

## *Bicoelia corticifera*, a new inozoid sponge from the Upper Triassic (Norian) reef boulders of the Central Taurids (southern Turkey)

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**Abstract:** Upper Triassic Norian reef boulders, exposed in a locality in the Central Taurids, southern Turkey, yielded a high number of hypercalcified sponges, including Sphinctozoans, Inozoans, Spongiomorphids, and Chaetetids. The reef boulders are exposed near the fountain Tavuk Çeşme, located at the road leading from the town of Aksu to Yenişarbademli. Geologically this locality belongs to the Anamas Akseki Autochthon. In this paper a new inozoan sponge, *Bicoelia corticifera* nov. sp., is described from Tavuk Çeşme. It is a cylindrical and unbranched sponge, found in several thin sections. The sponge is characterized by 2 axial spongocoels, and the sponge wall is composed of fine reticulate fiber skeleton and a distinct outer wall. Usually several specimens grow closely side by side.

**Key words:** Sponge, Inozoa, *Bicoelia*, Triassic, Norian, reef, Central Taurids, Taurus Mountains, Turkey

### 1. Introduction

Upper Triassic (Carnian-Norian) reef boulders, exposed in several localities in the Taurus Mountains, southern Turkey, have been known for more than 40 years (Poisson, 1967). Within these boulders the hypercalcified sponges (including Sphinctozoans, Inozoans, Spongiomorphids, and Chaetetids) are the most abundant reef builders, followed by the scleractinian corals and other reef organisms. While the Norian Sphinctozoans of the Taurus Mountains are relatively well known (Senowbari-Daryan and Link 2011, see further references *ibid.*), there are fewer investigations about the other mentioned groups, particularly the Inozoans. The sponge described here as *Bicoelia corticifera* nov. sp. is the first representative of the Inozoan genus in the Triassic deposits. This paper documents the occurrence of the genus *Bicoelia* in the Triassic, which was known only from the Permian.

General geological works about the Triassic of the Taurus Mountains (Central Taurids) are published by Brunn et al. (1971) and Gutnic et al. (1979). One of the first descriptions of Triassic sediments in the studied Anamas Mountains was given in Blumenthal (1947). Brunn et al. (1971) recognized the Kasımlar Shales as siliciclastic sediments of Norian age at the base of the Anamas Mountains. The first interpretation of the sedimentary basin of the Kasımlar Formation was given by Gutnic et al. (1979). The southern area of the Anamas Mountains was studied by Monod (1977) and Lheureux (1983). The

investigated area was geologically mapped in detail by the MTA (Şenel et al., 1992).

Investigations about the fossil content of this locality are found in Senowbari-Daryan and Link (2011) and about the neighboring upper Triassic localities in Riedel (1990) and Flügel and Link (1996).

### 2. Geologic and geographic position of the locality

The studied locality, called Tavuk Çeşme locality in this paper (Figure 1), belongs geologically to the Anamas Akseki Autochthon in the Taurus Mountains, southern Turkey. The upper Norian Kasımlar Formation at the southern edge of the Anamas Mountains. (north of the Dipoyraz Dağ) consists of siliciclastic shales. In these sediments are embedded local accumulations of isolated and displaced reef boulders (Figure 2). The studied reef boulders are exposed near the fountain Tavuk Çeşme, located near the road leading from the town of Aksu to Yenişarbademli. This locality is one of several known localities with debris flow composed of reef limestones ("cipit"). This densely packed and isolated appearance of dislocated reef boulders probably represents a submarine canyon filling. The sponges were collected at the slope above the curve west of the fountain (Figure 3; 37°42'58.42"N, 31°19'38.65"E). The limestones are classified as sponge-dominated reef carbonates; corals and other reef builders are not abundant. This locality yielded a high number of hypercalcified sponges. The studied

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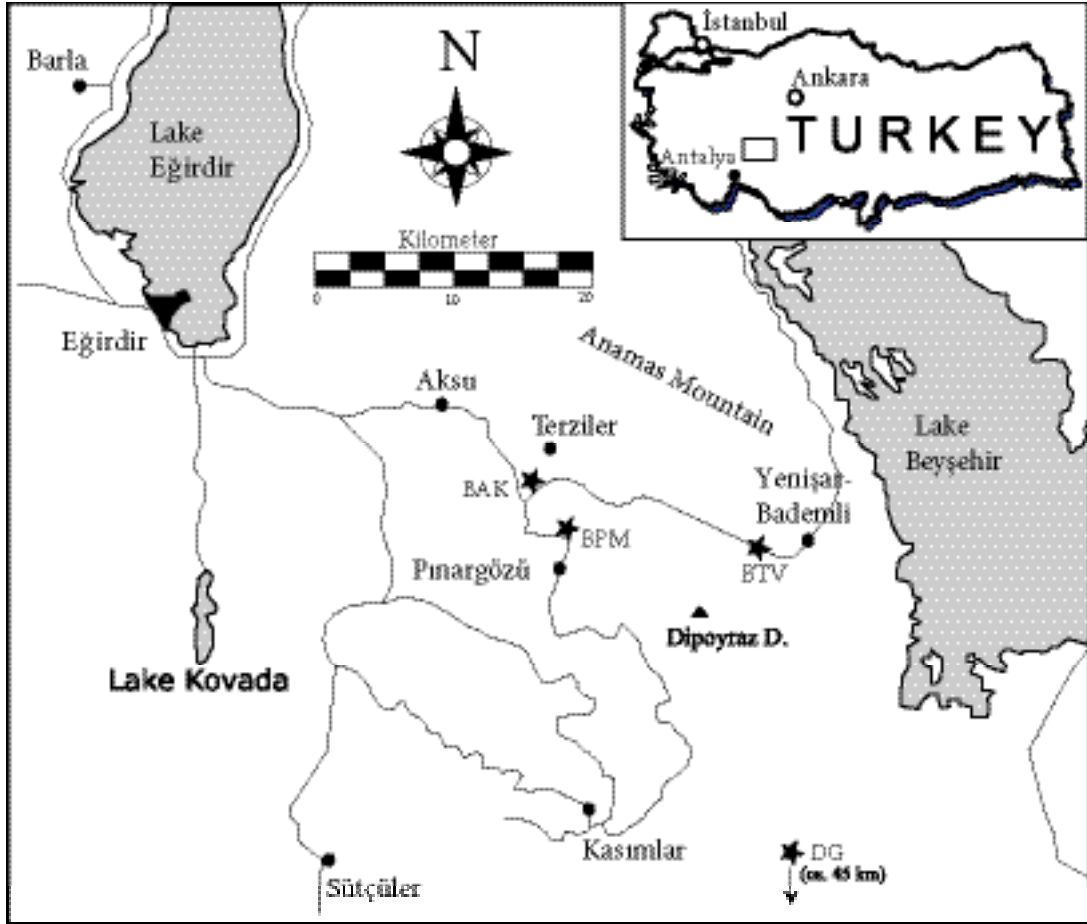


Figure 1. Geographic position of the Tavuk Çeşme locality (BTV) marked with an asterisk.

material will be kept at the Geo-Center of Northern Bavaria, Department of Palaeontology, University of Erlangen-Nuremberg (Material M. Link, Turkey). Holo- and paratypes are deposited at the Forschungsinstitut

Senckenberg, Frankfurt am Main, Germany (inventory number XXVI 561).

### 3. Systematic palaeontology

*Remarks:* The systematic classification of hypercalcified sponges proposed by Finks and Rigby (2004) is used to describe the following sponge:

Phylum Porifera Grant, 1836

Class Demospongiae Sollas, 1875

Subclass Ceractinomorpha Lévi, 1953

Order Agelasida Verrill, 1907

Family Preperonidellidae Finks and Rigby, 2004

Subfamily Precorynellinae Termier & Termier (in Termier et al.), 1977

Genus *Bicoelia* Rigby, Senowbari-Daryan and Liu, 1998

*Diagnosis:* "Cylindrical sponges with two spongocoels in axial region of skeleton, each with own wall pierced by pores or tubes connecting to pores in reticulate skeleton of sponge wall around spongocoel. Outer surface of sponge characterized by perforated dermal layer. Skeleton between outer wall and walls of spongocoel loose and partially

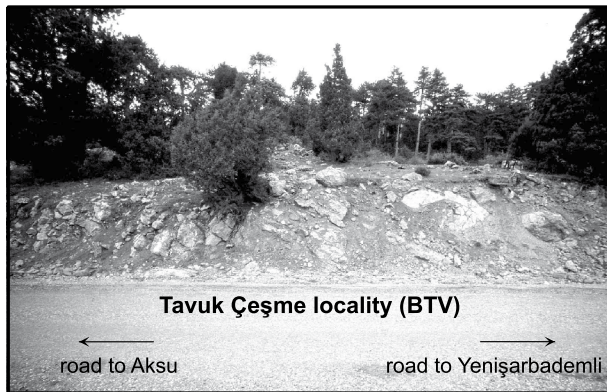
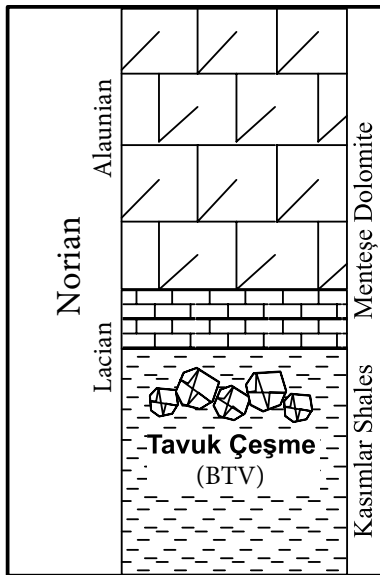


Figure 2. Outcrop of Tavuk Çeşme locality. The reef boulders ("cipit" limestones) are embedded within the siliciclastic Kasımlar Formation. This densely packed and isolated appearance of dislocated reef boulders probably represents a submarine canyon filling.



**Figure 3.** Schematic section of the Norian deposits at the southern edge of the Anamas Mountains. The reef boulders are embedded within the marly to siliciclastic shales of the Kasımlar Formation.

radially-arranged fibrous network. Some horizontal elements, tabulae, may occur within spongocoel” (Rigby et al., 1998: 73; for diagnosis see also Finks and Rigby, 2004: 635).

Type species: *Bisiphonella tubulara* Senowbari-Daryan and Ingavat-Helmcke, 1994.

Further species: *Bicoelia guadalupensis* Rigby, Senowbari-Daryan and Liu, 1998.

**Remarks:** Wu (1991) established the genus *Bisiphonella* as a sponge genus with 2 spongocoels. He illustrated 3 specimens of the type species *Bisiphonella cylindrata* in Plate 7, Figures 4 and 5, and in Plate 9, Figure 11. According to the fine or coarse and regularity of the fiber skeletons, specimens 4 and 5 of Wu seem to belong to different species. Detailed features of the specimen illustrated in Wu (1991: Plate 9, Figure 11) are not recognizable. In agreement with Rigby et al. (1994), Senowbari-Daryan and Ingavat Helmcke (1994), and Rigby and Senowbari-Daryan (1996), we also argue for the distinction of these specimens.

Both genera, *Bisiphonella* Wu (1991) and *Bicoelia* Rigby et al. (1998), are defined by possession of 2 axial canals. “The principal difference separating *Bisiphonella* Wu from the *Bicoelia* is that in the latter each of the spongocoels has a distinct, well differentiated gastral wall, which is not developed in *Bisiphonella* nor in the related *Peronidella*” (Rigby et al., 1998: 73). The perforated dermal layer in *Bicoelia*, lacking in *Bisiphonella*, is an additional feature for the differentiation of both genera.

Both *Bisiphonella* and *Bicoelia* were known only from the Permian. The new species described in this paper was found in the Norian reef boulders of the Tavuk Çeşme locality. This sponge is characterized by 2 spongocoels like the Permian species *Bisiphonella cylindrata* Wu. According to the definition of the genus *Bicoelia* with walled spongocoel, the specimens from Turkey are attributed as a new species to this genus. Therefore the genus is described for the first time from Triassic deposits.

*Bicoelia corticifera* nov. sp.

(Figure 4a–4f)

**Derivatio nominis:** Named for the possession of a distinct cortex on the sponge’s outer surface.

**Holotype:** The axial longitudinal section is illustrated in Figure 4b and marked with H, magnification in Figure 4d. Thin section BTV 50.

**Paratypes:** All specimens illustrated in Figures 4a, 4c, 4e, 4f.

**Locus typicus:** Tavuk Çeşme (“chicken fountain”) locality. Outcrop on the Aksu–Yenişarbademli road, slope north of the road, west of the fountain (Figure 2).

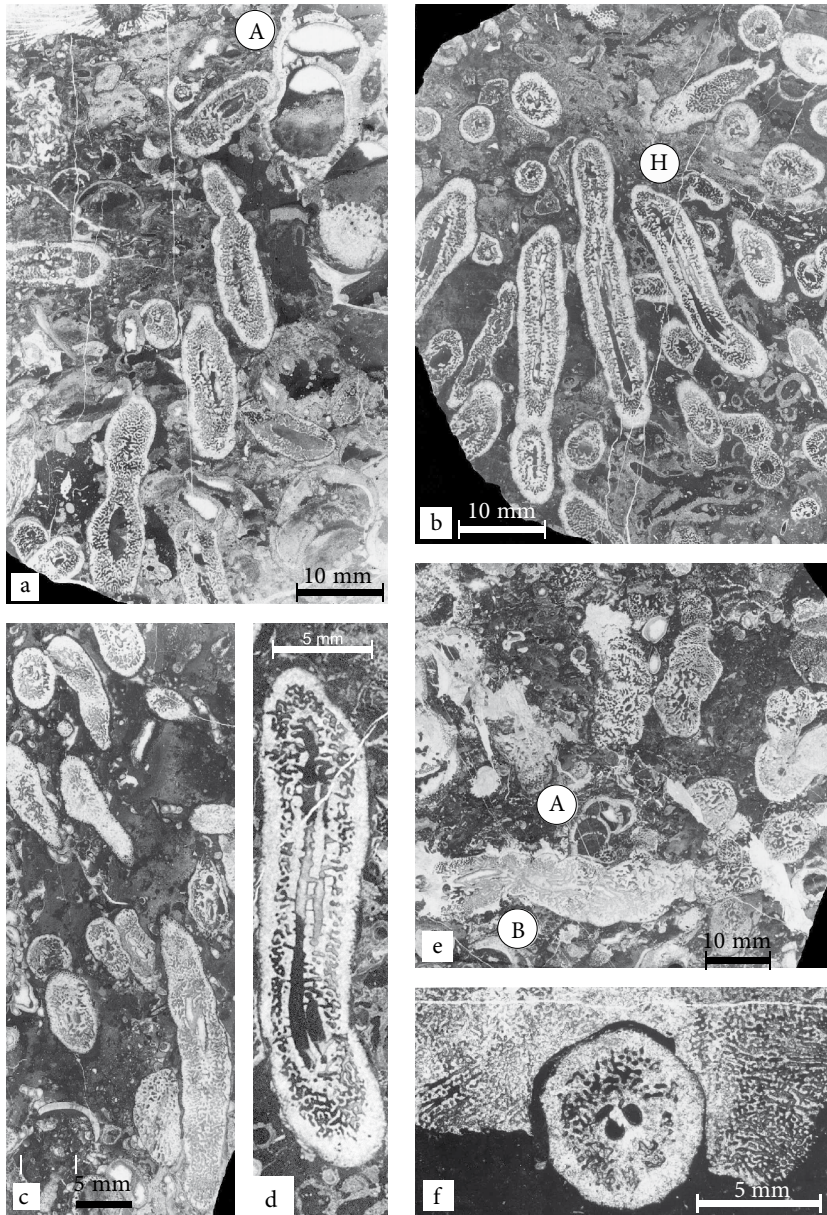
**Stratum typicum:** Reef boulders (“cipits”) of the Kasımlar Formation, Norian, Upper Triassic.

**Diagnosis:** Cylindrical and unbranched species with 2 well walled spongocoels. Spongocoel wall is pierced by relatively large openings. Sponge wall is composed of reticulate fiber skeleton. Distinctly thick cortex.

**Material:** Numerous specimens. For illustrated specimens see the inventory.

**Inventory:** The holotype and the illustrated paratypes are deposited at the Senckenberg Natural History Museum, Frankfurt/Main (Germany), Inventory Numbers BTV 31, BTV 47, BTV 50 (holotype), BTV 71, and BTV 168.

**Description:** Numerous specimens of this species were usually found together in several thin sections (Figures 4a–4c). The cylindrical stems of this single sponge reach diameters between 4 mm and 6 mm. Maximum height of the sponge cannot be determined, but the largest specimen reaches a height of at least 35 mm. The holotype (Figure 4b, marked with H) is a specimen reaching a height of 27 mm with a diameter of 5 mm. Most specimens, including the holotype, exhibit the 2 axial spongocoels passing internally through the whole sponge skeleton. Some specimens, however, possess only one partly wide spongocoel (Figure 4a). The diameter of both spongocoels together is 1.7 mm, individual spongocoels reach diameters of about 0.5 mm without the wall. Individual spongocoels have their own wall with a thickness of approximately 0.5 mm. Moreover, the wall between the spongocoels reaches a thickness of up to 0.5 mm. The sponge wall (about 3 mm) between the spongocoel walls and the outer cortex is composed of a loose reticulate fiber skeleton. The thickness of fibers is usually about 0.1 mm. Spongocoels are connected to the interfiber spaces with openings of 0.1–0.25 mm in



**Figure 4.** *Bicoelia corticifera* n. sp. from the Norian reef boulders of the Tavuk Çeşme locality. **a.** Oblique and cross sections through several specimens. Some specimens (at the bottom of the photograph) exhibit a single wide spongocoel. Remarkable of all specimens is the thick and perforated wall around the spongocoel(s). (A): A sphinctozoan sponge of *Colospongia*-type. BTV 47. **b.** Longitudinal, oblique, and cross sections through numerous specimens. (H): Holotype. The majority of specimens and the holotype exhibit 2 axial spongocoels. BTV 50. **c.** Similar to a. BTV 71. **d.** The magnification of holotype (H) from b shows the 2 axially parallel running spongocoels and the reticulate fiber skeleton of the sponge wall in detail. BTV 50. **e.** Sections through several specimens. (A) A specimen of the chambered sponge *Colospongia*, growing on *B. corticifera* (B). BTV 168. **f.** Cross section through a specimen showing the spongocoels and the sponge wall with thick dermal layer in details. BTV 31.

diameter. The dermal layer (cortex) of approximately 1 mm thickness is recrystallized in all specimens. It is composed of densely packed skeletal fibers and pierced by a not well recognizable complicated pore system.

*Remarks:* Both genera—*Bicoelia* and *Bisiphonella*—are defined by the possession of 2 axial spongocoels. As

described above, some specimens of the upper Triassic species from Turkey exhibit 1 and others 2 spongocoels. Apart from the 1 or 2 spongocoels all other features of the specimens are identical. The specimens show that the number of spongocoels is not fixed and this feature is variable in this sponge.

*Occurrence:* Until now *Bicoelia corticifera* nov. sp. was known only from the type locality. In unpublished material from the Norian-Rhaetian reefs of Sicily, Italy (collection B. Senowbari-Daryan), 2 different sized specimens of *Bicoelia* were found. Based on the sponge size one of them is very similar to *B. corticifera* and could be identical to this species.

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