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Data to revision and distribution of small foraminifera species described by HANTKEN (1868, 1875)

Part I, Textulariidae and Miliolidae

by
Mária HORVÁTH

Abstract — Only 40 original specimens of HANTKEN'S species remained in Hungarian collections. Recently, I have studied 13 species described by HANTKEN (1868, 1875a, b). In this work the systematic position, diagnosis, stratigraphical range and scanning electron microscope photos of these species are given. These species belong to the Textulariida and the Miliolida.

Key words — HANTKEN's small foraminifers, "*Clavulina Szabói*" layers, diagnoses, types, stratigraphy, ecology, Eocene, Oligocene.

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Introduction

In the 19th century Miksa HANTKEN played a leading role in the collection and description of the micro-organisms, mainly foraminifers. Its monograph on the fossil Foraminifera of Middle Eocene sediments, Buda Marl and Kiscell Clay Formations ("*Clavulina Szabói* layers") was published in 1875. With the employment of the scanning electron microscope (SEM), documentation of the remains of the original collection has been elevated. This advance justifies a revision of HANTKEN's work.

The subject of this work is the re-examination of the foraminifera species described by HANTKEN in "**A *Clavulina Szabói* rétegek faunája. I. Foraminifera**" (Die Fauna der *Clavulina Szabói* Schichten. I. Theil Foraminiferen) published in a volume of the Annales of the Hungarian Royal Geological Institute in 1875.

This work belongs to the fundamental foraminifera literature of the 1800-ies. Value of this composition can be compared only with the works of the greatest micropaleontologists of the 19th century. While REUSS and GÜMBEL worked in German territories, D'ORBIGNY investigated and described several species of the Middle Miocene (Badenian) formations of the Vienna Basin. HANTKEN studied the Hungarian Eocene and Oligocene formations, mainly the area of the Transdanubian Central Range. At that time, significant building operations were carried out in the areas of Pest, Buda, and Óbuda (later unified as "Budapest"). The necessary building materials were mined in the brickyards of Óbuda (NW Budapest), that is partly a recultivated area today, partly a modern residential section therefore the classical localities are not accesible. Nowadays Kiscell Clay is mined only at Törökbálint and Pilisborosjenő, in the environs of Budapest. Buda Marl can also be sampled only during the founding process of constructions.

Material, methods

Due to the classic localities are not accessible, material of the present work comprises the collections of previous years, completed by findings of the last three years. Nowadays, well-preserved and "photogenic" faunas can be collected only in the environs of Eger (Kiseged, Noszvaj and N Hungary). Specimens of the faunas at Törökbálint and Pilisborosjenő have recrystallized shells, so they are less suitable for taking of photographs.

Materials from HANTKEN's Collections have been preserved at several places, including the Department of General and Historical Geology, the Department of Palaeontology of the Eötvös Loránd University at Budapest; in the Museum of the Hungarian Geological Institute (Table 1), as well as the collection of the Naturhistorisches Museum in Vienna, Austria. The original collections consisted of tiny bottles, fixed on wooden planks. Corks closed the bottles, and the names and localities were indicated beside them. On the bottom of the plank, below the bottles, even the drawings of the specimens were placed. It is important to note that in these phials not only the species, held by HANTKEN as new ones, but also the specimens of those frequent species of the Buda Marl and Kiscell Clay were stored, which had been previously described by others (mainly GÜMBEL, REUSS, D'ORBIGNY).

More or less specimens of the frequent species, have been preserved in the Hungarian traceable collections, however, there is no marked type specimen (holotype) among them. Having appreciated HANTKEN's life work, László MAJZON

(1962b) attempted a revision, but only on the basis of the depictions. His great experience helped him to find systematic position of the majority of the species, being still valid or approximately valid. However, he also did not indicate types.

According to GELLAI-NAGY (1988), the collections that have remained in Hungary contain 111 small foraminifer fossil types (species) in fixation. Out of them, I selected 31 species, indicated by HANTKEN as new ones, with the aim of describing and taking photos of them. On this basis, work of GELLAI-NAGY "Delineation of HANTKEN's foraminiferal species from the original collection" was composed for the XXI[st] European Micropaleontological Colloquium in 1989. This work contains the scanning electron microscope shots of 35 taxa, deriving from the original collections. Compared to it, the present study gives also the description of 13 species, belonging to Textulariidae and Miliolidae with SEM photos.

The SEM photos were taken by AMRAY 1830 I/76. type microscope, in the Microscope Laboratory of the Petrological and Geochemical Department of Eötvös University, with the leading Kamilla GAÁL-SOLYMOS.

The classification of benthic foraminifera, applied in this volume, follows that of LOEBLICH & TAPPAN (1988).

The material studied in the present work is deposited in the Geological and Paleontological Department of the Hungarian Natural History Museum under the inventory numbers M.99.39–44 and M.99.47–49

Localities, geology

HANTKEN's localities

As HANTKEN said, the *Clavulina Szabói* layers "...represent an independent class of the Tertiary formation". According to the author they range from Porva (Veszprém County) to Recsk (Mátra Mountains) (Table 1), from Padrag Marl to Szécsény Schlier (Table 2).

The richest fauna localities according to the exposure conditions of 1875:

- Újlak brickyard, Óbuda;
- ground-plot of the Lónyay House on the Albrecht road of the Vár-hegy (Budapest, today: Hunyadi János street);
- the sunk road in the East side of the Kis-Sváb-hegy, besides the Balássy vineyard;
- the road to the old coal mines at Mogyorós;
- the public road between village and the Lábatlan creek at Piszke;
- the quarry at the fringe of the Szápár forest at Csernye.

Rocks of the *Clavulina Szabói* layers in HANTKEN'S description: *tályag* (=clay), marl, marly limestone, subordinately clayey sandstone. In some places, there is considerable quantity of glauconite that fills also the shells. "The *tályag* contains organic remnants of microscopic size in a great amount".

In the environs of Buda, its underlying rock is the "*Orbitoid* limestone", which, according to the evidence of the Kis-Sváb-hegy and Szépvölgy quarries, grades into "the Buda Marl forming the lower class of the *Clavulina Szabói* layers, from which it can be distinguished rather petrographically than paleontologically".

In the description of HANTKEN, the *Clavulina Szabói* layers are divided into two main classes; its upper part consists of clay, while their lower part is marl. In the environs of Buda, the lower part is represented by the Buda Marl and the upper part by the "Kis-czell *tályag*", respectively.

Formations, bearing HANTKEN's foraminifers

The Buda Marl — The Buda Marl is dominantly a light grey or light brown (weathered) silty marlstone, marly siltstone. It is often well-bedded. The average of the $CaCO_3$ content is 35–40 %. Graded limestones (allodapic limestones) are interbedded in the lower-middle part of the formation (VARGA 1984). The lower contact of these beds is sharp, whereas the uppermost part grades upward gradually to the marly beds. Within each limestone bed, gradation is observable with oysters and pectinids in the lowermost layer and small *Nummulites fabianii* specimens in the middle part (BÁLDI, 1986). The thickness of these allodapic beds is 0.5–1.0 m; and the complete thickness of the Buda Marl remains below 100 m. The area of its occurrence extends from the Transdanubian Central Range to the Bükk Mts.

In the Budapest area the Bryozoa Marl (Priabonian) grades upward into the Buda Marl. And the Buda Marl grades upward into the Tard Clay.

Molluscs, large and small foraminifers, and calcareous nannoplankton indicate the biostratigraphic position of the Buda Marl. The main part belong to the Priabonian stage (NP 19–20, P17; Báldi 1986, B.-BEKE 1972; KECSKEMÉTI & VARGA 1985) However, the uppermost part of the formation is Early Oligocene by the data of calcareous nannoplankton and planktonic foraminifers (NP 21–22, P18) (NAGYMAROSY 1992, HORVÁTH 1998).

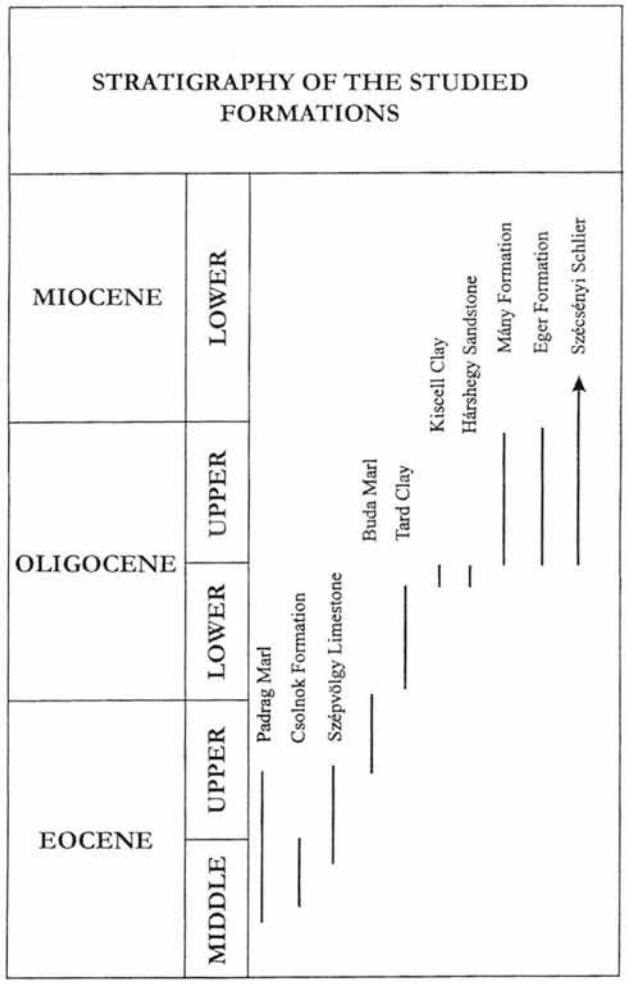
Two types of small foraminiferal assemblages can be separated in the formation. The first is a ***Globigerina–Gemellides* assemblage** with many benthic and planktonic specimens. The abundant taxa are *Cyclammina, Tritaxia, Vulvulina, Gemellides eocaenus, Gemellides costatus, Uvigerina eocaena, Uvigerina spinicostata, Uvigerina cocoaensis, Gavelinella asterians, Korobkovella grosserugosa, Almaena, Asterigerinata, Queraltina, Turborotalia ampliapertura, Turborotalia* mainly *Subbotina eocaena, Subbotina corpulenta, Turborotalia ampliapertura, Dentoglobigerina prasaepis, Globigerina officinalis, Globigerina praebulloides,* small tenuitellinids, chiloguembelinids, *Bulimina sculptilis, Bulimina alazanensis, increbescens, Subbotina tripartita, Subbotina linaperta* and *Subbotina eocaena*. These foraminifers indicate bathyal bottom conditions (600–1000 m depth) and normal salinity.

Table 1 — Hantken's localities.

Occurrence		Clavulina Szabói layers		Lithostratigraphic unit
		low.	upp.	
Porva	S part of the village	x		Padrag Marl
Bakony-nána	Peres-domb	x		Padrag Marl
Jásd	W Sánchegy	x		Padrag Marl
Csernye	stream valley	x		Padrag Marl
	E part of the village	x		Padrag Marl
	small quarry	x		Padrag marl
Kis-gyón	quarry	x		Padrag Marl
Puszta-Nána	old coal mine	x		Csolnok F.
Bajóth	W Domonkoshegy	x		Padrag Marl
	along the road to Szarkás	x		Padrag Marl
Nagysáp	road cut to Orisáp		x	Kiscell Clay
Epöly	Epöly mill		x	Kiscell Clay
Sárisáp	N part of the village		x	Kiscell Clay
	at Anna valley		x	Kiscell Clay
	between coal mines		x	Kiscell Clay
Tokod	brickyard		x	Kiscell Clay
	E side of Sashegy		x	Kiscell Clay
	road to Dorog		x	Kiscell Clay
Dorogh	Liget borehole		x	Kiscell Clay
Mogyorós	road cut to old coal mine		x	Kiscell Clay
Nyerges-	W part of the village	x		Padrag Marl
Szarkás	so called Giant (Óriás)		x	Kiscell Clay
Esztergom	S side of Őrhegy		x	Kiscell Clay
	Sz.Lélek valley		x	Kiscell Clay
Piszke	between village and stream	x		Padrag Marl
Bogdány			x	Kiscell Clay
Boros-Jenő	at Szarvas inn		x	Kiscell Clay
Üröm	well		x	Kiscell Clay
	bank of the stream		x	Kiscell Clay
Sz.Iván	stream near old coal mine		x	Kiscell Clay
	old coal mine		x	Kiscell Clay
Solmár	on the bank of stream		x	Kiscell Clay
	near the Várhegy, road to		x	Kiscell Clay
Hidegkút	Csúcshegy–Hárshegy valley		x	Kiscell Clay
	N side of Hárshegy		x	Kiscell Clay
Pomáz			x	Kiscell Clay
Nagy-Kovácsi	old (abandoned) brickyard		x	Kiscell Clay
	well at the court of		x	Kiscell Clay
	old pit of mine		x	Kiscell Clay
Budakeszi	S part of the village		x	Many
	road cut to Buda		x	Many
Budaőrs	Farkashegy	x		Buda Marl
Csík-puszta	W side of the hill	x		Buda Marl
Buda	Szép Juhászné restaurant	x		Buda Marl
	road cut to Budakeszi	x		Buda Marl
	road cut to Zugliget	x		Buda Marl
	road cut to Nagy Svábhegy	x		Buda Marl
	road cut Svábhegy →Buda	x		Buda Marl
	at the top of Kis Svábhegy	x		Buda Marl
	Balássy grape farm	x		Buda Marl
	Ördögárok	x		Buda Marl
	road cut to Farkashegy	x		Buda Marl
Buda	N side of the Buda railway	x		Buda Marl
	Albrecht road, Lónyay	x		Buda Marl
	SW side of the Rókushegy	x		Buda Marl
	stream to Lipótmező	x		Buda Marl
	Kis-czell brickyard		x	Kiscell Clay
	Újlak brickyard		x	Kiscell Clay
	Szépvölgy brickyard		x	Kiscell Clay
	Ferenczárok	x		Buda Marl
	Zöldárok	x		Buda Marl
	road cut		x	Kiscell Clay
Puszta-Lökös	well near the road			
Kelecseny	stream valley near road		x	Szécsény
Gádony	brickyard		x	Szécsény
Kis-Hartyán	Near the old coal pit		x	Szécsény
Recsk			x	Kiscell Clay

The second assemblage, dominated by *Globigerina*, *Bulimina* and *Bolivina* species, consists of *Bulimina. alsatica*, *Bolivina aenariensiformis*, *Bolivina elongata*, *Bolivina. nobilis*, *Bolivina semistriata*, *Latibolivina reticulata*, *Gemellides costatus*, *Gemellides. eocaenus*, *Uvigerina eocaena*, *Uvigerina chirana Uvigerina spinicostata Uvigerina. rippensis*.

Table 2



The Tard Clay — The Tard Clay is dark gray coloured, sometimes-dark brown clayey silt with low carbonate content (10 %). The formation is maximum 100 m thick. Its lower part is built up of alternating fine-laminated pelites. The whole upper part consists of an alternation of black and white laminae with monospecific nannofloras in the white laminae (B.-BEKE 1977; NAGYMAROSY 1983). The high organic content and 2–7 % pyrite are rock-building constituents. The organic content originates from autochtonous, marine sapropelic matter (VETŐ 1987). South of Budapest, VARGA (1982) recognised graded limestone intercalations from several mm to 10-cm thickness in the lower part of the formation. From these graded laminae, *Nummulites fabianii* and *Chapmannina gassinensis* were recorded. The most common megafossils of the formation are plant remains and fish scales. Until the sixties, the Tard Clay was thought to be so-called "foraminifera-free zone" (MAJZON 1966). Subsequent investigations resulted in a relatively rich fauna (molluscs, large sized ostracodes, foraminifera)

and microflora in the formation (BÁLDI 1984; BÁLDI HORVÁTH et al. 1984; NAGYMAROSY 1983, MONOSTORI 1983, HORVÁTH 1980, 1983).

In the lower, hardly bedded part, the foraminifera assemblages consist of small tenuitellinids and chiloguembelinids. *Globigerina officinalis, Tenuitella angustiumbilicata, Tenuitella gemma, "Globigerina" postcretacea, Chiloguembelina cubensis, Chiloguembelina gracillima* and *Globanomalina barbadoensis* are abundant. *Bolivina nobilis, Bolivina elongata, Bolivina beyrichi, Bolivina aenariensiformis, Caucasina oligocaenica, Chilostomella oolina, Allomorphina trigona, Trifarina budensis, Uvigerina gracilis, Asterigerinata falcilocularis* and *Cibicidoides pseudoungerianus* occur sporadically. Based upon the benthic species the bottom water was oxygen-deficient. The water mass was stratified as it is shown by dominating surface dwelling planktonic forms and by the absence of typical intermediate and deep planktonic species. The age of the lower part of the Tard clay is Early Kiscellian, P18 foraminifera zone.

Fossils are usually absent in the upper part of the Tard Formation, only some megaflora elements (leaves, grains) as well as fish remains occur. In this part of the Formation the foraminifera fauna is generally absent. There are few levels with characteristic mikrofauna with *Ammomarginulina, Eratidus, Ammobaculites, Trochammina,* and *Globotextularia*. These forms indicate special lagoonal environment with lower salt content.

The Kiscell Clay — This Formation consists of grey calcareous clay and clayey marl. It is non-stratified, bioturbated, with low $CaCO_3$ content. The exposures of the Kiscell Clay were the localities to Hantken's classic foraminifera investigations (HANTKEN 1868, 1871, 1875a, b). In the Kiscell Clay, the lower stratigraphical level can be characterised by *Cassidulina vitálisi* from the *Globigerina–Gemellides–Uvigerina* assemblages. The more frequent taxa are: *Subbotina eocaena, Subbotina angiporoides, Gemellides costatus, Gemellides eocaenus, Uvigerina moravica,* typical *Cassidulina vitálisi, Hansenisca soldanii*. The calcareous/agglutinated ratio is variable depending on the quantity of the sandy sediment influx. In the upper part of the Kiscell Clay the agglutinated taxa are dominant, the characteristic ones are *Reticulophragmium acutidorsatum, Tritaxia szabói, Karreriella, Dorothia, Haplophragmoides, Gaudryina, Vulvulina, Rhabdammina, Rhizammina, Martinottiella* (HORVÁTH 1998).

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Table 3 — Occurrences of HANTKEN's Textulariida and Miliolida species.

HANTKEN's name:	*U. acutidorsatum*	*U. rotundidorsatum*	*Plecanium elegans*	*Gaudryina Reussi*	*Gaudryina textilaroides*	*Gaudryina irregularis*	*Tavulina Szabói*	*Tavulina cylindrica*	*Cornuspira obygogyra*	*Triloculina porvaensis*	*Textilaria subflabelliformis*	*Textilaria elongata*	*Textilaria globosa*	*Vulvulina pectinata*
Valid name:	*R. acutidorsatum*	*R. rotundidorsatum*	*Plecanium elegans*	*Tritaxilina hantkeni*	*Gaudryina textilaroides*	*Eggerella irregularis*	*Tritaxia szabói*	*Cylindroclavulina rudilosta*	*Cyclogyra obygogyra*	*Triloculina porvaensis*	*Vulvulina subflabelliformis*	*Textularia elongata*	*"Textilaria" globosa*	*Vulvulina pectinata*
Buda	x	x	x	x		x	x		x		x			x
St.J.restaurant	x						x							
Budakeszi	x	x		x		x	x	x						
Nagy-Kovácsi	x	x		x			x							
Üröm	x			x			x	x						
Pomáz	x						x							
Bogdány	x						x							
Sz.Iván	x													
Solymár	x													
Esztergom	x			x			x							
Tokod	x			x			x	x						
Sárisáp	x						x							
Sz.Kereszt	x						x							
Puszta-Lökös	x													
Recsk	x			x										
Kis-Hartyán	x													
Zöldárok	x												x	
Szépvölgy	x			x	x		x	x						
Kis-Svábhegy	x			x	x		x	x						
Szápár				x			x	x						
Várhegy				x	x		x	x						
Császárfürdő				x	x		x	x				x		
Mogyorós				x			x	x						
Porva				x			x	x		x				
Zugliget					x		x	x						
Piszke					x		x							
Dorog							x							
Nagy-Sáp							x							
Hidegkút							x	x						
Bajót							x	x						
Szarkás							x	x						
Nyerges-Újfalu							x							
Puszta-Nána							x							
Csernye							x							
Puszta-Gyón							x							
Bakony-nána							x							

The localities of the present studies

Budapest, Újlak, former Holzspach brickyard — Kiscell Clay samples were collected from this clay pit in 1973. The clay was light grey coloured, with considerable amount of aleurit. It contained also some molluscan and fish remains. A borehole. [Kiscell (K)-1] was drilled here that crossed a Kiscell Clay and Tard Clay succession. The Kiscell Clay was 80 m and the Tard Clay was 13-m thick (BÁLDI et al. 1984).

Budapest, Pusztaszeri street, road cut — The outcrop has recently become a protected geological object near the crossing of the Pusztaszeri út and the Zöldmáli út (Budapest). The locality was originally described by LŐRENTHEY (1911). Nowadays the road cut exposed a 12 m thick sequence with an alternation of incompact marl, limy marl and hard, compact allodapic marly limestone layers (BÁLDI et al. 1983). The thickness of the allodapic layers ranges from 10 to 350 mm. The graded bedding is usually invisible megascopically. The 0.5–0.6 mm sized microbioclasts are characteristic in thin section; the belong to red algae, echinids, bryozoans, benthic foraminifers and thin shelled ostracods. The Buda Marl has important planktonic foraminifers, as *Subbotina linaperta, Subbotina. tripartita, Subbotina eocaena, Turborotalia ampliapertura, Globorotalia increbescens, Globigerinita pera.*

Budapest, Péter-hegy quarry — The quarry, closed in 1996, was near Csillaghegy, at the northwestern part of Budapest. Only one section remained exposed where the geological formations can be seen in two parts. In the lower block, typical Kiscell Clay is visible in 10–13 m. thickness In the upper block, 10 m thick sandstone is covered by 20 m thick Tard Clay and 8–9 m Kiscell Clay. The final member of this section is Pleistocene travertino of 1-m thickness.

Pilisborosjenő brickyard — The clay pit is near the Budapest–Dorog road, in the NW suburb area of Budapest. A light grey, sometimes marly and/or aleuritic clay, belonging to the Kiscell Clay Formation, is exposed here. Some thin glaukonitic sand intercalations can be also found. Here, the Kiscell Clay is in contact with the Hárshegy Sandstone along a fault. In the foraminifer fauna, the agglutinated species are characteristic.

Törökbálint brickyard — It is near the M7 highway in a few kms ditance SW from Budapest. Here, the Kiscell Clay is marly and aleuritic and bearing also a few molluscs. A curiosity of the foraminifera fauna is an agglutinated assemblage with huge *Reticulophragmium*.

Kiseged, road cut — It lies in NE part of Eger (N Hungary). WEILER (1933) mentioned this locality first in the geological literature. The Eocene–Oligocene strata can be studied here in a 180 m long section. The whole series contain a continuous sequence of Priabonian limestone (Szépvölgyi Limestone Formation), Buda Marl, Tard Clay, and Kiscell Clay. Unfortunately, the contacts of the formations are not exposed. Szépvölgy Limestone is compact, slightly laminated with red algae and corals. Here, the Buda Marl is light yellowish, brown and clayey. The lower member of the Tard Clay is poorly stratified clayey marl with molluscs [*Cardium lipoldi* (ROLLE)] and giant ostracods (BÁLDI, 1986). The upper member of the Tard Clay is strongly laminated, silicified clay (shale) with fish imprints and scales. Typical, compact Kiscell Clay coveres the former starata.

Noszvaj, Síkfőkút quarry — This quarry lies NE of Eger, near the village Noszvaj. SCHRÉTER (1939) mentioned it first. The quarry and an artificial outcrop expose an 11 m thick profile. The sequence from bottom to the top is as follows:

– glauconitic, bioclastic limestone with red algae, bryozoans, echinids, molluscs, Nummulites

– the alternation of slightly laminated clay, clayey marl and light-grey glauconitic limestone

– the incompact glauconitic limestones and marly limestone is exposed in a 4.7 m thickness in the artificial outcrop.

The larger foraminifers do not give satisfactory information about the age of the exposed formation because the exclusively Oligocene forms are lacking. The disappearance of the rare Late Eocene species (*Nummulites pulchellus, N. chavanensis*) may help to put the Eocene /Oligocene boundary into the white clayey marl layers. According to the planktonic foraminifers, the Eocene/Oligocene boundary can be drawn in the upper part of this section, near the white clayey marl layers, too BÁLDI et al., 1984).

Table 4 — The available Textulariida and Miliolida material.

	Hungarian Geological Institute															Dept. Paleontology, Univ. Eötvös Loránd						
		Clavulina cylindrica	Clavulina. Szabói	Gauryina Reussi	Gaudryina textilaroides	Haplophragmium rotundidorsatum	L.	Clavulina cylindrica	Clavulina Szabói	Gaudryina irregularis	Gaudryina textilaroides	Gaudryina Reussi	Haplophragmium acutidorsatum	Haplophragmium rotundidorsatum	Textilaria sublabelliformis		Clavulina cylindrica	Clavulina Szabói	Gaudryina Reussi	Haplophragmium acutidorsatum	Haplophragmium rotundidorsatum
Üröm		33										4										
Várhegy			17	2	1				50		3	8										
Szépvölgy		3				8			25													
Budakeszi		17																				
Kis-Svábhegy		8						30			38	44			2		10	48	6			
Zúgliget		5	13	8																		
Újlak										1			75	1	2							1
Józsefhegy								1	25			11										
Sárisáp		8										14										
Szápár																	1	24				
Buda																				11		
Porva																	7					
Tokod																						
Kisgyőr																						
Mogyorós						5																
Kiscell		2								1												
Gellérthegy		3																				
Bogdány		16																				
N.Kovácsi		34																				
Esztergom		6															14					
Csfürdő																						
Zöldárok																						
Sum		207	30	10	1	13		31	100	2	41	81	75	1	4		32	72	6	11	1	

Eger, Wind brickyard — This profile is a type section of the Egerian. It has been known since the beginning of the Twentieth century (TELEGDI-ROTH, 1914). Its knowledge considerably increased after drilling an 80- m borehole in 1961. The succession, from the bottom is as follows:

– Kiscell Clay - clay, marly clay, and marl, with tuffitic lenses. In the foraminifera fauna, *Gemellides eocaenus*, *G. costatus* and some *Uvigerinas* are characteristic.

– Tuffitic and glauconitic sandstone member of the Eger Formation coveres the Kiscell Clay, conformably. These layers contain *Flabellipecten burdigalensis* and *Miogypsina formosensis*.

– The molluscan clay member of the Eger Formation is monotonous with some aleuritic layers. *Heterolepa dutemplei*, *Cassidulina-Caucasina* associations (HORVÁTH, 1985), and *Globigerina angulisuturalis*, *Globigerinoides quadrilobatulus* are typical in these beds.

– The upper part of the profile consists of alternating clay-sand-sandstone layers, with rich molluscan fauna (BÁLDI, 1973, 1984), *Caucasina* and *Ammonia viennesis* foraminifera associations.

– Continental clay and tuff cover the Oligocene layers.

Taxonomy

Table 5 — HANTKEN's Textulariida and Miliolida species from the *Clavulina Szabói* layers and their current valid names (reversed comma indicate nomina dubia).

Name by HANTKEN 1875a	Valid name
Haplophragmium acutidorsatum	*Reticulophragmium acutidorsatum* (HANTKEN, 1868)
Haplophragmium rotundidorsatum	*Reticulophragmium rotundidorsatum* (HANTKEN, 1875)
Plecanium elegans	*Plecanium elegans* HANTKEN, 1868
Gaudryina Reussi	*Tritaxilina hantkeni* CUSHMAN, 1936
Gaudryina textilaroides	*Gaudryina textilaroides* HANTKEN, 1875
Gaudryina irregularis	*Eggerella irregularis* (HANTKEN, 1875)
Clavulina Szabói	*Tritaxia szabói* (HANTKEN, 1868)
Clavulina cylindrica	*Cylindroclavulina rudilosta*(HANTKEN, 1875)
Cornuspira olygogyra	*Cornuspira olygogyra* HANTKEN, 1875
Triloculina porvaensis	*Triloculina porvaensis* HANTKEN, 1875
Textilaria elongata	*Textularia elongata* (HANTKEN, 1875)
Textilaria globosa	*"Textilaria" globosa* HANTKEN, 1875
Textilaria subflabelliformis	*Vulvulina subflabelliformis* (HANTKEN, 1875)
Vulvulina pectinata	*Vulvulina pectinata* HANTKEN, 1868

Classis **FORAMINIFERA** EICHWALD, 1830
Order **Textulariida** DELAGE & HÉROUARD, 1896
Superfamily Haplophragmiacea EIMER & FICKERT, 1899
Family Cyclamminidae MARIE, 1941
Subfamily Alveolophragmiinae SAIDOVA, 1981
Genus *Reticulophragmium* MAYNC, 1955

Reticulophragmium acutidorsatum (HANTKEN, 1868)

(Plate I: 1; Plate II: 1)

1866b *Haplophragmium acutidorsatum* n. sp. — HANTKEN, p. 235, in list.
1868 *Haplophragmium acutidorsatum* n. sp. — HANTKEN, p. 82, pl. I, fig.
1875a *Haplophragmium acutidorsatum* HANTKEN — HANTKEN, S. 12, Taf. I, Fig .1.
1875b *Haplophragmium acutidorsatum* HANTKEN — HANTKEN, p. 10, pl. I, fig. 1.
1962b *Cyclammina placenta* (REUSS) — MAJZON, pl. XXIX(I), fig. 1.
1962 *Cyclammina acutidorsata* (HANTKEN) — LÜHR, Taf. 1, Fig. 2.
1963 *Cyclammina acutidorsata* (HANTKEN) — CICHA & ZAPLETALOVA, p. 101, Abb. 13.
1970 *Cyclammina acutidorsata* (HANTKEN) — KIESEL, S. 187, Taf. II, Fig. 18, 19.
1973 *Cyclammina cancellata* BRADY — NAGYNÉ GELLAI, p. 441, pl. I, fig. 6.
1975 *Cyclammina acutidorsata* (HANTKEN) — CICHA et al., p. 241, pl. 1, fig. 2.
1975 *Cyclammina acutidorsata* (HANTKEN) — BRAGA & GRÜNIG in BRAGA et al., p. 102, Tav. 4, fig. 7.
1978 *Cyclammina acutidorsata* (HANTKEN) — SZTRÁKOS, pl. 2, figs 5a–b.
part 1979 *Cyclammina acutidorsata* (HANTKEN) — SZTRÁKOS, pl. 2, figs 5a–b.
1981 *Cyclammina placenta* (REUSS) — GRADSTEIN & BERGGREN, p. 254, pl. VII, figs 4–8.
1982 *Cyclammina acutidorsata* (HANTKEN) — SZTRÁKOS, pl. 2, figs 1a–b.
1985 *Cyclammina acutidorsata* (HANTKEN) — SIKIČ, pl. I, fig. 12.
part 1985 *Cyclammina cancellata* (HANTKEN) — SIKIČ, pl. II, fig. 4.
1985 *Cyclammina acutidorsata* (HANTKEN) — KORECZNÉ LAKY & NAGYNÉ GELLAI, pl. IV, fig. 1.
1987 *Cyclammina acutidorsata* (HANTKEN) — REISER, S. 58, Taf. 1, Fig. 12.
1987 *Cyclammina acutidorsata* (HANTKEN) — WENGER, S. 244, Taf. 1, Fig. 9,10; Abb. 23/1.
1988 *Haplophragmium acutidorsatum* HANTKEN — GELLAI-NAGY, pl. 1, figs 1–3.
1998 *Reticulophragmium acutidorsatum* (HANTKEN) — CICHA et al., p. 123, pl. 4, figs 12–14.

Lectotype — GELLAI-NAGY, 1988, pl. 1, figs 1–3.

Paralectotype — M.99.39. Budapest, Újlak, upper part of the Kiscell Clay with agglutinated foraminifers, Upper Kiscellian, P21 zone.

Type locality — Budapest, Újlak.

Type level — Kiscell Clay Formation, Upper Kiscellian.

Material — 86 specimens remained in the Hantken Collections in Hungary (Table 4).

Dimensions — Diameter generally ranges from 1.6 to 3.5 mm.

Diagnosis — The test is planispirally coiled, involut. It consists of 8–12 broad and low chambers per whorl. They increase rapidly in height. The sutures are nearly radial, the periphery is angular. The wall agglutinated, with very thin imperforate outer layer. The aperture is a low slip at the base of apertural face.

Remarks — It is one of the most characteristic forms of the *Clavulina szabói* layers. MAJZON (1962b) and NAGYNÉ GELLAI (1973) had thought that this species is equivalent to *Cyclammina placenta* (REUSS, 1851). However, it differs from *Cyclammina placenta* (REUSS, 1851) and *Cyclammina cancellata* (BRADY, 1884) species with its size, the aperture, and the inner

structure. The inner structure of *Reticulophragmium acutidorsatum* was examined by CICHA & ZAPLETALOVA (1963).

Stratigraphical range — It is known from all HANTKEN localities (HANTKEN, 1875a, b), from the Middle Eocene formations to the Lower Oligocene Kiscell Clay Formation (Table 2).

In Hungary it is rarer in the Buda Marl than in the Kiscell Clay. It ranges from the Middle Eocene to the Early Miocene (Eggenburgian). It is very frequent in the Lower Eocene and Upper Kiscellian, mainly in the upper part of the Kiscell Clay [horizon of agglutinated foraminifers (MAJZON 1966)]; associations with agglutinated foraminifers (HORVÁTH 1998); *Anomalina affinis* zone (SZTRÁKOS 1982).

In Europe *Reticulophragmium acutidorsatum* occurs in the Paleogene. It is frequent in the Upper Eocene and Oligocene formations (N Italy, Monte Brione, Possagno, HAGN 1952; BRAGA & GRÜNIG in BRAGA et al 1975). In the foreland molasse sediments it ranges from Upper Eocene to Oligocene, but it is also known from the Eggenburgian and the Lower Ottnangian (HAGN 1956; LÜHR 1962; WENGER 1987; REISER 1987). In the Central Paratethys, it ranges from the Late Eocene to the Late Eggenburgian (CICHA et al. 1998). In Croatia, it occurs in the Rupelian (SIKIČ 1985).

In the North Sea *Reticulophragmium acutidorsatum* occurs from the Middle Eocene to the Oligocene (GRADSTEIN & BERGGREN 1981).

Ecology — It is a typical epifaunal, detrivore and euhalin form in the neritic zone, frequents in the fine sandy clay facies (MURRAY 1973, 1991, MORKHOVEN et al. 1986, HORVÁTH 1998).

Reticulophragmium rotundidorsatum (HANTKEN, 1875)

(Plate I: 2; Plate II: 2)

	1871	*Haplophragmium rotundidorsatum* n. sp. — HANTKEN, p. 128 (in list)
	1875a	*Haplophragmium rotundidorsatum* n. sp. — HANTKEN, S. 12, Taf. I, Fig. 2.
	1875b	*Haplophragmium rotundi-dorsatum* — HANTKEN, p. 10, pl. I, fig. 2.
non	1960	*Haplophragmoides rotundidorsatus* (HANTKEN) — SUBBOTINA, pl. II, figs 3a–c.
	1962b	*Haplophragmoides latidorsatus* (BORNEMANN) — MAJZON, pl. XXIX(I), fig. 2.
	1963	*Cyclammina rotundidorsata* (HANTKEN) — CICHA & ZAPLETALOVA, p. 103, Abb. 14.
non	1969	*Haplophragmopides rotundidorsatum* (HANTKEN) — KRAEVA & ZERNECKIJ, p. 20, pl. 5, figs 10a–b.
	1970	*Cyclammina rotundidorsata* (HANTKEN) — KIESEL, S. 188, Taf. III, Fig. 1.
	1971	*Cyclammina rotundidorsata* (HANTKEN) — POPESCU & IVA, pl. I, fig. 6.
	1973	*Haplophragmoides latidorsatus* (BORNEMANN) — NAGYNÉ GELLAI, p. 440.
	1975	*Haplophragmoides rotundidorsatum* (HANTKEN) — BRAGA & GRÜNIG in BRAGA et al., p. 102.
	1978	*Cyclammina rotundidorsata* (HANTKEN) — SZTRÁKOS, p. 64, pl. 2, figs 6a–b.
	1979	*Cyclammina rotundidorsata* (HANTKEN) — SZTRÁKOS, p. 58, pl. 2, figs 6a–b.
	1981	*Cyclammina rotundidorsata* (HANTKEN) — GRADSTEIN & BERGGREN, p. 256, pl. VII, figs 9–12.
	1981	*Cyclammina rotundidorsata* (HANTKEN) — MORGIEL & OLSZEWSKA, p. 14, pl. 4, fig. 15.
	1982	*Cyclammina rotundidorsata* (HANTKEN) — SZTRÁKOS, pl. 1, figs 15a–b.
	1987	*Cyclammina rotundidorsata* (HANTKEN) — WENGER, S. 244, Taf. 1, Fig. 11, 16; Abb. 23/2.
	1994	*Reticulophragmium rotundidorsata* (HANTKEN) — SCHRÖDER-ADAMS & MCNEIL, p. 41, pl.8, fig.5a–c.
	1998	*Reticulophragmium rotundidorsatum* (HANTKEN) — CICHA et al., p. 124, pl. 5, fig. 5.
part	1999	*Reticulophragmium rotundidorsatum* (HANTKEN) — DARAKCHIEVA, p. 8.

Lectotype — M.99.40.

Type locality — Budapest, Újlak.

Type level — Upper part of the Kiscell Clay Formation, late Kiscellian, P 21a zone.

Material — 15 specimens remained in the Hantken Collections in Hungary (Table 2).

Dimensions — Diameter ranges 2–3 mm, thickness 0.6–1.2 mm.

Diagnosis — The broad and low chambers planispirally coiled, involute. The number of chambers 7–10 per whorl. The sutures nearly radial, the periphery rounded. The umbilicus is deep. The wall agglutinated with very thin imperforate outer layer. The aperture a low slit at the base of the apertural surface.

Remarks — HANTKEN had already mentioned the special new form of the Kiscell Clay in 1871, but the description was given only in 1875. It differs from *H. latidorsatus* (BORNEMANN 1855) in the inner structure, in the number of the chambers, the size, and the shape of the dorsal periphery. Without comments, NAGYNÉ GELLAI (1973) regarded H. *rotundidorsatus* as the synonym of *H. latidorsatus* (BORNEMANN, 1855).

Stratigraphical range —The occurrence of *Reticulophragmium rotundidorsatum* is sparser than that of *Reticulophragmium acutidorsatum* (Table 3) from lower and upper part of the *Clavulina Szabói* layers (HANTKEN, 1875a, b).

In Hungary it is known from Upper Eocene–Oligocene sediments, but this species is not frequent. Some specimens occur also in the upper part of the Kiscell Clay Formations (SZTRÁKOS, 1979, 1982; HORVÁTH 1980, 1998).

In West Europe it occurs from Upper Eocene to Lower Miocene (KIESEL 1970; WENGER 1987). In the Central Paratethys it ranges from the Upper Eocene to the Lower Miocene (Eggenburgian), it is typical in the Oligocene (CICHA et al. 1998). In the External Carpathians *Reticulophragmium rotundidorsatum* occurs in the Oligocene (MORGIEL & OLSZEWSKA 1981). In South Bulgaria it ranges from the Middle to the Late Eocene (DARAKCHIEVA 1999).

In the North Sea sediments it occurs from Middle Eocene to the Oligocene (GRADSTEIN & BERGGREN, 1981).

Ecology — It is a typical epifaunal, detritivore, euhalin and cold water dweller form, being frequent in the upper bathyal sandy clay and sand facies (MURRAY 1973, 1991).

Superfamily Spiroplectamminacea CUSHMAN, 1927
Family Spiroplectamminidae CUSHMAN, 1927
Subfamily Vulvulininae D'ORBIGNY, 1826
Genus *Vulvulina* D'ORBIGNY, 1826

Vulvulina pectinata HANTKEN, 1868

(Plate I: 3; Plate II: 3)

1868 *Vulvulina pectinata* n. sp. — HANTKEN, p. 94.
1875a *Vulvulina pectinata* HANTKEN — HANTKEN, S. 68, Taf. VII, Fig. 10.
1875b *Vulvulina pectinata* HANTKEN — HANTKEN, p. 58, pl. VII, fig. 10.
1949 *Vulvulina pectinata* HANTKEN — CUVILLIER & SZAKALL, p. 18, pl. 6, fig. 4.
1962b *Vulvulina pectinata* HANTKEN — MAJZON, pl. XXXV(VIII), fig. 10.
1971 *Semivulvulina pectinata* (HANTKEN) — POPESCU & IVA, pl. II, fig. 5.
non 1973 *Vulvulina pectinata* HANTKEN — NAGYNÉ GELLAI, p. 444, pl. I, fig. 9.
1978 *Semivulvulina pectinata* (HANTKEN) — SZTRÁKOS, pl. 4, figs 3a–b.
part 1979 *Semivulvulina pectinata* (HANTKEN) — SZTRÁKOS, pl. 4, figs 5a–b.
non 1982 *Semivulvulina* aff. *pectinata* (HANTKEN) — SZTRÁKOS, pl. 3, fig. 6.
1985 *Vulvulina pectinata* HANTKEN — SIKIČ, pl. I, fig. 10.
1985 *Semivulvulina pectinata* (HANTKEN) — KORECZNÉ LAKY & NAGYNÉ GELLAI, pl. VI, figs 10, 13; pl. XXI, figs 1–2.
1988 *Vulvulina pectinata* HANTKEN — GELLAI-NAGY, pl. XIV, figs 4–5, non fig. 2–3.

Lectotype — GELLAI-NAGY (1988), pl. XIV, figs 4–5.

Paralectotype — M.99.41. Budapest, Kis-Sváb-hegy, Buda Marl Formation, Upper Eocene.

Type locality — Budapest, Kis-Sváb-hegy.

Type level — Buda Marl Formation, Upper Eocene.

Material — Six specimens (as *Vulvulina pectinata*) and one specimen as *Schizophora pectinata* remained in the Hantken Collections in Hungary (Table 4).

Dimensions — height 1.5–2 mm, width 0.6–0.9 mm.

Diagnosis — The test is broad, elongate and rhomboidal in section. The margins are sharply angular.. The early portion of test is planispirally coiled, later the chambers become biserially arranged. They are very broad and low, and slightly curved backwards toward the proloculus. The wall is finely agglutinated, its surface smooth. The aperture is a narrow elongate slit in terminal position.

Remarks — The figured specimen in NAGYNÉ GELLAI (1973) belongs to *Semivulvulina pectinata* (REUSS), after its aperture, position of chambers and agglutination.

The aperture of specimens in figures of GELLAI-NAGY (1988, pl. XIV, figs 2–3) is different from *Vulvulina*. It is similar to *Semivulvulina pectinata*.

Stratigraphical range — It is not rare in the upper part of the *Clavulina Szabói* layers in all brickyards (HANTKEN 1875a, b).

In Hungary it occurs in the Upper Eocene and the Oligocene (SZTRÁKOS 1979, 1982; HORVÁTH 1998, KORECZNÉ LAKY & NAGYNÉ GELLAI 1985). There is no data from its occurrence in other parts of the Central Paratethys.

There are few data for its occurrence also from further parts of Europe. It occurs in the Middle Eocene to Langhian (Vindobonian) interval in the Aquitanian basin (CUVILLIER & SZAKALL 1949). Egerian occurrence is indicated also in the Transylvanian basin (POPESCU & IVA 1971) and Rupelian in Croatia (SIKIČ 1985), respectively.

Ecology — There are no data for *Vulvulina* distributions in the Recent seas. In the Oligocene, it occurs in the open sea sediments together with typical bathyal agglutinated forms, such as *Reticulophragmium acutidorsatum*.

Vulvulina subflabelliformis (HANTKEN, 1875)

(Plate I: 4, Plate II: 4)

1875a *Textilaria subflabelliformis* — HANTKEN, S. 66, Taf. XV, Fig. 2.
1875b *Textilaria subflabelliformis* — HANTKEN, p. 57, pl. XV, fig. 2.
1927 *Vulvulina spinosa* CUSHMAN — CUSHMAN, p. 111, pl. 23, fig. 1.
1960 *Vulvulina subflabelliformis* (HANTKEN) — HAGN, Taf. 7, Fig. 2.
1962b *Vulvulina subflabelliformis* (HANTKEN) — MAJZON, pl. XLII(XV), fig. 2.
1975 *Vulvulina haeringensis* (GÜMBEL) — PROTO DECIMA & De BIASE in BRAGA et al., Tav. 1, fig. 23.
part 1979 *Vulvulina haeringensis* (GÜMBEL) — SZTRÁKOS, pl. 3, fig. 7.
1988 *Textilaria subflabelliformis* HANTKEN — GELLAI-NAGY, pl. XIV, fig. 1.

Lectotype — GELLAI-NAGY (1988), pl. XIV, fig. 1.

Paralectotype — M.99.42. Budapest, Kis-Sváb-hegy, Buda Marl Formation, Upper Eocene.

Type locality — Budapest, top of the Kis-Sváb-hegy.

Type level — Buda Marl Formation, Upper Eocene.

Material —4 specimens.

Dimensions — Length 0.6–0.9 mm, width 0.5–0.8 mm, and thickness 0.2–0.3 mm.

Diagnosis — The test is elongate, rhomboidal in section. The margins are sharply angled. In the early growth stage the broad and low chambers are planispirally coiled in the microspheric generation. Later they become biserially arranged and strongly curved backwards toward the proloculus. The uniserial stage did not evolved. The sutures are distinct. The smooth wall is finally agglutinated. The aperture is a broad and low interiomarginal arch.

Remarks — The difference between *Vulvulina subflabelliformis* (HANTKEN 1875a) and *Vulvulina haeringensis* (GÜMBEL, 1868) is proved in the juvenile stage, when the aperture is a split at the base of the apertural face. In the adult forms the aperture becomes an interiomarginal arch with parallel the side of the test.

Stratigraphical range — It is frequent in the *Clavulina Szabói* layers, in all sections of HANTKEN (1875a, b). In Hungary it has been found from the Middle Eocene to Oligocene, mainly Upper Eocene and Upper Kiscellian (SZTRÁKOS 1979; HORVÁTH 1998).

In Possagno section it occurs in the Lower and Middle Eocene (PROTO DECIMA & De BIASE in BRAGA et al. 1975), and Upper Eocene in Bavaria (HAGN 1960).

Ecology — There are no data for its distributions in the Recent seas. In Eocene and Oligocene it occurs together with typical bathyal agglutinated and calcareous forms, such as *Reticulophragmium*, *Planulina*.

Superfamily: Verneuilinacea CUSHMAN, 1911
Family: Verneuilinidae CUSHMAN, 1911
Subfamily: Verneuilininae CUSHMAN, 1911
Genus: *Gaudryina* D'ORBIGNY, 1939

Gaudryina textilaroides HANTKEN, 1875

(Plate I: 5, Plate II: 5)

1871 *Gaudryina textilaroides* n. sp. — HANTKEN, p. 90. (in list)
1872 *Clavulina textilaroides* n. sp. — HANTKEN, p. 59. (in list)
1875a *Gaudryina textilaroides* n. sp. — HANTKEN, S. 15, Taf. I, Fig. 6.
1875b *Gaudryina textilaroides* — HANTKEN, p. 12, pl. I, fig. 6.
1962b *Dorothia textilaroides* (HANTKEN) — MAJZON, pl. XXIX(I), fig. 6.
1936 *Gaudryina reynoldsi* CUSHMAN — CUSHMAN, p. 6, pl. 1, fig. 16.
1937 *Dorothia textilaroides* (HANTKEN) — CUSHMAN, p. 87, pl. 9, figs 17–18.
1978 *Dorothia textilaroides* (HANTKEN) — SZTRÁKOS, pl. 5, figs 11a–b.
non 1982 *Dorothia textilaroides* (HANTKEN) — SZTRÁKOS, p. 22, pl. 4, fig.4.
1988 *Gaudryina textillaroides* HANTKEN — GELLAI-NAGY, pl. II, figs 3–5.
1993 *Pseudogaudryina ? textilaroides* (HANTKEN) — SZTRÁKOS in MATHELIN & SZTRÁKOS, p. 410, pl. 4, fig. 5.
1998 *Gaudryina textilaroides* HANTKEN — CICHA et al., p. 97–98, pl. 8, fig. 5.

Lectotype — GELLAI-NAGY (1988) pl. II, figs 3–5.

Paralectotype — M.99.44. Budapest, Buda, Vár-hegy, Buda Marl Formation, Upper Eocene.

Type locality — Budapest, Buda, Vár-hegy.

Type level — Buda Marl Formation, late Eocene.

Material — 42 specimens (Table 2).

Dimensions — Length: 2–4 mm, width (on the upper part): 1–2 mm.

Diagnosis — The test is elongate, stout, its early stage has triserial and triangular cross-section that becomes biserial and rounded later. The size of the chambers increases very slowly therefore the test has nearly parallel sides. The wall finely is agglutinated, solid. The aperture is an arch in the inner margin of the final chamber.

Remarks — RÖGL (in CICHA et al. 1998) has written: "The designated lectotype (GELLAI-NAGY 1988) is comparable with HANTKEN'S material in the NHM collection in Vienna, and it is triserial and triangular in section; the triserial stage later becomes biserial."

Stratigraphical range — HANTKEN collected this species from Piszke Marl (recently equivalent with Padrag Marl Formation; BERNHARDT B., personal com.) and the Buda Marl Formation (1871, 1875a, b).

In Hungary it occurs only in the Eocene Padrag and Buda Marl Formations. Rare.

In the Central Paratethys this species ranges from Middle Eocene to Upper Oligocene (CICHA et al. 1998).

Ecology — It is a normal marine, epifaunal, suspension feeder form, living on hard substrat. The different *Gaudryina* species range from 50 to 500 m depth, from shelf to bathyal zone (MURRAY 1973, 1991). In the Kiscell Clay and Buda Marl *Gaudryina textilaroides* ranges in the bathyal zone.

Family Tritaxiidae PLOTNIKOVA, 1979
Genus *Tritaxia* REUSS, 1860

Tritaxia szabói (HANTKEN, 1868)

(Plate I: 6, Plate II: 6)

1866b *Rhabdogonium Szabói* — HANTKEN, p. 235. (in list)
1868 *Clavulina szabói* n. sp. — HANTKEN, p. 83, pl. I, fig. 4a–b, 6a–b, 7a–b.
1875a *Clavulina szabói* HANTKEN —HANTKEN, S. 15, Taf. I, Fig. 9.
1875b *Clavulina szabói* HANTKEN — HANTKEN, p. 13, pl. I, fig. 9.
1949 *Clavulinoides szabói* (HANTKEN) — CUVILLIER & SZAKALL, p. 24, pl. 10, fig. 4.
1956 *Clavulinoides szabói* (HANTKEN) — HAGN, S.116, Taf. 10, Fig. 1.
1962b *Clavulinoides szabói* (HANTKEN) — MAJZON, pl. XXIX(I), fig. 9.
1962 *Tritaxia szabói* (HANTKEN) — LÜHR, Taf. 1, Fig. 15; Taf. 8, Fig. 9.
1969 *Clavulinoides szabói* (HANTKEN) — KRAEVA & ZERNECKIJ, p. 32, pl. 7, fig. 7.
1971 *Tritaxia szabói* (HANTKEN) — POPESCU & IVA, pl. II, figs 6a,b–7a,b; pl. III, fig. 1

1973 *Clavulinoides szabói* (HANTKEN) — NAGYNÉ GELLAI, p. 445, pl. II, fig. 1.
1975 *Tritaxia szabói* (HANTKEN) — BRAGA & GRÜNIG in BRAGA et al., p. 103, Tav. 4, fig. 1–2.
1978 *Tritaxia szabói* (HANTKEN) — SZTRÁKOS, pl. 5, fig. 10.
1979 *Tritaxia szabói* (HANTKEN) — SZTRÁKOS, pl. 5, fig. 8.
1982 *Tritaxia szabói* (HANTKEN) — SZTRÁKOS, pl. 4, fig. 3.
1985 *Tritaxia szabói* (HANTKEN) — SIKIČ, pl. I, fig. 4.
1985 *Tritaxia szabói* (HANTKEN) — KORECZNÉ LAKY & NAGYNÉ GELLAI., pl. VII, figs 9–10; pl. XXII, figs 1–3.
1988 *Clavulina szabói* HANTKEN — GELLAI-NAGY, pl. IV, figs 1–7.
1993 *Tritaxia szabói* (HANTKEN) — RUSU et al., p. 32, figs 15/9,10.
1998 *Tritaxia szabói* (HANTKEN) — CICHA et al., p. 132, pl. 7, figs 12–13.
1999 *Tritaxia szabói* (HANTKEN) — OZSVÁRT, p. 83, pl. 1, fig. 2.
1999 *Tritaxia szaboj* (HANTKEN) — DARAKCHIEVA, p. 15.

Lectotype — GELLAI-NAGY (1988), pl. IV, figs 1–7.

Paralectotype — M.99.43. Kis-Sváb-hegy, Buda Marl Formation, Upper Eocene.

Type locality — Budapest, Buda, Császár fürdő.

Type level — Buda Marl Formation, Upper Eocene.

Material: — 202 specimens were in the Hantken Collections in Hungary (Table 4).

Dimensions — length is 2–4 mm, width 0.6–1.0 mm.

Diagnosis — The test is elongate, triserial in the early ontogenetic stages, later uniserial, and triangular in section. The wall is agglutinated, relatively thick and solid. The aperture rounded, terminal and central in the adult stage, and may occur on a small neck.

Remarks — It is one of the most characteristic form of the *Clavulina Szabói* layers (HANTKEN 1864, 1866a, b, as *Rhabdogonium Szabói*; 1868, 1875a, b). On the basis of the occurrence of this species HANTKEN (1866a) wrote: "... the Buda Marl and Kiscell Clay (Kis-czelli tályag) are of the same in age, Oligocene".

Stratigraphical range — *Tritaxia szabói* is a common species, being the most characteristic foraminifer in the lower and upper part of the *Clavulina Szabói* layers (HANTKEN, 1868; 1875a, b). HANTKEN collected specimens from many occurrences (Table 3).

In Hungary, this species ranges from the Middle Eocene to the Early Miocene (NAGYNÉ GELLAI 1973; SZTRÁKOS 1978, 1979, 1982; KORECZNÉ LAKY & NAGYNÉ GELLAI 1985; OZSVÁRT 1999) and characteristic in the Buda Marl and Kiscell Clay, but it occurrs in the Upper Oligocene and Lower Miocene formations, too.

In the Central Paratethys, it ranges from the Middle Eocene to Middle Egerian (POPESCU & IVA 1971; SIKIČ 1985; CICHA et al. 1998). In Ukraine it occurs from Middle Eocene to the Lower Oligocene (KRAEVA & ZERNECKIJ 1969). In South Bulgaria, it ranges from Upper Eocene Paleocene to Lower Oligocene (DARAKCHIEVA 1999).

In the Aquitanian basin it ranges from the Middle Eocene to the Oligocene (CUVILLIER & SZAKALL 1949). In Italy this species occurs in the Upper Eocene (HAGN 1956; BRAGA & GRÜNIG in BRAGA et al. 1975).

Ecology — *Tritaxia szabói* is a typical euhalin form, frequent in the bathyal sandy clay and sandy facies together with bathyal agglutinated and calcareous taxa, such as *Reticulophragmium*, *Planulina*, *Heterolepa*.

Superfamily Textulariacea EHRENBERG, 1838
Family Eggerellidae CUSHMAN, 1937
Subfamily Eggerellinae CUSHMAN, 1937
Genus *Eggerella* CUSHMAN, 1935
Eggerella irregularis (HANTKEN, 1875)
(Plate I: 7, Plate II: 7)

1875a *Gaudryina irregularis* n. sp. — HANTKEN, p 15, Taf. I, Fig. 7.
1875b *Gaudryina irregularis* — HANTKEN, p. 12, pl. I, fig. 7.
1962b *Dorothia (?) irregularis* (HANTKEN) — MAJZON, pl. XXIX(I), fig. 7.
1979 *Eggerella irregularis* (HANTKEN) — SZTRÁKOS, pl. 5, fig. 10.
1998 *Eggerella* (?) *irregularis* (HANTKEN) — CICHA et al., p. 94, pl. 8, fig. 6.

Lectotype — M.00.00.

Type locality — Budapest, Újlak.

Type level — Kiscell Clay Formation, Upper Kiscellian.

Material — Two specimens remained in the Hantken Collections in Hungary.

Dimensions — length 2.5 mm, width 1.3 mm.

Diagnosis — The test is subconical and trochospirally coiled in early ontogenetic stages. The number of the inflated chambers is five per whorl. Subsequently, the number of chambers per whorl reduced to three. The wall is finely agglutinated with calcareous particles. The aperture is a low slit near the base of the apertural face. A narrow lip may border it.

Remarks — "The generic attribution of the species is doubtful. A canaliculate wall has not been proved", wrote RÖGL (in CICHA et al. 1998), on the basis of the specimen, stored in NHM (Wien) Collection. The figured specimen is collected from the Kiscell Clay, Budapest, Mátyás-hegy, Holzspach brickyard, coll. T. BÁLDI).

Stratigraphical range — It is sparse in the *Clavulina Szabói* layers HANTKEN (1875a, b), mainly in the Kiscell Clay.

SZTRÁKOS (1979) found the figured specimen in Újlak, in the Kiscell Clay Formation. In the Central Paratethys it ranges from the Upper Eocene to the Egerian (CICHA et al. 1998).

Ecology — It is an infaunal, detritivore form, living under cold water condition in normal marine, fine sediment bathyal facies (MURRAY 1973, 1991).

Subfamily Textulariinae EHRENBERG, 1838
Genus *Textularia* DEFRANCE, 1824
***Textularia elongata* (HANTKEN, 1875)**
(Plate I: 8, Plate II: 8)

1875a *Textilaria elongata* n. sp. — HANTKEN, S. 67, Taf. XV, Fig. 3.
1875b *Textilaria elongata* — HANTKEN, p. 57, pl. XV, fig. 3.
1935 *Textularia halkyardi* LALICKER — LALIKER, p. 45, pl. 7, fig. 5.
1962b *Bolivina budensis* (HANTKEN) microspheric form — MAJZON, pl. XLIII(XV), fig. 3, non fig. 1.
1982 *Textularia elongata* (HANTKEN) — SZTRÁKOS, p. 20, pl. 2, figs 10a–b.
1987 *Textularia elongata* (HANTKEN) — SZTRÁKOS, pl. 1, fig. 16.
1993 *Textularia elongata* (HANTKEN) — SZTRÁKOS in MATHELIN & SZTRÁKOS, p. 40, pl. 24, fig. 12.

Material — One specimen. Kiscell-1. borehole, 83 m, Budapest, Óbuda. The lower part of the Tard Clay Formation, Lower Kiscellian. The specimen has broken after taking the photo..

Dimensions — 0.7 mm, width 0.3 mm.

Diagnosis — The test is a biserial one. The chambers are slightly inflated. Their number is 8–10 per side. The sutures are horizontal, parallel to each other. The height and width of the chambers are equal. The wall is agglutinated with calcareous portions. The aperture is a low arch at the base of the apertural face.

Remarks — It had been lost from the Hantken Collections. SZTRÁKOS (1982) gave the exact definition and taxonomical position for this species.

Stratigraphical range — This species is very rare (HANTKEN 1875a, b). It could be found in the lower part of *Clavulina Szabói* layers, near Császár-fürdő, Buda. Recently one specimen has been found in the lowermost part of the Tard Clay Formation, Lower Oligocene. It is rare also in the Buda Marl, Upper Eocene (SZTRÁKOS 1987).

Ecology — It is an epifaunal detritivore, clinging on hard substrates normal marine, cold water of the bathyal region (MURRAY 1973, 1991). It is sporadic in bathyal marl and clayey marl sediments.

Subfamily Siphotextulariinae LOEBLICH & TAPPAN, 1985
Genus *Plecanium* REUSS, 1862
***Plecanium elegans* HANTKEN, 1868**
(Plate I: 9, Plate II: 9)

1868 *Plecanium elegans* n. sp. — HANTKEN, p. 83, pl. I, fig. 5.
1875a *Plecanium elegans* HANTKEN — HANTKEN, S. 13.
1875b *Plecanium elegans* HANTKEN — HANTKEN, p. 11.
1988 *Plecanium elegans* HANTKEN — GELLAI-NAGY, pl. I, figs 4–5.

Lectotype — GELLAI-NAGY (1988), pl. I, figs 4–5.

Paralectotype — Budapest, Újlak, Kiscell Clay Formation, Upper Kiscellian. The specimen has broken after taking the photo.

Type locality — Budapest, top of the Kis-Sváb-hegy.

Type level — Buda Marl Formation, Upper Priabonian.

Material — One specimen remained in the Hantken Collections in Hungary.

Dimensions — Length 1.5 mm.

Diagnosis — The test is elongate, large, oval in section. The chambers ordered biserial, increasingly added. The wall is agglutinated, not so finely. The sutures are distinct, horizontally. The aperture is a short slit above the base of the apertural face and surrounded by a lip.

Remarks — HANTKEN (1868) described this species on the basis of a single specimen. Subsequently, he succeeded in collecting some further specimens in a sample from the Neustifter Zielegschlag (Újlak, brickyard) from Kiscell Clay.

Stratigraphical range —*Plecanium elegans* is a very rare species (HANTKEN 1868, 1975 a, b), occurring in the Buda Marl Formation, Upper Eocene and in the Kiscell Clay, Upper Kiscellian. No specimens have been found recently.

Ecology — There are no data for its distributions in the Recent seas. Sparse fossil occurrences are known in bathyal marl and clay formations.

Family Valvulinidae BERTHELIN, 1880
Subfamily Valvulininae BERTHELIN, 1880
Genus *Cylindroclavulina* BERMÚDEZ & KEY, 1952
***Cylindroclavulina rudilosta* (HANTKEN, 1875)**
(Plate I: 10, Plate II: 10)

1871 *Clavulina cylindrica* — HANTKEN, p. 98. (in list)
1872 *Gaudryina cylindrica* — HANTKEN, p. 59. (in list)
1875a *Clavulina cylindrica* n. sp. — HANTKEN, S. 18, Taf. I, Fig. 8.
1875b *Clavulina cylindrica* — HANTKEN, p. 14, pl. I, fig. 8.
1889 *Clavulina rudilosta* HANTKEN nom. nov. — HANTKEN in POSEWITZ, S. 383. (fide RÖGL in CICHA et al., 1998)
1936 *Liebusella hantkeni* n. sp. — CUSHMAN, p. 42, pl. 6, figs 15a–b.

1956 *Cylindroclavulina rudilosta* (HANTKEN) — HAGN, S. 122, Taf. 110, Fig. 5.
1962 *Cylindroclavulina rudilosta* (HANTKEN) — LÜHR, Taf. 1, Fig. 18.
1962b *Cylindroclavulina rudilosta* (HANTKEN) — MAJZON, pl. XXIX(I), fig. 8.
1969 *Clavulina cylindrica* HANTKEN — KRAEVA & ZERNECKIJ, p. 33, pl. 10, fig. 8.
1978 *Cylindroclavulina rudilosta* (HANTKEN) — SZTRÁKOS, p. 70, pl. 5, fig. 16.
1979 *Cylindroclavulina rudilosta* (HANTKEN) — SZTRÁKOS, p. 62, pl. 6, fig. 2.
1982 *Cylindroclavulina rudilosta* (HANTKEN) — SZTRÁKOS, pl. 4, fig. 12.
1988 *Clavulina cylindrica* HANTKEN — GELLAI-NAGY, pl. III, figs 1–5.
1998 *Cylindroclavulina rudilosta* (HANTKEN) — CICHA et al., p. 93, pl. 10, fig. 11.
1999 *Cylindroclavulina rudilosta* (HANTKEN) — DARAKCHIEVA, p. 12.

Lectotype — GELLAI-NAGY (1988), pl. III, figs 1–5.

Paralectotype — M.99.47. Kis-Sváb-hegy, Buda Marl Formation, Upper Eocene.

Type locality — Budakeszi, Buda Marl Formation.

Type level — Upper Eocene (Priabonian).

Material — 204 specimens remained in Hantken Collections in Hungary (Table 4).

Dimensions — Length 2.5–4.5 mm, diameter 0.7–1.2 mm.

Diagnosis — The test is large, robust, cylindrical. It has short triserial stage in the microspheric generation. The megalospheric generation has a slightly arcuate early series without distinct triserial stage. The uniserial stage is elongate. The sutures are hardly visible. The wall is coarsely agglutinated. The aperture is rounded and terminal on a neck.

Remarks — "*Clavulina cylindrica* HANTKEN is a junior homonym of *Clavulina cylindrica* D'ORBIGNY, 1826. HANTKEN in POSEWITZ (Borneo. - Verl. Friedländer and S., Berlin, 1889, Nachtrag p. 383) is giving a fossil list with *Clavulina cylindrica* HANTKEN = *Clavulina rudilosta* n. sp., but no further comments" has written RÖGL (in CICHA et al., 1998, p.93).

Stratigraphical range — "This species is so important in the Buda Marl as *Clavulina Szabói* in the *Clavulina Szabói* layers" - HANTKEN (1875a, b).

In Hungary, finds range from the Middle Eocene to the Lower Egerian. It is frequent in the Buda Marl Formation, Upper Eocene (SZTRÁKOS 1982; HORVÁTH 1998).

In the Central Paratethys *Cylindroclavulina rudilosta* occurs from Upper Eocene to Egerian (CICHA et al., 1998). In South Bulgaria, it ranges from the Middle Eocene to Lower Oligocene (DARAKCHIEVA 1999).

Ecology — There are no data for Recent distribution. In fossil sediments, it is frequent in the bathyal clayey marls and marls, such as the Padrag Marl and the Buda Marl Formations in the Eocene.

Subfamily Tritaxilininae LOEBLICH & TAPPAN, 1976
Genus *Tritaxilina* CUSHMAN, 1911
***Tritaxilina hantkeni* CUSHMAN, 1936**
(Plate I: 11, Plate II: 11)

non 1864 *Gaudryina Reussi* n. sp. — STACHE, p. 171, Taf. XXI, Fig.11a–d.
1868 *Gaudryina Reussi* n. sp. — HANTKEN, p. 83, pl. I, fig. 2.
1875a *Gaudryina Reussi* HANTKEN — HANTKEN, p. 14, Taf. I, Fig. 5.
1875b *Gaudryina Reussi* HANTKEN — HANTKEN, p. 10, pl. I, fig. 5.
1936 *Tritaxilina hantkeni* n. sp. — CUSHMAN, p. 41, pl. 6, fig. 13.
1962b *Tritaxilina hantkeni* (CUSHMAN) — MAJZON, pl. XXIX(I), fig. 5.
1978 *Tritaxilina reussi* (HANTKEN) — SZTRÁKOS, p. 71, pl. 6, fig.10.
1979 *Tritaxilina reussi* (HANTKEN) — SZTRÁKOS, p. 62, pl. 6, fig. 6.
1982 *Tritaxilina hantkeni* (CUSHMAN) — SZTRÁKOS, pl. 4. figs 13a–b.
1985 *Tritaxilina hantkeni* (CUSHMAN) — SIKIČ, pl. I, fig. 6.
1988 *Gaudryina reussi* HANTKEN — GELLAI-NAGY, pl. II, figs 1–2.
1998 *Tritaxilina hantkeni* CUSHMAN — CICHA et al., p. 132, pl. 10, fig. 12.

Lectotype — GELLAI-NAGY (1988), pl. II, figs 1–2.

Paralectotype — M.99.48., Budapest, Újlak, Kiscell Clay Formation, Upper Kiscellian.

Type locality — Budapest, Kis-Sváb-hegy.

Type level — Buda Marl Formation, Upper Eocene.

Material — Material: 97 specimens remained in Hantken Collections (Table 3).

Dimensions — Dimensions: length 2.1-2.5 mm, width 0.4-1.2 mm.

Diagnosis — The test is elongate, cylindrical. In the early growth stage the first four or five chambers are trochospiral. Later, the number of the chambers descreases to two per whorl, the test becomes biserial. The chambers are broad and low. The sutures are distinct, elevated, frequently thickened. The wall is thick and agglutinated. The aperture is terminal.

Remarks — "*Tritaxilina hantkeni* CUSHMAN is a nomen novum for *Gaudryina reussi* (HANTKEN 1868) not *Gaudryina reussi* STACHE (1864)" - wrote RÖGL (in CICHA et al., 1998).

Stratigraphical range — It is a rather common species, occurring in the lower and upper part of the Clavulina Szabói layers (HANTKEN 1875a, b). In Hungary, it is a typical and characteristic form of the lower part of the Buda Marl Formation (SZTRÁKOS 1978, 1982).

In the Central Paratethys its specimens ranges from the Upper Eocene to the Lower Egerian (CICHA et al., 1989). In Croatia, it occurs in the Oligocene (Rupelian) (SIKIČ, 1985).

Ecology — *Tritaxilina hantkeni* is an epifaunal fom, attached to hard substrates and feeding on suspension in normal marine environment (MURRAY 1973, 1991). It is typical in cold water, bathyal sediments.

Order Miliolida DELAGE & HÈROUARD, 1896
Superfamily Cornuspiracea SCHULTZE, 1854
Family Cornuspiridae SCHULTZE, 1854
Subfamily Cornuspirininae SCHULTZE, 1854
Genus:*Cornuspira* SCHULTZE, 1854

Cornuspira cf. *olygogyra* HANTKEN, 1875
(Plate I: 12, Plate II: 12)

1875a *Cornuspira olygogyra* — HANTKEN, S. 20, Taf. I, Fig. 10.
1875b *Cornuspira olygogyra* — HANTKEN, p. 16, pl. I, fig.. 10.
1935 *Cornuspira olygogyra* HANTKEN — CUSHMAN, p. 15, pl. 4, fig. 14.
1962b *Cornuspira olygogyra* HANTKEN — MAJZON, pl. XXIX(I), fig. 10.

Diagnosis — The test is discoidal. The proloculus is spherical, the second chamber is undivided and planispirally enrolled to four to five whorls tube-like and evolute. The wall is calcareous, porcelaneous and imperforate. The surface is smooth. The aperture is terminal at the open end of the tube.

Material — One specimen from Pilisborosjenő, brickyard, Kiscell Clay Formation, Upper Kiscellian.

Dimensions — Diameter 1 mm.

Remark — No specimen remained in the Hantken Collections in Hungary. I have found only a single similar specimen in the Kiscell Clay.

Stratigraphical range — It is very rare, HANTKEN (1875a, b) found this species in Budapest (Buda, Krisztinaváros, brickyard) in Kiscell Clay, Lower Oligocene. It is known also from Jackson Formation (USA), Upper Eocene (CUSHMAN, 1935).

Ecology — It is a normal marine, shelf dweller taxon, preferring cold water. The occurrence in the batyhal sediments may be allochtonous.

Suborder Miliolina DeLage & HÈROUARD, 1896
Superfamily Miliolacea EHRENBERG, 1839
Family Hauerinidae SCHWAGER, 1876
Subfamily Miliolinellinae VELLA, 1957
Genus *Triloculina* D'ORBIGNY, 1826

Triloculina porvaensis HANTKEN, 1875
(Plate I: 13, Plate II: 13)

1875a *Triloculina porvaensis* n. sp. — HANTKEN, S. 21, Taf. XIII, Fig. 3.
1875b *Triloculina porvaensis* — HANTKEN, p. 76, pl. XIII, fig. 3.
1962b *Triloculina porvaensis* HANTKEN — MAJZON, pl. XLI(XIII), fig. 3.
1970 *Triloculina porvaensis* HANTKEN — Le CALVEZ, p. 52, pl. 13, fig. 11.
1970 *Triloculina porvaensis* HANTKEN — NYÍRŐ, p. 71, pl. I, fig. 9.
1975 *Triloculina porvaensis* HANTKEN — BRAGA & GRÜNIG in BRAGA et al., p. 104.
1988 *Triloculina porvaensis* HANTKEN — HORVÁTH-KOLLÁNYI, p. 58, pl. VIII, figs 4–5.
1999 *Triloculina porvaensis* HANTKEN — OZSVÁRT, p. 87, pl. 2, fig.4.

Neotype — M.99.49.

Type locality Csordakút, Csordakút-2. brickyard, Csolnok Formation, Middle Eocene.

Material — Two specimens from OZSVÁRT (1999).

Dimensions — Length 1.4–1.7 mm, width 0.5–0.6 mm, and thickness 0.7 mm.

Diagnosis — The test is ovate in outline and equilaterally triangular in section. The chambers are one to half whorl long. The early growth stages are not preserved the available part is triloculine. Only three chambers are visible from the exterior. The wall is calcareous, porcelaneous and imperforate. The surface is ornamented by longitudinal costae. The aperture is rounded and having a short bifid tooth at the end of the final chamber.

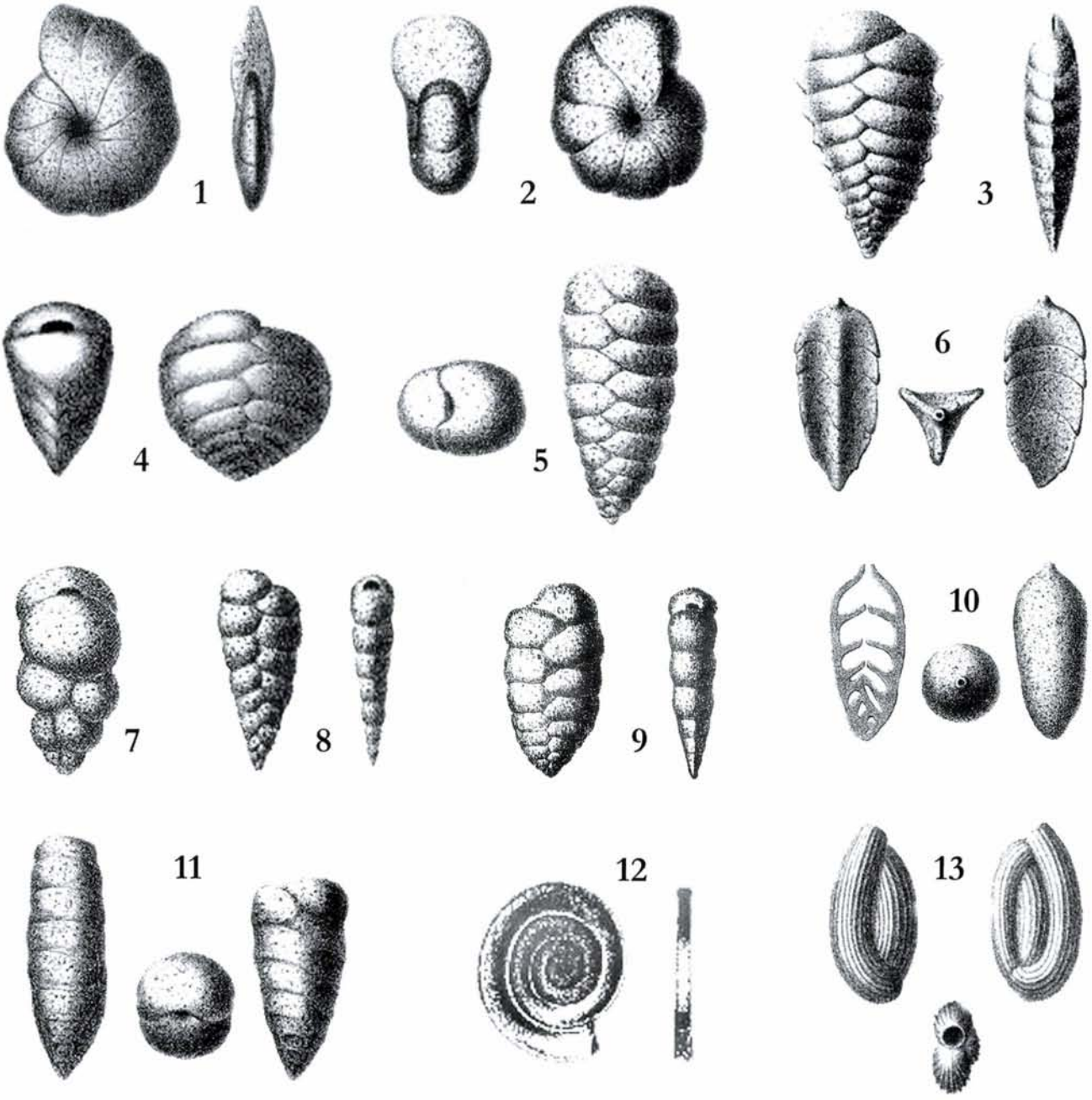
Remark: — HANTKEN (1875a, b) found one specimen in the Porva Marl (today Padrag Marl Formation), in the lowermost part of the *Clavulina Szabói* layers (HANTKEN 1875a, b).

Stratigraphical range — In Hungary it is known only in Middle Eocene from the Transdanubian Mountains localities (Nagyesztergár, Dudar, Csordakút; NYÍRŐ 1970; HORVÁTH-KOLLÁNYI 1988; OZSVÁRT 1999).

In Europe it is known from the Middle Eocene in the Paris Basin (Le CALVEZ 1970), and from the Upper Eocene sediments in Possagno (BRAGA & GRÜNIG in BRAGA et al. 1975).

Ecology — It is an epifaunal, marine, temperate or warm, euhalin species, living in upper bathyal sediments.

Plate I



Explanation to Plate I

1 *Haplophragmium acutidorsatum* HANTKEN, 1868, Taf. I, fig.1
2 *Haplophragmium rotundidorsatum* HANTKEN, 1875, Taf. I, fig. 2.
3 *Vulvulina pectinata* HANTKEN, 1868; 1875a, Taf. VII, fig. 10
4 *Textilaria subflabelliformis* HANTKEN, 1875, Taf. XV, Fig. 2.
5 *Gaudryina textilaroides* HANTKEN, 1875, Taf. I, Fig. 6.
6 *Clavulina Szabói* HANTKEN, 1868, pl. I., figs 4a–b, 6a–b, 7a–b.
7 *Gaudryina irregularis* HANTKEN, 1875, Taf. I, Fig. 7.
8 *Textilaria elongata* HANTKEN, 1875), Taf. XV, Fig. 3.
9 *Plecanium elegans* HANTKEN, 1868, Pl. I, fig. 5.
10 *Clavulina cylindrica* HANTKEN, 1875 a, Taf. I, Fig. 8.
11 *Gaudryina Reussi* HANTKEN, 1868, Pl. I, fig. 2.
12 *Cornuspira* cf. *olygogyra* HANTKEN, 1875a, Taf. I, Fig. 10.
13 *Triloculina porvaensis* HANTKEN, 1875a, Taf. XIII, Fig. 3.

(All figures are copied from HANTKEN's original publications.)

Plate II

Explanations to Plate II

1 *Reticulophragmium acutidorsatum* (HANTKEN, 1868) — Paralectotype. Budapest, Újlak, Kiscell Clay, Upper Kiscellian M = 32x
2 *Reticulophragmium rotundidorsatum* (HANTKEN, 1875) — Lectotype. Budapest, Újlak, Kiscell Clay, Upper Kiscellian. M = 41x
3 *Vulvulina pectinata* HANTKEN, 1868 — Paralectotype. Budapest, Újlak, Kiscell Clay, Upper Kiscellian. M = 40x
4 *Vulvulina subflabelliformis* (HANTKEN, 1875) — Paralectotype..Budapest, Újlak, Kiscell Clay, Upper Kiscellian. M = 60x
5 *Gaudryina textilaroides* HANTKEN, 1875 — Paralectotype. Budapest, Vár-hegy hill, Buda Marl, Upper Eocene. M = 20x
6 *Tritaxia szabói* (HANTKEN, 1868) — Paralectotype. Budapest, Kis-Sváb-hegy hill, Buda Marl, Upper Eocene. M = 20x
7 *Eggerella irregularis* (HANTKEN, 1875) — Lectotype. Budapest, Újlak, Kiscell Clay, Upper Kiscellian. M = 40x
8 *Textularia elongata* (HANTKEN, 1875a) — Neotype. Budapest, Óbuda, K-1 borehole, 83 m. Basic bed of Tard Clay, Lower Kiscellian. M = 54x
9 *Plecanium elegans* HANTKEN, 1868 — Paralectotype. Budapest, Újlak, Kiscell Clay Formation, Lower Oligocene. M = 32x
10 *Cylindroclavulina rudilosta* (HANTKEN, 1875a) — Paralectotype. Budapest, Kis-Sváb-hegy hill, Buda Marl Formation, Upper Eocene. M = 34x
11 *Tritaxilina hantkeni* CUSHMAN, 1936 (= *Gaudryina Reussi* HANTKEN, 1868) — Paralectotype. Budapest, Újlak, Kiscell Clay, Upper Kiscellian. M = 36x
12 *Cornuspira* cf. *olygogyra* HANTKEN, 1875a — Budapest, Újlak, Kiscell Clay Formation, Upper Kiscellian. M = 56x
13 *Triloculina porvaensis* HANTKEN, 1875a — Neotype. Csordakút-2. brickyard, Csolnok Marl Formation, Middle Eocene. M = 47x

Appendix

"Textilaria" globosa HANTKEN, 1875

1875a *Textilaria globosa* — HANTKEN, S. 67, Taf. XV, Fig. 5.
1875b *Textilaria globosa* — HANTKEN, p. 58.
Textilaria globulosa — HANTKEN, pl. XV, fig. 5.
1962b *Bolivina globosa* (HANTKEN) — MAJZON, pl. XLIII(XV), fig. 5.
1966 *Bolivina globosa* (HANTKEN, 1875) — LINDENBERG, S. 98, Abb. 6, 13a–b, 14

Remarks — No specimen remained in the Hantken Collections in Hungary. MAJZON (1962b) renamed it on the basis of HANTKEN's description and figure. As I have not found similar form in our material, I could not accomodate it in the system of LOEBLICH & TAPPAN (1988).

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Author's address:

Dr. Mária HORVÁTH
Department of General and Historical Geology
Eötvös Loránd Univesity
1117 Budapest, Pázmány Péter sétány 1/c
Hungary
E-mail: hmaria@iris.geobio.elte.hu