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.


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 *Dissoyclina*). It also includes 95 holotypes and paratypes of foraminifera species.

The micropalaeontological collection was founded by Á. FRANZENAU and by the world-wide renowned foraminiferologist M. HANTKEN. FRANZENAU 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 19th 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 20th 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 FRANZENAU’s collection. Currently, this unique slide collection contains 37 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 culttata* (MONTFORT, 1808)

(Plate I: 1)

1808: *Robulus culttatu* 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 — Sárisáp.
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 µm.
7 Marginulina arcuata (PHILIPPI, 1843) — scale = 500 µm.
8 Marginulina gladius (PHILIPPI, 1843) — scale = 500 µm.
9 Marginulina granosum (D’ORBIGNY, 1825) — scale = 500 µm.
Oriented thin-sections of isolated Paleogene benthic foraminifera

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)


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 backwards. 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.

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Suborder Rotaliina DELAGE & HÉROUARD, 1879
Superfamily Fursenkoinacea LOEBLICH & TAPPAN, 1961
Family Fursenkoinidae LOEBLICH & TAPPAN, 1961

**Fursenkoina hungarica (HANTKEN, 1868)**
(Plate II: 1)


**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)


**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 outline, 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 & CRESPIN, 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.

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Plate II
HANTKEN; µm) foraminifera species includes: final whorl, increasing gradually in size. Relatively large in outline, thick calcareous wall. Six or eight chambers visible in final whorl, increasing gradually in size. Relatively large and rounded protoconch visible in cross section. Sutures strongly curved backwards. Aperture forms intermarginal slit.

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

Superfamily Rotaliacea EHRENBERG, 1839
Family Rotalidae EHRENBERG, 1839
Subfamily Ammoniinae 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 oval 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 foraminifers 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 budesis* 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 calcis* (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, realltively large test (>650 µm) and rounded planispiral, spherical test shapes (*Epistomaroides grosserugosa* (GÜMBEL) and *Ammonia beccari* (LINNÉ)). Such taxa are typical of high-oxygen conditions (oxic environment, KAIHO 1994).

**References**


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