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**TABASOSPHERA PUSTULOSA NOV. GEN., NOV. SP.,
A MICROPROBLEMATICUM (FORAMINIFER?) FROM
THE UPPER TRIASSIC (NORIAN-RHAETIAN) REEF
LIMESTONES OF NAYBAND FORMATION (NE IRAN)**

BABA SENOWBARI-DARYAN¹

ABSTRACT. A microproblematicum with calcareous test, *Tabasosphaera pustulosa* nov. gen., nov. sp., a hollow spherical microfossil with pustule-like elements on the outer surface, is described from Upper Triassic (Norian-Rhaetian) reef limestones exposed near the town of Ali-Abad, south of Tabas (northeast Iran). *Tabasosphaera* is an endobiotic organism living within the cavities of other organisms, such as brachiopods, worm tubes, or in sponge spongocoels. The systematic position of *Tabasosphaera*, its interspecific association and the fossil assemblage of which it makes part is discussed. Most probably *Tabasosphaera* represents a foraminifer belonging to the group Lagenina.

Key words: *Tabasosphaera*, microproblematicum, Triassic, Norian, Nayband Formation, reef, Iran.

INTRODUCTION

Microproblematica are microscopic small organisms whose systematic position within the animal or plant kingdoms is uncertain or disputed. More than thirty such problematic organisms have been described from Triassic shallow water deposits, mostly reefs or reefal carbonates (Flügel 1972, Borza 1975, Senowbari-Daryan 1984). Some microproblematica are important contributors to the construction of the reef framework (e.g. *Radiomura cautica* SENOWBARI-DARYAN & SCHÄFER or *Lithocodium* sp.), other are well stratigraphic or facies index fossils in Middle or Upper Triassic reefs and lagoonal carbonates (e.g. *Ladinella porata* OTT or *Microtubus communis* FLÜGEL). Problematic organisms of Upper Triassic reefs (Norian-Rhaetian age) known until 1981 are listed in Flügel (1981). The systematic position of some Triassic microproblematica is classified after the original description by different authors (Ebli & Schlagintweit 1989, Senowbari-Daryan & Flügel 1996, Senowbari-Daryan 1997, Senowbari-Daryan & Majidifard 2003).

Different microproblematic organisms, such as *Microtubus communis* FLÜGEL, *Radiomura cautica* SENOWBARI-DARYAN & SCHÄFER, *Lithocodium* sp., *Bacinella irregularis* RADOICIC etc. occur also in Upper Triassic bioconstructions embedded within the Nayband Formation in central and northeast Iran. Additionally, the presently described *Tabasosphaera pustulosa* nov. gen., nov. sp. was found in two thin sections from the reef limestones exposed near the town of Ali-Abad, south of Tabas (text-Fig. 1).

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Fig. 1. Geographic map of locality (marked with asterisk) of *Tabasosphaera pustulosa* nov. gen., nov. sp.

LOCALITY

The siliciclastic-carbonate deposits of the Nayband Formation is one of the most widespread and important geological units outcropping at numerous localities in central and northeast Iran (Seyed-Emami 2003). In both south and north flanks of Kuh-e Nayband, approximately 220 km south of the town Tabas, the Nayband Formation occurs in a widespread area (Brönnimann et al. 1971, Kluyver et al. 1983). Especially at the southern flank (type locality of the Nayband Formation) it reaches a thickness of up to 3000 m (personal observation). In different stratigraphic levels of the Nayband Formation several coral- or sponge-dominated bioconstructions of biohermal- and biostromal-type were developed.

Samples with *Tabasosphaera* come from a small sponge-dominated reef located approximately 6.5 km northwest of the small town of Ali-Abad, on the right side of the road from Ali-Abad to Ab-Boneh (text-Fig. 1). This reef yielded a high diversity of invertebrates, especially coralline sponges of the “Sphinctozoida”, “Inozoida” and “Chaetetida” type (including “Spongiomorphida”), corals, etc. Within the marly sediments in this locality a variety of other reef building organisms, such as solitary and colonial corals, and reef dwellers, like gastropods, bivalves, brachiopods, etc. are very abundant. The gastropods of this locality are described by Nützel & Senowbari-Daryan (1999) and the bivalves by Hautmann (2001). The description of sponges is in preparation.

Tabasosphaera pustulosa nov. gen., nov. sp., with several specimens, was found in two thin sections (AB6 and AB7) collected from this locality. It may also occur in bioconstructions of other localities within the Nayband Formation.

PALEONTOLOGY

Incertae sedis

Tabasosphaera nov. gen.

Derivatio nominis: From the town Tabas (the closest large town to the type locality) and the spherical shape of the microfossil.

Diagnosis: Hollow spherical to egg-shaped test of approximately 1 mm in diameter with numerous pustule-like protuberances on the outer surface. Thin wall, originally composed of aragonite or calcite, but presently preserved as calcite. Interior of the test is usually filled with calcite cement.

Type species: *Tabasosphaera pustulosa* nov. sp.

Tabasosphaera pustulosa nov. sp.

(pl. I, figs. 1-3, pl. II, figs. 1-4, text-fig. 2)

Derivatio nominis: Pustula (lat.= pimple). According to pimple-like protuberances on the test surface.

Holotype: Designated as holotype is the specimen illustrated in pl. I, fig. 1/1. Contrary to paratypes, whose interior is filled with calcite cement, the interior of the holotype is filled with micritic sediment exhibiting the thin wall of the test.

Paratypes: Except holotype all specimens figured in pl. I and pl. II.

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Locus typicus: At the north flank of Kuh-e Nayband, small reef located about 6.5 km NW of the small town of Ali-Abad (text-fig. 1).

Stratum typicum: Upper Triassic, most probably Rhaetian.

Diagnosis: See diagnosis of the genus.

Material: Several specimens in thin section AB6 and AB7 (Senowbari-Daryan: Triassic Iran).

Depository: Institute of Paleontology, University of Erlangen (Senowbari-Daryan, Triassic Iran)



Fig. 2. Reconstruction of *Tabasosphaera pustulosa* nov. gen., nov. sp.

DESCRIPTION

The interior of all specimens except the holotype (pl. I, fig. 1/1) are filled with secondary calcite cement. The diameter of this spherical to egg-shaped (oval in thin section: see pl. I, fig. 3) microfossil varies between 0.6 mm and 1.2 mm (tab. 1). The smaller specimens could be marginal sections of larger specimens. The dimensions of some specimens are given in tab. 1.

The **holotype** (pl. I, fig.1/1) has a diameter of 0.64 by 0.8 mm and is filled with micritic sediment, showing the thin wall of the test. The wall (approximately 0.02 mm) appears light in transmitted light indicating the primary aragonite or calcite (now calcite) mineralogy of the test.

The outer surface of all specimens bear numerous pustule-like protuberances with a length of 0.6-0.1 mm. One protuberance in the holotype shows a pore piercing the protuberances. Because of intense recrystallization in all other specimens this character could not be recognized. The small specimen illustrated in pl. II, fig. 4 exhibits a neck-like elongation, but this could not be observed in other specimens. Therefore, the presence of a neck is not confirmed.

Tabasosphaera pustulata was found in reef facies within the interior of other organisms, such as brachiopod shells (Pl. I, figs. 2-3), spongocoel of "pharetronid" sponges (pl. I, figs. 1, 4), chambers of sphinctozoid sponges (pl. I, fig. 1, pl. II, fig. 2) or in worm tubes (pl. II, fig. 3). No specimens were found in the surrounding micritic sediment. A reconstruction of *Tabasosphaera pustulata* is given in text-fig.2.

ORGANISM ASSOCIATION

Tabasosphaera pustulata nov. gen., nov. sp. is associated with sponges (Sphinctozoida, Inozoida, Chaetetida, Spongiomorphida), abundant worm tubes, brachiopod shells and the microproblematicum *Microtubus communis* FLÜGEL. The space between the organisms is filled with micritic or with microsparitic sediment. All facies characters and the fossil assemblage indicate a reef rock deposited in low water movement below the current wave.

DISCUSSION

All specimens of *Tabasosphaera pustulosa* were found within the cavities of organisms (spongocoel or chambers of sponges, brachiopods) representing the endobiotic and maybe cryptic lifestyle of this microorganism. Regarding the systematic position of this spherical or egg-shaped microfossil, the following microorganisms may be considered: radiolarians, ostracods, calcispheres and foraminifers.

Radiolarians: The mineralogy of skeleton (calcareous), the endobiotic lifestyle and the facies type do not favour the interpretation of *Tabasosphaera pustulosa* as a radiolarian.

Ostracods: Ostracods are relatively abundant in micritic sediments or in cavities between or within the organisms in Triassic reefs. Sections through an ostracod shell may appear as circular or oval in thin section. Also ostracod shells may have pustule-like protuberances on the shell surface. However, because of the absence of connected shells, the ostracod assignment is out of the question. Also the pore-pierced pustules are not a typical feature for ostracods.

Calcispheres: Calcispheres "are calcitic spheres, ranging in size from less than 0.1 to 0.5 mm; thickness of shells varies from 3 to more than 200 microns." (Häntzschel 1975: 155). The systematic position of calcispheres as foraminifera, acritarchs, planktonic algae or as cysts of algae is disputed. Because of its endobiotic lifestyle, the large dimensions of the test and the thin wall, *Tabasosphaera pustulosa* can hardly be regarded as calcispheres. A comparison with acritarchs is also out of the question.

Foraminifers: The shape and dimension of the test, the test mineralogy (calcareous) and the perforated protuberances on the test wall allowed an interpretation of *Tabasosphaera pustulosa* in favour of foraminifers. Also the reefal facies type and lifestyle of *Tabasosphaera pustulosa* is consistent with this interpretation. As a foraminifer it can be regarded as a monochambered species, because no proloculus is observed. Morphologically identical monochambered foraminifers are also known, especially from Paleozoic deposits. For example, the representatives of the family Parathuramminidae have a test characterized by a globular shape and pustule-like protuberances of the test wall with pores (apertur). An excellent example compared with *Tabasosphaera pustulosa* is the Paleozoic

genus *Paraturrammina* with the following diagnosis: "Test globular, up to 0.45 mm in diameter; wall calcareous, granular, may appear striate in section; surface with numerous tubular protuberances, terminating in apertures. U. Silurian (Ludlovian) to L. Carboniferous (Tournaisian), Mississippian; Europe; Asia" (Loeblich & Tappan 1988: 191).

The main difference between the representatives of family Parathuramminidae and *Tabasosphaera pustulosa* is the microstructure of the wall (granular in Parathuramminidae, hyalin in *Tabasosphaera*). Most probably *Tabasosphaera pustulosa* represents a foraminifer, which may be attributed to the group Lagenina.

Table 1

Measurements of *Tabasosphaera pustulosa* nov. gen., nov. sp. (DT) diameter of the test, LP) length of protuberances, NP) count number of protuberances, DP) diameter of protuberances at the base, H) Holotype. All measurements in mm.

Thin section/ pl./fig.	DT	LP	NP	DP
AB6/pl.2, fig.1	1.00 x 1.20	0.06	4	0.06
AB7/pl. 1, fig.2	1.10 x 1.20	0.06	2	0.10
AB7/pl. 1, fig. 2	1.00 x 1.04	0.06	8	0.08
AB7/pl. 1,fig. 3	0.78 x 1.08	0.08	4	0.08
AB7/pl. 1, fig. 1(H)	0.64 x 0.8	0.06	3	0.08
AB7/pl.1, fig. 1	0.7 x 0.7	0.10	3	1.20
AB7/pl. 2, fig. 4	1.24 x 1.40	0.08	8	0.08

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PLATE CAPTIONS

Plate I

Fig. 1-3: *Tabasosphaera pustulosa* nov. gen., nov. sp. from the Upper Triassic reef limestones of Nayband Formation near Ali-Abad (NE Iran).

- Fig. 1: Section through three specimens. The number "1" indicates the holotype. The interior of the holotype is – in contrary to all other specimens – filled with micritic sediment showing the thin wall and three protuberances. All three specimens are imbedded within the chamber interior of a sphinctozoid sponge. AB7, x22.
- Fig. 2: Three specimens in the interior of a brachiopod shell. All specimens are filled with calcite cement. One specimen shows up to 8 pustules. AB7, x20
- Fig. 3: An oval (in section) specimen within a brachiopod test. The pustule-like elements are well recognizable. AB7, x34.

Plate II

Fig. 1-4: *Tabasosphaera pustulosa* nov. gen., nov. sp. from the Upper Triassic reef limestones of Nayband Formation near Ali-Abad (NE Iran).

- Fig. 1: Specimen imbedded within the spongocoel of a "pharetronid" sponge. AB6, x22.
- Fig. 2: Two specimens within the chambers of a sphinctozoid sponge. AB7, x32.
- Fig. 3: Two specimens which are imbedded within a serpulid worm tube or a brachiopod shell. AB7, x7.5.
- Fig. 4: Two specimens within the spongocoel of a "pharetronid" sponge. The small specimen shows a neck-like extension of the test. AB7, x7.5



