

**COMPARISON OF ALPINE AND GERMANO-TYPE  
MIDDLE TRIASSIC BRACHIOPOD FAUNAS FROM  
HUNGARY, WITH REMARKS ON COENOTHYRIS  
VULGARIS (SCHLOTHEIM 1820).**

by

**J. PÁLFY\* and Á. TÖRÖK\*\***

\*Geological and Paleontological Department of the  
Hungarian Natural History Museum,  
H-1370, Budapest, P.O.B. 330

\*\*Department of Mineralogy and Geology, Budapest Technical University,  
H-1521, Budapest

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**Abstract**

Two well-known Middle Triassic areas, Balaton Highland (Alpine) and Mecsek Mts (Germano-type) were investigated. The attention was concentrated on the faunistical and sedimentological characters of the fossiliferous Pelsonian (Upper Anisian) limestone. The intense collections yielded a very rich, high diversity brachiopod fauna (35 species) from the Balaton Highland and an impoverished one (7 species) from the Mecsek. Based on internal morphology the so-called *Coenothyris vulgaris* from those territories seems to be not conspecific. Sedimentological data give evidence of a shallow marine normal sedimentation which was interrupted by storms (storm-generated coquinas) in Mecsek. Various paleoenvironments of a disrupted bottom relief provided advantageous conditions for brachiopods in Balaton Highland. By the comparative faunistical analysis paleobiogeographic considerations were deduced, as the present geographic position of Balaton Highland and Mecsek is inverse to that of Triassic period.

## Introduction

The Balaton Highland and the Mecsek Mts are two regions of Hungary with extended and well-known Triassic sequences (*Fig. 1/a*). The authors' contemporaneous studies on Middle Triassic formations and their fauna – primarily brachiopods – provided new data for comparison and conclusions.

Brachiopods from the Balaton Highland have been known since the middle of the 19th century. BÖCKH (1873) surveyed the region and set an outstanding stratigraphic division for its Triassic formations and provided a faunal list with 14 brachiopod species. LÓCZY (1916) compiled a geological map and a comprehensive volume about the geology of the Balaton Highland. BITTNER (1900) and FRECH (1912) were also involved in the study of fossils collected during this work. After a long time DETRE (1970) contributed to the knowledge of the Triassic brachiopods of the region. Recently one of the present authors has engaged in the revision of this fauna (PÁLFY, 1986 and 1988).

Even the earliest studies about the Mecsek Mts mentioned the peculiar Middle Triassic limestones (BEUDANT, 1822) and referred to their characteristic fossil "*Terebratula vulgaris*" (HAIDINGER, 1865 and LŐRENTHEY, 1891). The latter emphasized the low diversity of the fauna. VADÁSZ (1935) gave a faunal list in the first monograph on the geology of the Mecsek Mts. He was succeeded by NAGY E. (1968). Recently DETRE (1973), and DETRE et al. (1986) dealt with this subject.

In the first descriptions (BÖCKH, 1881; KLEIDORFER, 1898) Alpine-type names and synonyms like Recoaro and Guttesntein limestone could be found. VADÁSZ (1935) referred to Anisian Alpine analogies, but he considered the Upper Triassic of Mecsek as Middle European Keuper. Concerning the paleogeographic position NAGY (1968) placed the Mecsek in transitional position between Alpine and Germano-type areas. Most recently it is widely considered that Mecsek has rather German than Alpine affinity (KÁZMÉR, 1986).

## Description of localities

The two investigated areas have different tectonical and geographical position. Balaton Highland is a part of the Transdanubian Central Range, while Mecsek Mts is situated south of the Zagreb-Zemplén tectonic line in the Mecsek Zone, Tisza Unit (*Fig. 1/a*). Their stratigraphy reflects this dissimilarity. (*Fig. 2*).

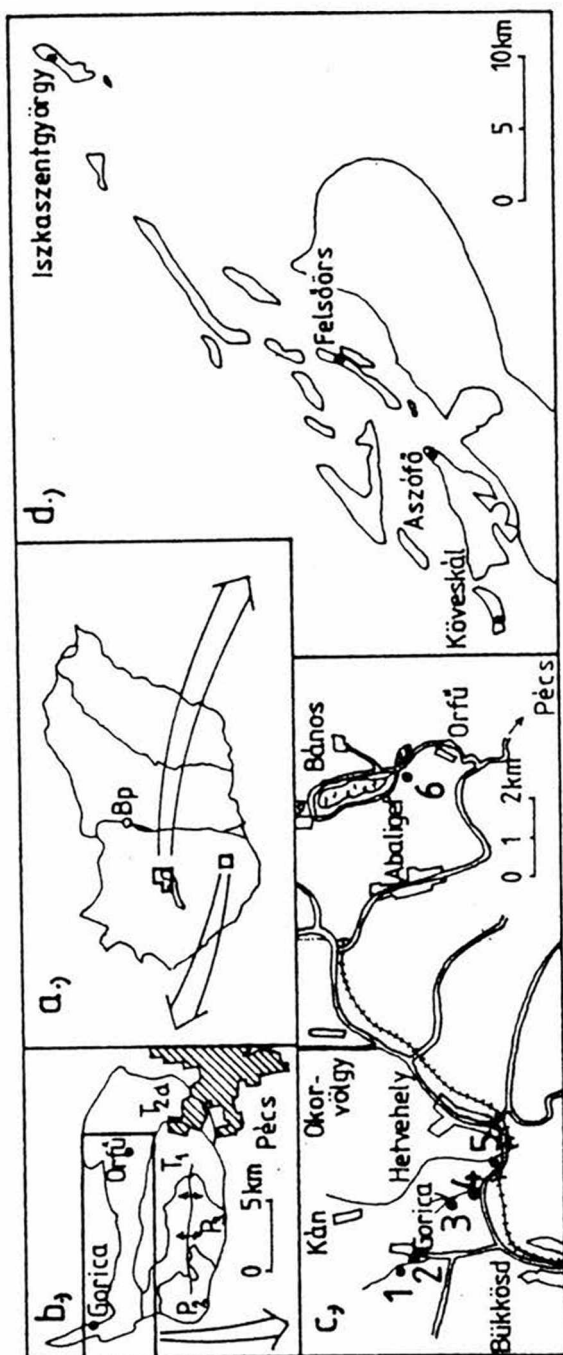


Fig. 1. a; Location of Balaton Highland and Mecsek Mts in Hungary. b; Distribution of Middle (P<sub>2</sub>), Upper (P<sub>3</sub>) Permian and Lower (T<sub>1</sub>), Middle (T<sub>2</sub>) Triassic in the Western Mecsek anticline. c; Map of the investigated area in Western Mecsek. Localities of exposures; 1, Gorica Valley, 2, Gorica, road cut, 3, Valley fork near Gorica, 4, Path to Gorica, 5, Hetvehely, roadside slope, 6, Orfű, Sárkánykút, d; Surface distribution of Anisian rocks in the Balaton Highland and the four investigated localities.

In Balaton Highland four major localities were studied: Köveskál, Aszófő, Felsőörs and Iszkaszentgyörgy (*Fig. 1/a, d*). In Köveskál crinoidal-brachiopodal lumashella-like Recoaro-type limestone is densely packed with usually disarticulated and often fragmentary shells of brachiopods. It represents the Lower Pelsonian, underlain by Megyehegy Dolomite and overlain by *Balatonites*-bearing, marly Reifling-type limestone.

The succession of Megyehegy Dolomite and the overlying thin crinoidal-brachiopodal Recoaro-type limestone is exposed at Aszófő. The well-bedded brown, butiminous limestone is rich in brachiopods and cephalopods (particularly *Balatonites* are abundant). Stratigraphically this part of the section belongs to the Balatonicus Zone (Pelsonian) according to VÖRÖS (1987).

The slope of the Forrás Hill near Felsőörs village has been a reference section for more than a century (TELEGDI-RÓTH, 1871; BÖCKH, 1873; SZABÓ et al. 1980). The Recoaro-type limestone here is Upper Pelsonian on the basis of ammonoid data.

At the village of Iszkaszentgyörgy the Recoaro-type limestone overlies the Megyehegy Dolomite with probable unconformity (RAINCSÁK, 1980). Yellowish, siliceous, marly limestone contains the brachiopods.

Six exposures were investigated in the Mecsek Mts. The outcrops are situated in east-west axial anticline of the Western Mecsek (*Fig. 1/b, c*). The lumashella-like beds of Bertalanhegy Limestone Member contain brachiopods and bivalves. The underlying Tubes Limestone Member consists of thick-layered (0.5-0.8 m) grey limestone beds. The overlying yellow and red spotted grey intraclastic limestone is identical with Dömörkapu Limestone Member (*Fig. 2*).

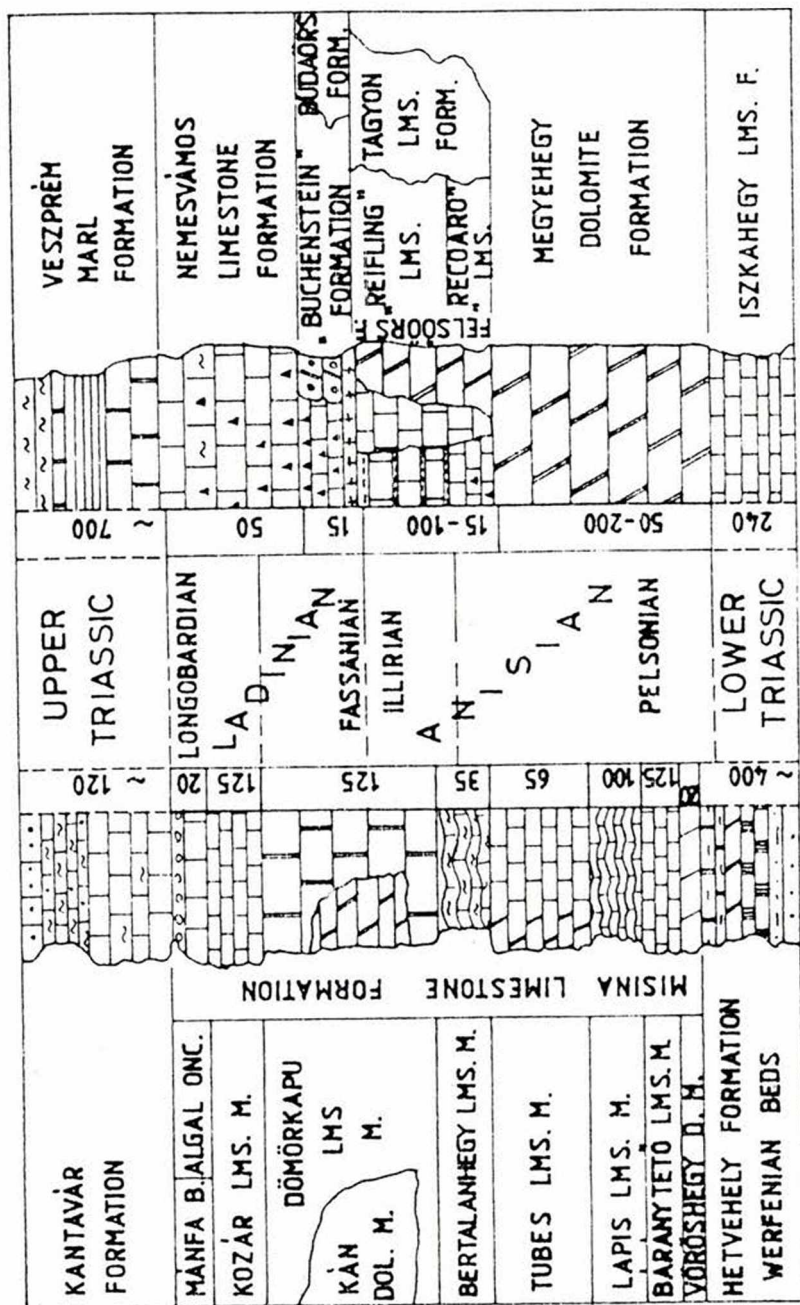


Fig. 2. Composite stratigraphical column of the Middle Triassic of Mts (left) and Balaton Highland (right).

Four different, alternating lithological types were identified in Bertalanhegy Limestone Member:

- Nodular calcareous marl: There are pale grey micritic lime nodules (3-6 cms) in marly matrix. Internal moulds of *Coenothyris vulgaris* were sporadically found in this rock type.
- Calcareous layers with marl intercalations: 2-3 cm thick laminated marl layers are between the undulating bedding plane of the 8-10 cms thick calcareous layers. Fossils were seldom found in this rock type (*Fig. 1/c*, exposure 4).
- Fossiliferous banks: Reworked disarticulated shells of brachiopods and articulated shells in micritic matrix characterize the banks. Graded layers with larger biogenic fragments are often intercalated. Beside the dominant brachiopods pelecypods, gastropods and crinoids are the main faunal elements (*Fig. 1/c*, exposures 1,4,5,6).
- Grey limestone with yellow clayey spots: It is a transitional rock type to the overlying Dömörkapu Limestone Member (*Fig. 2.*). The grey micritic part gives the matrix of the rock and yellow clayey infillings, spots are scattered in it. The fine micritic matrix and spots contain a well-preserved fauna (*Fig. 1/c*, exposures 3,5).

### The composition of the fauna

The collection from both the Balaton Highland and the Mecsek was carried out by the authors and partly by the Hungarian Geological Survey (in Aszófő and Iszkaszentgyörgy localities). Brachiopods are the most characteristic faunal elements of the Anisian Recoaro-type limestone in the Balaton Highland. The relatively high diversity indicates favourable life conditions. Beside them cephalopods appear in great number and diversity, while gastropods and bivalves are also major elements in Aszófő locality. In Felsőörs and Köveskál cephalopods and bivalves also occur, but much less frequently. In Iszkaszentgyörgy brachiopods represent the only fossil group.

As far as the brachiopods are concerned up to now the presence of 35 taxa was recognized from the four localities of the Balaton Highland. Brachiopod species are listed in *Table 1.*

Table 1.

*List of brachiopods*

	BALATON HIGHLAND			Iszkaszent- györgy	MECSEK
	Köveskál	Aszófő	Felsőörs		
<i>Lingula tenuissima</i> BRONN 1856				+	+
<i>Discina</i> cf. <i>discoides</i> SCHLOTHEIM 1820	+				
<i>Homoeorhynchia</i> ? sp. <i>Decurtella decurtata</i> (GIRARD 1843)		+			
<i>Decurtella</i> cf. <i>illyrica</i> (BITTNER 1902)	+	+	+		+
<i>Volirhynchia vivida</i> (BITTNER 1890)	+		+		
<i>Volirhynchia tommasi</i> (BITTNER 1890)	+	+			
<i>Volirhynchia projectifrons</i> (BITTNER 1890)		+	+		
<i>Volirhynchia</i> cf. <i>productifrons</i> (BITTNER 1890)		+			
<i>Costirhynchopsis mentzeli</i> (BUCH 1843)	+	+			
<i>Caucasorhynchia altaplecta</i> (BÖCKH 1872)	+		+		
<i>Holcorhynchella delicatula</i> (BITTNER 1890)		+			
<i>Piarorhynchella trinodosi</i> (BITTNER 1890)	+	+	+		
<i>Trigonirhynchella attilina</i> (BITTNER 1890)		+	+		
<i>Sinucosta pectinata</i> (BITTNER 1890)	+				
<i>Costispiriferina manca</i> (BITTNER 1890)	+				
<i>Dinarispira</i> cf. <i>dinarica</i> (BITTNER 1890)	+				
<i>Dinarispira avarica</i> (BITTNER 1890)	+				
<i>Punctospirella fragilis</i> (SCHLOTHEIM 1814)	+	+			+
<i>Mentzelia mentzeli</i> (DUNKER 1851)	+	+	+	+	+
<i>Mentzelia balatonica</i> (BITTNER 1890)			+		
<i>Koiveskallina koveskalyensis</i> (STUR 1865)	+	+	+		+

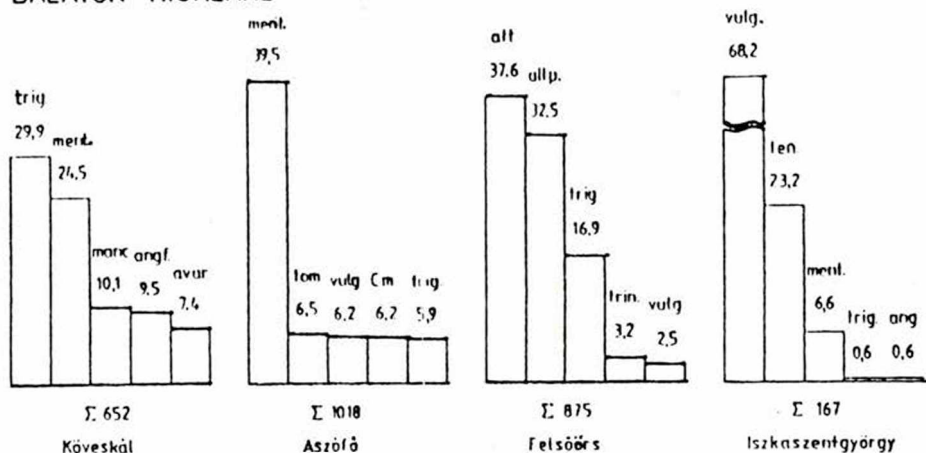
	BALATON HIGHLAND			Iszkaszent- gyögy	MECSEK
	Köveskál	Aszófó	Felsőörs		
<i>Koiveskallina paleotypus</i> (LORETZ 1875)		+			
<i>Thecozyrtella</i> sp.	+				
<i>Tetractinella trigonella</i> (SCHLOTHEIM 1820)	+	+	+	+	+
<i>Schwagerispira schwageri</i> (BITTNER 1890)	+	+	+		
<i>Schwagerispira mojsisovicsi</i> (BÖCKH 1872)	+	+	+		
<i>Athyridida</i> gen. et sp. indet.		+			
<i>Coenothyris vulgaris</i> (SCHLOTHEIM 1820)	+	+	+	+	+
<i>Coenothyris?</i> cf. <i>krafftii</i> (BITTNER 1902)		+			
<i>Coenothyris?</i> cf. <i>cuccensis</i> (BITTNER 1902)		+			
<i>Sulcatinella incrassata</i> (BITTNER 1890)		+			
<i>Angustothyris angustaeformis</i> (BÖCKH 1872)	+	+	+		
<i>Silesiathyris angusta</i> (SCHLOTHEIM 1820)			+	+	+
<i>Terebratulida</i> gen. et sp. indet.		+			

In the Mecsek the fauna has much lower diversity with extreme density of *Coenothyris vulgaris*. Brachiopods make up more than 90% of fauna and within them *Coenothyris vulgaris* represents 99% with the exception of two exposures (localities No. 2 and 5).

In the first one bivalves are more frequent than brachiopods (*Fig. 3*). Some unidentifiable gastropods and ammonoids were observed in thin sections.



## BALATON HIGHLAND



## MECSEK Mts. (2,5x magnification of the upper scale)

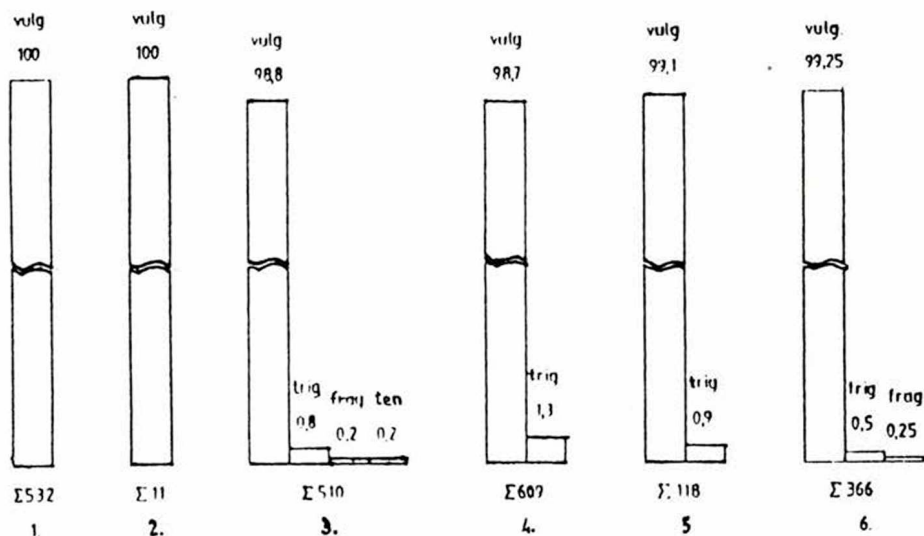


Fig. 3. Percentage of the five most frequent brachiopod species and the number of collected specimens in each localities. Explanation of abbreviations: alt. — *Caucasorhynchia altaplecta*, ang. — *Silesiathyris angusta*, angf. — *Angustothyris angustaeformis*, att. — *Trigonirhynchella attilina*, avar. — *Dinarispira avarica*, C.m. — *Costirhynchopsis mentzeli*, frag. — *Punctospirella fragilis*, manc. — *Costispiriferina manca*, ment. — *Mentzelia mentzeli*, ten. — *Lingula tenuissima*, trig. — *Tetractinella trigonella*, trin. — *Piarorhynchella trinodosi*, vulg. — *Coenothyris vulgaris*.

The low diversity can be explained by extreme environmental factors such as varying salinity and fluctuating water energy. The unstable physical conditions were not favourable for the organisms. There was only one euryecious species – *Coenothyris vulgaris* – (see DZULINSKI and KUBICZ, 1975) which could proliferate.

Beside the brachiopods showed on Table 1 the following taxa were identified:

Gastropods: *Worthenia* sp.

Bivalves: *Nucula* sp.; *Hoernesia socialis* (SCHLOTHEIM 1823); *Entolium discites* (SCHLOTHEIM 1820); *Enantiostreon difforme* (SCHLOTHEIM 1823); *Plagiostoma lineata* (SCHLOTHEIM 1823); *Plagiostoma striata* (SCHLOTHEIM 1823).

### Sedimentological models based on paleoecological and microfacies evidences

Paleoecological and microfacies studies of fossiliferous Anisian formations of the Balaton Highland and the Mecsek Mts suggested different models for paleoenvironment and sedimentation.

In the westernmost locality of the Balaton Highland a coarse-grained, biodetrital crinoidal-brachiopodal limestone occurs. It has a biosparitic, grainstone texture. The proportion of disarticulated brachiopod shells is very high. The shells are poorly sorted, their size is usually large, the diversity is high. However the overwhelming frequency of two species, *Mentzelia mentzeli* and the *Tetractinella trigonella* allows us to define a *mentzeli-trigonella* assemblage. Beside the densely packed brachiopods the cephalopods are relatively rare, while the occurrence of epibenthic bivalves is sporadic. These data suggest good life conditions for brachiopods in the nearby area with well-agitated shallow water and firm substratum. The short-range post-mortem transportation caused the disarticulation of shells, but did not allow a better sorting. The presence of Tagyon Limestone, a patch-reef deposit within a distance of few kilometers suggest a foreslope depositional situation for Köveskál locality.

In Aszófő the intraclastic biomicrite contains very rich fauna. The ratio of disarticulated shells is relatively high. The size of brachiopods is more variable, the average size of the most common species is somewhat smaller than that of Köveskál. The fauna from Aszófő has the greatest diversity and the richest mollusc assemblages among the localities. It may represent a slightly mixed assemblage of fauna, fossils from more or less different habitats got together by slumping or small-scale gravitational sliding of sediments from a shallow water, high energy environment.

In Felsőörs crinoidal-brachiopodal marly limestone (biomicrite) contains the fauna. The ratio of disarticulation among brachiopod shells is extremely low. The size of brachiopods is remarkably smaller than that in Aszófő or Köveskál. The diversity is also slightly lower, while cephalopods occur quite frequently. Two rhynchonellids, *Caucasorhynchia altaplecta* and *Trigonirhynchella atilina* are predominant. This *altaplecta-atilina* assemblage has not been reported from elsewhere. It probably indicates a basin environment characterized by low energy quiet water. It must be mentioned however, that typical basinal forms of the Alpine Schreyeralm Limestone do not occur.

In Iszkaszentgyörgy in the marly limestone about one-fourth of brachiopods were preserved as disarticulated shells. The diversity of brachiopods is very low, only six species were recognized. Beside brachiopods neither crinoid ossicles, nor other faunal elements were found. Based on the two most common species (*Coenothyris vulgaris* and *Lingula tenuissima*) the *vulgaris-tenuissima* assemblage could be set. The impoverished association suggests unfavourable life conditions, probably due to the very shallow water and the soft substratum. The fluctuating salinity and food supply can be the further causes of the low diversity. The presence of *Lingula* suggests sedimentation in the soft bottom tidal zone (EMIG, 1986).

These paleoecological observations help to reconstruct the paleoenvironmental pattern in the Balaton Highland for the Anisian: foreslope patch-reef deposits (Köveskál), high energy environment with redeposition by slumping (Aszófő), low energy local basinal development (Felsőörs) and subtidal soft substratum environment (Iszkaszentgyörgy). This scheme is highly different from the subtidal shallow marine platform of the Mecsek, which shows much more uniform character.

Bertalanhegy Limestone Member in Mecsek represents a deeper facies of a very shallow marine series. Normal sedimentation processes were interrupted by drastic changes. Sedimentological characteristics of Bertalanhegy Limestone indicate a soft calcareous bottom with moderate carbonate sedimentation. Depending on water energy and supply of terrigenous material alternating marl and limestone layers or marls with calcareous nodules were deposited. During the periods characterized by low water energy poorly fossiliferous micritic layers and clayey lime ooze were developed. Their microfacies type is mudstone, while the latter contains clayey spots and intraclasts. The most significant sediment of the high water energy periods are the shell-beds of disarticulated brachiopods. These fossiliferous lenses are underlain by graded beds, which gives the other evidence of the fast redeposition. We consider these layers as storm-generated coquinas which are similar to the German Upper Muschelkalk (AIGNER et al., 1979).

In summary, these data from the Mecsek Mts suggest that the sediments were deposited in quiet shallow water just below the wave base. The normal sedimentation was interrupted by storms which produced considerable sediment

redeposition. In quiet periods laminated and nodular beds were formed, while in the periods characterized by storms graded beds and coquina tempestites were accumulated.

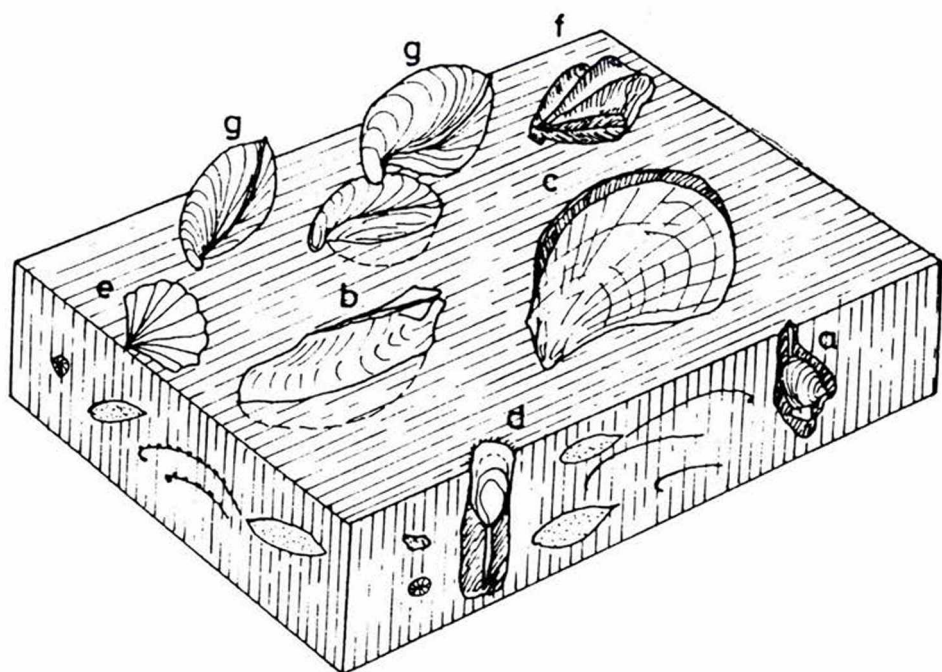


Fig. 4. Paleoecological community of the Middle Triassic Bertalanhegy Limestone (Mecsek Mts.) a. – *Nucula* sp., b. – *Hoernesia socialis*, c. – *Plagiostoma lineata*, d. – *Lingula tenuissima*, e. – *Punctospirella fragilis*, f. – *Tetractinella trigonella*, g. – *Coenothyris vulgaris*.

Comparing the data of the Balaton Highland and Mecsek it becomes clear that within the distance of some tens of kilometers the measurable and comparable features show significant differences in the Balaton Highland, while they remain practically uniform in the Mecsek Mts. These paleoecological deductions involve a paleogeographic implication: the former one was a part of a mobile shelf, while the latter belonged to a stable shelf during the Anisian.

### **Paleobiogeographical significance of the brachiopod faunas**

The Triassic paleogeography of Hungary has been the target of investigations and polemics for long time. The Alpine affinity of the Balaton Highland – both lithologically and faunistically – was first recognized in the second half of the 19th century. STUR (1865) divided the Alpine Muschelkalk into two parts – the Recoaro and the Reifling Limestones, and BÖCKH (1873) justified the presence of analogous developments in the Balaton Highland. After the careful study of brachiopods BITTNER (1890, 1900) considered its fauna as transitional between those of the Southern Alps and the Northern Calcareous Alps. ARTHABER (1903) confirmed this judgement by similarities of cephalopod faunas.

The present study and the comparison to recent and older data from different areas shows the greatest similarities between the faunas from the Balaton Highland, West Carpathians and Southern Alps. Important, but less close affinities exist to the faunas of Northern Calcareous Alps and the Dinarids (*Table 2*).

Table 2.

*Comparison of Anisian brachiopod faunas of different regions, showing the number of common species having reference to the Balaton Highland fauna.*

	Number of species	Number of common species
BALATON HIGHLAND	35	
NORTHERN CALCAREOUS ALPS		
Schreyeralm (BITTNER 1890)	10	7
SOUTHERN ALPS		
Alpi Orobie		
(CASATI et GNACCOLINI 1967)		
Val Trompia (SPECIALE 1967)		
Guidicaria (GAETANI 1969)	28	15
Monte Rite (Cadore) (DE TONI 1912)		
DINARIDS		
Ljubisnja (SUSIC-PROTIC 1962)	23	12
Seljani (BESIC 1949)	16	8
WESTERN CARPATHIANS		
Silica (SIBLÍK 1971, 1972)	24	16
Aggtelek (SCHOLZ 1972)	15	12
SILESIA		
Tarnowitz (ASSMANN 1937)	12	9
MECSEK (DETRE 1986, NAGY E. 1968)	8	8

Concerning the Mecsek VADÁSZ (1935) already mentioned the Germano-type character of its Triassic sequence. Later it was reaffirmed by NAGY (1968). Recently KÁZMÉR (1986) emphasized the Germano-type features. HAAS et al. (1986) after the comparison of Lower Triassic sequences concluded, that different developments of the Scythian of the Balaton Highland and that of the Tisza Unit (which the Mecsek belongs to) marks different paleotectonic positions. As far as the Jurassic faunas are concerned, the Mediterranean affinity of the Bakony and the European character of the Mecsek was clearly proved by GÉCZY (1973), VÖRÖS (1980, 1984) GALÁCZ (1984), TÖRÖK et al. (1987). However, recently KOZUR and MOCK (1987) studying lithologic sequences and conodont faunas seriously doubted the true German character of the Mecsek Triassic.

Regarding the Middle Triassic brachiopods the Mecsek fauna resembles that of the German Basin. The low diversity *Coenothyris vulgaris* dominated assemblages are very typical to both territories. All species found in the Mecsek have also been reported from the German Basin. By extensive collections (over 2000 specimens from the Mecsek and about 3500 specimens from the Balaton Highland) 35 species were distinguished from the Balaton Highland, while that number is only 4 in the Western Mecsek, and does not exceed 8 added the other species reported from the Eastern Mecsek by DETRE (1986). DAGYS (1974) concluded, that Alpine and Germano-type territories should not be considered as distinct faunal provinces, but the Germano-type brachiopod faunas are rather impoverished assemblages of species, which are not endemic and are also characteristic for the Alpine localities. Indeed, there is no any species in Mecsek assemblage, which would be missing from the Balaton Highland. All brachiopod species of Mecsek were also found in the certainly Germano-type localities, such as Thuringia, Silesia and so on. However, primarily not the common species, but the common features, such as the low diversity, the percentage distribution of taxa and often the overwhelming occurrence of *Coenothyris vulgaris* are distinctive.

It should be mentioned, that these features were observed in the assemblage found in Iszkaszentgyörgy locality, at the edge of Balaton Highland. This fact gives evidence that Germano-type brachiopod assemblages are not indicators of an independent faunal province, but compose rather environmentally and ecologically controlled associations. The slightly fluctuating salinity would have been one of the factors determining the species distribution, resulting in dominance of the most adaptive forms, like *Coenothyris vulgaris*, *Mentzelia mentzeli*, *Tetractinella trigonella*. Due to the lateral facies changes on a disrupted mobile shelf (Balaton Highland during the Anisian) within a distance of few tens of kilometers in Iszkaszentgyörgy similar conditions appeared which usually characterized the widespread European epicontinental seas.

In the Mecsek these characteristics are typical for each localities, so this uniform appearance allows to assume the belonging to a Germano-type sedimentary basin.

### Remarks on *Coenothyris vulgaris*

Comparing Middle Triassic Brachiopod faunas from different localities one of the most striking facts is the almost overall presence of *Coenothyris vulgaris*, the most common species of that period. The interpretation of its extremely wide geographic distribution, somewhat controversial stratigraphic range (Anisian to Lanidnian, as most widely accepted), and occurrence in

strongly different assemblages, which suggests the toleration of different habitats and life conditions is an important issue. The species has very simple external morphology, medium-sized, smooth, biconvex shell with rectimarginate or slightly uniplicate anterior commissure. It is hard to imagine a more simple form for a terebratulid brachiopod. It seems to be interesting that SCHLOTHEIM (1823), the author of the species mentioned a number of earlier named forms in his original description. His unification can be justified by the supposedly great morphological variability. Later on this opinion was widely accepted. However, up to now no modern research has been carried out based on serial grinding method to expose the internal structure of *Coenothyris vulgaris* in question.

The serial grinding of several specimens of the so called *Coenothyris vulgaris* from both the Balaton Highland and the Mecsek was done by the authors. In the inner structure so sharp differences occurred, that their conspecific character became doubtful. The presence or absence of dental plates is such a feature, which would not be considered within the limits of intraspecific variability (Fig. 5). Moreover *Coenothyris vulgaris* specimens from the Mecsek have rather semicircular pedicle valve section, longer dorsal median septum (about 40% of the total valve length), oval septal cavities and deeper septalium, while the Balaton Highland morphotype has rather trapezoidal pedicle valve section, slightly shorter median septum (about 30% of the valve length), trigonal septal cavities and shallower septalium.

The internal morphology of *Coenothyris vulgaris* specimens (studied by the authors) from Thüringia, a typical Germano-type locality, coincides with that of the Mecsek specimens. Since the true *Coenothyris vulgaris* was described from the German Basin, the Balaton Highland morphotype should be treated taxonomically separated.

Hitherto no effort was made to investigate so-called *Coenothyris vulgaris* specimens from other Alpine localities. It is theoretically possible, that the paleobiogeographic difference of Alpine and Germano-type areas is reflected in the difference of these species, as the majority of the "*Coenothyris vulgaris*" from Alpine areas are taxonomically distinct from those of Mecsek and other Germano-type areas.

This preliminary evaluation does not serve as a detailed redescription of the species and the possible separation of the two more or less distinct morphotypes (which is planned to publish later on by the authors), but rather to inspire further studies.



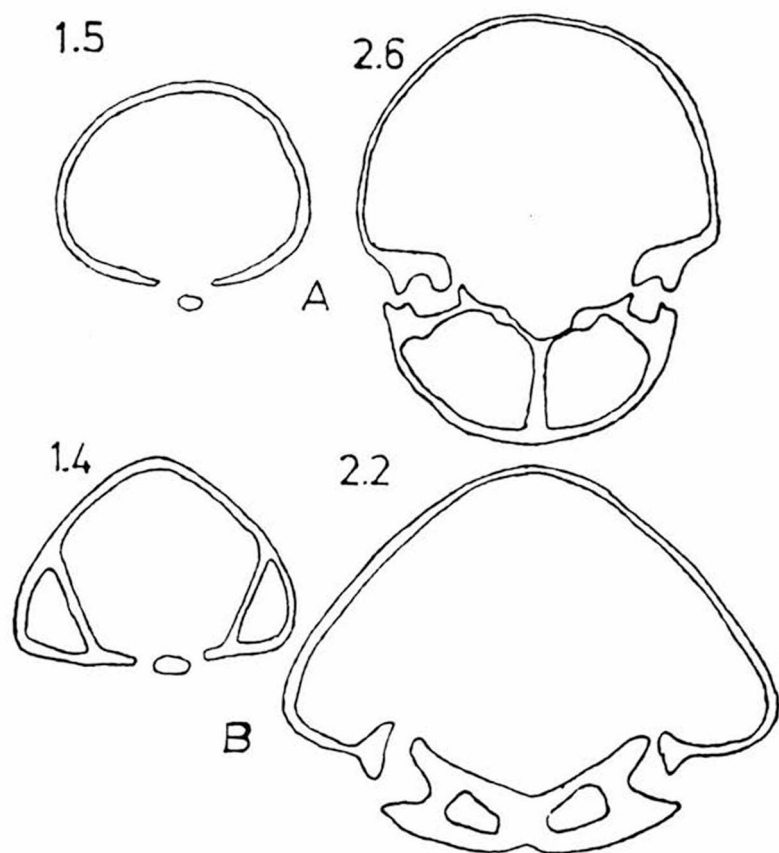


Fig. 5. Two characteristic stages of serial transverse sectioning of "*Coenothyris vulgaris*" from Mecsek and Balaton Highland. A – specimen from Mecsek (locality Gorica). Original length 17.1 mm. B – specimen from Balaton Highland (locality Aszófő) Original length 17.9 mm.

The specimens were fixed in the same orientation. Distances are in mm from the pedicle umbo.

### Conclusions

The Balaton Highland and the Mecsek Mts are now situated in a distance of 150 kms, on the opposite sides of the Zagreb-Zemplén tectonic lineament. The former belongs to Transdanubian Central Range, the latter to Tisza Unit.

During the Anisian time shallow water marine sediments formed in both territories. These carbonates yielded the brachiopod faunas serving as basis for comparison.

The lithological sequence is more various in Mecsek, while lateral facies changes are more typical for Balaton Highland. Collections yielded 35 brachiopod species from Balaton Highland, while only 8 species were found in Mecsek.

Serious doubt arose concerning the identity of *Coenothyris vulgaris*, which is the most widespread brachiopod of the Middle Triassic. The difference in the internal morphology between the Balaton Highland and the Mecsek forms seems to exceed the limit of intraspecific variability.

The densely packed brachiopod shell-beds of Mecsek reveal storm-generated accumulation in an even, uniform littoral environment. Only a few species were able to tolerate the extreme conditions, such as the fluctuating salinity and water energy.

The four investigated localities in Balaton Highland represent ecologically different environments, providing different habitats and usually favourable life conditions for brachiopods. The disrupted bottom relief was one of the main causes of the high diversity and abundance of brachiopods.

Comparing with Anisian faunas of other territories the Mecsek shows German affinities (low diversity, *Coenothyris vulgaris* dominated assemblages), while the Balaton Highland has closer relations to Alpine faunas. However, during the Middle Triassic no distinct faunal provinces existed within the Tethys, so the Germano-type fauna means an ecologically controlled, impoverished assemblage of the Alpine faunal elements.

The above mentioned data seem to support the theory, that the present and the Anisian paleogeographic position of Balaton Highland and Mecsek are inverse, as a result of large-scale strike-slip movements (e. g. KÁZMÉR and KOVÁCS, 1985).

The so-called *Coenothyris vulgaris* from Mecsek and Balaton Highland seems to be taxonomically different by the internal morphological characters. The Mecsek forms belong to the true *Coenothyris vulgaris* while the specimens from Balaton Highland should be assigned to a new taxon which still needs a formal description.

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