *Protogrammoceras–Fuciniceras*, Bed 464 belongs to the upper part of the Davoei Zone. *Protogrammoceras detractum* is particularly abundant in the bed, being characteristic of the transitional Carixian-Domerian beds as shown by Cantaluppi and Montanari (1968, p. 74).

The present writer earlier considered *Hemiparinodiceras* to be a subgenus of *Liparoceras*. On the strength of recent samplings, however, its affinity with *Phricodoceras* is more probable and it seems to be very closely related to the forms referred to *Phricodoceras lamellosum* (d'Orbigny, 1844) by Buckman (1920, Pl. 149).

In terms of specimens the fauna is constituted for 21.1% by Phylloceratidae, 31.0% by Juraphyllitidae, 2.9% by Lytoceratidae and 45.0% by Ammonitinae. Of the Phylloceratidae the species *Calliphylloceras emeryi* is most abundant (63 specimens of a total of 602), to be followed by *P. hantkeni* (10 specimens). Of the Juraphyllitidae the species *Juraphyllites planispira* (46 specimens) and *J. libertus* (33 specimens) and *J. telegdirothi* (30 specimens) are most frequent. Of the Ammonitinae, *Protogrammoceras detractum* was found to predominate with 141 specimens accounting for 23% of the entire fauna! The other *Protogrammoceras* and *Fuciniceras* species are represented in very low numbers of specimens only.

Bed 465:

Phylloceras hantkeni (Schloenbach in Prinz, 1904)
Phylloceras meneghinii (Gemmellaro, 1874)
Phylloceras disciforme (Reynes, 1868)
Phylloceras zetes (d'Orbigny, 1849)
Phylloceras bonarellii (Bettoni, 1900)
Partschiceras sp.
Calliphylloceras emeryi (Bettoni, 1900)
Calliphylloceras microgonium (Gemmellaro, 1884)
Juraphyllites libertus (Gemmellaro, 1884)
Juraphyllites cf. *libertus* (Gemmellaro, 1884)
Juraphyllites telegdirothi (Kovács, 1934)
Juraphyllites planispira (Reynès, 1868)
Juraphyllites cf. *diopsis* (Gemmellaro, 1884)
Juraphyllites sp.

Harpophylloceras cf. *eximium* (Hauer, 1854)
Meneghiniceras bicicolae (Bonarelli, 1895) n. subsp.?
Lytoceras cf. *fimbriatoides* (Gemmellaro, 1884)
Lytoceras sp. aff. *secernendum* (De Stefani, 1887)
Audaxlytoceras sp.
Radstockiceras n. sp.
Coeloceras sp.
Coeloceras ? *fallax* (Fucini, 1905)
Coeloceras ? *fallax irregularis* (Fucini, 1905)
Coeloceras ? cf. *asperum* (Fucini, 1905)
Coeloceras ? cf. *indunense* (Meneghini, 1881)
Prodactylioceras cf. *italicum* (Meneghini in Fucini, 1900)
Phricodoceras sp. aff. *imbricatum* (Bettoni, 1900)
Liparoceras (Becheiceras) gallicum (Spath, 1936) n. subsp.
Androgynoceras sp.
Oistoceras sp.
Protogrammoceras n. sp. (= *normanianum* in Fucini, 1905) non d'Orbigny, 1844
Protogrammoceras costicillatum (Fucini, 1900)
Protogrammoceras detractum (Fucini, 1900)
Protogrammoceras n. sp.
Fuciniceras cf. *coniungens* (Fucini, 1900)
Fuciniceras sp. aff. *ruthenense* (in Fucini, 1900 non Reynès, 1868)
Fuciniceras n. sp. (= *F.* cf. *boscense* in Cataluppi – Montanari, 1968)
Fuciniceras cf. *capellinii* (Fucini, 1899) ?
Fuciniceras sp.

The appearance of *Oistoceras* in NW Europe is characteristic of the upper part of the Davoei Zone (Oistoceras figulinum Subzone), though subordinate representatives of Oistoceras can also be found together with the first representatives of *Amaltheus* (cf. Dean et al., 1961, p. 468). Similar is the case with *Liparoceras (Becheiceras)*. Since no *Amaltheus* has so far been found in Bed 465, this bed is placed too in the Davoei Zone on the basis of *Oistoceras*. However, it is quite plausible that the condensed fauna may also include forms occurring in the Amaltheus stokesi Zone.

The new *Radstockiceras* species is characterized by extreme compression, a very narrow umbilicus and a richly differenciated suture line. The new *Liparoceras (Becheiceras)* subspecies is also more compressed than the nominate subspecies of *gallicum*. The closely spaced ribs of the new *Protogrammoceras* are slightly sigmoidal, the venter being heavily tricarinate.

In the fauna the share of Phylloceratidae is 29.1%, that of Juraphyllitidae 35.7%, that of Lytoceratidae 5.6%, and that of Ammonitinae 29.6%. Most frequent species is *Juraphyllites planispira* (114 of the total number of 586 specimens). *Juraphyllites telegdirothi* (39 specimens) is also very frequent. The genera *Radstockiceras*, *Phricodoceras* and *Bechei-*

ceras are represented by one specimen each, *Androgynoceras* and *Oistoceras* by a total of five specimens. The population of *Coeloceras* is also very subordinate. The representatives of *Protogrammoceras* and *Fuciniceras* show a little more varied specific composition as compared to that observable in Bed 464, being characterized by the predominance of *P. costicillatum* and *P. detractum* here too.

4. Pleuroceras spinatum Zone

The Amaltheus margaritatus Zone in the strict sense is absent at Lókút. Bed 465 is overlain by crinoidal limestones of greyish to purple-pink colour (Beds 466 – 473) containing just sporadical and single representatives of ammonites:

Phylloceras hantkeni (Schloenbach in Prinz, 1904) n. subsp.
Phylloceras sp. aff. *frondosum* (Reynes, 1868)
Calliphylloceras emeryi cf. *diversisulcatum* (Kovács, 1939)
Lytoceras sp.
Emaciaticeras cf. *lottii* (Gemmellaro, 1885)
Emaciaticeras cf. *dolosum* (Fucini, 1899)
Emaciaticeras sp. (Bonarelli)
Paltarpites meneghinii (Bonarelli, 1899)

The only specimen of *Paltarpites meneghinii* was found in Bed 466. The systematic position of the species is a point of controversy. Bonarelli placed the species conditionally in the genus *Harpoceras*, admitting, however, its possible affiliation with the genus *Polyplectus* (1899, p. 203). Cantaluppi (1967, p. 46) conditionally referred *meneghinii* to the genus *Protogrammoceras*, indicating, however, its possible affiliation with the genera *Paltarpites* and *Polyplectus*, too. According to Pinna (1969, p. 13), *meneghinii* would belong to the *Protogrammoceras* genus, too. On the basis of the narrow umbilicus, the sharp ventral area, the well-developed external saddle, *meneghinii* stands closer to the type of *Platyharpites platypleurus* Buckman, 1927, than to the types of the genera *Protogrammoceras*, *Polyplectus* or *Lioceratoides*. Arkell (1957, p. 256) included the genus *Platyharpites* in the genus *Paltarpites*. According to Buckman, *platypleurus* would belong to the Argutus Hemera, i.e. to the lower part of the Spinatum Zone. Pinna suggests *P. mediterraneum* to occur also in the Spinatum Zone.

The only specimen of *Emaciaticeras* cf. *lottii* was found in Bed 467, several specimens of *E.* cf. *dolosum* and *E.* sp. were collected from Bed 473. Therefore it is probable that the uppermost fossiliferous bed belongs to the upper part of the Spinatum Zone (cf. Dubar et al. 1967, p. 832).

Because of the marked scarcity of the fauna, it would be rather difficult to give any quantitative evaluation of the fauna of the Spinatum Zone. Nevertheless, the representatives of *Phylloceras* and *Lytoceras* seem to show a slight increase in percentage (Phylloceratidae 28.6%, Juraphyllitidae 0.0%, Lytoceratidae 16.7%, Ammonitinae 64.7%).

The Spinatum Zone is overlain with a break in sedimentation by the Toarcian manganiferous sequence.

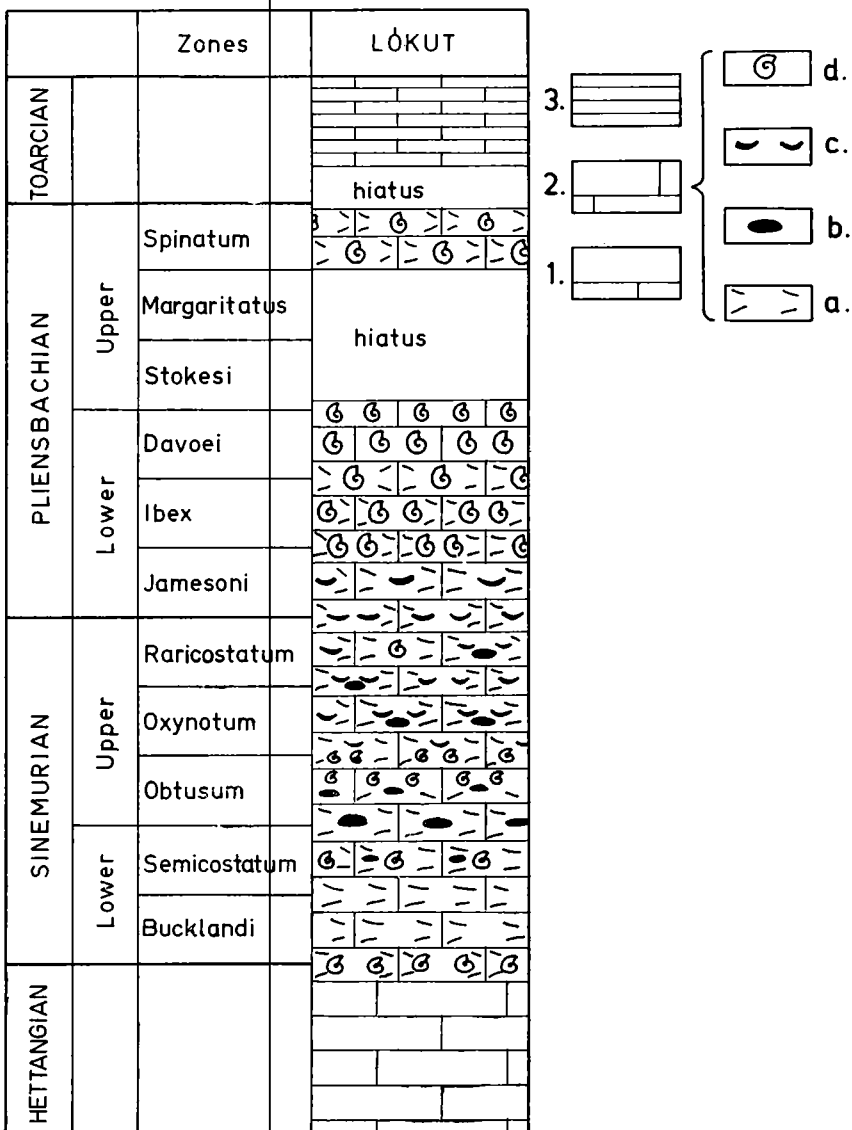

Fig. 2. Correlation diagram of the Lókút standard profile
1. oölitic limestone
2. Ammonitico Rosso limestone
(a) with crinoids; *b)* with chert nodules; *c)* with Bositra; *d)* with ammonites
3. manganiferous sequence

Conclusions

The limestones exposed on the easily walkable slope of the Lókút hill represent all stages of the Jurassic system. Three zones of the Sinemurian Stage and six zones of the Pliensbachian are evidenced by fauna. Surprisingly enough, very little "material" (rock) is sufficient to record a long range of geohistorical events. Although fossiliferous beds have had to be looked for in the Jurassic sequence of low thickness, the correlation diagramme is almost completely filled up.

Correlation has been based primarily on the occurrences of NW European zonal or subzonal indices. It may be supposed that the realm of these species was widened during their acme. Consequently, their sporadical Mediterranean occurrences are synchronous with their acme. In principle, it would also be possible that the time ranges of the species may be different in the Northwest European and the Mediterranean provinces and that some groups would have migrated to new areas after abandoning their original habitat. This hypothesis, however, is contradicted by the identity of the susccessions of the index species in both faunal provinces.

If the chronological subdivision of the Lókút profile is correct, several *Protogrammoceras* and *Fuciniceras* species must have appeared earlier than shown by the references known to the author, at least as far as the eastern Mediterranean areas are concerned.

Quantitatively, the increase of the ammonite populations on the boundary of the Davoei-Stokesi Zones is remarkable. The Obtusum Zone and the top of the Jamesoni Zone are also characterized by a rich fauna. The Semicostatum, Ibex and Stokesi Zones, in turn, are poor in species. The Oxynotum Zone is not evidenced by any faunal record as of yet. The percentage ratio of the Phylloceratidae and Lytoceratidae, as a rule, is higher than in the near-seamount zones, being, however, lower than in the basinal sediments occurring far away from the seamounts.

In the Bakony Mountains it was recognized already by Telegdi Róth (1934) that "the stratigraphic successions of the Liassic vary from profile to profile". K o n d a (1970) referred the various profiles to two main types in dependence on the continuity or discontinuity of sedimentation. According to K o n d a, Lókút belongs to the type of continuous sedimentation. The investigations of the fauna have confirmed his statement. In the Early Jurassic the area of Lókút may have been a basin portion, where the organic detritus supplied from the seamounts caused temporary changes in the character of the Ammonitico Rosso limestone.

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PLATE I

1. *Calliphylloceras* cf. *emeryi* (Bettoni, 1900). Bed: N° 439.
2. *Partschiceras* sp. „
3. *Juraphyllites libertus* (Gemmellaro, 1884) „
4. *Juraphyllites libertus* (Gemmellaro, 1884) „

Foto: Quaiser

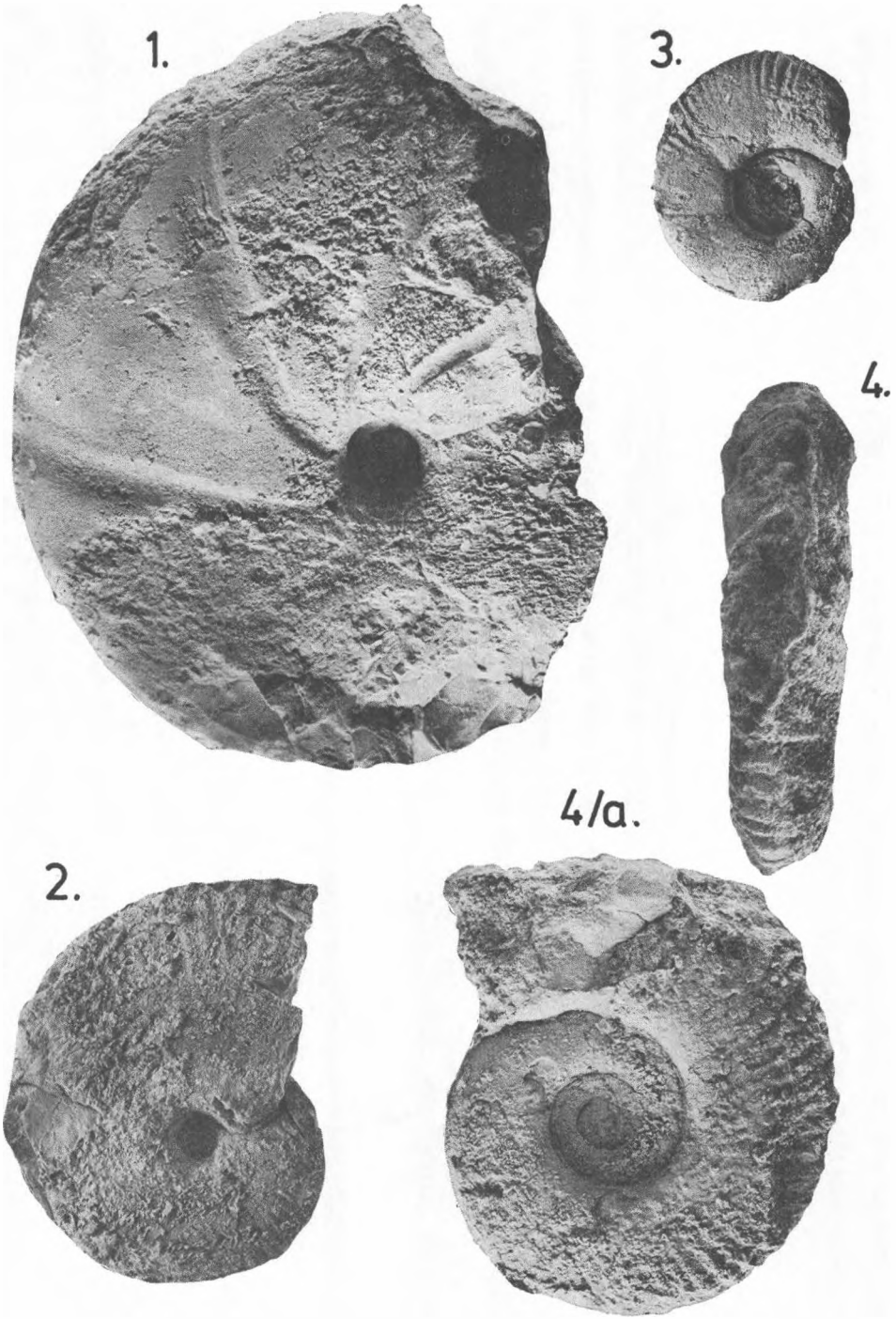
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PLATE II

Lytoceras altum Vadász, 1910. Bed: 439.

Foto: Quaiser

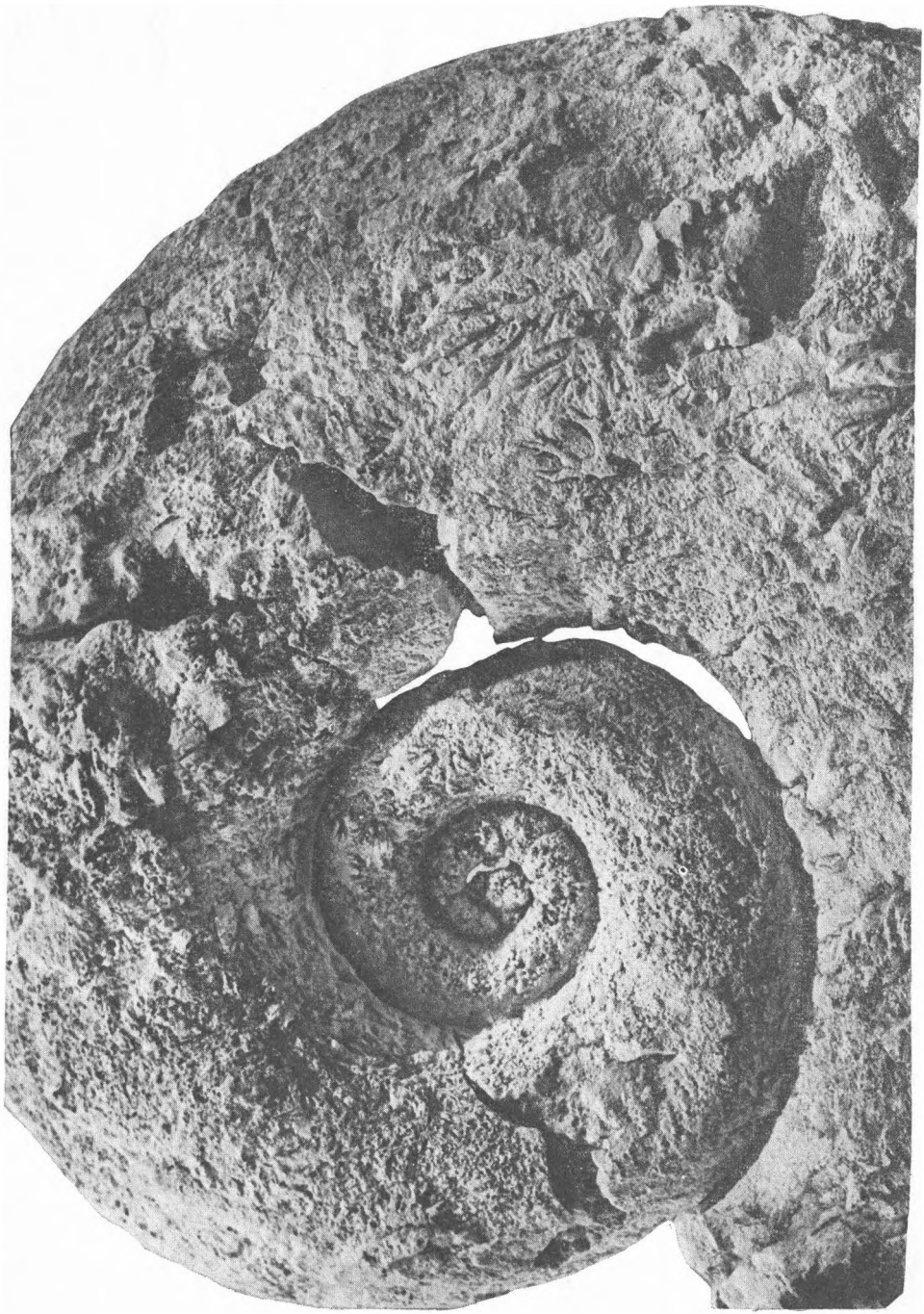

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PLATE III

1. *Metoxynoticeras* cf. *involutum* (P o m p e c k j, 1907). Bed: N° 439.
2. *Metaderoceras beirense* M o u t e r d e, 1970.

Foto: Q u a i s e r

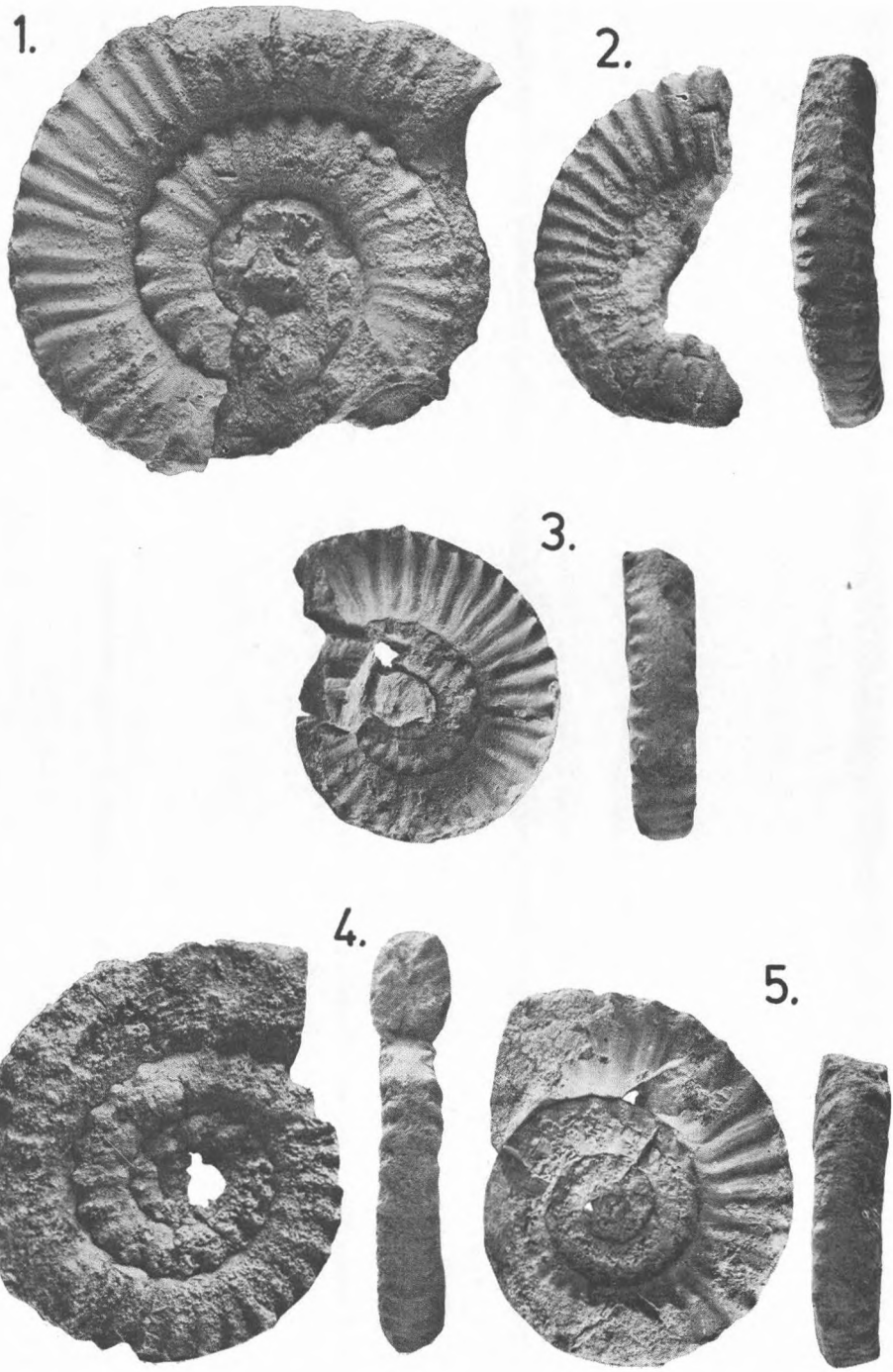
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PLATE IV

1. *Metaderoceras densinodum* (Quenstedt, 1849) ? Bed: N° 439.
2. *Metaderoceras* n. sp. aff. *submuticum* (Oppel, 1856)
3. *Metaderoceras* n. sp. aff. *submuticum* (Oppel, 1856)
4. *Metaderoceras* cf. *beirense* Mouterde, 1970
5. *Metaderoceras* n. sp. aff. *submuticum* (Oppel, 1856)

Foto: Quaiser

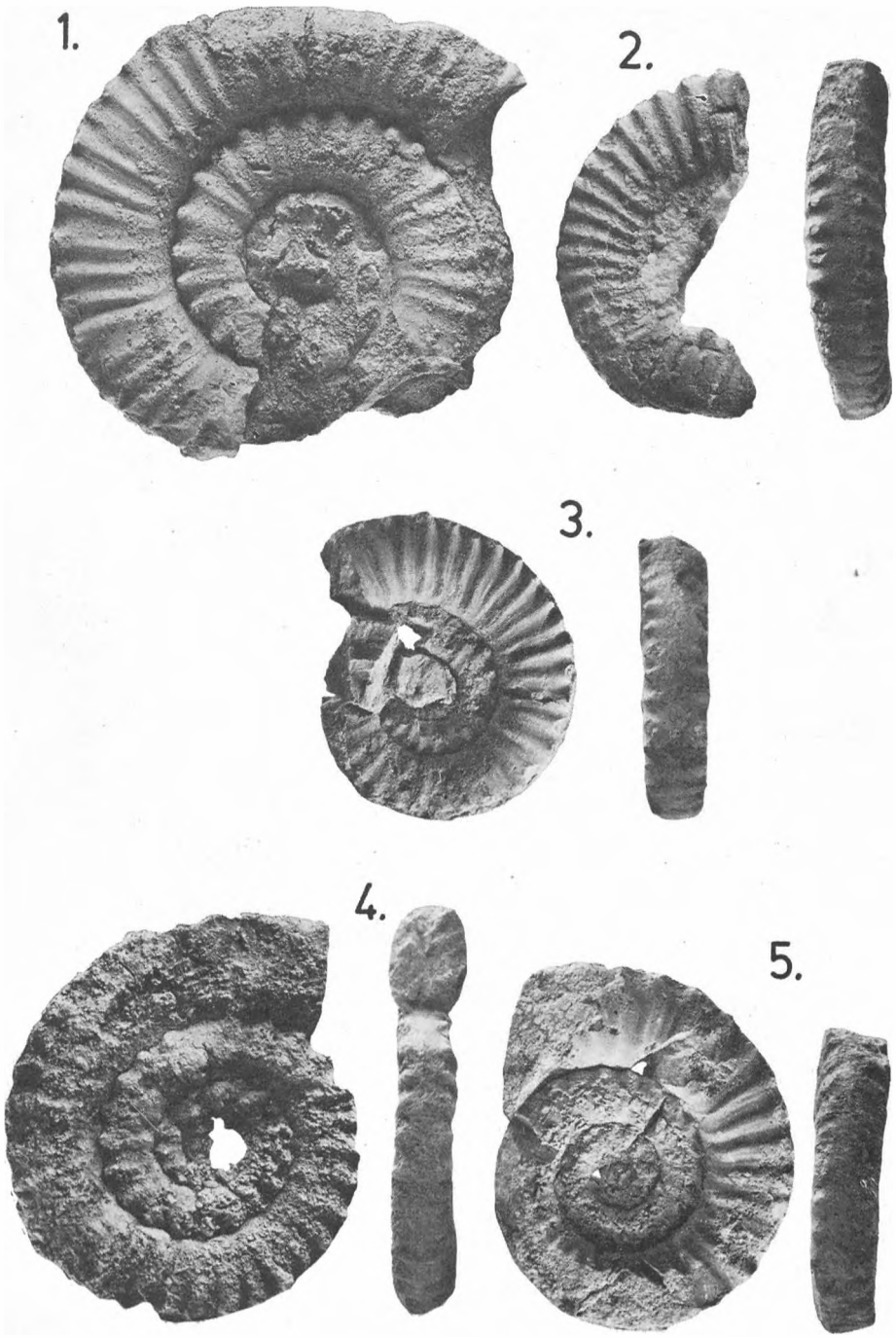
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PLATE V

1. *Uptonia* n. sp. Bed: N° 439
2. *Uptonia* cf. *angusta* (Quenstedt, 1849) ? „
3. *Metaderoceras beirense* Mouterde, 1970 „

Foto: Quaiser

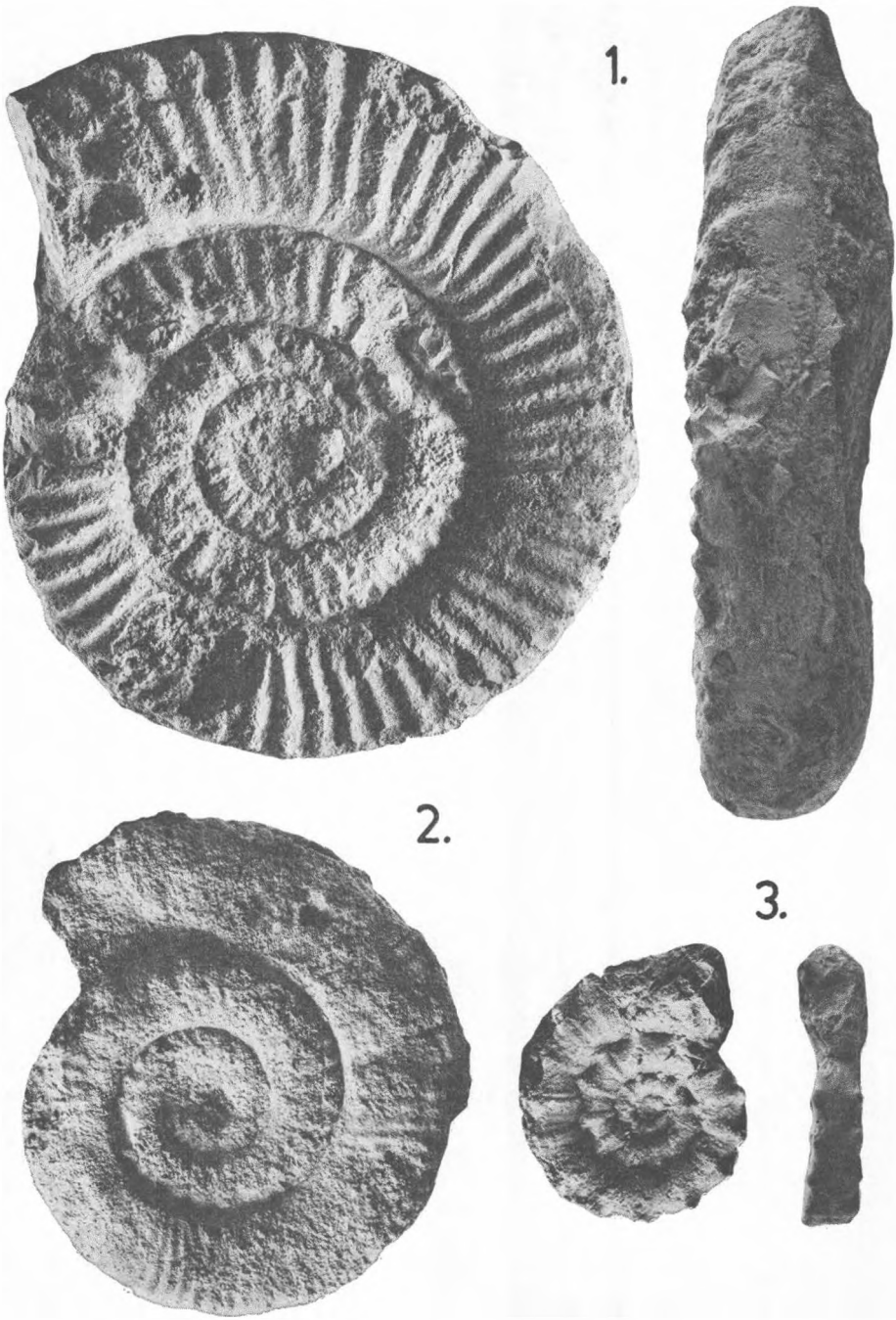
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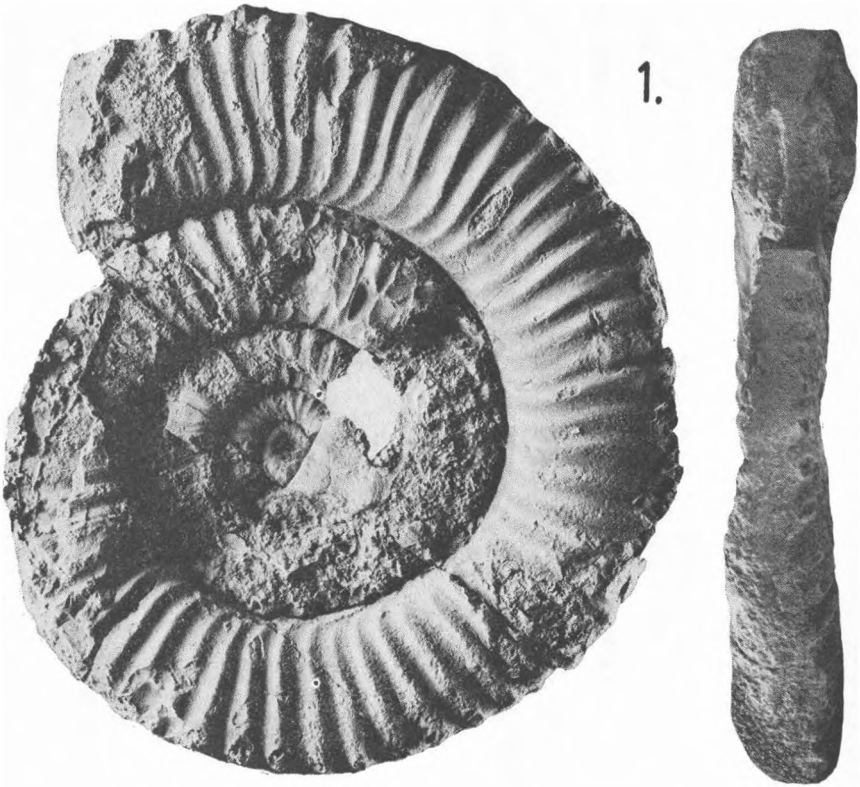
PLATE VI

1. *Uptonia* n. sp. Bed: N° 439
2. *Uptonia regnardi* (d'O r b i g n y, 1844) n. subsp. „

Foto: Q u a i s e r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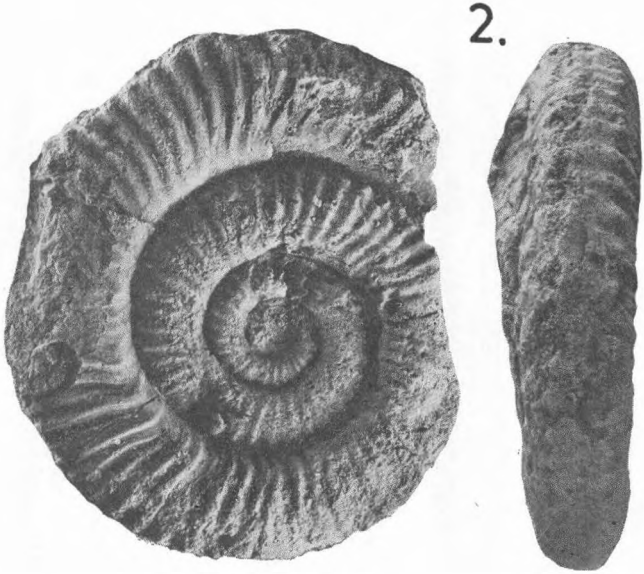
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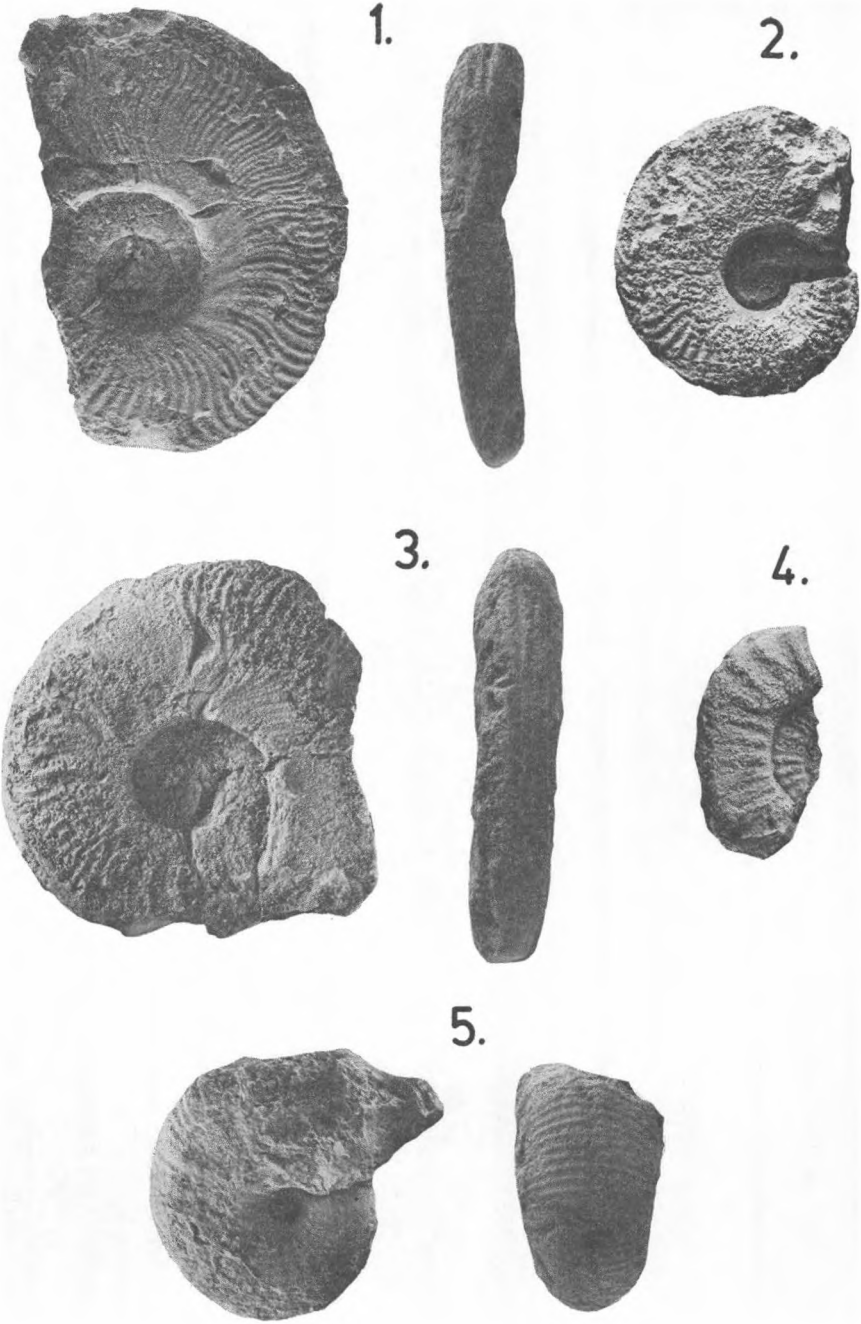
PLATE VII

1 – 3. *Protogrammoceras* n. sp. Bed: N° 439
4. *Tropidoceras* sp. „
5. *Liparoceras (Becheiceras)* sp. „

Foto: Quaiser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