

**Oriented thin-sections of isolated Paleogene benthic foraminifera.  
A catalogue from the micropalaeontological collection of the Hungarian Natural History  
Museum, Budapest**

by  
Péter OZSVÁRT

**Abstract** — The micropalaeontological collection of the Hungarian Natural History Museum is the largest repository in Hungary with over 7000 inventory items. It contains small and large benthic foraminifera slides, assemblages and residues (including 95 holotypes and paratypes of foraminifera) and an oriented thin-sections collection. A catalogue and brief taxonomic descriptions of this oriented thin-sections of isolated Paleogene small benthic foraminifera from Hungary is given here.

**Keywords** — Oriented thin-section, small benthic foraminifera, taxonomy, Paleogene, Hungary.

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### Introduction

The micropalaeontological collection of the Hungarian Natural History Museum is a part of the invertebrate collection of the Department of Geology and Palaeontology. Practically, this separately curated collection contains more than 7000 inventory items: micropalaeontological assemblage slides and residues, large benthic foraminifera slides (mainly *Nummulites* and *Discocyclina*). It also includes 95 holotypes and paratypes of foraminifera species.

The micropalaeontological collection was founded by Á. FRANZENA and by the world-wide renowned foraminiferologist M. HANTKEN. FRANZENA was engaged mainly in the study of Miocene foraminifers. In his 19 palaeontological papers several new genera and species were described. In addition, he was a pioneer in studying the shell structure of foraminifera. His papers and the taxa that he introduced are referred to even today (KECSKEMÉTI & NAGY 1991).

M. HANTKEN also had a world-wide reputation for the palaeontological and stratigraphical study of Paleogene foraminifera at that time. The micropalaeontological collection includes his *Nummulites* slides, and his benthic foraminifera collection, which was the base of the classification of Paleogene horizons in Hungary. His extremely beautifully prepared *Nummulites* spp. were unique in the second half of 19<sup>th</sup> century and they are the most valuable

portion of the collection.

The micropalaeontological collection was enriched with more than 6000 large foraminifera inventory items from wells and outcrops from over 40 countries world-wide by T. KECSKEMÉTI in the second half of 20<sup>th</sup> century.

The micropalaeontological collection also contains a small thin-sections collection. We do not know exactly who made these magnificent thin-sections. Presumably, they could be belonged to the FRANZENA's collection. Currently, this unique slide collection contains 57 oriented thin-sections of isolated Paleogene small benthic foraminifera from Hungary. Each isolated foraminifera were mounted on regular (27×46 mm) petrographic slides (Figure 1) and polished until the structure of foraminifera test is thin enough for light to pass through it. This allows the internal details of the chambers and structure to be seen. The collection has subsequently been curated and catalogued.

The present paper aims to publish the catalogue of the thin-sections collection (Table I). The fifty-seven thin-sections contain twenty-four identified small benthic foraminifera species and four unidentified benthic foraminifera species. Brief taxonomic description of 14 characteristic and well identified species is given here.

### Systematic palaeontology

Order Foraminifera EICHWALD, 1830  
Suborder Lagenina DELAGE & HÉROUARD, 1896  
Superfamily Nodosariacea EHRENBERG, 1838  
Family Vaginulinidae REUSS, 1860  
Subfamily Lenticulininae CHAPMAN, PARR & COLLINS, 1934  
***Lenticulina cultrata* (MONTFORT, 1808)**  
(Plate I: 1)

1808: *Robulus cultratus* n. sp. — MONTFORT, p. 214 (fide: ELLIS & MESSINA 1951)

**Original label** — *Cristellaria cultrata* (D'ORBIGNY, 1846).

**Locality** — Buda Újlak (Budapest).

**Description** — Wall calcareous, completely transparent. Test planispiral, broadly circular in outline. Six or seven chambers visible in final whorl, increasing gradually in

size; 15 chambers visible in the whole test; aperture terminal. Large-sized protoconch present. Tangential and straight sutures visible between the chambers.

**Dimensions** — Diameter of the test is 3–3.5 mm. Width of the test at widest point is 3.5 mm.

***Lenticulina kubinyii* (HANTKEN, 1875)**

(Plate I: 2–3)

1875: *Robulina kubinyii* n. sp. — HANTKEN, p. 47, Plate VI, fig. 7.

**Original label** — *Robulina kubinyii* HANTKEN, 1875.

**Locality** — Sárissáp.

**Description** — Wall calcareous, completely transparent. Test planispiral, broadly oval in outline. Twelve chambers in final whorl. Chambers elongated, increasing gradually in size. Sutures straight, slightly curved backwards.

Relatively large sized and rounded protoconch visible in cross section. Wide, irregular carina present. Aperture terminal, hardly visible.

**Dimensions** — Diameter of the test is 2.5–3.0 mm. Width of the test at widest point is 3.0 mm

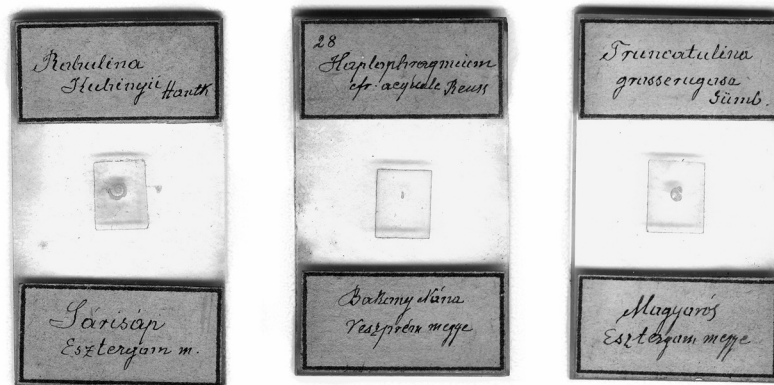


Figure 1 — Three oriented thin-sections of isolated Paleogene small benthic foraminifera.

***Lenticulina limbosa* (REUSS, 1863)**

(Plate I: 4)

1863: *Robulina limbosa* n. sp. — REUSS, (fide: ELLIS & MESSINA, 1951)

**Original label** — *Robulina limbosa* REUSS, 1863.

**Locality** — Buda Újlak (Budapest).

**Description** — Test planispiral, broadly circular in outline. Ten or eleven chambers in adult coil, increasing gradually in size as added. Small sized and rounded

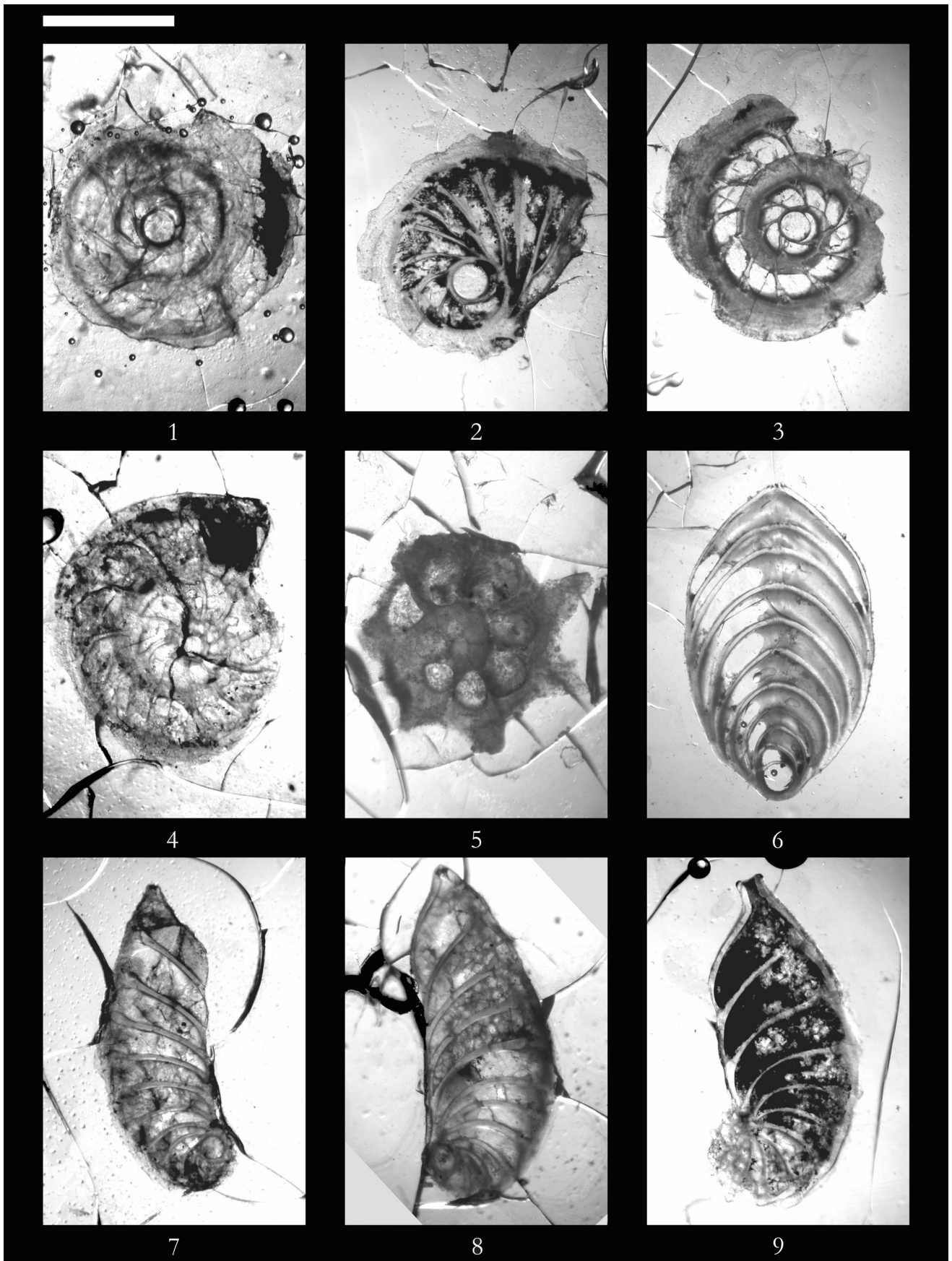
protoconch visible in cross section. Sutures oblique, slightly raised, strongly curved backwards. Aperture on outer side of last chamber.

**Dimensions** — Diameter of the test is 2.3–2.5 mm. Width of the test at widest point is 2.5 mm.

**Explanation to Plate I**

- 1 *Lenticulina cultrata* (MONTFORT, 1808) — scale = 1.5 mm.
- 2–3 *Lenticulina kubinyii* (HANTKEN, 1875) — scale = 2.0 mm.
- 4 *Lenticulina limbosa* (REUSS, 1863) — scale = 1.8 mm.
- 5 *Lenticulina calcar* (LINNÉ, 1758) — scale = 2.0 mm.
- 6 *Palmula budensis* (HANTKEN, 1875) — scale = 500  $\mu$ m.
- 7 *Marginulina arcuata* (PHILIPPI, 1843) — scale = 500  $\mu$ m.
- 8 *Marginulina gladius* (PHILIPPI, 1843) — scale = 500  $\mu$ m.
- 9 *Marginulina granosum* (D'ORBIGNY, 1825) — scale = 500  $\mu$ m.

Plate I



***Lenticulina calcar* (LINNÉ, 1758)**

(Plate I: 5)

1758: *Nautilus calcar* n. sp. — LINNÉ, p. 709 (fide: ELLIS & MESSINA 1951)**Original label** — *Rotalia calcar* (LINNÉ, 1758).**Locality** — No data.**Description** — Test planispiral, wall calcareous, moderately transparent; chambers bearing small spines;

ten or eleven chambers in adult coil, increasing gradually in size as added. Aperture terminal, hardly visible.

**Dimensions** — Diameter of the test is 2.0–2.3 mm. Width of the test at widest point is 2.3 mm.

Subfamily Palmulinae SAIDOVA, 1981

***Palmula budensis* (HANTKEN, 1875)**

(Plate I: 6)

1875: *Flabellina budensis* n. sp. — HANTKEN, p. 37, Plate IV, fig. 17.**Original label** — *Flabellina budensis* HANTKEN, 1875.**Locality** — Buda Újlak (Budapest), Kiscell Clay Formation.**Description** — Test monoserial, oval shaped in cross section; wall of test calcareous, completely transparent.

Eleven chambers in adult coil, increasing gradually in size as added. Small sized and rounded protoconch visible in cross section. Aperture at top of the last chamber.

**Dimensions** — Length of the test is 600 µm, width of the test is 300 µm.

Subfamily Marginulininae WEDEKIND, 1937

***Marginulina arcuata* (PHILIPPI, 1843)**

(Plate I: 7)

1843: *Marginulina arcuata* n. sp. — PHILIPPI, p. 5, p. I, f. 28. (fide: ELLIS & MESSINA 1951)1875: *Cristellaria arcuata* PHILIPPI — HANTKEN, p. 43, Plate V, fig. 10.**Original label** — *Cristellaria arcuata* (PHILIPPI, 1843).**Locality** — Budapest, Kis-Sváb-hegy.**Description** — Test calcareous, early chambers planispiral, later chambers becoming monoserial. Length of test approximately three and half times longer than maximum width. Twelve chambers in adult coil, increasing gradually

in size as added. Relatively large sized and rounded protoconch visible in cross section. Sutures oblique, strongly curved backwards between earlier chambers, later raised. Aperture on outer part of last chamber.

**Dimensions** — Length of the test is 650 µm, width of the test is 200 µm.***Marginulina gladius* (PHILIPPI, 1843)**

(Plate I: 8)

1843: *Marginulina gladius* n. sp. — PHILIPPI, p. 6, Plate I, fig. 37. (fide: ELLIS & MESSINA 1951)1875: *Cristellaria gladius* PHILIPPI — HANTKEN, p. 43, Plate V, fig. 12.**Original label** — *Cristellaria gladius* (PHILIPPI, 1843).**Locality** — Budapest, Kis-Sváb-hegy.**Description** — Test calcareous, early chambers planispiral, later chambers becoming monoserial. Length of test approximately two and half times longer than maximum width. Twelve chambers in adult coil, increasing gradually in size as added. Moderately large sized and rounded protoconch visible in cross section. Sutures oblique, strongly

curved backwards between earlier chambers, later raised. Aperture on outer part of last chamber.

**Remarks** — *Marginulina gladius* (PHILIPPI) is hardly different from the *Marginulina arcuata* (PHILIPPI) in the thin section.**Dimensions** — Length of the test is 600 µm, width of the test is 250 µm.***Marginulina granosum* (D'ORBIGNY, 1825)**

(Plate I: 9)

1825: *Nonionina granosa* n. sp. — D'ORBIGNY, p. 128, nr. 17 (fide: ELLIS & MESSINA 1951)**Original label** — *Cristellaria granosa* (D'ORBIGNY, 1825).**Locality** — No data.**Description** — Test calcareous, earlier chambers planispiral, later chambers becoming monoserial. Length of the test approximately two times longer than maximum width. Eleven chambers in adult coil, increasing gradually in size as added. Sutures oblique, strongly curved back-

wards. Aperture on a long neck on outer part of last chamber.

**Remarks** — *Marginulina granosum* (D'ORBIGNY), is distinguished from *Marginulina arcuata* (PHILIPPI) and *Marginulina gladius* (PHILIPPI) by the longer aperture on the last chamber.**Dimensions** — Length of the test is 650 µm, width of the test is 200 µm.

Table I — Catalogue of the oriented thin-sections collection.

Inv. No.	Taxon	Valid name	Locality (original spelling)	Locality (modern names)
2005.108.1.	<i>Clavulina triquetra</i>	<i>Clavulina triquetra</i>	Budakesz, Mély árok	Budakeszi, Mély-árok
2005.109.1.	<i>Clavulina triquetra</i>	<i>Clavulina triquetra</i>	Budakesz, Mély árok	Budakeszi, Mély-árok
2005.110.1.	<i>Cristellaria arcuata</i>	<i>Marginulina arcuata</i>	Budapest, Kis-Svábhegy	Budapest, Kis-Svábhegy
2005.111.1.	<i>Cristellaria gladius</i>	<i>Marginulina gladius</i>	Buda, Kis-Svábhegy	Budapest, Kis-Svábhegy
2005.112.1.	<i>Cristellaria gladius</i>	<i>Marginulina gladius</i>	Buda, Kis-Svábhegy	Budapest, Kis-Svábhegy
2005.113.1.	<i>Cristellaria gladius</i>	<i>Marginulina gladius</i>	Buda, Kis-Svábhegy	Budapest, Kis-Svábhegy
2005.114.1.	<i>Cristellaria gladius</i>	<i>Marginulina gladius</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.115.1.	<i>Cristellaria gladius</i>	<i>Marginulina gladius</i>	Buda, Kis-Svábhegy	Budapest, Kis-Svábhegy
2005.116.1.	<i>Cristellaria gladius</i>	<i>Marginulina gladius</i>	Buda, Kis-Svábhegy	Budapest, Kis-Svábhegy
2005.117.1.	<i>Cristellaria granosa</i>	<i>Marginulina granosum</i>	Tokod	Tokod
2005.118.1.	<i>Cristellaria granosa</i>	<i>Marginulina granosum</i>	Tokod	Tokod
2005.119.1.	<i>Cristellaria</i> sp.	<i>Marginulina</i> sp.	Jásd, Veszprém megye	Jásd, Veszprém-megye
2005.120.1.	<i>Cristellaria</i> sp.	<i>Marginulina</i> sp.	Jásd, Veszprém megye	Jásd, Veszprém-megye
2005.121.1.	<i>Cristellaria</i> sp.	<i>Marginulina</i> sp.	Szápár, Veszprém	Szápár, Veszprém-megye
2005.122.1.	<i>Cristellaria</i> sp.	<i>Marginulina</i> sp.	Szápár, Veszprém	Szápár, Veszprém-megye
2005.123.1.	<i>Cristellaria</i> sp.	<i>Marginulina</i> sp.	Szápár, Veszprém	Szápár, Veszprém-megye
2005.124.1.	<i>Flabellina budensis</i>	<i>Palmula budensis</i>	Buda Újlak, Kiscelli tájag	Budapest, Buda, Újlak, Kiscell Clay Fm.
2005.125.1.	<i>Haplostiche dentalinoides</i>	<i>Haplostiche dentalinoides</i>	Jásd, Veszprém megye	Jásd, Veszprém-megye
2005.126.1.	<i>Haplobragmium</i> cfr. <i>aequale</i>	<i>Haplobragmium</i> cf. <i>aequale</i>	BakonyNána, Veszprém megye	Bakonynána, Veszprém-megye
2005.127.1.	<i>Haplobragmium</i> cfr. <i>aequale</i>	<i>Haplobragmium</i> cf. <i>aequale</i>	BakonyNána, Veszprém megye	Bakonynána, Veszprém-megye
2005.128.1.	<i>Haplobragmium rotundidorsatum</i>	<i>Haplobragmium rotundidorsatum</i>	Nagykovácsi, Pest megye	Nagykovácsi, Pest-megye
2005.129.1.	<i>Haplostiche dentalinoides</i>	<i>Haplostiche dentalinoides</i>	Jásd, Veszprém megye	Jásd, Veszprém-megye
2005.130.1.	<i>Heterostegina carpatica</i>	<i>Heterostegina carpatica</i>	Buda, Kis-Svábhegy	Budapest, Kis-Svábhegy
2005.131.1.	<i>Plecanium</i> cfr. <i>parallellum</i>	<i>Plecanium</i> cf. <i>parallellum</i>	Jásd, Veszprém megye	Jásd, Veszprém-megye
2005.132.1.	<i>Plecanium</i> cfr. <i>parallellum</i>	<i>Plecanium</i> cf. <i>parallellum</i>	Jásd, Veszprém megye	Jásd, Veszprém-megye
2005.133.1.	<i>Plecanium</i> sp.	<i>Plecanium</i> sp.	Kis-Győr, Táblabánya völgy, Borsod megye	Kisgyőr, Táblabánya-völgy, Borsod-megye
2005.134.1.	<i>Plecanium</i> sp.	<i>Plecanium</i> sp.	Kis-Győr, Táblabánya völgy, Borsod megye	Kisgyőr, Táblabánya-völgy, Borsod-megye
2005.135.1.	<i>Polystomella latidorsata</i>	<i>Polystomella latidorsata</i>	Budakesz, Mély árok	Budakeszi, Mély-árok
2005.136.1.	<i>Pulvinulina haidingeri</i>	<i>Eponides haidingeri</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.137.1.	<i>Pulvinulina haidingeri</i>	<i>Eponides haidingeri</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.138.1.	<i>Pulvinulina haidingeri</i>	<i>Eponides haidingeri</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.139.1.	<i>Pulvinulina haidingeri</i>	<i>Eponides haidingeri</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.140.1.	<i>Pulvinulina</i> sp.	<i>Eponides</i> sp.	Budakesz, Mély árok	Budakeszi, Mély-árok
2005.141.1.	<i>Pulvinulina</i> sp.	<i>Eponides</i> sp.	Budakesz, Mély árok	Budakeszi, Mély-árok
2005.142.1.	<i>Pulvinulina umbonata</i>	<i>Eponides umbonata</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.143.1.	<i>Rhinchospira abnormis</i>	<i>Rhinchospira abnormis</i>	Buda, Várhegy, Lónyai féle ház, Budai márga	Budapest, Buda, Várhegy, Lónyai féle ház (?), Buda Marl Fm.
2005.144.1.	<i>Robulina cultrata</i>	<i>Lenticulina cultrata</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.145.1.	<i>Robulina cultrata</i>	<i>Lenticulina cultrata</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.146.1.	<i>Robulina kubinyii</i>	<i>Lenticulina kubinyii</i>	Sárisáp	Sárisáp
2005.147.1.	<i>Robulina kubinyii</i>	<i>Lenticulina kubinyii</i>	Sárisáp	Sárisáp
2005.148.1.	<i>Robulina kubinyii</i>	<i>Lenticulina kubinyii</i>	Sárisáp	Sárisáp
2005.149.1.	<i>Robulina limbosa</i>	<i>Lenticulina imbosa</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.150.1.	<i>Robulina limbosa</i>	<i>Lenticulina imbosa</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.151.1.	<i>Robulina limbosa</i>	<i>Lenticulina imbosa</i>	Buda, Újlak	Budapest, Buda, Újlak
2005.152.1.	<i>Robulina limbosa</i>	<i>Lenticulina imbosa</i>	Sárisáp	Sárisáp
2005.153.1.	<i>Rotalia calcar</i>	<i>Lenticulina calcar</i>	Budakesz, Mély árok	Budakeszi, Mély-árok
2005.154.1.	<i>Rotalia calcar</i>	<i>Lenticulina calcar</i>	Budakesz, Mély árok	Budakeszi, Mély-árok
2005.155.1.	<i>Rotalia</i> sp.	<i>Lenticulina</i> sp.	Kis-Győr, Táblabánya völgy, Borsod megye	Kisgyőr, Táblabánya-völgy, Borsod-megye
2005.156.1.	<i>Rotalia</i> sp.	<i>Lenticulina</i> sp.	Kis-Győr, Táblabánya völgy, Borsod megye	Kisgyőr, Táblabánya-völgy, Borsod-megye
2005.157.1.	<i>Rotalina beccaria</i>	<i>Ammonia beccari</i>	Buda	Budapest, Buda
2005.158.1.	<i>Tritaxia tricarinata</i>	<i>Tritaxia tricarinata</i>	Jásd, Veszprém megye	Jásd, Veszprém-megye
2005.159.1.	<i>Trochamina conica</i>	<i>Trochamina conica</i>	Budakeszi	Budakeszi
2005.160.1.	<i>Truncatulina grosserugosa</i>	<i>Epistomaroides grosserugosa</i>	Mogyorós	Mogyorós
2005.161.1.	<i>Truncatulina grosserugosa</i>	<i>Epistomaroides grosserugosa</i>	Mogyorós	Mogyorós
2005.162.1.	<i>Truncatulina grosserugosa</i>	<i>Epistomaroides grosserugosa</i>	Mogyorós	Mogyorós
2005.163.1.	<i>Truncatulina grosserugosa</i>	<i>Epistomaroides grosserugosa</i>	Mogyorós	Mogyorós
2005.164.1.	<i>Virgulina hungarica</i>	<i>Fursenkoina hungarica</i>	Dorog	Dorog

Suborder Rotaliina DELAGE & HÉROUARD, 1879  
 Superfamily Fursenkoinacea LOEBLICH & TAPPAN, 1961  
 Family Fursenkoinidae LOEBLICH & TAPPAN, 1961  
*Fursenkoina hungarica* (HANTKEN, 1868)  
 (Plate II: 1)

1868: *Virgulina hungarica* n. sp. — HANTKEN, p. 92., P III, f. 26.

**Original label** — *Virgulina hungarica* HANTKEN, 1868.

**Locality** — Dorog.

**Description** — Test calcareous, alternate biserial, elongate, length about three and half times longer than

width. Chambers, sutures and aperture hardly visible in thin section.

**Dimensions** — Length of the test is 400 µm, width of the test is 150 µm.

Superfamily Discorbacea EHRENBERG, 1838  
 Family Eponididae HOFKER, 1951  
 Subfamily Eponidinae HOFKER, 1951  
*Eponides haidingeri* (D'ORBIGNY, 1846)  
 (Plate II: 2–3)

1846: *Rotalina haidingeri* n. sp. — D'ORBIGNY, p. 154., T. 8., f. 7–9.

**Original label** — *Pulvinulina haidingeri* (D'ORBIGNY, 1846).

**Locality** — Buda Újlak (Budapest).

**Description** — Test planispiral, broadly circular in outline, thick calcareous wall; 6–8 chambers visible in final

whorl, increasing gradually in size and 14 chambers visible in whole test. Protoconch hardly visible in cross section; sutures oblique.

**Dimensions** — Diameter of the test is 2.5 mm.

*Eponides umbonata* (REUSS, 1851)  
 (Plate II: 4–5)

1851: *Rotalia umbonata* n. sp. — REUSS, p. 75., T. V, f. 35 a–c. (fide ELLIS et MESSINA 1951)

**Original label** — *Pulvinulina umbonata* (REUSS, 1851).

**Locality** — Buda Újlak (Budapest).

**Description** — Test planispiral, broadly circular in out-

line, thick calcareous wall; rounded protoconch; chambers increasing gradually in size; sutures and aperture hardly visible.

**Dimensions** — Diameter of the test is 2.3 mm.

Superfamily Planorbulinacea SCHWAGER, 1877  
 Family Victoriellidae CHAPMAN & CRESPIAN, 1930  
*Victoriella abnormis* (HANTKEN, 1875)  
 (Plate II: 6)

1875: *Rhynchospira abnormis* n. sp. — HANTKEN, p. 60, Plate VII, figs 17–19.

**Original label** — *Rhynchospira abnormis* HANTKEN, 1875.

**Locality** — Buda, Várhegy (Budapest).

**Description** — Test alternate biserial, thick calcareous wall, elongate, length about two and half times width. 8

chambers visible in thin-section, increasing gradually in size. Aperture forms interiomarginal slit.

**Dimensions** — Length of the test is 2.5 mm, width of the test is 1.0 mm.

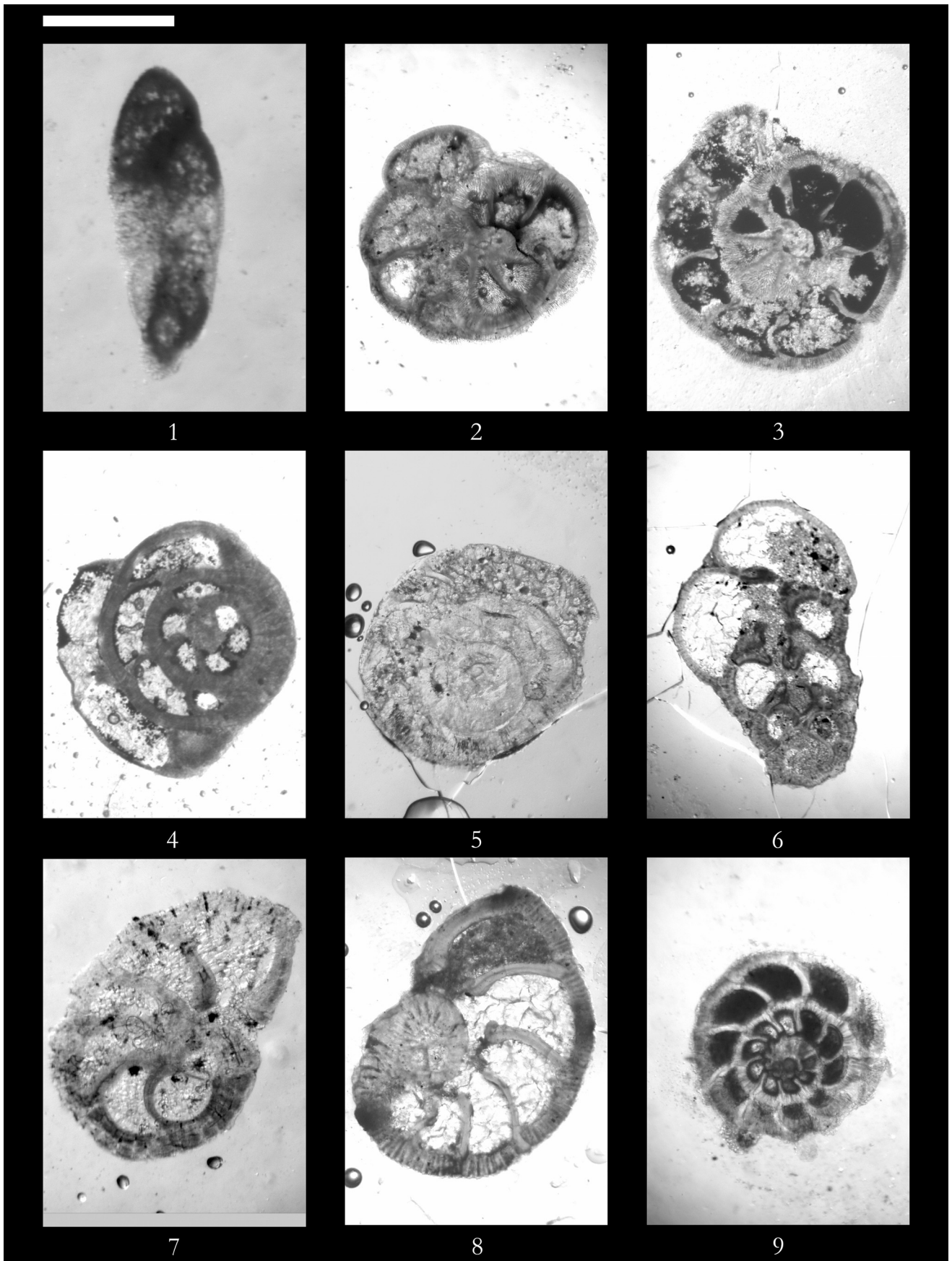
Superfamily Acervulinacea SCHULTZE, 1854  
 Family Alfredinidae S. N. SINGH & KALIA, 1972  
*Epistomaroides grosserugosa* (GÜMBEL, 1868)  
 (Plate II: 7–8)

1868: *Truncatulina grosserugosa* n. sp. — GÜMBEL, p. 82, T. 2, f. 104. (fide ELLIS & MESSINA 1951)

Explanation to Plate II

- 1 *Fursenkoina hungarica* (HANTKEN, 1868) — scale = 300 µm.  
 2–3 *Eponides haidingeri* (D'ORBIGNY, 1846) — scale = 2.0 mm.  
 4–5 *Eponides umbonata* (REUSS, 1851) — scale = 2.0 mm.  
 6 *Victoriella abnormis* (HANTKEN, 1875) — scale = 2.0 mm.  
 7–8 *Epistomaroides grosserugosa* (GÜMBEL, 1868) — scale = 1.5 mm.  
 9 *Ammonia beccari* (LINNÉ, 1758) — scale = 2.5 mm.

Plate II



**Original label** — *Truncatulina grosserugosa* GÜMBEL, 1868.

**Locality** — Mogyorós.

**Description** — Test planispiral, broadly oval shaped in outline, thick calcareous wall. 6 chambers visible in final whorl, increasing gradually in size. Relatively large

sized and rounded protoconch visible in cross section. Sutures strongly curved backwards. Aperture forms interior-marginal slit.

**Dimensions** — Length of the test is 2.8 mm, width of the test is 1.6 mm.

Superfamily Rotaliacea EHRENBERG, 1839

Family Rotaliidae EHRENBERG, 1839

Subfamily Ammoninae SAIDOVA, 1981

***Ammonia beccari* (LINNÉ, 1758)**

(Plate II: 9)

1758: *Nautilus beccari* n. sp. — LINNÉ, p. 710 (fide ELLIS & MESSINA 1951)

**Original label** — *Rotalina beccaria* (LINNÉ, 1758)

**Locality** — Buda.

**Description** — Test planispiral, broadly circular in outline, thick calcareous wall. Six or eight chambers visible in final whorl, increasing gradually in size and 24 chambers

visible in whole test. Relatively large sized and rounded protoconch visible in cross section. Sutures strongly curved backwards. Aperture hardly visible.

**Dimensions** — Diameter of the test is 2.5 µm.

### Discussion

The most significant morphologic character of the investigated foraminifera species is the thickness of their wall. On the basis of wall thickness the calcareous benthic foraminifera can be divided into three groups. The first group, the thin-walled and small (length of elongate <650 µm) foraminifera species includes: *Palmula budensis* HANTKEN; *Marginulina arcuata* (PHILIPPI); *Marginulina gladius* (PHILIPPI); *Marginulina granosum* (D'ORBIGNY) and *Virgulina hungarica* HANTKEN. The thin-walled test is common in dysoxic environment and may be related to the difficulty of secreting calcium carbonate in environments with very low oxygen content (RHOADS & MORSE 1971).

The second group of taxa includes the rounded planispiral or broadly oval and circular forms with terminal

aperture on the outer part of last chamber (*Lenticulina cultrata* (MONTFORT), *Lenticulina kubinyii* HANTKEN, *Lenticulina limbosa* (REUSS), *Lenticulina calcar* (LINNÉ) and *Victoriella abnormis* (HANTKEN)). Many authors (e. g. BOERSMA 1986; ROSOFF & CORLISS 1992; KAIHO 1994) reported that these taxa are associated with low- or intermediate-oxygen conditions (suboxic environment, KAIHO 1994) in modern and subrecent ocean.

The third group includes foraminifera taxa with thick wall, relatively large test (>650 µm) and rounded planispiral, spherical test shapes (*Eponides haidingeri* (D'ORBIGNY), *Epistomaroides grosserugosa* (GÜMBEL) and *Ammonia beccari* (LINNÉ)). Such taxa are typical of high-oxygen conditions (oxic environment, KAIHO 1994).

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### Author's address:

Dr. Péter OZSVÁRT  
 Research Group for Palaeontology  
 Hungarian Academy of Sciences – Hungarian Natural History Museum  
 Budapest, VIII, Ludovika tér 2.  
 Mail: 1431 Budapest, pf. 137, Hungary  
 E-mail: ozsi@nhmus.hu