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Revision of the Middle Jurassic ammonite fauna from Csóka-hegy, Vértes Hills (Transdanubian Hungary)

András GALÁCZ

Department of Palaeontology, Eötvös University
H–1083 Budapest, Ludovika tér 2, Hungary

(with 1 figure and Plates 18–19)

Abstract

In the Vértes Hills, a part of the Transdanubian Central Range, exposures of Middle Jurassic rocks are limited to some spots. The best-known occurrence is that on the Csóka-hegy, of which fauna was briefly described in 1960. The depositional and faunal features indicated a revision, what was made on the basis of the original material. The sediments are re-interpreted as fissure-filling materials of Middle Jurassic neptunian dykes, where a Bajocian and a Bathonian ammonite assemblage was recognized. The Bathonian fauna indicating the Oxycerites orbis Zone is richer and more interesting, because it contains forms which are interpreted here as cryptogenetic homoeomorphs. These previously less-known or unrecognized forms (e.g. *"Morphoceras" gignouxi, ?"Dimorphinites" nodifer*, special *Epistrenoceras* sp., etc.) were preserved here in this locality because the fissure-filling material escaped the normal sedimentologic and diagenetic processes which were general in the area of overwhelming radiolaritic deposition. In addition to these general conclusions, the paper gives short descriptions and figures of the characteristic Bajocian and Bathonian ammonites.

Key words: Transdanubian Central Range, Hungary, submarine fissure-filling, Bajocian, Bathonian, ammonites, rare forms

Introduction

In the Vértes Hills of the Transdanubian Central Range Jurassic rocks are exposed only in the marginal areas (GALÁCZ 1985). Aalenian red, nodular limestone and debris of supposedly overlying Bathonian limestone are recorded east of Vértessomló (FÜLÖP et al. 1960). Brown cherts and limestones were ranged on the basis of microfacies studies in the Callovian-Oxfordian from the eastern margin of the Vértes Hills (KNAUER 1973).

The best-known Middle Jurassic locality of the Vértes is in its western margin, on the Csóka-hegy (Csóka Hill) of Mór, where the rocks are dated by ammonites. The formations and faunas ranged into the Bathonian were first described by FÜLÖP et al. (1960). On the basis of recent field studies and re-evaluation of the fossils, the general conclusions on the formations and the faunal lists of that paper need a revison.

Middle Jurassic rocks on the Csóka-hegy of Mór

The locality is a few tenches on the steep slope of the hill which were made in the late 50's, in the time of field studies for detailed mapping by the Hungarian Geological Institute. "It was unsuccessful to establish the succession of the tectonically disordered beds" (FÜLÖP et al. 1960, p. 18), thus the different rocks were interpreted in a supposed stratigraphic order. FÜLÖP in a later work (1971, fig. 4) published a section of the locality, where the incomplete sequence is figured in undisturbed order. Five Middle Jurassic rock- types were distinguished (see also VIGH 1968, pp. 36–37), of which two yielded ammonite faunas. These two formations, and the published respective faunal lists (determinations by G. VIGH) are as follows:

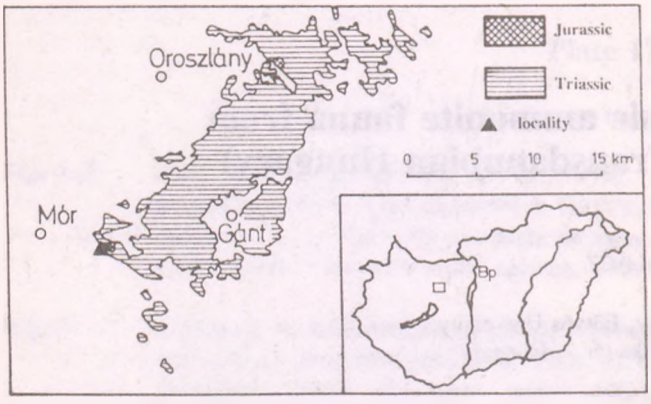

Fig. 1. Triassic and Jurassic rocks in the Vértes Mts, and the location of Csóka-hegy near Mór.

rock-type b ("crinoidal, Posidonomya limestone with manganiferous nodules and manganese-coated skeletal elements"):

Phylloceras sp.
Lytoceras sp.
Hecticoceras sp.
Teloceras sp.
Peltoceras sp.? ("of primitive character").

rock-type c ("red limestone with calcitic fillings and rich fauna"):

Phylloceras sp. aff. *P. kunthi* NEUM.
Phylloceras flabellatum NEUM.
Phylloceras div. sp.
Phylloceras subobtusum KUDERN.
Calliphylloceras sp. aff. *disputabile* ZITT.
Holcophylloceras mediterraneum NEUM.
Holcophylloceras sp. (from the *H. mediterraneum* NEUM. group)
Lytoceras adeloides KUDERN.
Lissoceras oolithicum D'ORB.
Hecticoceras recticostatum DE GROSS. (sic!)
Hecticoceras sp. aff. *H. primaevum* DE GROSS.
Hecticoceras sp.
Teloceras sp.
(?)*Clydoniceras* sp.
Delecticeras sp. (from the *D. legayi* RIGAUX & SAUVAGE group)
Delecticeras sp.
Garantiana cf. *ferruginea* OPP.
Garantiana sp.
Gracilisphinctes cf. *fusciacensis* LISSAJOUS
Siemiradzkia sp.
Berbericeras cf. *schwandorfense* KRUMB.

On the basis of the dominating small-sized forms, the assemblages were regarded by VIGH as dwarfed faunas, and from the embedding of the forms he concluded that the fossils were swept together in shallow, agitated marine water. As of age, he suggested the Bathonian for both.

In addition to the general conclusions drawn from the depositional and petrographic features, the above faunal lists are especially interesting. In his discussion VIGH mentions only *Peltoceras* sp.? as the only element as a contrast with his Bathonian age determination. However, in his lists *Teloceras*, *Garantiana* and *Hecticoceras* are also included, which, being Bajocian and Callovian forms, would also need some explanation.

Probably realizing the presence of true Bajocian forms, FÜLÖP later (1971) "completed" the 4 to 5 m thick sequence, inserting Bajocian beds in between the Sinemurian (identified by brachiopods) and Bathonian (determined by VIGH's ammonites) strata.

The longer faunal list of VIGH (from rock-type c above) has some further interesting elements, because he recorded *Clydoniceras* and *Delecticeras*. These two subgenera are significant from palaeogeographical point of view, because their species are hitherto unknown from s. str. Mediterranean areas (see GALÁCZ 1990).

All these interesting aspects indicated a revision of the fauna. The material, kept in the collections of the Hungarian Geological Museum, was made available by J. KONDA, former director of the Hungarian Geological Institute.

Depositional environment

The locality, as it was described by FÜLÖP et al. (1960) is a clustrer of rocks and blocks standing out from the soil of a covered area. On the southwestern slope of the hill, southeast to the outcropping Lower Cretaceous crinoidal limestone, in a 200 to 400 m wide strip, red, brecciated, crinoidal limestone debris are scattered on the surface. There are some blocks of pale, micritic limestone, which were the sources of Liassic (Sinemurian) brachiopods recorded by FÜLÖP et al. (1960), but all red limestone types are seemingly of fissure filling material. Most belong probably to the Middle Jurassic, as judged from the mass-occurring *Bositra* shells in all rocks. There are now only a single point where Bajocian brachiopods occur (A. VÖRÖS, pers. comm.). We could have not find any ammonite-bearing Middle Jurassic rocks in the recent field studies. This does not exclude the possibiliy of future discovery of in-situ occurrences of Bajocian or Bathonian rocks with ammonites.

On the basis of the lithologic types and the inferred depositional features, FÜLÖP et al. (op. cit. pp. 17,18) concluded that the Liassic rocks are products of transgressive sedimentation following an emerged phase at the Triassic/Jurassic boundary. The Bathonian was interpreted as a sequence with transgressive breccia above the Dachstein Limestone and Liassic rocky shore sediments, which was followed by shallow-water bioclastic accumulation.

Since the publication of FÜLÖP's and VIGH's works, the sedimentological re-evaluation of the Jurassic rocks in the Transdanubian Central Range has been revealed facts which exclude the subaerial exposure – transgressive

overflood explanation of incomplete sequences. According to earlier and recent depositional models (GALÁCZ 1984, GALÁCZ & VÖRÖS 1985) the Middle Jurassic was the time of the deepest-water marine environment of the area, where the dominant Bathonian and Callovian sediment is the radiolarite. This fact, and the lithologic features of the Csóka-hegy limestones suggesting submarine fissure-filling material, indicate an explanation for the occurrence as an exceptional depositional site.

According to this explanation the locality indicates the rare case of preservation of ammonitic sediments from an environment otherwise destructive for carbonate shell material. The fissures in the Liassic and Upper Triassic Dachstein Limestone provided preservational shelters for carbonates (with the embedded ammonite shells) which were formed presumably in a short calcareous deposition episode in a period characterised generally by siliceous deposition and carbonate dissolution. These carbonates filled the fissures at least in two phases: in the Bajocian and in the Bathonian. Later – prior to the Lower Cretaceous crinoidal limestone – probably submarine erosion took away all Middle and Upper Jurassic rocks. On the basis of the general development in the Transdanubian Central Range, these rocks might have been Middle Jurassic radiolarites and Upper Jurassic carbonates, not more than 10–20 m in thickness.

This case is significant not only because it shows an exceptional sedimentological situation, but in general perspectives also. In the Mediterranean realm Bathonian and Callovian ammonitic sediments are rare, because in these ages the siliceous radiolarites were developed in most places. The Csóka-hegy example may raise enthusiasm for searching faunas of this time interval in areas generally thought hopeless because of the destructive or hostile sedimentological circumstances.

Stratigraphic results

Because the efforts to collect in-situ material in the field were unsuccessful, the basis of the faunal revision was the museum material.

The ammonite specimens which have been prepared free from the original matrix are not easy to group by their original whereabouts. An additional difficulty is that there are transitions between the rock types which were recordeded previously. However, the systematic revision has resulted in the distinguishing of two, temporally different faunas: one of Upper Bajocian and one of Upper Bathonian age.

The Upper Bajocian ammonites are:

Phylloceras trifoliatum NEUMAYR
Phylloceras kudernatschi (HAUER)
Adabofoloceras belinskji (BESNOSOV)
Adabofoloceras besnosovi (STURANI)
Holcophylloceras zignodianum (D'ORBIGNY)
Ptychophylloceras longarae STURANI
Lytoceras sp. indet.
Nannolytoceras polyhelictum (BÖCKH)
Nannolytoceras pygmaeum (D'ORBIGNY)
Sphaeroceras sp.
Lissoceras oolithicum (D'ORBIGNY)
Cadomites (Cadomites) sp.
Parkinsonia sp. indet.

This fauna suggests most probably the Parkinsonia parkinsoni Zone.

The richer, Upper Bathonian fauna yielded the following determinable forms:

Phylloceras kudernatschi (HAUER)
Adabofoloceras sp.
Calliphylloceras disputabile (ZITTEL)
Holcophylloceras zignodianum (D'ORBIGNY)
Ptychophylloceras flabellatum (NEUMAYR)
Ptychophylloceras sp.
Lytoceras adeloies (KUDERNATSCH)
Oxycerites sp. indet.
Eohecticoceras sp. indet.
Prohecticoceras retrocostatum (DE GROSSOUVRE)
Cadomites (Cadomites) rectelobatus (HAUER)
Cadomites (Cadomites) sp.
?Cadomites (?Polyplectites) compressus DE GROSSOUVRE
?"Dimorphinites" nodifer WENDT
"Morphoceras" gignouxi GUILLAUME
unnamed genus and species
Epistrenoceras sp.
Bullatimorphites (Bullatimorphites) sp
Bullatimorphites ("Treptoceras") sp.
Parapatoceras distans (BAUGIER & SAUZÉ)
Procerites (Procerites) sp.
Procerites (Siemiradzkia) sp.
?Choffatia (Homoeoplanulites) pseudoannularis (LISSAJOUS)

This is an Upper Bathonian fauna, as shown by the diagnostic co-occurrence of *Prohecticoceras retrocostatum*, *Parapatoceras distans* and *Homoeoplanulites pseudoannularis*. The presence of *Epistrenoceras* sp. gives a possibility to narrow the stratigraphic range of the fauna within the Oxycerites orbis Zone (Aspidoides Zone auctt.), because this genus is restricted to the Histricoides horizon, i.e. to the upper part of this zone (see ELMI 1967, p. 453).

The strange forms in the above list (their descriptions see below) are forms of doubtful ages. *?Cadomites (?Polyplectites) compressus* DE GROSSOUVRE and *"Morphoceras" gignouxi* GUILLAUME were recorded form the Middle Bathonian Morrisi Zone. However, both forms are known in the literature by single specimens (i.e. the types), thus their Upper Bathonian occurrences cannot be excluded. *?C. (?P.) compressus* is known from the Mecsek Mts, South Hungary (GALÁCZ 1995), where it

ranges up into the Upper Bathonian. ?*"Dimorphinites" nodifer* and the form mentioned here as unnamed genus and species are ammonites showing close similarity to species described from Sicily by WENDT (1964), from faunas where Lower and Upper Bathonian forms are equally represented. During recent field work in Monte Kumeta, Sicily, very similar ammonites were collected from an assemblage of similary Upper Bathonian, Oxycerites orbis Zone age (GALÁCZ 1993). Thus there are good indications that these forms are Upper Bathonian homoeomorphs, which need further study and probably new names.

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The small size of the ammonite specimens is striking and needs some explanation. Similarly to many Jurassic ammonites coming from fissure-filling material, the entire or nearly complete forms are of small-size: maximum 1 to 2 cm in diameter. This may suggest dwarfed faunas, as in the case of STURANI's (1971) Upper Bajocian fissure-filling assemblages from North Italy. However, in the Csóka-hegy fauna occasional large (i.e. nomal) specimens, and more commonly fragments of big examples also occur. A 6.5 cm fragment of a phylloceratid of 11 cm estimated diameter occurred in the material, and other fragments from larger ammonites are also not uncommon. Additionally, many of the here mentioned and below described and figured ammonites are small forms when occurring in "normal" sediments: *Nannolytoceras, Sphaeroceras, Adabofoloceras, Epistrenoceras,* etc. An other part of the fauna is represented seemingly by young specimens: individuals, which presumably disappear by diagenetic processes in most other accumulation sites.

These above facts and considerations suggest that the openings of the suddenly splitting fissures might have been size-limiting factors. Specimens – small forms, juveniles and fragments of bigger adults – were apparently sieved into the crevices with the unconsolidated matrix. Eventually a fauna of small ammonites is resulted, which could be misleading to interpret as a dwarfed, or "cave-dwelling" association.

Short description of some Middle Jurassic ammonites from Csóka-hegy

Phylloceras trifoliatum NEUMAYR, 1871

Few small, partly fragmentary specimens. The high-oval whorl section, the sculptureless, only growth-line covered shell and the suture-line make the identification easy. The species was discussed recently (GALÁCZ 1980) in detail. That study supported the view that the species is restriced to the Upper Bajocian.

The items *"Phylloceras* div. sp." and *"Phylloceras* sp." in VIGH's faunal list partly refer to this species.

Phylloceras kudernatschi (HAUER, 1854)
Plate 18, fig. 1

Three small and four bigger, incomplete specimens of which the best-preserved is figured here. In spite of the small size, the species is easily recognizable by the fine, dense ribbing. The umbilicus is relatively wide, though this is a feature generally characteristic to most juvenile phylloceratids.

On the basis of the preservation and matrix, the specimens came from both the Upper Bajocian and the Upper Bathonian faunas.

VIGH did not determine the small specimens, but the bigger ones (the biggest speciemen is of 50 mm diameter) were identified and listed as *"Phylloceras* sp. aff. *P. kunthi* NEUM.". The differences between *P. kunthi* and *P. kudernatschi* were discussed recently (GALÁCZ 1980) on the basis of Bakony material.

Adabofoloceras belinskji (BESNOSOV, 1958)

Three fragmentary specimens which show curved ribs arising deep on the flanks and prevailingly very narrow, almost closed umbilicus – features match very well the figures in BESNOSOV 1958 (pl. 7, figs 6–8).

A. beliskji was described from the Upper Bajocian, but it ranges up into the deeper Bathonian (GALÁCZ 1994).

VIGH's original labels refer to the specimens as *"Phylloceras* div. sp.", corrected later as *"Partschiceras* sp." which is more correct, because *Adabofoloceras* was introduced by JOLY (1976) for Middle Jurassic phylloceratids having been regarded formerly as late *Partschiceras* species.

Adabofoloceras cf. *besnosovi* (STURANI, 1971)
Plate 18, fig. 4

Some *Adabofoloceras* specimens showing sharp umbilical edge and weaker ribs are closer to the species described by STURANI (1971, p. 85).

A. besnosovi was recorded from the Upper Bajocian, and the Csóka-hegy specimens are also of this age. The figured specimen was determined previously as *Calliphylloceras* sp., then as *Partschiceras* sp. indet.

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There are some additional, fragmentary, thus indeterminable *Adabofoloceras* specimens in the material. These include the one which was mentioned by VIGH as *"Phylloceras* cf. *subobtusum* KUDERN.".

Calliphylloceras disputabile (ZITTEL, 1868)

Some phylloceratid nuclei with wide umbilicus, big whorl-width and characteristic constrictions could be ranged into this species.

H. disputabile is a typical Mediterranean ammonite with a wide vertical range; the Csóka-hegy specimens came probably from the Upper Bathonian.

The species was also recorded by VIGH, as *Calliphylloceras* sp. aff. *disputabile* ZITT. in his faunal list.

Holcophlylloceras zignodianum (D'ORBIGNY, 1848)

This is a form occurring as tiny nuclei or fragments of bigger specimens in the fauna. The small specimens show the characteristically bent constrictions, the bigger fragments have the same constrictions just as the young forms, while bear additionally the short, dense ventral ribs.

H. zignodianum is an ammonite of extended vertical range (see GALÁCZ 1980, pp. 41–42). The Csóka-hegy specimens came partly from the Upper Bajocian, partly from the Upper Bathonian.

VIGH also recorded this species, citing *"Holcophylloceras mediterraneum* NEUM." and *"Holcophylloceras* sp. (from the *H. mediterraneum* group)", though part of these identified specimens belongs to *Adabofoloceras* (see above).

Ptychophylloceras longarae STURANI, 1971
Pl. 18. fig. 3

This is the most common phylloceratid in the faunas. Several specimens – all of small-sized – can be well matched with STURANI's species (1971, p. 88), which is a form with flat flanks, widely-arched venter and weak constrictions.

All data suggest that *P. longarae* is restricted to the Upper Bajocian. The Csóka-hegy specimens may belong also to this substage.

Some of the *P. longarae* specimens were listed by VIGH as *Phylloceras* sp.

Ptychophylloceras flabellatum (NEUMAYR, 1871)

Only a single, fragmentary specimen represents this species. It shows the specific features: the characteristic cross-section and the traces of the periumbilical constrictions (rosette).

This is a typical Bathonian species, thus the Csóka-hegy specimen came most probably from the Upper Bathonian beds.

The specimen was also identified by VIGH, as *"Phylloceras flabellatum* NEUM".

Ptychophylloceras sp.
Pl. 18, fig. 2

Some phylloceratid nuclei significantly differ from those of the aforementioned two *Ptychophylloceras* species, mainly by their spiral groove in the lower third of the flanks. Their matrix indicates the Upper Bathonian.

These specimens were identified by VIGH partly as *"Phylloceras* cf. *subobtusum* KUDERN.", and partly as *"Calliphylloceras* sp. aff. *disputabile* ZITT.".

Lytoceras adeloides (KUDERNATSCH, 1851)
Pl. 18, figs 5, 6–7

Two, relatively well-preserved inner whorls showing the characteristic thin collars on the shell.

The specimens probably came from the Upper Bathonian, though the species itself ranges from the Upper Bajocian to the Callovian.

VIGH identified the same species also as *"Lytoceras* cf. *adeloides* KUDERN.".

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There are several *Lytoceras* specimens in the material (from the Upper Bajocian also), but these fragmentary, incomplete examples are insufficent for closer determination.

Nannolytoceras polyhelictum (BÖCKH, 1881)
Pl. 18, fig. 10

Five specimens, of which the biggest is figured here. The characteristic oval cross-section and the numerous (i.e. 5) constrictions suggest BÖCKH's species clearly.

This is one of the most characteristic elements of the Transdanubian Central Range Upper Bajocian faunas, which is easy to identify even in fragmentary state.

VIGH did not give any names for these ammonites, but on the basis of his label, the item *"Lytoceras* sp., 4 specimens" in one of his faunal lists may be regarded as a reference to these forms.

Nannolytoceras pygmaeum (D'ORBIGNY, 1845)
Pl. 18, fig. 11

A single specimen which was damaged during the preparation works. It differs from *N. polyhelictum* (BÖCKH) by its smaller size, extremely wide umbilicus, and fewer, narrower constrictions.

N. pygmaeum is a characteristic, but rare Upper Bajocian ammonite. However, it is widely distributed in Mediterranean and NW European localities.

VIGH did not mention it in his faunal lists.

Lissoceras oolithicum (D'ORBIGNY, 1845)
Pl. 18, figs 8–9

Well-preserved, nearly complete specimen. The specific features: rounded flanks, relatively wide umbilicus, and numerous auxiliaries in the surture are well visible.

L. oolithicum is an Upper Bajocian species. This age is also suggested by the matrix of this Csóka-hegy specimen.

VIGH recorded this form also, with the same name.

Oxycerites sp. indet.
Pl. 18, figs 17–18

In the Csóka-hegy material there are several fragmentary *Oxycerites* specimens which are incomplete to be determined properly. A smaller, better-preserved example is figured here. Its narrow whorls, dense outer riblets, well-distinguished, high keel suggest the genus undoubtedly, but closer determination is impossible.

The specimens came from the Upper Bathonian.

The "?*Clydoniceras* sp. indet." name in VIGH's work refers to a tiny ventral part fragment of a bigger *Oxycerites*. All species of *Clydoniceras* show high keel and characteristic ribs which are well visible on the ventrolateral region at this diameter (see e.g. ARKELL 1951–59, pp. 33–34). In lack of these features, the range of this specimen into the genus *Clydoniceras* can be excluded.

Eohecticoceras sp. indet.
Pl. 18, figs 12–13, 14–15

Several small specimens are present with rather incomplete preservation. The two figured, quite similar forms have narrow whorls, no primary ribs but dense, curved secondaries, and low keel, thus show close relations to *Eohecticoceras*. Very similar nuclei were figured by ELMI (1967, pl. 4) from the Upper Bathonian of Ardéche. However, in lack of well-preserved adults, the Csóka-hegy specimens cannot be determined on specific level.

Genus *Eohecticoceras* ranges from the topmost Lower Bathonian to the Upper Bathonian; the Csóka-hegy specimens are probably of Upper Bathonian.

VIGH determined the two here figured specimens as *Delecticeras* (i.e. "*Delecticeras* sp. ex gr. *D. legayi* RIGAUX & SAUVAGE" for that on Pl. 18, figs 14–15, and "*Delecticeras* sp." for that on Pl. 18, figs 12–13). Both identifications are wrong, because the tricarinate-bisulcate venter of *Delecticeras* could be recognised even at smallest diameters and in fragments (see e.g. ARKELL 1951–59, p. 32).

Prohecticoceras retrocostatum (DE GROSSOUVRE, 1888)
Pl. 18, figs 16, 19–21

This is a species with representation by several incomplete specimens in the fauna. The nucleus is shown in figs 19–21, and an adult, but fragmentary specimen in fig. 16 of Pl. 18. The species is well recognizable by the wide, depressed venter, the strong primaries and the dense secondary ribs shown mainly at bigger diameters.

In the former Bathonian zonal scheme (TORRENS 1967) *P. retrocostatum* had important, zonal index value. This role has changed now, because a wider range (from the later Middle Bathonian to the higher Upper Bathonian) have been demonstrated (see TORRENS 1981). However, *P. retrocostatum* is one of the best indicators of the lower part of the Upper Bathonian Oxycerites orbis Zone (see WESTERMANN & CALLOMON, 1988), thus crucial in the age assignment of the Csóka-hegy fauna.

VIGH has identified also the species (the spelling *"recticostatum"* is evidently a minor error). The names *Hecticoceras* sp. and *Hecticoceras* aff. *H. primaevum* DE GROSS. also refer to specimens of *P. retrocostatum*, just as *"Oecotraustes* sp.". This latter name appears only on labels, but was not included into the faunal lists.

Sphaeroceras sp.
Pl. 19, figs 7–10, 11

These small sphaerocone ammonites are rare elements in the Csóka-hegy fauna. An incomplete specimen (Pl. 19, figs 7–10) shows tightly-coiled, depressed phragmocone whorls with dense, bifurcating ribs, and a quarter-whorl of body chamber with excentric coiling. The other specimen (Pl. 19, fig. 11) also preserved the beginning of the body chamber, which shows the rapid contraction better.

Sphaeroceras species are generally more globular than these Csóka-hegy specimens, but STURANI (1971) demonstrated how variable these forms could be in shape and sculpture.

On the basis of the preservation and matrix, the specimens most probably came from the Upper Bajocian, from the Parkinsoni Zone. Genus *Sphaeroceras* is most common in the Humphriesianum and Niortense Zones (see e.g. WESTERMANN 1956), but there are records of species also from the Garantiana and Parkinsoni Zones (see FERNANDEZ LOPEZ 1985, p. 391).

The figured specimens were previously determined by VIGH also as *Sphaeroceras* sp., but he was seemingly uncertain, and did not include that in his faunal lists.

Cadomites (Cadomites) rectelobatus (HAUER, 1857)
Pl. 18, figs 22–23, 24

Several fragmentary specimens, of which the best-preserved ones are figured. These are inner whorls with cross-section more depressed than in the adult forms.

Characteristic are the strong, pointed tubercles and the sharp secondary ribs.

The type of *C. rectelobatus* was described by HAUER (1857) from the basal Middle Jurassic fauna of Swinitza (see GALÁCZ 1994), but the species has an extended vertical range which includes the Upper Bathonian also (GALÁCZ 1980, p. 73).

VIGH has determined the *Cadomites* specimens from Csóka-hegy as *Teloceras*. Disregarding the facts that inner whorls of *Teloceras* are quite different, and the genus is characteristically Bajocian, VIGH cited them as Bathonian in his faunal lists.

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In addition to the well-recognizable *C. rectelobatus* specimens, there are some fragmentary *Cadomites* specimens also from the Bajocian fauna. One of these was identified on its label as "?*Bigotites* sp.", but omitted from the published faunal lists.

?*Cadomites (?Polyplectites) compressus*
DE GROSSOUVRE, 1930
Pl. 19, figs 18–19

This is a curious ammonite, represented by four fragments, of which the best is figured here. This is a form with medium-wide umbilicus and high-oval cross-section. Its dense ribbing consists of sharp, projected primaries which bi- or trifurcate at various height on the lower part of the flanks. The secondaries are undulating, but generally proverse, and cross the venter without interruption. This sculpture is exactly the same as that on the type (DE GROSSOUVRE 1930, pl. 40, fig. 5), which is a small specimen from Nièvre.

The generic state of this species is controversial. DE GROSSOUVRE (op. cit., p. 374) ranged it into *Cadomites*, but the style of ribbing and the cross-section are quite different. ARKELL (1951–59, p. 231) put it (with question mark) into *Berbericeras*, ROMAN, which is a morphoceratid. TORRENS (1967, p. 592) cited this form as belonging to a "genus of *Berbericeras*-like homoeomorphs". Later (1971, p. 143) he concluded that this is perhaps a *Polyplectites* nucleus.

Most probably this ammonite represents one group of cryptogenetic homoeomorphs which are so misteriously common in the Upper Bathonian Orbis Zone. In the Mecsek Mts (South Hungary) ?*C. (?Polyplectites) compressus* specimens occur also in the same stratigraphic level (GALÁCZ 1995).

The here figured ammonite was determined by VIGH as *Garantiana*. However, the Upper Bajocian *Garantiana* is a genus with characteristic tubercles and conspicuous ventral furrow, thus quite different.

Parkinsonia sp. indet.
Pl. 18, fig. 25

A single specimen, a body-chamber fragment of a big *Parkinsonia*. Only a portion of the lateral side is preserved, with the characteristic straight, sharp, bifurcate ribs, which suggest the genus even in lack of the distinctive ventral parts. However, with this state of preservation, the species-group cannot be identified either.

The age of the specimen – judged from its matrix – is probably Upper Bajocian.

According to the original label, VIGH also identified the specimen as *Parkinsonia* sp. (determined as of Upper Bajocian), but he did not include it into his published faunal lists.

?*"Dimorphinites" nodifer* WENDT 1964
Pl. 19, figs 12–13

A very interesting small ammonite fragment of puzzling affinity. Its inner whorls are globular with simple, strong ribs and a well-visible deep constriction. The preserved body chamber part shows contraction, whorl-section of rectangular shape with wide, lowly-arched venter. The ribbing is bifurcate, ribs are straight, with tubercle-like swellings near the umbilical margin.

The only similar form in the literature is that described and figured by WENDT (1964, p. 134, pl. 21, fig. 5a–c) from the Bathonian of Monte Inici, Sicily. The type of this ammonite, a curious form, has more differentiated tubercles, more numerous outer ribs, but its style of coiling, constrictions and cross-section are rather similar.

WENDT (op. cit.) found his specimen in a bed (MI 1/2) where Bathonian and Callovian ammonites occurred together ("Mischfauna"). At least one figured ammonite [*Oxycerites aspidoides* in WENDT 1964, pl. 13, fig. 2a–b = *Oxycerites orbis* (GIEBEL)] is of Upper Bathonian in this fauna, thus a same age for *"Dimorphinites" nodifer* cannot be excluded. The same Upper Bathonian age for the Csóka-hegy specimen is indicated by its preservation and matrix.

"Morphoceras" gignouxi GILLAUME, 1927
Pl. 19, figs 20–21, 22–23, 26–28

This is one of the most interesting ammonite species of the Csóka-hegy fauna. The best-preserved, adult specimen (Pl. 19, figs 25–28) shows the aperture at 12 mm maximum diameter. It is an almost perfect morphological equivalent of the Lower Bathonian *Ebrayiceras:* it has compressed whorls, strong ventral furrow, dense, swayed, bifurcate and single ribs, and aperture with short lateral lappets. The only difference is that the inner ribs of *Ebrayiceras* are shorter, tubercle-like (see ARKELL 1951–59, pl. 16; MANGOLD 1970b, pl. 7).

The specimens, especially that on Pl. 19, figs 20–21, show very good agreement with *"Morphoceras Gignouxi"* GILLAUME 1927, p. 217, fig. 1). This is a small, lappetted ammonite from the Caillasse inférieur de Marigny (= Morrisiceras morrisi Zone) of Normandy. A forgotten species, not mentioned in any later works on *Morphoceras/Ebrayiceras*, which is probably a cryptogenetic

homoemorph, one more of those appearing as rare ancillary forms in Middle and Upper Bathonian faunas (see above). Same forms were collected from Sicily (see GALÁCZ 1993), thus a good material is available to describe and name these forms properly in the near future.

These ammonites belong to the Upper Bathonian Orbis Zone fauna of Csóka-hegy. The age of *"M. Gignouxi"* is Morrisi Zone (see ARKELL 1956, p. 48), which is probably the lower part of the range of closely allied forms, because TORRENS (1967, p. 595) cited indirect evidences for appearance of *"Ebrayiceras"* in the Upper Bathonian, together with *Epistrenoceras*.

One of the figured specimens (that on Pl. 19, figs 22–23) was listed by VIGH as *"Garantiana* cf. *ferruginea* OPP.". This is certainly a misidentification, because *Ammonites ferrugineus* OPPEL is a Lower Bathonian *Oraniceras* (see HAHN 1970, p. 25), of which nuclei are quite different, having well-spaced, regularly bifurcating ribs (see e.g. NICOLESCO 1927, pl. 9, figs 4–8).

Unnamed genus and species
Pl. 19, figs 14–15, 16–17

Two poorly preserved specimens of doubtful affinity. The better specimen (Pl. 19, figs 14–15) is a half-whorl of a small ammonite with deep, medium-wide umbilicus, gently convex umbilical side, and wide, arched flanks and venter, giving a semi-circular cross-section. There are weak primaries on the margin, where dense, radial secondaries arise. The primary/secondary ratio is c. 1/2.5. On the preserved portion there is a very strong, narrow constriction which crosses the ribs in morphoceratid style.

There is no similar ammonite in any published Upper Bathonian faunas. All characters suggest *Berbericeras*, but that is a Lower Bathonian genus, of which all previous Middle Bathonian records were corrected later as *Holzbergia*, the microconch counterpart of *Morrisiceras* (TORRENS 1971).

The only similar form is what described and figured by WENDT (1964, p. 133, pl. 21, fig. 4a–b) as *Dimorphinites* cf. *dimorphus* (ORBIGNY) from the Bathonian of Isola di Favignana, off Sicily. This form was excluded form *Dimorphinites dimorphus* by STURANI (1964, p. 26) and GALÁCZ (1980, p. 102) on morphologic grounds, and its Bathonian age is also an argument. The stratigraphic horizon is indicated by WENDT (op. cit., p. 93) as a level with Bathonian "Mischfauna", where Lower Bathonian *Ebrayiceras* and Upper Bathonian *Prohecticoceras retrocostatum* (DE GROSS.) are also recorded. Thus an Upper Bathonian, Orbis Zone age, what is indicated by the preservation of the here figured Csóka-hegy specimen, cannot be excluded.

VIGH determined his specimens as "*Berbericeras* cf. *schwandorfense* KRUMBECK", what was a reasonable solution in the time of the publication (in 1960).

Epistrenoceras sp.
Pl. 19, figs 24, 29–30

Another interesting and valuable ammonite from the Csóka-hegy fauna. The two available specimens are figured. These are tiny, wide-umbilicated forms with smooth inner and ribbed middle whorls which bear larger, pointed, clavus-like tubercles on the ventrolateral edge. Constrictions also appear. The specimen in Pl. 19, fig. 24 shows the body-chamber as becoming smooth and slightly uncoiled.

The only group which seems possible to accomodate these ammonites is genus *Epistrenoceras*. The variability of one of *Epistrenoceras* species, i.e. that of *E. subcontrarium* (BEHRENDSEN) was discussed and figured by DOUVILLÉ (1915, pl. 7). Some of his figures (e.g. figs 16 and 18 in pl. 7) show forms with wide umbilicus and extremely rare ribs, standing very close to these in the Csóka-hegy fauna. This variant was named by DOUVILLÉ as "var. *Termieri* nov.".

If these ammonites were identified rightly, the age assignment of the Upper Bathonian assemblage can be restricted to the Epistrenoceras horizon of the upper part of the Orbis Zone.

These specimens were left unidentified by VIGH, but these are the only forms which may fit the item *"Peltoceras* sp.? (of primitive character)" in his faunal list.

Bullatimorphites (Bullatimorphites) sp.
Pl. 19, figs 1–3, 5–6

There are several nuclei and middle whorls of *Bullatimorphites* in the Csóka-hegy fauna, of which two are figured here. They show wide, rounded whorls and dense, regular ribbing. The umbilicus is wide in smaller forms and becomes narrower with growth, which is a typical *Bullatimorphites* character. However, in lack of complete forms with adult whorls, identification on species level cannot be made.

Genus *Bullatimorphites* ranges from the topmost Lower Bathonian to the Lower Callovian, thus the species belong to the Upper Bathonian fauna of Csóka-hegy.

VIGH did not mention these forms in his faunal lists, but the label of one of the here figured forms (that on Pl. 19, figs 5–6) bears the name *Emileia* sp. as his determination.

Bullatimorphites ("Treptoceras") sp.
Pl. 19, fig. 4

Together with the macroconchiate *Bullatimorphites*, some microconchs also occur. These are characterised by excentric coiling at small diameters and coarse ribbing which appears also at smaller size.

There is no aswer yet to the question what are the proper names of microconch *Bullatimorphites*. For early

forms *Sphaeroptychius* LISSAJOUS, 1927 seems appropriate, while *Bomburites* ARKELL, 1952 is a better pair for s.str. *Kheraiceras*. The name *Treptoceras* ENAY, 1959 is preoccupied (see WESTERMANN & CALLOMON 1988), but the group itself contains almost all Middle and Upper Bathonian *Bullatimorphites* microconchs.

VIGH did not determine these specimens.

Parapatoceras distans (BAUGIER & SAUZÉ, 1843)
Pl. 19, fig. 26

This is a single specimen of 6 mm length. A slightly curved portion of a small heteromorph, with projected ribs bearing tiny, pointed tubercles. In spite of the incomplete preservation, the specimen is well comparable to the young stages of the Upper Bathonian *P. distans* figured by DIETL 1978, especially those shown in his fig. 10 of pl. 8. *P. distans* is known to range through the Upper Bathonian and Lower Callovian (DIETL, op. cit., p. 48). Its first appearance is diagnostic, because it is recorded everywhere in the Orbis Zone (in the Julii Horizon, see e.g. TORRENS 1987, p. 107).

The specimen was collected and carefully prepared by VIGH, but eventually it remained unmentioned in his faunal lists.

Procerites (Procerites) sp.
Pl. 19, fig. 28

A well-preserved inner whorls with dense, straight, mostly bifurcate ribs and 2 deep constrictions per whorl. The Bathonian *Procerites*, even in the cases of fully-grown specimens, are not easy to determine, so this single inner phragmocone is difficult to identify on species level.

As a form belonging to the genus *Procerites*, its age is Bathonian, and its matrix supports the Upper Bathonian assignment.

This specimen was the only ammonite from the entire Csóka-hegy fauna which was figured in the cited earlier paper (FÜLÖP et al. 1960, pl. 2, fig. 2). VIGH determined it as *Gracilisphinctes* cf. *fusciacensis* LISSAJOUS sp.

Procerites (Siemiradzkia) sp.
Pl. 18, figs 29–30

A well-preserved, but incomplete specimen. The ribbing, especially the parabolic nodes, and the suture line indicate the subgenus, however specific identification cannot be made.

Subgenus *Siemiradzkia*, as the microconch counterpart of *Procerites*, ranges through the Bathonian, thus the specimen most probably belongs to the Upper Bathonian fauna.

VIGH determined and put the specimen in his faunal list also as *Siemiradzkia* sp.

?Choffatia (Homoeplanulites) pseudoannularis
(LISSAJOUS, 1923)
Pl. 18, fig. 27

This is a well-preserved inner whorls of a widely-umbilicated perisphinctid. Its whorl-section is circular, ribs bifurcate high on the flanks, near the ventrolateral margin, and it has weak constriction. The commonly occurring similar nuclei or innermost whorls of these perisphinctids are traditionally determined as *C. pseudoannularis*. MANGOLD (1970a, pl. 3, fig. 12) figured a specimen with lappetted aperture at 48 mm diameter, thus the species, in fact, is a small form. Of the several figures in the literature (KRYSTYN 1972, pl. 18, figs 2,3; MARCHAND et al. 1990, pl. 1, fig. 6; etc.) the one in SANDOVAL (1983, pl. 50, fig. 3) is the most similar.

The majority of the stratigraphic data on the species in the literature refers to the Upper Bathonian. The matrix of the Csóka-hegy specimen also suggests this age.

According to its label, the specimen was not identified by VIGH.

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Plate 18

Fig. 1: *Phylloceras kudernatschi* (HAUER), Upper Bathonian (1×)
Fig. 2: *Ptychophylloceras* sp., Upper Bathonian (1×)
Fig. 3: *Ptychophylloceras longarae* STURANI, Upper Bajocian (1×)
Fig. 4: *Adabofoloceras* cf. *besnosovi* (STURANI), Upper Bajocian (1×)
Figs 5, 6–7: *Lytoceras adeloides* (KUDERNATSCH), Upper Bathonian (2×)
Figs 8–9: *Lissoceras oolithicum* (D'ORBIGNY), Upper Bajocian (1×)
Fig. 10: *Nannolytoceras polyhelictum* (BÖCKH), Upper Bajocian (1×)
Fig. 11: *Nannolytoceras pygmaeum* (D'ORBIGNY), Upper Bajocian (1×)
Figs 12–13, 14–15: *Eohecticoceras* sp. indet., Upper Bathonian (2×)
Fig. 16: *Prohecticoceras retrocostatum* (DE GROSSOUVRE), Upper Bathonian (2×)
Figs 17–18: *Oxycerites* sp. indet., Upper Bathonian (1×)
Figs 19–21: *Prohecticoceras retrocostatum* (DE GROSSOUVRE), Upper Bathonian (2×)
Figs 22–23, 24: *Cadomites (Cadomites) rectelobatus* (HAUER), Upper Bathonian (22–23:1×; 24: 2×)
Fig. 25: *Parkinsonia* sp. indet., Upper Bajocian (1×)
Fig. 26: *Parapatoceras distans* (BAUGIER & SAUZÉ), Upper Bathonian (2×)
Fig. 27: ?*Choffatia (Homoeoplanulites) pseudoannularis* (LISSAJOUS), Upper Bathonian (2×)
Fig. 28: *Procerites (Procerites)* sp., Upper Bathonian (2×)
Figs 29–30: *Procerites (Siemiradzkia)* sp., Upper Bathonian (1×)

Plate 19

Figs 1–3: *Bullatimorphites (Bullatimorphites)* sp., Upper Bathonian (2×)
Fig. 4: *Bullatimorphites ("Treptoceras")* sp., Upper Bathonian (2×)
Figs 5–6: *Bullatimorphites (Bullatimorphites)* sp., Upper Bathonian (1×)
Figs 7–10, 11: *Sphaeroceras* sp., Upper Bajocian (2×)
Figs 12–13: ?*"Dimorphinites" nodifer* WENDT, Upper Bathonian (2×)
Figs 14–15, 16–17: unnamed genus and species, Upper Bathonian (2×)
Figs 18–19: ?*Cadomites* (?*Polyplectites) compressus* DE GROSSOUVRE, Upper Bathonian (2×)
Figs 20–21, 22–23: *"Morphoceras" gignouxi* GUILLAUME, Upper Bathonian (2×)
Fig. 24: *Epistrenoceras* sp., Upper Bathonian (2×)
Figs 25–28: *"Morphoceras" gignouxi* GUILLAUME, Upper Bathonian (2×)
Figs 29–30: *Epistrenoceras* sp., Upper Bathonian (2×)