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Foraminifera from the Norian–Rhaetian reef carbonates of the Taurus Mountains (Saklıkent, Turkey)

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Abstract: Norian–Rhaetian reef carbonates are exposed in several localities in Taurus Mountains. They predominately contain hypercalcified sponges, followed by scleractinian corals and other less numerous organisms. A coherent Norian–Rhaetian reef structure is exposed near the small town of Saklıkent, west of Antalya. Foraminifers occur in reef carbonates of Saklıkent by numerous genera as shown in this paper. Two species — *Siculocosta taurica* and *Siculocosta sadati* — are described as new. The foraminiferal association of Saklıkent is similar or almost identical to the associations known from the Norian–Rhaetian reefs of Sicily, Northern Calcareous Alps, and Greece but shows less similarity to the foraminiferal association from the Apennines, Italy. The most abundant foraminifers are milioliporoids, particularly galeanellids and cucurbitids. Some sessile and agglutinated foraminifers, including *Alpinophragmium perforatum* Flügel, which mostly occurs abundantly in the Norian–Rhaetian reef carbonates, could not be found in the Saklıkent reef. This association of foraminifera is reported for the first time from a Norian–Rhaetian reef in the Taurus Mountains of Turkey.

Keywords: Foraminifera, Upper Triassic, reef, Saklıkent, Taurus Mountains, Turkey.

Introduction

In the Taurus Mountains of southern Turkey, Upper Triassic (Carnian, Norian–Rhaetian) reef carbonates are exposed as reef boulders ("Cipit" blocks) in several localities, embedded within the siliciclastic Kasımlar and Dereköy basins. The main reef builders of such Cipit blocks are hypercalcified sponges or scleractinian corals. Some sponges and other organisms of these boulders were described by Senowbari-Daryan & Link (e.g., 2011, 2014, 2015). Generally the fossil associations of these boulders are different from the Norian–Rhaetian associations of the reef structures in other localities in the Tethyan realm (e.g., Northern Calcareous Alps, Austria: Schäfer & Senowbari-Daryan 1981, Sicily: Senowbari-Daryan 1984, Greece: own observations). Foraminifers and typical microproblematic organisms of the Norian-Rheaetian reefs are rare or missing in the Cipit boulders.

A coherent Norian–Rhaetian reef structure crops out around the small village of Saklıkent, about 30 km west of Antalya (Fig. 1). The organism associations, including sponges, corals, foraminifers and problematic organisms of this reef complex are distinctly different from the reef boulders in the Kasımlar or Dereköy basins. The organism associations, especially concerning the foraminifers and microproblematica, are similar to the associations known from the other contemporary Norian–Rhaetian reefs from Sicily, Northern Calcareous Alps, Greece and subordinately Apennines in southern Italy and Oman (e.g., Bernecker 1996). The majority of the foraminiferal fauna described in this paper is not known from the other localities in Turkey.

Saklıkent locality

The Saklıkent locality is a part of the Western Antalya Nappes, Gödene zone (Robertson & Woodcock 1981). The "local mountain" Bakırlı Dağı, south of Saklıkent, and the hills east of the winter resort are composed of massive carbonates of Jurassic to Cretaceous age. Sandwiched between the massive carbonates at the Saklıkent locality is a small tectonic block with a size of some hundred metres, representing Norian reef carbonates. Typical for these reef carbonates is a snow white colour, which is very different to the grey and brown reef carbonates of Cipit boulders in other localities in Turkey. The reef carbonates of the Saklıkent locality are unique and an outlier. A similar occurrence of this reef carbonate type is not yet known in the Taurus Mountains.

Systematic palaeontology

Before the description of the majority of species a (most probably) incomplete synonymy-list is given. Beside the brief descriptions of species the original references and partial descriptions are referred.

Family: Cucurbitidae Zaninetti, Altiner, Dager & Ducret, 1982a
Genus: *Cucurbita* Jablonsky, 1973

Synonymy: *Paratintinnina* Borza & Samuel, 1977b; *Pseudocucurbita* Borza & Samuel, 1978.

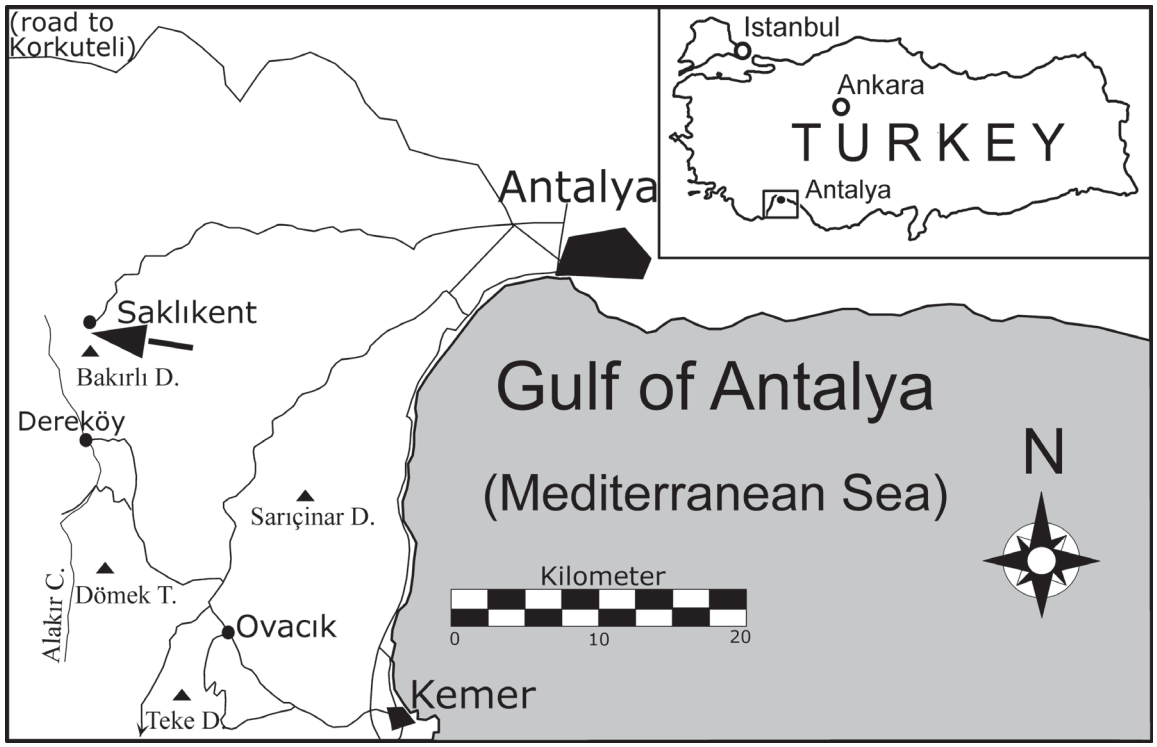


Fig. 1. Geographical position of the Saklıkent locality west of Antalya (arrow).

Type species: *Cucurbita infundibuliforme* Jablonský, 1973

Cucurbita longicollum (Senowbari-Daryan), 1983
(Fig. 2a,b?, c–e, f?, g–i)

*1983 *Pseudocucurbita longicollum* sp. n. - Senowbari-Daryan, p. 196, pl. 14, figs. 1-10, pl. 15, figs. 1-2, 6, pl. 16, fig. 5, text-fig. 8.
1983 *Pseudocucurbita longicollum* Senowbari-Daryan - Miconnet et al., pl. 3, fig. 10.
1986 *Pseudocucurbita longicollum* Senowbari-Daryan - Senowbari-Daryan & Abate, pl. 19, figs. 4-5.
1988 *Pseudocucurbita longicollum* Senowbari-Daryan - Pirdeni, pl. 2, fig. 4.
?1990 *Pseudocucurbita longicollum* Senowbari-Daryan - Riedel pl. 5, fig. 7.
?1991 *Hydrania dulloi* Senowbari-Daryan - Martini et al. p. 17, fig. 12.
1993 *Cucurbita longicollum* (Senowbari-Daryan) - Senowbari-Daryan, p. 3, fig. 3.
1996a *Cucurbita longicollum* (Senowbari-Daryan) - Senowbari-Daryan & Flügel, p. 254, pl. 3, figs. 7-10, 12 (cum syn.).
2004 *Cucurbita longicollum* (Senowbari-Daryan) - Martini et al., pl.3, fig, 21.
2012 *Cucurbita longicollum* - Gale et al., fig. 2.
2016 *Cucurbita longicollum* (Senowbari-Daryan) - Senowbari-Daryan, p. 190, pl. 6, figs. 9-12, text-figs. 2-3.

Remarks: See Senowbari-Daryan (1983), Senowbari-Daryan & Flügel (1996a: 254).

Description: The free test with porcelaneous wall of this foraminifer is composed of several amphora-like chambers with a broad basal part, passing to the narrower and long cylindrical "neck" ending with a broad "collar". Individual chambers are about 300 µm (150–480) long and are arranged one above the other in a straight or curved line. The neck is usually 2–3 times longer than the collar. Collars reach a diameter of 40–100 µm. A terminal aperture is located at the centre of the collar.

As noted by Senowbari-Daryan (2016) the initial part of some specimens from the Carnian and Norian–Rhaetian of Sicily is characterized by an enrolled tube (see also the specimen illustrated determined as *Hydrania dulloi* in pl. 17, fig. 12 by Martini et al. 1991). The initial part of some specimens (Fig. 2b,f) of the investigated material from Turkey exhibits *Siculocosta*-like enrolled part with a terminal collar on the youngest part (see also Di Stefano et al. 1990, pl. 3, figs. 11, pl. 4, fig. 10). It is unclear, whether the amphora-shaped last part of the specimen illustrated in Fig. 2b belongs to a second foraminifer (initial part) or if the full length represents only one specimen.

Occurrence and stratigraphic range: *Cucurbita longicollum* was originally described from the Norian–Rhaetian reefs of Sicily (Senowbari-Daryan 1983). It was later reported from the contemporary limestones of the Apennines, southern Italy (Miconnet et al. 1983), possibly from Albania (Pirdeni 1987, 1988), Sicily (Di Stefano et al. 1990), Austria (Senowbari-Daryan & Flügel 1996a), and from Seram, Indonesia (Martini et al. 2004). The stratigraphic age of all the mentioned localities is Norian–Rhaetian. Senowbari-Daryan & Abate (1986) and Senowbari-Daryan (2016) have described the species from the Carnian of Sicily.

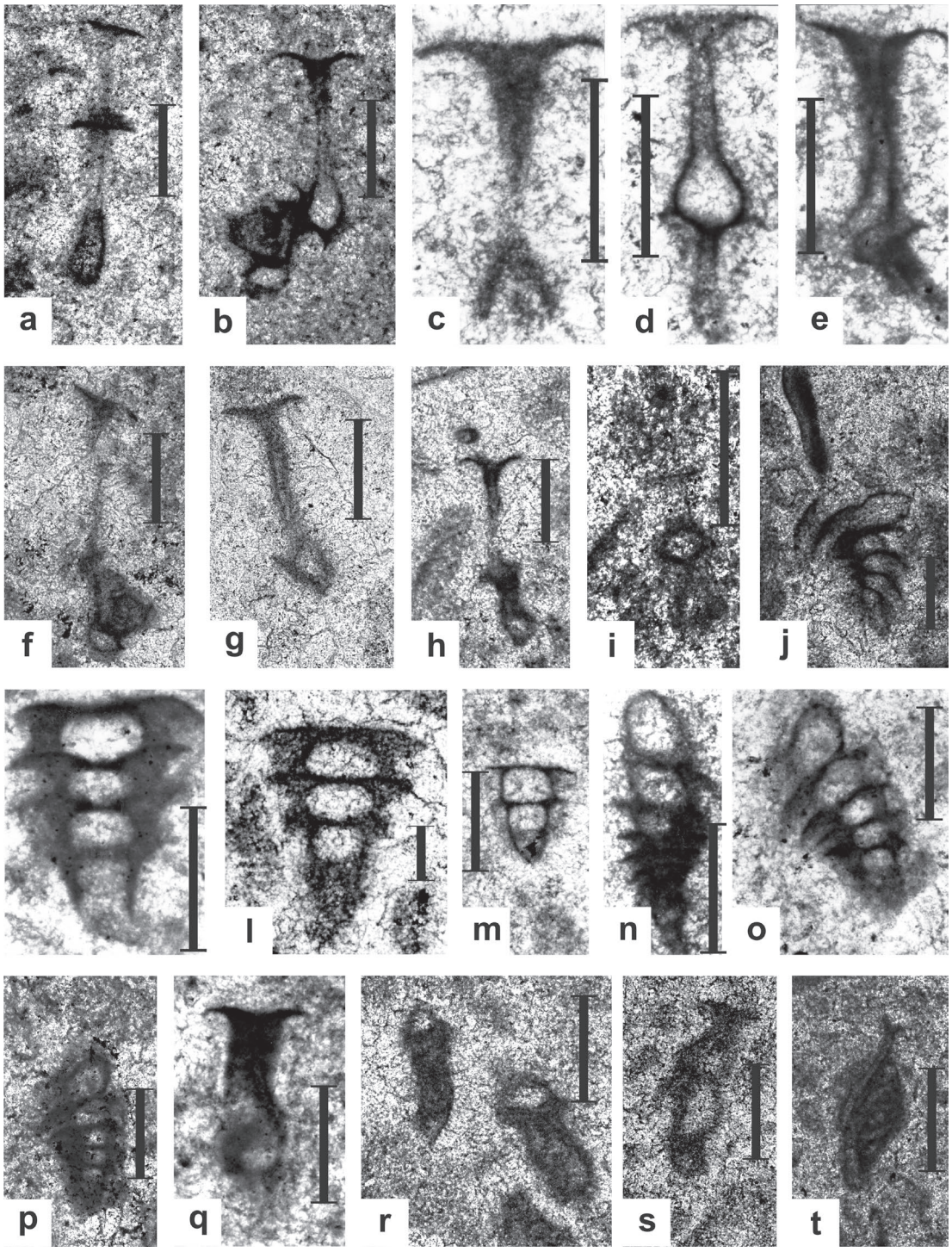


Fig. 2. Scale bar for Figs. a–t = 0.2 mm. Figs. **a–i**: *Cucurbita longicollum* (Senowbari-Daryan). **a** — Section through two chambers of a specimen with long "necks" and broad collar on the distal ends. BSM15; **b** — Section through a specimen with a *Siculocosta*-like test followed by a long amphora-like chamber similar to *C. longicollum*. The attribution of the specimen to *C. logicollum* is uncertain. BSM6/1; **c** — Section through one amphora-like chamber. 19B22/7; **d** — Section through two chambers. 19B23/5; **e** — Similar section as Fig. d. 19B20/4; **f** — The section shows the coiled part of the initial stage, similar to Fig. b. BSM6/2; **g** — Similar section as Fig. e. BSM6/2; **h** — Similar to Fig. a. BSM6/2; **i** — Similar to Fig h. BSM6/1. Figs. **j–p**: *Cucurbita brevicollum* (Senowbari-Daryan). **j** — Marginal section through several chambers with broad collars. SM2; **k** — Longitudinal section through four chambers. The diameter of the chambers is smaller than their height. The collars are broader then the diameter of the chambers. 19B19/3; **l** — Similar section like Fig. l. BSM6/2; **m** — Section through two chambers exhibiting the chamber characteristics. BSM15; **n** — Section through several chambers with distinct collars. 19B17/5; **o** — Longitudinal section through five chambers arranged on a moderately curved line. All chambers exhibit their characteristics. BSM6; **p** — Similar section like Fig. o. BSM6/1. Figs. **q–s:** not in detail determinable "cucurbitid" foraminifers. **q** — BSM10a; **r** — BSM4/5; **s** — BSM9. Fig. **t** — *Parophthalmidium* sp. BSM6/1.

Cucurbita brevicollum (Senowbari-Daryan, 1983)
(Fig. 2j–p)

*1983 Pseudocucurbita brevicollum sp. n. - Senowbari-Daryan, p. 200, pl. 15, figs. 4, 9-11.
?1983 Pseudocucurbita brevicollum Senowbari-Daryan - Miconnet et al., pl. 3, fig. 9.
1990 Pseudocucurbita brevicollum Senowbari-Daryan - Di Stefano et al., p. 110, pl. 4, fig. 11.
1990 Pseudocucucurbita brevicollum Senowbari-Daryan - Riedel, pl. 5, fig. 9.
1991 Cucurbita brevicollum Senowbari-Daryan - Martini et al., pl. 17, fig. 19.
?2009 *Cucurbita brevicollum* Senowbari-Daryan - Martini et al., pl. 2, fig. 2.

Description: The porcelaneous test of this species is composed of several funnel- or barrel-shaped chambers with a wide collar on the distal end. The collar diameter is larger than the height of the chambers. Chambers are arranged on straight or curved lines. Biometrical data and a detailed description of the species are given by Senowbari-Daryan (1983). Measurements of the specimens from Saklıkent are given in Table 1.

Occurrence and stratigraphic range: *Cucurbita brevicollum* was described originally from the Norian reef limestones of the Palermo Mountains by Senowbari-Daryan (1983). It was later described from the time equivalent reef limestones of Monte Genuardo (southwestern Sicily) by Di Stefano et al. (1990). Martini et al. (1997) illustrated from the Norian–Rhaetian of Indonesia a specimen as *Cucurbita* sp., which could be *C. brevicollum*. The species was described from the reef limestones of Saklıkent, Turkey by Riedel (1990).

Genus: *Tignumporina* Senowbari-Daryan, 1993

Original diagnosis: "The porcelaneous and multichambered test is composed of several amphora-like chambers exhibiting a long 'neck' passing into a wide collar on the distal part. The simple aperture is positioned terminal. The chambers are arranged under an angle of about 130 degrees. The younger chambers are supported by beam-like elements. The outer surface of the test without any ornamentation" (Senowbari-Daryan 1993: 192).

Type species: *Tignumporina zeissi* Senowbari-Daryan, 1993.

Table 1: Metrical data of *Cucurbita brevicollum* Senowbari-Daryan from Turkey. KL – length of the chamber, KD — chamber height, AKD — chamber outer diameter, WD — wall thickness of the chamber, GL — length of the test. All measurements in µm.

Thin-section	KL	AKD	KD	WD	GL
Fig. 2k;	80	200	260	70	340
19B19/3	70	180	250	70	
	70	160	220	70	
	80	140	180	30	
Fig. 2l;	90	200	300	70	400
BSM6/2	70	180	260	60	
	70	120	200	40	
	80	80	120	–	

Tignumporina zeissi Senowbari-Daryan, 1993
(Fig. 3p, Fig. 4: re-illustrated from Senowbari-Daryan 1993)

1990 cf. *Hydrania dulloi* Senowbari-Daryan - Di Stefano et al., pl. 3, fig. 10/1.
?1991 *Hydrania dulloi* Senowbari-Daryan - Martini et al., p. 16, figs. 6-7, pl. 17, figs. 3, 11-14.
*1993 *Tignumporina zeissi* n. sp. - Senowbari-Daryan, p. 192-193, pl. 19, figs. 1-9, text-fig. 5 (cum syn.).
non 1996b *Tignumporina zeissi* Senowbari-Daryan - Bérczi-Makk, pl. 1, fig. 9.
non 2009 *Tignumporina zeissi* - Carrillat & Martini, fig. 4/16-18.

Description: The description of the species of this monospecific genus corresponds to the diagnosis of the genus (Senowbari-Daryan 1993).

Occurrence and stratigraphic range: *T. zeissi* is known from the Carnian reef boulders of Sicily (Martini et al. 1991; Senowbari-Daryan 1993), from the Carnian of Albania (Pirdeni 1987, 1988). The stratigraphic range of the species is now extended to Norian–Rhaetian based on the occurrence in the Saklıkent carbonates.

?Family: Siculocostidae Zaninetti, Martini & Altiner, 1992
Genus: *Siculocosta* Senowbari-Daryan & Zaninetti, 1986

Type species: *Costifera battagliensis* (Senowbari-Daryan, 1983).

Discussion: All genera (*Amphorella, Spiriamphorella, Urnulinella, Pseudocucurbita*, *Paratintinnina, Costifera* and *Siculocosta*), established by Borza & Samuel (1977b, 1978), Samuel & Borza (1981), and Senowbari-Daryan (1983) were placed in synonymy with *Cucurbita* Jablonský (1973) by Gale et al. (2012). Senowbari-Daryan (2016) discussed the validity of some of these genera. He re-introduced the genera *Costifera, Siculocosta,* and *Urnulinella*.

Siculocosta taurica nov. sp.
(Fig. 5a–e)

1983 *Costifera*? sp. - Senowbari-Daryan, pl. 20, figs. 3, 5, 9, 12.
1990 *Costifera*? sp. - Riedel, pl. 5, fig. 10.

Derivatio nominis: After the Taurus Mountains, southern Turkey.

Holotype: Specimen illustrated in Fig. 5c (19B17/2).

Paratypes: All specimens illustrated in Fig. 5a–b, d–e.

Locus typicus: Saklıkent reef limestones.

Stratum typicum: Norian–Rhaetian.

Diagnosis: Test free and porcelaneous, composed of several amphora-like chambers arranged in straight or curved lines. Chambers with longitudinal ribs are not separated by a distinct wall.

Differential diagnosis: See remarks after the description of the species.

Description: Specimens of this foraminifer are composed of several amphora-like chambers arranged in straight or

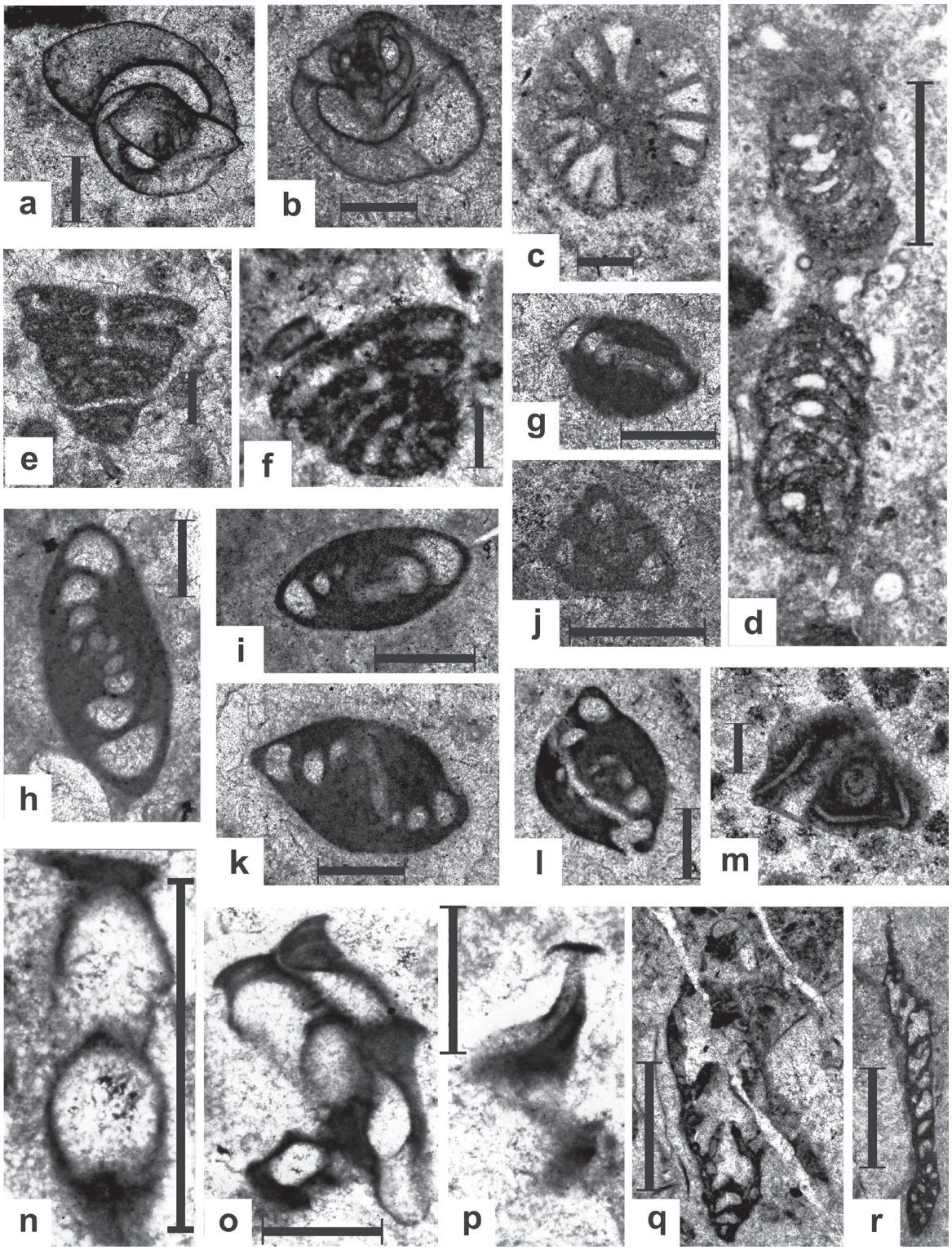


Fig. 3. Scale bar for Figs. d,q and r=1 mm, for all other Figs.=0.2 mm. Figs. **a–b**: *Galeanella* cf. *laticarinata* Al-Shaibani et al. **a** — BSM2/2; **b** — BSM6/1; Fig. **c** — *Kaeveria fluegeli* (Zaninetti, Altiner, Dager & Ducret). Cross section through the chamber. The pillars within the chambers appear as radially arranged elements. BSM10b. Fig. **d** — Agglutinated foraminifer gen. et sp. indet. The triangular chambers are low. The chamber is as high as the chamber walls are thick. BSM13. Figs. **e-f:** *Palaeolituonella meridionalis* (Luperto). **e** — BSM4/5; **f** — BSM10a. Fig. **g** — *Ophthalmidium* cf. *O. chialingchiangensis* (Ho). BSM15. Figs. **h–i**, **k–l**: *Decapoalina schaeferae* Gale, Rettori, Martini & Rozic. **h** — 19B16/2; **i** — BSM6/1; **k** — BSM6/1; **l** — BSM6/1. Fig. **j** — *Miliolipora*? sp. The fine perforation of the chamber walls is well recognizable in some parts. BSM10b. Fig. **m** — *Ophthalmidium* sp. BSM6/1. Figs. **n-o:** *Siculocosta sadatii* nov. sp. **n** —19B24/6, **o** —19B21/4. Fig. **p** — *Tignumporina zeissi* Senowbari-Daryan. 19B22/2. Fig. **q** — *Reofax* sp. The agglutinated nature of the wall is clearly recognizable. 19B20/11. Fig. **r** — Sessile agglutinated foraminifer gen. et sp. indet. 19B20/8a.

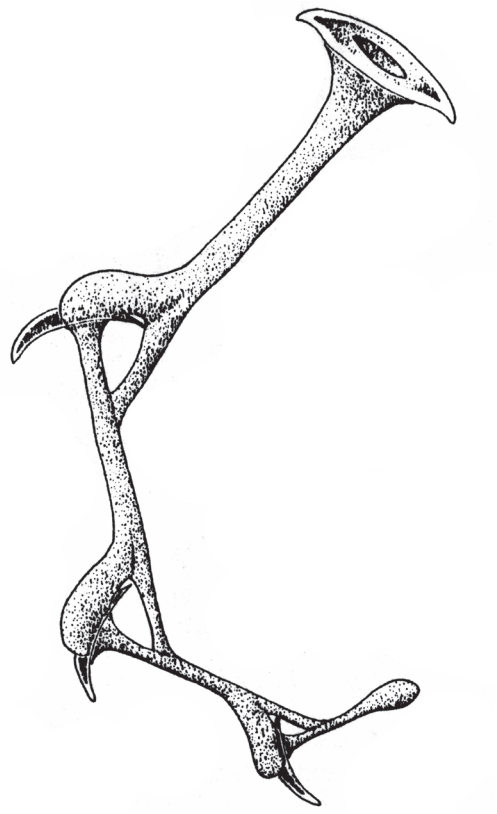


Fig. 4. Reconstruction of *Tignumporina zeissi* Senowbari-Daryan. The sketch shows the broad collar around the axial aperture and the chambers are characterized by a long neck and an extended element stabilizing the test (re-illustrated from Senowbari-Daryan 1993).

curved lines. Individual chambers consist of three parts: The basal part is composed of a chamber lumen surrounded by a thin wall appearing dark in transmitted light. The second part is composed of a short neck with a relatively thickened wall. The third part is the collar, which is wider than the first or the second part. The diameter of the collar is about the length of the chamber or moderately a bit smaller. The chamber walls are characterized by longitudinal running ribs, which are not separated from the test by a distinct wall. The ribs appear as spines and are recognizable in sections perpendicular to the long axis of the chamber.

Remarks: The genera *Costifera* and *Siculocosta* differ from each other by the ribs, which are separated (*Costifera*) or not separated (*Siculocosta*) by the distinct wall between the ribs and the test (Senowbari-Daryan & Zaninetti 1986). The spine-like ribs in the new species seem not to be separated from the test by a distinct wall. This feature justifies its attribution to the genus *Siculocosta*. In addition, the shape of the chambers (pear-like or pyriform) is similar to the type species of the genus. *Siculocosta taurica* nov. sp. differs from the only known species — *S. battagliensis* (Senowbari-Daryan, 1983) — by the circular outline of the chamber in cross section, by the well developed collars of the individual chambers and by the indistinct longitudinal ribs on the surface of the chambers.

Occurrence and stratigraphic range: *S. taurica* nov. sp. is known from the Norian–Rhaetian reef limestone of Sicily (Senowbari-Daryan 1983: see synonymy) and from the reef limestones of Saklıkent in southern Turkey (Riedel 1990, this paper).

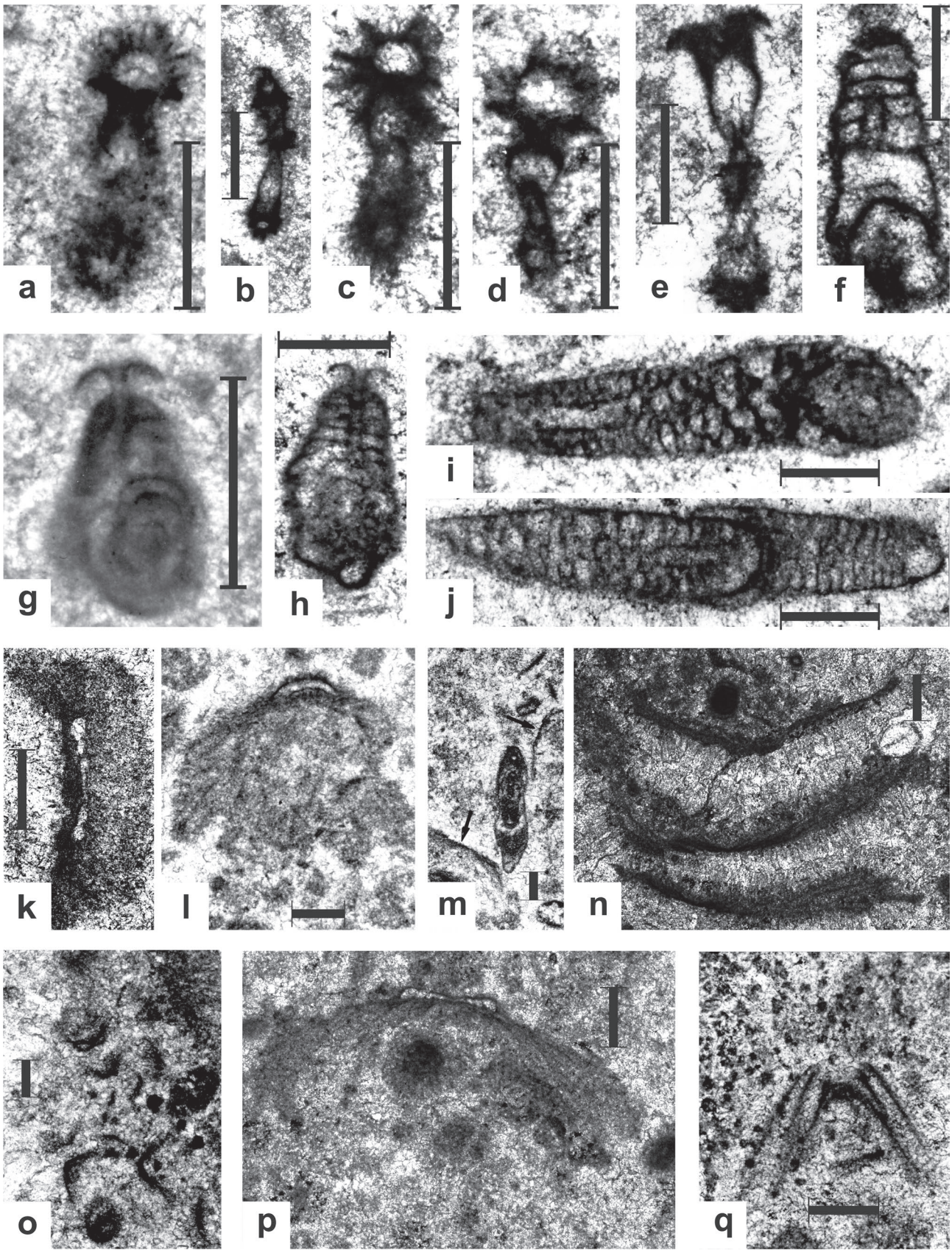
Siculocosta sadati nov. sp.
(Fig. 6a–d, Fig. 3n–o, Figs. 7–8 re-illustrated from Sadati 1981)

?1981 *Spiriamphorella districta* Borza & Samuel - Altiner & Zaninetti, p. 733, pl. 80, figs. 1-10, 15, 17?, 19?, 20?
?1981 *Spiriamphorella districta* Borza & Samuel - Altiner & Zaninetti, pl. 80, figs. 16-18, 20.
?1983 Spiriamphorella? Al-Shaibani et al. - pl. 3, fig. 1.
1981 *Spiriamphorella districta* Borza & Samuel, 1977 - Sadati, p. 211, pl. 63, figs. 3-25, text-fig. 7.
2009 *Spiriamphorella* cf. *S. districta* Borza & Samuel, 1977 - Martini et al., pl. 2, fig. 3.

Derivatio nominis: Dedicated to Dr. Seyed-Massoud Sadati (Hamedan, Iran), who described this species (1981) for the first time as *Spiriamphorella districta* Borza & Samuel from the Norian–Rhaetian of Hohe Wand, Austria.

Holotype: Pl. 63, fig. 16 of Sadati's specimen (1981) from Hohe Wand, Austria (see Figs. 7 and 8).

Fig. 5. Scale bar for Figs. a–q=0.2 mm. Figs. **a–e**: *Siculocosta taurica* nov. sp. **a** — Longitudinal section similar to the holotype (Fig. c). (BSM6); **b** — Marginal section exhibiting the costae in the last chamber. 19B20/10; **c** — *Siculocosta taurica* nov. sp. Holotype. The youngest chamber, arranged above the collars of the second to last chamber is cut in cross section exhibiting costae. The chamber before the last chamber is pear-shaped (pyriform). 19B17/2; **d** — Similar section to the holotype (Fig. c). 19B20/8b; **e** — Longitudinal section. The not clearly recognizable costae are cut in the two older chambers. 19B23/6. Figs. **f–h**: *Siphonophera pilleri* Senowbari-Daryan. **f** — Oblique section through a specimen exhibiting the enrolled (lower part in photograph) and the ring-like arranged chambers around the tube (upper part). 19B20/8b; **g** — Oblique section shows the first enrolled part and the second part above. BSM14; **h** — The longitudinal section exhibits very well the first enrolled initial part at the base and the second part with ring-shaped chambers around the axially running tube. The collar of the youngest part is clearly recognizable. 19B20/b. Fig. **i** — *Orthotrinacria gracilis* Zaninetti, Senowbari-Daryan, Ciarapica & Cirilli. Section through two chambers. The young chamber shows the chamber lumen and the irregular structures of the chamber walls. The indistinct collar of the youngest chamber is hardly recognizable. 19B16/3. Fig. **j** — Similar section to Fig, i. (19B8/4). Figs. **k–p**: *Hirsutospirella pilosa* Zaninetti, Ciarapica, Cirilli & Cadet. **k** — Section through the low trochospirally coiled tubular chamber. BSM6/2; **l** — Similar section to Fig. k, exhibiting very long bristles on one side. BSM6/1; **m** — *Hirsutospirella pilosa* (arrow) and *Ophthalmidium* sp. BSM6/2; **n** —Three sections through the ornamentation of *Hirsutospirella pilosa* appearing as dark micritic bent lines. BSM6/1; **o** — BSM12 ; **p** — The section similar to Fig. k shows the rolled up chambers of the test and the broad ornamentation on one side of the test. BSM6/1. Fig. **q** — *Foliotortus spinosus* Piller & Senowbari-Daryan. Marginal section through the test and the ornamentation around the test. BSM6/1.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Locus typicus: Hohe Wand mountain ridge, Gutenstein Alps, Lower Austria.

Stratum typicum: Norian–Rhaetian.

Diagnosis: Porcelaneous test with several pear-like chambers. Chambers with an indistinct collar at the distal part. The younger chambers overlap the preceding chambers on one side, forming an involution of the test.

Description: Porcelaneous test of about 1 mm with several amphora- to pear-shaped chambers. Distal parts of the chambers end with an indistinct collar, surrounding a terminal aperture. The short "neck" and the collar of the chambers and the chamber lumen are well recognizable in the young chambers. The test seems to be rolled up planispirally. The younger chambers overlap the older chamber(s) only on one side. Chamber walls are thick. The ornamentation of the test's outer surface is not well known. However, some specimens of Sadati (1981: pl. 63, figs. 8, 16, 25) and his text-fig. 7: A/d, B/b) exhibit the hollow longitudinal ribs formed by the folding of the chamber wall.

Discussion: Some specimens of Sadati's material from Austria show the ornamentation of the test's outer surface formed by the outfolding of the chamber wall. This feature justifies the attribution of Sadati's species from Hohe Wand to the genus *Siculocosta*. Although the chamber walls of specimens from Saklıkent do not show the hollow ribs formed by the folding of the chamber walls, but the chamber shape, their arrangement and other features of the test from Austria and Turkey support the unification of the specimens of both localities into one species.

Ornamentation of the Carnian specimens, described as *Spiriamphorella* by Borza & Samuel (1977a) or other genera is not known. The majority of the sections of different *Spiriamphorella* species, described by Borza & Samuel seem to be in axial section similar to the specimens from Saklıkent, illustrated in Fig. 6c,d.

Occurrence and stratigraphic range: *Siculocosta sadati* nov. sp. occurs in Austria (Sadati 1981), Turkey (this paper) and possibly in Indonesia (Al-Shaibani et al. 1983). Also some specimens (pl. 80. figs. 1–2, 15) illustrated in Altiner & Zaninetti (1981) from the Taurus Mountains, Turkey and determined as *Spiriamphorella districta* or *S. carpathica* could belong to this species.

Family: Milioliporidae Brönnimann & Zaninetti, 1971

Genus: *Bispiranella* Samuel, Salaj & Borza, 1981

Bispiranella subcarinata Samuel, Salaj & Borza, 1981
(Fig. 6h–i)

(Selected synonymy):

*1981 *Bispiranella subcarinata* nov. sp. - Samuel, Salaj & Borza, p. 88, pl. 31, figs. 1-3.

1983 *Bispiranella subcarinata* Samuel, Salaj & Borza. - Salaj, Borza & Samuel, p. 103-104, pl. 58, figs. 1-3 (re-illustration).

1988 *Bispiranella subcarinata* Samuel, Salaj & Borza. - Loeblich & Tappan, p. 366, pl.385, figs. 1-2 (re-illustration).

2009 *Bispiranella subcarinata* Samuel, Salaj & Borza. – Martini et al., pl. 1, fig. 22.

Description: The specimens of *Bispiranella subcarinata* reach lengths of up to 1 mm. The outline of the oval test is not always even (see Fig. 6h–i). The axis of the rolled up and initial stage is inclined to the axis of the test. The enrolled deuteroloculum increases rapidly and the cross section of the V-shaped last winding is large. For the detailed description of the species see the original description by Samuel, Salaj & Borza (1981).

Occurrence and stratigraphic range: *Bispiranella subcarinata* was originally described from the Carnian Tisovec limestone of West Carpathians by Samuel, Salaj & Borza (1981). Here the species is reported from the Norian–Rhaetian.

Bispiranella sp.
(Fig. 6j?, k–l)

Description: Two (three?) specimens of this *Bispiranella* were found in two thin-sections. Compared with *B. subcarinata* it is smaller with a smooth outer surface. The cross section of the deuteroloculum appears as small white points on both sides of the test (Fig. 6k–l).

Genus: *Galeanella* Kristan, 1958

Galeanella panticae Zaninetti & Brönnimann
(in Brönnimann et al., 1973)
(Fig. 6f–g,p)

*1973 *Galeanella panticae* n. sp.- Zaninetti & Brönnimann (in Brönnimann et al.), p. 420, pl.2, figs. 1-21, pl. 3, figs. 1-5, 7-13 (non 6!).

1982b *Galeanella panticae* Zaninetti & Brönnimann (in Brönnimann et al.).- Zaninetti et al., p. 112, pl. 1, figs. 1-3, 4?, 5-11 (cum syn.)

Description: See original description of Zaninetti & Bronnimann (in Brönnimann et al. 1973).

Occurrence and stratigraphic range: *G. panticae* is known from the Norian–Rhaetian reefs of numerous localities worldwide.

Galeanella cf. *G.*? *laticarinata* Al-Shaibani,
Carter & Zaninetti, 1983.
(Fig. 6m-o)

*1983 *Galeanella*? *laticarinata* Al-Shaibani, Carter & Zaninetti n. sp. - p. 303, pl. 3, figs. 17-20, 21?.

2004 *Galeanella laticarinata* Al-Shaibani, Carter & Zaninetti - Martini et al., pl. 2, figs. 8-12.

Description: This small species of the genus exhibits thin chamber walls. The thin collar of the last chamber is clearly recognizable. Perforation of the chamber walls is indistinct. For detailed information and metrical data of the test see the original description by Al-Shaibani et al. (1983).

According to L. Gale (journal reviewer) the specimens illustrated in this paper could be *G. tollmanni* (Kristan 1957), too.

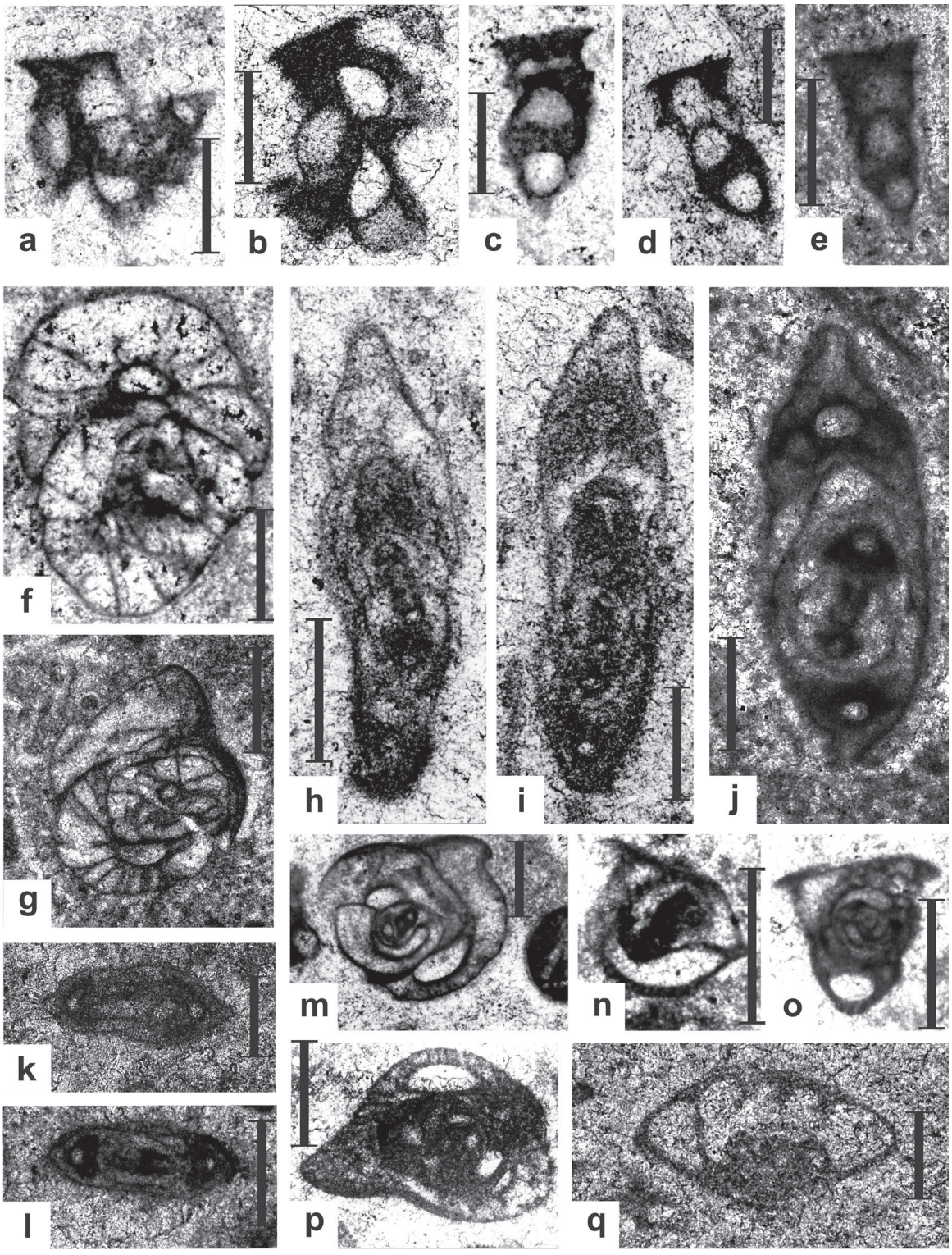

Fig. 6. Scale bar for Figs. a–q=0.2 mm. Figs. **a–e**: *Siculocosta sadatii* nov. sp. **a** — Longitudinal section through a specimen exhibiting the pear-like chamber with thick chamber walls and an indistinct collar around the terminal aperture. The collar is not clearly recognizable in the old chambers. BSM6/2; **b** — Similar section to Fig. b. BSM6/2; **c** — Oblique longitudinal section through the three last chambers. BSM6/1; **d** — Similar section to Fig. c. BSM6/2; **e** — Similar section to Figs. c or d. BSM10a. Figs. **f-g:** *Galeanella panticae* Zaninetti & Brönnimann (in Brönnimann et al.). **f** — The section exhibits the thick and poorly preserved chamber walls with numerous pores. BSM6/1; **g** — Similar section with partly clearly recognizable pores of the chamber walls. BSM6/1. Figs. **h-i:** *Bispiranella subcarinata* Samuel, Salaj & Borza. **h** — BSM6/2; Fig. **i** —BSM6/2. Fig. **j** —? *Bispiranella* sp. BSM8. Figs. **k-l:** *Bispiranella* sp. **k** —BSM6/2; **l** —BSM4/5. Figs. **m–p**: *Galeanella* cf. *laticarinata* Al-Shaibani et al. **m** — BSM 6/1; **n** — 19B1; **o** — 19B21/4; **p** — 19B6. Fig. **q** — Duostominid foraminifer gen. et sp. indet. 19B17/5.

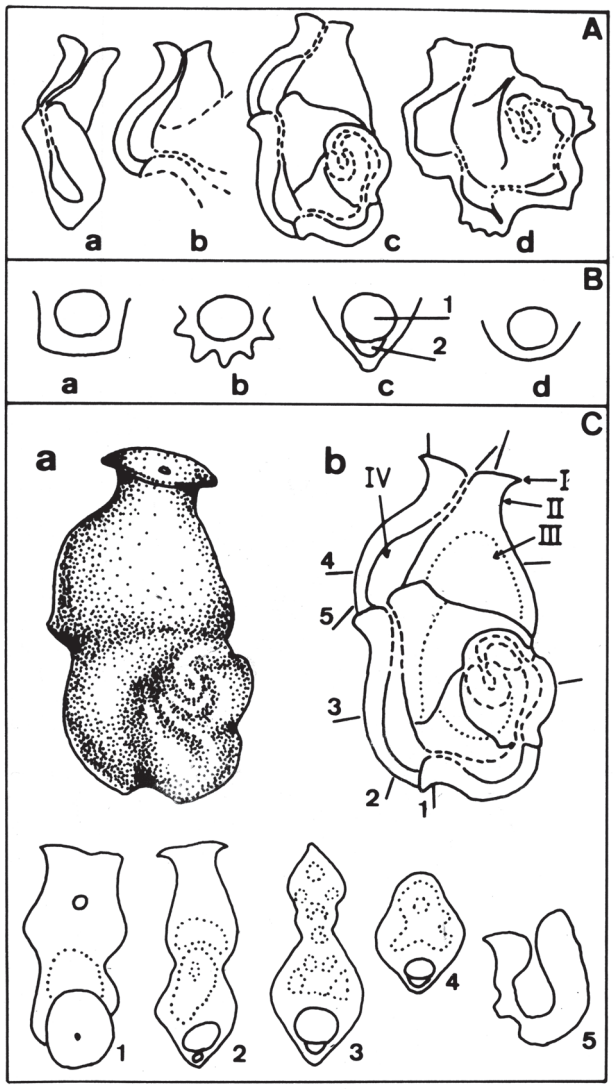

Fig. 7. Numerous sections and reconstruction of *Siculocosta sadatii* nov. sp. (described as *Spiriamphorella districta* by Sadati 1981). Re-illustrated from Sadati 1981.

Fig. 8. *Siculocosta sadati* nov. sp. (holotype). Re-illustrated from Sadati 1981, pl. 53, fig. 12. This specimen shows the most important features for the reconstruction presented in Fig. 7.

Remarks: Al-Shaibani et al. (1983) have compared *G.*? *laticarinata* from Indonesia with specimens from the Rhaetian of the Northern Calcareous Alps, described by Schäfer & Senowbari-Daryan (1978: pl. 1, fig. 5, pl. 2, fig. 4), Schäfer (1979: pl. 19, fig. 9), and Senowbari-Daryan (1980: pl. 17, fig. 2) discussing the synonymy of these specimens.

Occurrence and stratigraphic range: *Galeanella*? *laticarinata* is known from the Norian–Rhaetian of Indonesia (see synonymy), possibly (see remarks) from the Northern Calcareous Alps and probably Turkey.

Family: Siphonoferidae Senowbari-Daryan & Zaninetti, 1986
Genus: *Siphonofera* Senowbari-Daryan, 1983

Type species: *Siphonofera pilleri* Senowbari-Daryan, 1983.

Siphonofera pilleri Senowbari-Daryan, 1983
(Fig. 5 f–h)

* 1983 *Siphonofera pilleri* sp. n. - Senowbari-Daryan, p. 214, pl. 20 (erroneously numbered as 18), figs. 6-7, pl. 22, figs. 1-11, pl. 23, fig. 12.
1990 *Siphonofera pilleri* Senowbari-Daryan - Di Stefano et al., p. 110, pl. 3, figs. 9, 10/2.
1990 *Siphonofera pilleri* Senowbari-Daryan - Riedel, pl. 5, fig. 6.
1992 *Galeanella expansa* n. sp. - Zaninetti et al., p. 111, pl. 4, fig. 1.

Description: The porcelaneous test of *S. pilleri* is composed of two parts. The circular or oval initial part is a rolled up tube, passing to the younger part. This part is composed of a more or less axially running tube with a distinct collar (110–200 μm) on the distal end. Around the tube (20–40 μm) of the younger part ring-shaped low chambers are formed. Chamber walls appear dark in transmitted light. Perforation of the chamber walls is missing. Length of the test is about 220–550 μm. For discussion about the formation of the test see the original description by Senowbari-Daryan (1983).

Occurrence and stratigraphic range: *Siphonofera pilleri* is known from the Norian–Rhaetian reef carbonates of Sicily (Senowbari-Daryan 1983, Di Stefano et al. 1990), and Turkey (Riedel 1990, this paper).

The holotype of *Galeanella expansa* described as a new foraminifer by Zaninetti et al. (1992: pl. 4, fig. 1) from the Taurus Mountains of Turkey is a specimen of *Siphonofera pilleri* Senowbari-Daryan (1983), and a junior synonym of this species. The two specimens, illustrated as probable paratypes in pl. 5, figs. 1, 7 by these authors are not *Siphonofera*.

Family: Hirsutospirellidae Zaninetti, Ciarapica, Cirilli & Cadet, 1985
Genus: *Hirsutospirella* Zaninetti, Ciarapica, Cirilli & Cadet, 1985

Type species: *Hirsutospirella pilosa* Zaninetti, Ciarapica, Cirilli & Cadet, 1985.

Hirsutospirella pilosa Zaninetti, Ciarapica, Cirilli & Cadet, 1985
(Fig. 5k–p)

*1985 *Hirsutospirella pilosa* n. g., n. sp. - Zaninetti, Ciarapica, Cirilli & Cadet, p. 334, pl. 3, figs. 1-8, pl. 4, figs. 2-7, pl. 5, figs. 1-11, text-fig. 2.
non 1985 *Hirsutospirella pilosa* n. g., n. sp. - Zaninetti, Ciarapica, Cirilli & Cadet, p. 334, pl. 4, fig. 1.
1988 *Hirsutospirella pilosa* Zaninetti, Ciarapica, Cirilli & Cadet - Ciarapica et al., fig. 2.
1990 *Hirsutospirella pilosa* Zaninetti, Ciarapica, Cirilli & Cadet - Di Stefano et al., pl. 3, fig. 18.
1993 *Hirsutospirella pilosa* - Cirilli, fig. 16a.
1996a *Hirsutospirella pilosa* Zaninetti, Ciarapica, Cirilli & Cadet - Senowbari-Daryan & Flügel, p. 249, pl. 1, fig. 1–9, pl. 5, figs. 7-8, text-figs. 2-3 (cum sun.).
1996 *Hirsutospirella pilosa* Zaninetti, Ciarapica, Cirilli & Cadet - Senowbari-Daryan et al., pl. 20, fig. 6.

Description: *Hirsutospirella* is a very small foraminifer, which usually occurs within microbial crusts and is hardly recognizable. The test is composed of two parts: the first part is composed of a relatively large proloculus followed by a tubular second chamber, which is coiled plan- to moderately trochospiral. The chamber wall is very thin. The second part, appearing dark micritic in transmitted light covers one side of the chambered part of the test. This micritic part is composed of bristles or narrow filaments reaching thicknesses ten times thicker than the first part. A detailed description with biometrical data of *H. pilosa* with a spatial reconstruction is given by Senowbari-Daryan & Flügel (1996a).

H. pilosa is usually attached to microbial crusts ("Spongiostromata"-crusts). Most probably the bristles on one side of the test served as the attachment organ of the foraminifer. Isolated specimens of *H. pilosa* cannot be recognized if the section passes through the micritic bristle part. Such sections look like small and narrow micritic straight or curved lines (Fig. 5m — arrows, Fig. 5n).

Occurrence and stratigraphic range: *H. pilosa* is known from the Norian–Rhaetian reef limestones of former Yugoslavia (Bosnia: Zaninetti et al. 1985a), Sicily (Zaninetti et al. 1985a; Di Stefano et al. 1990), Greece (Senowbari-Daryan et al. 1996), Austria (Senowbari-Daryan & Flügel 1996a), and Turkey (this paper).

Genus: *Foliotortus* Piller & Senowbari-Daryan, 1980

Type species: *Foliotortus spinosus* Piller & Senowbari-Daryan, 1980.

Foliotortus spinosus Piller & Senowbari-Daryan, 1980
(Fig. 5q)

* 1980 *Foliotortus spinosus* n. gen. n. sp. - Piller & Senowbari-Daryan, p. 220, pl. 23, figs. 2-9, 11-13 (non figs. 1, 10).
1983 *Foliotortus spinosus* Piller & Senowbari-Daryan - Miconnet et al., pl. 1, fig. 6.
? 1985 *Hirsutospirella pilosa* n. g., n. sp.- Zaninetti, Ciarapica, Cirilli & Cadet, p. 334, pl. 4, fig. 1.
1985 *Foliotortus spinosus* Piller & Senowbari-Daryan - Zaninetti, Ciarapica, Cirilli & Cadet, pl. 4, figs. 8-9.
1988 *Foliotortus spinosus* Piller & Senowbari-Daryan - Ciarapica et al., fig. 5 (re-illustrated).
1990 *Foliotortus spinosus* Piller & Senowbari-Daryan - Di Stefano et al., pl. 3, figs. 116-17.
1990 *Foliotortus spinosus* Piller & Senowbari-Daryan - Riedel, pl. 5, figs. 12-14.
1992 *Foliotortus spinosus* Piller & Senowbari-Daryan - Miconnet et al., pl. 1, fig. 6.
1993 *Foliotortus spinosus* - Cirilli, fig. 16i.
1996a *Foliotortus spinosus* Piller & Senowbari-Daryan - Senowbari-Daryan & Flügel, p. 251, pl. 1, fig. 8/B, pl. 2, figs. 1-9 (cum syn.).
1996 *Foliotortus spinosus* Piller & Senowbari-Daryan - Di Stefano et al. pl. 30, figs. 4, 7, 9.
1996 *Foliotortus spinosus* Piller & Senowbari-Daryan - Senowbari-Daryan et al., pl. 20, fig. 7.
?1996 *Foliotortus spinosus* Piller & Senowbari-Daryan - Bernecker, p. 69, pl. 17, fig. 15.

Description: The test of *Foliotortus spinosus* is composed (as in *Hirsutospirella pilosa*) of two parts. The triangular-shaped first part is the proloculus and the trochospirally coiled deuteroloculus. The second part is composed of micritic and spine-like elements, which are arranged ring-like and originate from the trochospirally coiled tubular chamber. Sections through the second part of the test appear as curved micritic lines (pl. 57, fig. 13). For the dimensions of the test and detailed description of *H. spinosus* see Piller & Senowbari-Daryan (1980).

Occurrence: *Foliotortus spinosus* is known from the Norian–Rhaetian reef limestones of Sicily (Senowbari-Daryan, 1983, Di Stefano et al. 1990, 1996), Austria (Senowbari-Daryan & Flügel 1996a), Italy (Miconnet et al. 1983, Cirilli 1993), Oman (Bernecker 1996), and Turkey (Riedel 1990, this paper).

Genus: *Orthotrinacria* Zaninetti, Senowbari-Daryan, Ciarapica & Cirilli, 1985

Orthotrinacria gracilis Zaninetti, Senowbari-Daryan, Ciarapica & Cirilli, 1985
(Fig. 5i–j)

1982 *Ophthalmidium* cf. *carinatum* (Leischner).- Senowbari-Daryan, Schäfer & Abate, pl. 24, fig. 7.
*1985 *Orthotrinacria gracilis* n. gen., n. sp.- Zaninetti, Senowbari-Daryan, Ciarapica & Cirilli, p. 298, Figs. 8-9.
1996a *Orthotrinacria*? *gracilis* Zaninetti, Senowbari-Daryan, Ciarapica & Cirilli.- Senowbari-Daryan & Flügel, p. 253, pl. 3, figs. 1-3 (cum syn.)

Description: The two sections of this foraminifer with porcelaneous test are cut through the last chamber(s) exhibiting transverse lines, which are interpreted as "not clearly understood structures of the recrystallized wall". The initial part of the test is not known in the specimens from Turkey. The last chamber is tubular, ending with the aperture with an indistinct rim (Fig. 5i).

Occurrence and stratigraphic range: *Orthotrinacria gracilis* was known only from the Norian–Rhaetian reefs of Sicily (Senowbari-Daryan et al. 1982) and now from the contemporary reef limestones near Saklıkent, Taurus Mountains, Turkey.

Genus: *Decapoalina* Gale, Rettori, Martini & Rozic, 2013

Original diagnosis: "The juvenile stage consists of a globular proloculus and a probable flexostyle channel. The channel is followed by several chambers in a sigmoiline arrangement. The coiling is involute throughout the ontogeny, leading to the lateral thickening of the test. The wall is porcelaneous, pseudoperforated. No aperture is observed." (Gale et al. 2013: 85).

Type species: "*Sigmoilina*" *schaeferae* Zaninetti, Altiner, Dager & Ducret, 1982a.

Decapoalina schaeferae (Zaninetti, Altiner, Dager & Ducret, 1982a)
(Fig. 3h–i, k–l)

1982a "*Sigmoilina*" *schaeferae* n. sp - Zaninetti, Altiner, Dager & Ducret, p. 111, pl. 8, figs. 3, 6, 9, 12-13.
2004 *Sigmoilina schaeferae* Zaninetti, Altiner, Dager & Ducret - Martini et al., pl. 4, figs. 15, 18.
2004 *Sigmoilina* sp - Martini et al., pl. 4, figs. 17.
2009 "*Sigmoilina*" *schaeferae* Zaninetti, Altiner, Dager & Ducret - Martini et al. pl. 1, fig. 24-25.
2012 "*Sigmoilina*" *schaeferae* Zaninetti, Altiner, Dager & Ducret - Gale, p. 31, pl. 3, fig. 1^1.
2013 *Decapoalina schaeferae* (Zaninetti Altiner, Dager & Ducret) - Gale et al., p. 85-86, fig. 4, pl. 1, figs. 1-7, pl. 2, figs. 1-6 (incompl. cum syn.).

Description: For the description of the species see the original description by Zaninetti et al. (1982) and Gale et al. (2013).

Occurrence and stratigraphic range: *D. schaeferae* is known from numerous Norian–Rhaetian reefs on the world, for more information see Gale et al. (2013). Martini et al. (2004) reported the occurrence of the species from Seram, Indonesia.

Family: Ataxophragmiidae Schwager, 1877
Genus: *Palaeolituonella* Bérczi-Makk, 1981

Original diagnosis: "The shell is elongated, coniform and in its initial form it consists of 4 to 5 coiled chambers. Later on it turns to a linear form consisting of wide and low chambers with faint septum-rudimenta hardly observable even in thin sections. The one-layer wall is thick, agglutinated. The aperture is not known." (Bérczi-Makk 1981: 390-391) (see also Loeblich & Tappan 1988: 148).

Type species: *Textularia meridionalis* Luperto, 1965.

Genus: *Palaeolituonella meridionalis* (Luperto, 1965)
(Fig. 3e–f)

*1965 *Textularia meridionalis* n. sp. - Luperto, p. 177, pl. 10, figs. 6-7.
?1981 Foraminifere genus 1. - Altiner & Zaninetti, pl.88, fig. 1.
1981 Foraminifere genus 2. - Altiner & Zaninetti, pl. 88, fig. 2.
1981 *Palaeolituonella majzoni* n. g., n. sp. - Bérczi-Makk, p. 390-391, pl. 1, figs. 1-8.
1986 *Palaeolituonella meridionalis* (Luperto) - Zaninetti et al., p. 33-34, pl. 1, figs. 1-4.
1990 *Palaeolituonella meridionalis* - Ciarapica et al., fig. 4/A
1995 *Palaeolituonella meridionalis* (Luperto) - Rettori, p. 65, pl. 5, figs. 10-12, pl. 6, figs. 1-6.
1996a *Palaeolituonella meridionalis* (Luperto) - Senowbari-Daryan & Flügel, p. 255, pl. 5, figs. 1, 4 (cum syn.).
1996 *Palaeolituonella meridionalis* (Luperto, 1965) - Bernecker, p. 67, pl. 17, fig. 19
1996 *Palaeolituonella meridionalis* (Luperto, 1965) - Bérczi-Makk, p. 245-246, pl. 2, figs. 4-11, pl. 3, figs. 1-2.
1996b *Turriglomina mesotriasica* (Koehn-Zaninetti) - Bérczi-Makk, Pl. 10, fig. 13.
2004 *Palaeolituonella meridionalis* (Luperto) - Martini et al. pl. 4, figs. 19-21.
2006 *Palaeolituonella meridionalis* - Nittel, pl. 6, fig. 1 (for right name see p. 130)
2009 *Palaeolituonella meridionalis* (Luperto) - Senowbari-Daryan & Cacciatore, p. 52, pl. 1, figs. 11-12.
2009 *Palaeolituonella meridionalis* - Carrillat & Martini, fig. 4.29-30.
non 2009 *Palaeolituonella meridionalis* (Luperto) - Martini et al., pl. 2, fig. 7.
2010 *Palaeolituonella meridionalis* - Chablais, fig. 7.4/20-28.
2010 *Palaeolituonella meridionalis* - Chablais et al., fig. 8.p-q.
2011 *Palaeolituonella meridionalis* (Luperto) - Velledits et al., fig. 17/19-22.

Description: The free and conical-shaped test of this agglutinated foraminifer reaches a diameter of 0.5–0.8 mm. The initial part of the test is trochospirally rolled up, passing to the linear part. The linear part is composed of low chambers, moderately higher then the chamber walls. The aperture is terminal. The detailed description of the species is carried out by Bérczi-Makk (1981) and Zaninetti et al. 1986.

Occurrence and stratigraphic range: This foraminifer was described originally as *Textularia meridionalis* (=*Palaeolituonella meridionalis*) from the "Calcare de Abriola", southern Italy by Luperto (1965). He dated the limestones with this foraminifer as Permian. According to Zaninetti (1986) these limestones are Ladinian in age (see also Senowbari-Daryan & Flügel 1996a).

Palaeolituonella meridionalis is known from the Ladinian–Carnian of Hungary (Alsóhegy Mountains: Berczi Makk 1981; Flügel et al. 1991/1992, Aggtelek unit: Velledits 2011), from the Ladinian of the Northern Calcareous Alps (Boni et al. 1994; Nittel 2006), Carnian of Sicily (Senowbari-Daryan 1984; Carrillat & Martini 2009) and from numerous Norian–Rhaetian localities in the Northern Calcarous Alps (see Senowbari-Daryan & Flügel 1996a), Italy (Ciarapica et al. 1990), Malaysia (Fontaine et al. 1988), Seram, Indonesia (Martini et al. 2004), Japan (Chabailis et al. 2010), and from Oman (Bernecker 1996). According to Bernecker (1996) *Palaeolituonella* occurs from Anisian to Rhaetian.

The species, described as "Foraminifere genus 2" by Altiner & Zaninetti (1981, see synonymy) represents a specimen of *P. meridionalis* and the specimens in this paper document its

occurrence in Southern Turkey. *Palaeolituonella meridionalis* occurs also in the Norian–Rhaetian reefs within the Nayband Formation in Iran (own observation).

Genus: *Kaeveria* Senowbari-Daryan, 1984

Original diagnosis: "Free and conical test consisting of a trochospiral-multichambered initial part which is turning into a biserial and uncoiled part. The chambers of the initial part are lacking an interior subdivision. During the biserially and uncoiled stage the chambers are represented by septulae running radially and vertically and by alternating long and short ones. The aperture is simple and terminal." (Senowbari-Daryan 1984: 87) (see also Loeblich & Tappan 1988: 141).

Type species: *Palaeolituonella fluegeli* (Zaninetti, Altiner, Dager & Ducret, 1982b).

Kaeveria fluegeli (Zaninetti, Altiner, Dager & Ducret, 1982b) (Fig. 3c)

?1981 Foraminifere genus indet. 1. - Altiner & Zaninetti, pl. 88, fig. 3.
*1982b *Palaeolituonella fluegeli* n. sp. - Zaninetti, Altiner, Dager & Ducret, p. 107, pl. 8, figs. 1-2, 4-50
1984 *Kaeveria fluegeli* (Zaninetti, Altiner, Dager & Ducret) - Senowbari-Daryan p. 87, pl. 1, figs. 1-2, 5-7, 9-11, pl. 2, fig. 9 (cum syn.).
1986 ?*Kaeveria fluegeli* (Zaninetti, Altiner, Dager & Ducret) - Senowbari-Daryan & Abate, pl. 9, fig. 9 and pl. 10, fig. 3.
1988 *Palaolituonella*? sp. - Pideni, pl. 1, fig. 31.
1990 ?*Palaeolituonella majzoni* Bérczi-Makk - Riedel, pl. 4, fig. 6/1.
1991 *Kaeveria fluegeli* (Zaninetti et al.) - Brandner et al., pl. 74, fig. 16.
1990 *Kaeveria fluegeli* (Zaninetti Altiner, Dager & Ducret) - Di Stefano et al., pl. 3, fig. 2.
1994 *Kaeveria fluegeli* (Zaninetti) - Boni et al. pl. 20, fig. 10.
1996a *Kaeveria fluegeli* (Zaninetti Altiner, Dager & Ducret) - Senowbari-Daryan & Flügel, pl. 4, 1E, pl. 5, figs. 2-3 (cum syn.).
1996 *Kaeveria fluegeli* (Zaninetti Altiner, Dager & Ducret) - Bernecker, p. 67, pl. 17, fig. 9.
2009 *Kaeveria fluegeli* (Zaninetti Altiner, Dager & Ducret) - Korchagin, p. 66, fig. 3d.
2009 *Kaeveria fluegeli* (Zaninetti Altiner, Dager & Ducret) - Martini et al., pl. 2, figs. 4-5.
2009 *Palaeolituonella meridionalis* (Luperto) - Martini et al., pl. 2, fig. 7.
non 2012a *Kaeveria fluegeli* (Zaninetti Altiner, Dager & Ducret) - Gale et al., p. 22, pl. 1, figs. 3.
2012a *Kaeveria fluegeli* (Zaninetti Altiner, Dager & Ducret) - Gale et al., pl. 1, fig. 4.
2012b *Kaeveria fluegeli* - Gale et al., fig. 10f.
2013 *Kaeveria fluegeli* (Zaninetti Altiner, Dager & Ducret) - Gale et al., p. 22, pl. 1, figs. 4.

Description: In principle *Kaevaria fluegeli* is similar to the preceding species — *Palaeolituonella meridionalis*, but differs from the latter by the possession of a pillar-like structure within the chambers. In cross section the pillars appear as radially arranged elements (septum-like, Fig. 3c). Both foraminifers are associated, occur in the same facies and can be easily confused.

Occurrence & stratigraphic range: *Kaeveria fluegeli* is known from numerous Norian–Rhaetian localities (see synonymy-list). *Kaeveria fluegeli*, like *Palaeolituonella meridionalis* also occurs in the Norian–Rhaetian reefs within the Nayband Formation in Iran (own observation).

Agglutinated foraminifer, *Ammobaculites*? sp. (Fig. 3d)

Description: Only one or two(?) specimens of this agglutinated foraminifer is in the collection. The test is composed of several uniserially arranged chambers of triangular shape. The chambers are connected through the others by a terminal aperture. Chamber walls are about half as thick as the chamber lumen. It is not clear if the illustrated photo in Fig. 3d represents two specimens or two isolated parts of only one specimen.

Facies integration of described foraminifers

The distribution of benthic foraminifera and their association in Norian–Rhaetian reefs and platforms are useful for the differentiation of the coherent facies types. Hohenegger & Lobitzer (1971) have analysed in the Upper Triassic carbonate platform and basinal facies in the Northern Calcareous Alps (NCA) the distribution of foraminifera and Resch (1979) their integration. Schäfer & Senowbari-Daryan (1978) studied the distribution pattern in some Upper Rhaetian reefs of the Salzburg area (Austria, NCA) and Dullo (1980) also in a Dachstein platform (NCA), Chablais et al. (2011) in south-western Japan, and Gale (2012) in the Southern Alps.

The foraminifera described in this paper are derived from the reef carbonates around the town of Saklıkent, Taurus Mountains. Generally this foraminiferal association occurs in the reef core of other Norian–Rhaetian reefs of several localities in association with hypercalcified sponges (rarely with scleractinian corals) and other reef builders. Some of these foraminifera, for example, cucurbitids, siphonoferids, hirsutospirelids, and siculocostids were found only in the reef core and are "typical" reef foraminifers, occurring within micritic sediments or some of them within the microbial crusts (e.g., *Hirsutospirella*). Other groups, such as ataxophramids, miliolids (partly) occur not only in the reef core, but also in the carbonates near the reef core.

Duostominids, involutinids, glomosporids are typical foraminifera of the lagoon environment and occur sporadically in the reef core or in carbonates near the reef core.

Some of the described genera or species are limited to the Norian–Rhaetian reefs or shallow water deposits and are useful index fossils (see text).

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