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Upper Jurassic ammonite biostratigraphy of the Mecsek Mts., southern Hungary

Felső-jura ammonitesz biosztratigráfia a Mecsek hegységben

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(2 figures)

Abstract

More than 500 Upper Jurassic ammonites were collected from four sections of the eastern Mecsek Mts. (southern Hungary). The generally poorly preserved fossil material represents a narrow interval of the Oxfordian, the Cavouri, Beckeri and Darwini Zones of the Kimmeridgian and the Tithonian. The fauna contains about 40 taxa, some of them are typical for the Mediterranean Province.

Összefoglalás

A Keleti-Mecsek négy lelőhelyéről gyűjtött felső-jura ammoniteszek alapján az oxfordi emelet egy kicsi része, a kimmeridgei és a titon emeleteknek pedig a Cavouri, Beckeri, és a Darwini Zónái biztosan dokumentálhatók. A közel félezer példányt számláló ammonitesz anyag mintegy 40 taxont, köztük több, a mediterrán területeken is gyakori faunaelemet tartalmazott.

Key words: biostratigraphy, Ammonoidea, Upper Jurassic, Mecsek Hills, Hungary

Introduction

The Jurassic ammonites of the Mecsek Mts. are poorly known in comparison with the Jurassic ammonites of the Transdanubian Central Range. This is especially true in the case of the Late Jurassic.

The only relevant previous study is the monograph on the geology of the Mecsek Mts. by VADÁSZ (1935). He published faunal lists of Oxfordian and Tithonian forms with no illustration.

According to GÉCZY (1973a), the recent position of the Bakony Mts. (Transdanubian Central Range) and the Mecsek Mts. reflects an inverse palaeogeographic situation. It

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is of interest whether the statement above, mainly based on Lower and Middle Jurassic ammonites, could also be supported by the Upper Jurassic fauna.

The recent studies of the fossiliferous Upper Jurassic profiles in the Mecsek Mts. started in 1990. More than 500 Oxfordian, Kimmeridgian and Tithonian ammonites, identifiable at suborder level at least, were collected from the four localities.

Previous works

The Upper Jurassic rocks form a continuous belt in the eastern Mecsek Mts., mainly in the Kisújbánya Basin area.

Oxfordian and Kimmeridgian rocks were already separated in the pioneer work of PETERS (1862). The thick Tithonian formation was reported first time by BÖCKH (1880—1881).

Concerning ammonite biostratigraphy, the relatively rich and easily collectable ammonites of the Lower and Middle Jurassic were described by BÖCKH (1880—1881) and KOVÁCS (1953). The above mentioned publication of VADÁSZ (1935) is the only paper dealing with Malm megafossils. Later publications (such as map explanations) generally summerize and repeat VADÁSZ's data.

VADÁSZ reviewed the Late Jurassic ammonites stage by stage. From the Oxfordian, he mentioned the following ammonites from the localities of Ófalu, Óbánya and Pécsvárad: *Holcophylloceras* cf. *polyolcum* BEN., *Sowerbyceras tortisulcatum* ORB., *Peltoceras toucasi* ORB., *Aspidoceras perarmatum* SOW., and *Ataxioceras breviceps* QU.

The only Kimmeridgian and Tithonian locality known to him was a small quarry NNW of the village of Pusztakisfalu near Zengővárkony. He listed the following ammonites as Kimmeridgian forms: *Ptychophylloceras ptychoicum* QU., *Holcophylloceras* cf. *polyolcum* BEN., *Sowerbyceras* cf. *protortisulcatum* POMP., *Lytoceras* cf. *sutile* OPP., *Taramelliceras nobilis* NEUM., *T.* cf. *compsa* OPP., *T.* cf. *trachynota* OPP., *T. pseudoflexuosum* FAVRE, *T.* cf. *succedens* OPP., *Pseudowaagenia* cf. *haynaldi* HER., *P.* cf. *pressulum* NEUM., *Aspidoceras* cf. *acanthicum* OPP., *A.* cf. *neoburgensis* OPP., *A.* cf. *cyclotum* OPP., *A.* cf. *binodosum* OPP., *A.* cf. *liparum* OPP., *A.* nov. sp., *Acanthosphaerites longispinum* SOW., *Simoceras* sp., *Virgatosphinctes* sp., and *Perisphinctes* div. sp.

The Tithonian faunal list of VADÁSZ contains the following taxa: *Holcophylloceras* cf. *silesiacum* OPP., *Protetragonites quadrisulcatus* ORB., *Lytoceras* cf. *montanum* OPP., *Lissoceras hungaricum* nov. sp., *Oppelia zonarius* OPP., *Aspidoceras* cf. *binodum* OPP., *A.* cf. *cyclotum* OPP., *Perisphinctes cimbricus* NEUM., and *Prorarsenoides* cf. *transitorius* OPP.

The list, completed more than a half century ago, contains many invalid names and age assignments in the light of recent investigations. Some of the forms (e.g. *Aspidoceras neoburgensis* and *Aspidoceras cyclotum)* are synonymous, while certain „Kimmeridgian" forms (e.g. *Ptychophylloceras ptychoicum, Simoceras* sp.) are now considered Tithonian.

The identifications of VADÁSZ were not followed by subsequent Late Jurassic megafossil studies, only NAGY (1964, 1966a, 1966b, 1971) carried out micropalaeontological investigations.

The explanatory notes to the 1:10 000 scale geological maps of the Mecsek Mts. (BILIK et al., 1978; FÖLDI et al.; 1977, HÁMOR et al.; 1967, 1974; HETÉNYI et al., 1968, 1976; NAGY et al., 1978) contain important and detailed data on the lithology, but there was no new contribution concerning Late Jurassic ammonites.

The latest results of the Jurassic biostratigraphy of the Mecsek Mts. (PATAKY et al., 1982; FŐZY et al., 1985; TÖRÖK et al., 1987) report on Lower and Middle Jurassic ammonite biostratigraphy of the area.

The localities

The geographic position of the four studied sections is shown in Fig. 1.

The most important ammonite-bearing Upper Jurassic section is found in the vicinity of the small villages of Zengővárkony and Pusztakisfalu. The locality was already known by PETERS (1862), and a more detailed description was given by VADÁSZ (1935). The micropalaeontological succession of the section was established by Nagy (1964).

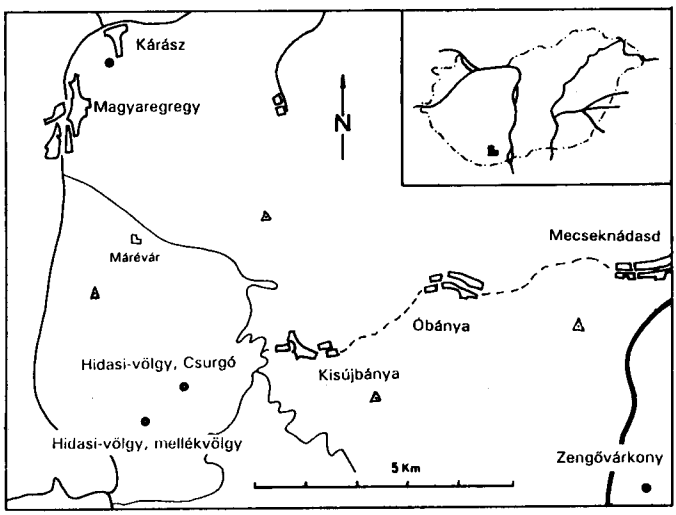

Fig. 1. Location of the profiles.

There is a small ravine east of the main road No. 6, where Upper Jurassic rocks crop out on both sides. The best outcrop is on the left side of the ravine, where Oxfordian, Kimeridgian, and Tithonian rocks are exposed in a more or less clear succession. There is a small, abandoned quarry which exposes the Tithonian part of the series. Until now this was the only section where bed-by-bed ammonite collection was carried out.

On the right side of the valley, there is another abandoned limestone quarry where Kimmeridgian rocks are exposed.

Another locality is found close to the village of Kárász. In a roadcut immediately above the swimming pool, the Upper Jurassic sediments and the Lower Cretaceous

volcanic rocks form a chaotic series. The profile yielded some poorly preserved Tithonian ammonites.

The third and the fourth localities were found close to each other, in the Hidasi Valley area. One of them is located in the main valley, about 200 metres above the spring called „Csurgó". Here „ammonitico rosso"-type Upper Jurassic limestone containing Tithonian fossils is exposed. The other locality is in a side ravine of the Hidasi Valley. Here, above the relatively thick series of Bajocian and Bathonian rocks, some beds yielded Callovian ammonites (TÖRÖK et al., 1987). Higher up in the ravine several metre thick cherty limestone is exposed which is overlain by a few metres of red, nodular ammonite-rich limestone becoming lighter and less nodular at the top. Both the red and the light-coloured limestone yielded Tithonian ammonites.

Ammonite biostratigraphy

Oxfordian

The Oxfordian stage is very poorly known in the Mecsek Mts. Until now, only the Zengővárkony locailty yielded ammonites of this stage from a one-metre thick, compact, white, moderately nodular, fossiliferous limestone bank. The following faunula, representing a narrow interval of the upper Middle or Upper Oxfordian, needs further study (with number of specimens):

Sowerbyceras sp.	1
Holcophylloceras sp.	1
Phylloceras sp.	1
Lytoceras sp.	1
Taramelliceras sp.	1
Aspidoceras cf. *binodum* (OPP.)	1
Euaspidoceras sp.	2
Orthosphinctes sp.	1
Perisphinctinae div. sp.	5
Bivalvia sp.	1

Kimmeridgian

Kimmeridgian ammonites were also found only at the locality of Zengővárkony. Since the beds of this age are better exposed and more fossiliferous, this stage is better represented than the Oxfordian.

On the right side of the Zengővárkony ravine, in the abandoned quarry, 2 to 4 disturbed limestone layers yielded the following fossils:

Sowerbyceras sp.	1
Lytoceras sp.	4
Taramelliceras pugile (NEUM.)	1
Taramelliceras cf. *compsum* (OPP.)	5
Taramelliceras sp. aff. *trachinotum* (OPP.)	1
Taramelliceras sp.	22
Aspidoceras cf. *binodum* (OPP.)	2

Aspidoceras cf. *longispinum* (SOW.)	3
Aspidoceras sp.	8
Hybonoticeras cf. *pressulum* (NEUM.)	3
Pseudowaagenia acanthomphala (ZITT.)	1
?*Orthosphinctes* sp.	3
„*Virgalithacoceras*" sp.	2
Ataxioceratidae div. sp.	31

Exactly the same type of rock (red, green, and grey, marly limestone) containing seemingly the same fossil association, can be found on the opposite side of the small ravine, between the Oxfordian and Tithonian beds. However, the exposure is rather poor there.

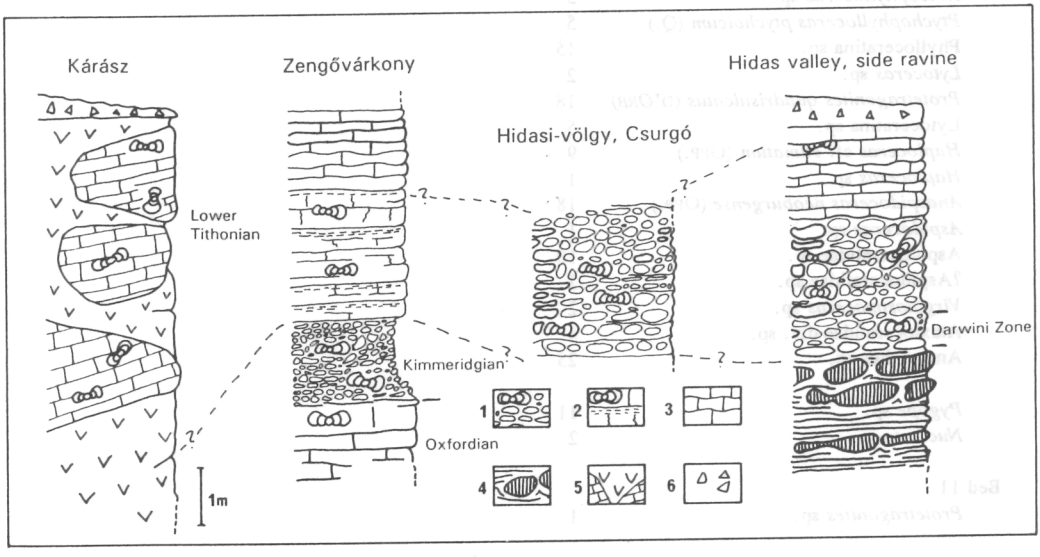

Fig. 2. Biostratigraphic correlation. **1.** Nodular limestone with ammonites. **2.** Limestone with shale intercalations and ammonites. **3.** Platy, nodular limestone. **4.** Siliceous limestone with chert nodules. **5.** Nodular limestone with basalt dykes. **6.** Quaternary debris.

This fossil assamblage, containing *Hybonoticeras* cf. *pressulum*, clearly belongs to the Beckeri Zone of the Upper Kimeridgian. This is supported by the rich *Taramelliceras* association. The diverse perisphinctid fauna needs further, detailed taxonomic study.

It is worth to mention, that several interesting specimens from the same locality were found in the old collection of the Hungarian Geological Survey. One of them collected by VADÁSZ and labelled as *Simoceras* sp., and another undetermined ammonite, can be identified as *Nebrodites cavouri* (GEM.). The genus suggests the presence of the deeper part of the Kimmeridgian in the Zengővárkony profile, while the species indicates the Cavouri Zone.

Tithonian

Zengővárkony

Tithonian ammonites were collected in each sampled locality, but only the Zengővárkony profile yielded a fauna collected bed-by-bed. Here, above the Oxfordian bank and a few beds with Kimmeridgian fossils, 7 beds were assigned to the Tithonian. The following taxa were encountered:

Bed 10	
Holcophylloceras sp.	3
Ptychophylloceras ptychoicum (Q.)	5
Phylloceratina sp.	15
Lytoceras sp.	2
Protetragonites quadrisulcatus (D'ORB)	18
Lytoceratina sp.	5
Haploceras cf. *elimatum* (OPP.)	9
Haploceras sp.	1
Anaspidoceras neoburgense (OPP.)	18
Aspidoceras sp.	1
Aspidoceratidae sp.	10
?Aspidoceratidae sp.	2
Virgatosimoceras sp.	2
Ataxioceratidae div. sp.	6
Ammonites sp.	25
Pygope sp.	11
Nucleata sp.	2
Bed 11	
Protetragonites sp.	1
Bed 12	
Holcophylloceras sp.	1
?Pseudolissoceras sp.	1
Anaspidoceras neoburgense (OPP.)	1
Usseliceras sp.	1
Bed 13	
Holcophylloceras sp.	3
Protetragonites sp.	3
Anaspidoceras neoburgense (OPP.)	1
Bed 14	
Holcophylloceras sp.	1
?Substreblites sp.	1
?Haploceras sp.	1
?Anaspidoceras sp.	1
Ataxioceratidae sp.	1

(Beds 15 and 16 yielded no megafossils.)

Bed 17	
?Simoceratidae sp.	1

The presence of the relatively frequent *Anaspidoceras* and *Haploceras* as well as the appearance of the genera *Usseliceras* and *?Pseudolissoceras* suggest Early Tithonian age. The division of the section into zones is uncertain but the presence of the Semiforme Zone is likely, on the basis of the common *Anaspidoceras neoburgense* and on the basis of the fauna as a whole. Beds above the Bed 10, representing the transition into the Lower Cretaceous succession, are partly covered by debris and yielded no ammonites.

Kárász

The volcanosedimentary rocks of the Kárász profile yielded the following ammonites:

Ptychophylloceras ptychoicum (Q.)	1
Calliphylloceras sp.	1
Phylloceratinae sp.	1
Protetragonites quadrisulcatus (D'ORB.)	3
Lytoceratinae sp.	4
Haploceras elimatum (OPP.)	4
Anaspidoceras cf. *neoburgense* (OPP.)	4
Virgatosimoceras cf. *rothpletzi* (SCHNEID)	1
?Virgatosimoceras sp.	1
Ataxioceratidae sp.	1

Anaspidoceras neoburgense and *Virgatosimoceras* are indicative of Early Tithonian age. It is difficult to decide, whether the Semiforme or the Fallauxi Zone is represented in the material.

Side ravine of the Hidasi Valley

At this locality 4—5 metres thick fossiliferous Upper Jurassic limestone is found above the cherty formation. The lowest 60 cm is of „Ammonitico Rosso" type and yielded the following taxa:

Ptychophylloceras ptychoicum (NEUM.)	8
Phylloceratinae sp.	4
Pterolytoceras sp.	2
Protetragonites quadrisulcatus (D'ORB.)	13
Neochetoceras sp.	1
Semiformiceras cf. *darwini* (NEUM.)	2
Haploceras elimatum (OPP.)	12
Haploceras sp.	3
Anaspidoceras neoburgense (OPP.)	5
Ataxioceratidae div. sp.	5

Higher in the succession, the rock becomes yellowish-white, similar to the Biancone. Due to the poor exposure, it is difficult to distinguish the in situ layers from the loose blocks. The upper part of the profile yielded the following megafossils:

Ptychophylloceras sp.	9
Calliphylloceras sp.	1

Phylloceras sp.	2
Protetragonites sp.	12
Semiformiceras sp.	1
Haploceras elimatum (OPP.)	11
Haploceras carachtheis (ZEUSCH.)	3
Anaspidoceras neoburgense (OPP.)	5
Aspidoceras cf. *rafaeli* (OPP.)	1
Ataxioceratidae div. sp.	4

The two assamblages, originating from different but close levels, are very similar to each other. Common *Aspidoceras* and *Haploceras* together with the densely ribbed perisphinctids, as well as the *Semiformiceras* specimen, suggest Early Tithonian age.

Hidasi-valley, „Csurgó"

The „Ammonitico Rosso"-type limestone exposed in the creek bed close to the spring „Csurgó" yielded the following assamblage:

Ptychophylloceras ptychoicum (QU.)	3
Phylloceratina sp.	5
Protetragonites quadrisulcatus (D'ORB.)	7
Haploceras elimatum (OPP.)	2
Haploceras carachtheis (ZEUSCH.)	2
Haploceras verruciferum (ZITT.)	1
Anaspidoceras neoburgense (OPP.)	4
Ataxioceratidae div. sp.	3
Belemnites sp.	1

The fauna is Early Tithonian in age. *Haploceras verruciferum* is common in the Semiforme Zone, but may appear also in the upper part of the Darwini Zone.

Conclusions

Faunistical and biostratigraphical results

The following taxa are reported for the first time from the Mecsek Mts.:

Taramelliceras pugile (NEUM.)
Substreblites sp.
Semiformiceras cf. *darwini* (NEUM.)
Haploceras elimatum (OPP.)
Haploceras carachtheis (ZEUSCH.)
Haploceras verruciferum (ZITT.)
Aspidoceras cf. *longispinum* (SOW.)
Pseudowaagenia acanthomphala (ZITT.)
Nebrodites cavouri (GEMM.)
Virgatosimoceras cf. *rothpletzi* (SCHNEID)
Ortosphinctes sp.
Lithacoceras sp.
„Virgalithacoceras" sp.

Data on the Oxfordian and Kimmeridgian of the Mecsek Mts. are very scarce. This is, at least partly, due to the predominantly siliciclastic sedimentation during the late Middle Jurassic and early Late Jurassic. The exact age of the Oxfordian assamblage remains uncertain, while the Kimmeridgian fauna represents the Cavouri and the Beckeri Zones.

Tithonian faunas were collected from four localities in the Mecsek Mts. All of them yielded Early Tithonian ammonites The lowermost Tithonian (Hybonotum) zone have not been documented. The subsequent (Darwini) zone was described from the Hidasi Valley. *S. darwini* was mentioned for the the first time from the Hungarian material. The presence of the next (Semiforme) zone was tentatively reported from Zengővárkony, from the Hidasi Valley and from the Kárász section. The index form *(Haploceras verruciferum)* and the common occurrence of *Anaspidoceras* and *Haploceras* are the best markers of this level.

Stratigraphically younger ammonites have not yet been found in the Jurassic of the Mecsek Mts.

The biostratigraphic correlation of the studied profiles is given in Fig. 2.

Palaeobiogeography

It is necessary to answer the question raised in the introduction: whether the Upper Jurassic of the Mecsek Mts. is of „Mediterranean", or „NW-European" affinity. With other words, is there any significant difference between the Upper Jurassic of the Transadanubian Central Range and the Mecsek Mts?

It is difficult to compare the two areas in the present state of the study, since about ten times more ammonites are available from the Transdanubian Central Range than from southern Hungary. Only some very cautious conclusions can be outlined.

The proportion of suborders is similar in the Upper Jurassic faunas of the Mecsek Mts. and the Transdanubian Central Range. In both areas, ammonites of the suborders Phylloceratina and Lytoceratina are very frequent.

The Oxfordian fauna was not studied in detail, but the general aspect of the assemblage is rather Submediterranean.

This is the case also in the Kimmeridgian, but here the more Mediterranean *Nebrodites cavouri* was also found.

The Tithonian assemblages (including *Semiformiceras darwini, Haploceras, Anaspidoceras, Virgatosimoceras)* also can be regarded as typical Submediterranean ones. In conclusion, the Upper Jurassic ammonites of the Mecsek Mts. reflect typical Tethyan aspect with certain Mediterranean affinity.

As far as the other megafauna is concerned, the brachiopods *(Pygope* and *Nucleata)* of the Mecsek Mts. are similar of those known from the Bakony Mts. (Transdanubian Central Range), therefore they also reflect Mediterranean features (Dr. A. VÖRÖS, pers. com.)

According to VÖRÖS (1980), the brachiopods from the Mecsek Mts. (and also from the Villány Mts.) show strong Mediterranean affinity from the Callovian onward.

GÉCZY (1973b) explained the similarities between the Upper Jurassic of the Mecsek Mts. and Bakony Mts. with the formation of a mid-oceanic ridge. VÖRÖS (1988)

developed a more sophisticated model, postulating a crustal fragment containing the Mecsek Mts. which was detached from Europe.

Palaeobiogeographical and palaeoecological factors are strongly connected in most cases and their separation was not successful during the present study. In spite of this, the similarities between the Upper Jurassic of the Bakony Mts. and Mecsek Mts. can be pointed out.

In conclusion, it is also reassuring that the results based on different fossil groups (ammonites and brachiopods), supported the same or similar hypothesis.

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