

## NOTA BREVE - SHORT NOTE

UPPER TRIASSIC SPHINCTOZOAN SPONGES FROM NORTHERN CALABRIA  
(SOUTHERN ITALY)

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**Key-words:** Sponge, "Sphinctozoan", Reef, Upper Triassic (Norian-Rhaetian), Northern Calabria, Italy.

**Riassunto.** Vengono descritte tre spugne appartenenti al gruppo degli "sfinctozoi" (*Amblyisiphonella* sp., *Colospongia* sp. ed una nuova specie *Deningeria iannacei* n.sp.). Esse sono state rinvenute in un blocco appartenente alla formazione della Dolomia Principale lungo la valle del fiume Argentino (Calabria settentrionale, Italia). Questi tre generi vengono segnalati per la prima volta in Calabria. L'associazione, costituita, oltre che da altre specie di sfinctozoi, anche da diversi gruppi di demospongie (inozoi, frammenti di "idrozoari," probabili chetetidi), contiene inoltre alcuni "microproblematica" (*Microtubus communis*), lamine microbialitiche, foraminiferi (*Aulotortus*, *Kaeveria*, *Ophthalmidium*, Nubecularidi), tubi di anellidi ed alcuni frammenti di dasycladacee molto ricristallizzate. Per quanto riguarda l'età, la presenza, in quest'associazione, di alcune spugne, microproblematici e foraminiferi abbastanza frequenti nelle classiche associazioni recifali del Trias superiore della Tetide, oltreché affinità litostratigrafiche con successioni affioranti in prossimità e datate sulla base della macrofauna permettono di riferire la fauna studiata al Triassico superiore (Noric-Retico).

**Abstract.** Three sphinctozoan sponges: *Amblyisiphonella* sp., *Colospongia* sp. and the new species *Deningeria iannacei* n. sp., are described from a loose boulder derived from Triassic dolomites ("Dolomia principale") of the Argentino valley in Northern Calabria (Southern Italy). All three genera are reported for the first time from Calabria. The sphinctozoans are associated with other sponges (inozoans, "hydrozoans", chaetetids), "microproblematica", foraminifers, abundant worm tubes, biogenic crusts, and rare dasycladacean algae. The age of the association is referred to Upper Triassic (Norian-Rhaetian) on the basis of its similarity to the classic reef assemblages of Upper Triassic in the Tethys realm and by the close proximity of the boulder to the well dated (macrofauna) outcropping Upper Triassic carbonate successions.

### Geological setting.

The described specimens have been found in a loose boulder, about 50 cm in diameter (N39° 10, E 15° 5920, Sheet 533, 1:50.000 Maratea, Istituto Geografico Militare), close to the trail following the Argentino river in Northern Calabria (Southern Italy). The locality is known as Golfo della Serra. (Fig. 1).

The geology of the Argentino narrow valley is poorly known. In its steep walls outcrop recrystallized, well-bedded limestones overlain by more massive, often cataclastic dolomites. These dolomites are grouped in a single formation, Carnian-Norian in age in the 1:25.000 geological map (Carta Geologica della Calabria, Monte Palanuda sheet), whereas two different dolomitic units are distinguished in the 1:100.000 map of the Carta Geologica d'Italia, Foglio Castrovillari. The first group of dolomites, Carnian/Norian in age, is placed, together with the recrystallized limestones, in the Campotenesse tectonic Unit (partly corresponding to the "San Donato Unit" of Amodio-Morelli et al., 1976); the bulk of the dolomitic rocks are attributed to the "Verbicaro" tectonic Unit, overlying the "San Donato Unit". The latter dolomites are characteristically more fossil-rich and have a well documented Norian-Rhaetian age (Damiani, 1970). The studied boulder has been found in loose scree, in a area where the carbonate successions, belonging to the "Verbicaro Unit" outcrop in situ.

Nevertheless, it has been shown by Iannace et al. (1995) that the distinction between the "San Donato" and "Verbicaro" Units, introduced by Amodio-Morelli et al. (1976) and accepted later by most authors, is not fully corroborated by field evidence. Particularly, it has been documented that Norian dolomites, similar to those of the classical "Verbicaro" Unit, can be locally found in stratigraphic sequence upon Ladinian-Carnian carbonates and evaporites, belonging to the "San Donato" Unit (Iannace et al. 1995; Zamparelli et al., 1995).

In this frame, the structural setting of the dolomitic succession of the Argentino valley is in need of revision. At present, we can only state the provenance of our fossil remains, outcropping at the head of the Argentino drainage basin, from a Norian-Rhaetian dolomitic unit.

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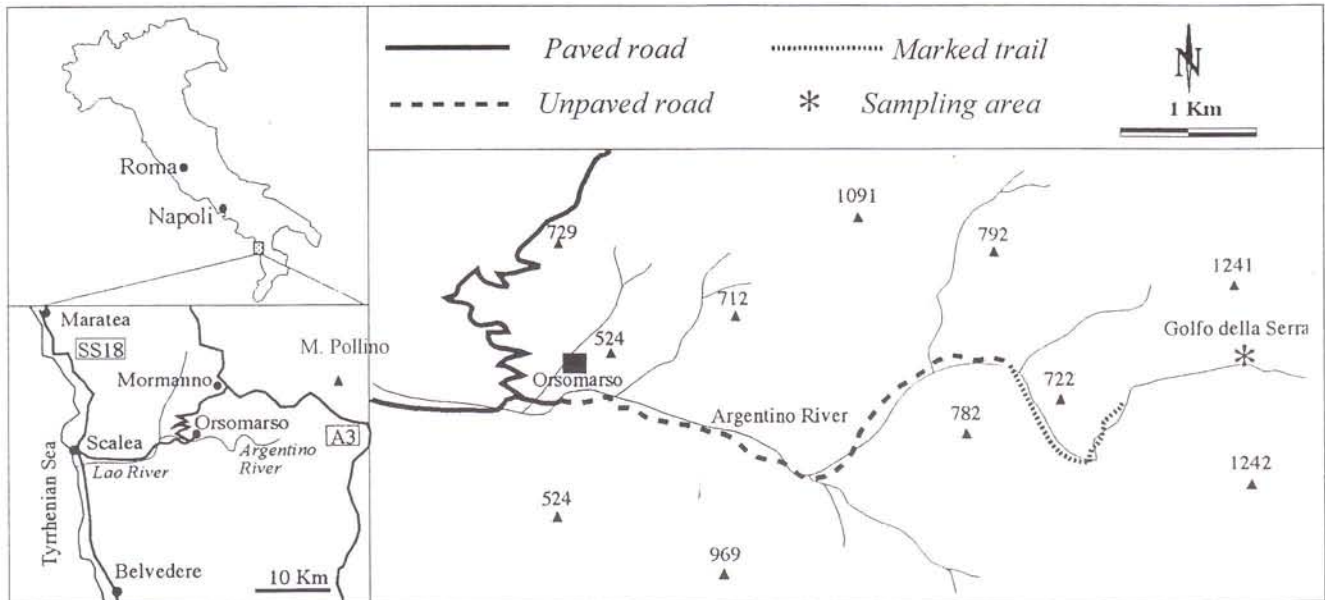


Fig.1 - Geographic location of the studied outcrop.

#### Stratigraphic age of the investigated carbonate boulder.

The sponges described in this paper do not allow further stratigraphic refinement for the age of the collected lithotype. The associated organisms, the assemblage of other sponges (inozoans and "sphinctozoans" like to *Paradeningeria* sp.), the "hydrozoans", the "microproblematica" (*Microtubus communis*) and rare foraminifers (*Aulotortus*, *Kaeveria*, *Planiinvoluta*, *Ophthalmidium*, ammodiscids), are all referred to the Upper Triassic (Norian-Rhaetian). The dasycladacean algae, associated with the sponges, are not well preserved and their systematic determination is not currently possible. However, the remains of some dasycladacean thalli look similar to *Clypeina besici* Pantic, an alga generally found in Carnian deposits. Others fragments show similarities with to the genera *Spinaporella* sp., *Physoporella leptoteca* Kochansky-Devidè (Flügel et al., 1984; Braga, 1986; Braga & Martin, 1987), found in the Upper Triassic of the Betic Cordillera (Spain).

Repository. All the documented material is kept in the Dipartimento di Scienze della Terra, University of Napoli "Federico II", Napoli, collection V. Zamparelli.

#### Systematic Paleontology.

Phylum **Porifera** Grant, 1872

Class **Demospongiae** Sollas, 1864

Order **Permospincta** Termier & Termier, 1977

Suborder **Porata** Seilacher, 1962

Family **Deningeriidae** Boiko, 1991

(in: Boiko et al., 1991)

Remarks. The family Deningeriidae was established by Boiko (in: Boiko et al., 1991, p. 156) with the following diagnosis: "Colonies catenulate, chambers subspherical, filling skeleton reticular, formation of the siphon is asiphonate or retrosiphonate". For these sponges, the family Solenolmiidae was established by Engeser (1986). According to the definition of the families Deningeriidae and the Solenolmiidae, both are identical. However, the type genus of Solenolmiidae (*Solenolmia* Pomel) possesses a spongocoel whereas the type genus of Deningeriidae (*Deningeria* Wilckens) lacks it (see Senowbari-Daryan, 1990). Senowbari-Daryan & Ingavat-

#### PLATE 1

Fig. 1-5 - *Deningeria iannacei* n. sp. Upper Triassic (Norian-Rhaetian), Vallone Argentino, Northern Calabria. Fig. 1) Holotype. Longitudinal section through numerous subspherical to barrel-shaped chambers. The filling structure at the peripheral part of the chamber interiors has trabecular appearance, as recognizable in chambers in the middle part. The lower part of the sponge seems to have an axial spongocoel, due to the loose packed filling structure and calcite cement in the central area, but in reality it is an asiphonate sponge. Thin section FS 624, X 2.2. Fig. 2) Longitudinal section through several chambers exhibiting the reticular filling structure in the lower part and trabecular appearing in the middle part. Thin section FS 624, X 3. Fig. 3) Section through numerous chambers of two or several specimens growing together. Thin section FS 624, X 1.2. Fig. 4) Longitudinal and oblique section through several specimens, partly grow together. Thin section FS 624, X 1.8. Fig. 5) Section through a branched (?) specimen showing the coarse filling structure within the chamber interiors, the chamber walls with pores, and the extension of chamber walls into the filling structure. Thin section FS 624, X 2.5.



Helmcke (1994) discuss this problem suggesting "to limit the family Deningeriidae to those genera without any spongocoel, but with a reticular filling skeleton". This suggestion has been followed in this paper.

#### Genus *Deningeria* Wilckens, 1937

**Type species:** *Deningeria camerata* (pars) Wilckens, 1937 (see Senowbari-Daryan, 1990, p. 97).

**Further species:** *Deningeria mirabilis* Wilckens, 1937.

*Deningeria tmeticus* (Hurcewicz, 1975).

*Deningeria tenuireticulata* Senowbari-Daryan, Zühlke, Bechstädt & Flügel, 1993.

*Deningeria crassireticulata* Senowbari-Daryan, Zühlke, Bechstädt & Flügel, 1993.

**Remarks.** Wilckens (1937) did not give a diagnosis for *Deningeria* in the original description. Also there is some confusion on the separation and description among the genera *Deningeria*, *Seranella* and *Cryptocoe-liopsis* by the same author. Ott (1967) synonymised all three genera to *Deningeria*. Senowbari-Daryan (1990) discussed the independence of the genera established by Wilckens and reintroduced the genus *Seranella* with type species *S. tenuissima* Wilckens (pars). *Seranella* differs from *Deningeria* by possessing an axial tube or spongocoel (for detailed discussion see Senowbari-Daryan 1990, p. 97). Based on Wilckens description and own observations, we summarize the diagnosis for *Deningeria* as follows.

**Diagnosis.** Asiphonate, perforate to coarse perforate sponge with a reticular filling structure within the interior of the chambers. The filling structure is coarse and densely packed at the peripheral part of the chambers, getting finer and loose to the central part of the chamber interiors. Skeletal mineralogy was most probably aragonitic. Microstructure and spicules are not known.

#### *Deningeria iannacei* n. sp.

(Pl. 1, fig. 1-5, Pl. 2, fig. 2-3, 5, 7)

**Derivation of name.** This species is dedicated to our colleague and friend Dr. Alessandro Iannace, for his outstanding contribution to the knowledge of the Triassic of Calabria.

**Type locality.** Argentino river valley, at 10 km in distance from the Orsomarso village: outcrop located on the left side of the Argentino river (see Fig. 1).

**Type level.** Triassic, most probably Upper Triassic (Norian-Rhaetian).

**Holotype.** Pl. 1, fig. 1. Thin section FS 624.

**Paratypes.** All figured specimens in Pl. 1, fig. 2-5, Pl. 2, fig. 2-3, 5, 7. Thin section FS 624.

**Material.** Numerous specimens examined in numerous (20) thin sections and polished slabs.

**Diagnosis.** Asiphonate stems with coarse pores or openings on the chamber walls. The interiors of the chambers are filled with a relatively coarse reticular filling skeleton. The chambers are usually irregular in shape but also spherical or barrel-shaped. The filling skeleton is coarse and densely packed at the peripheral part of the chambers, but fine and loose in the center part. Microstructure and spicules are not known.

**Description.** The stems of *Deningeria iannacei* n. sp. are composed of several, usually irregular, but also spherical, subspherical or barrel-shaped chambers. The arrangement of the chambers is either moniliform or irregular. Some specimens with irregularly arranged chambers have an appearance of glomerate sponges. The size of the chambers varies between 5 mm and 25 mm, usually it is about 10 mm in diameter.

The chamber walls, especially the exowalls (outer walls) are distinct, presenting as white structures in polished slabs. The skeleton is mostly recrystallized and the pores or openings of the chamber walls are not well recognizable. They are pierced by relatively large openings similar to other species of the genus. It is not easy to distinguish if to the pores of the chamber walls are branched or not. Some well preserved specimens show simple openings. Usually the exowalls are a little thicker than the endowalls (Pl. 1, fig. 5).

The fibers of the chamber walls are branching, extending into the filling skeleton of the chambers interior. This branching gives to the filling skeleton a radial trabecular appearance at the peripheral part (Pl. 1, fig. 1-2). The filling skeleton is coarse and densely packed at the peripheral part of the chambers, but fine and loose in the central part. Because of the loose packing of the filling skeleton, the central part of the chambers contains more sparry calcite cement than the peripheral part. This phenomenon could lead to the interpretation

#### PLATE 2

"Sphinctozoans" from Upper Triassic (Norian-Rhaetian) of Vallone Argentino, Northern Calabria.

Fig. 1 - *Amblysisiphonella* sp. Longitudinal section through 5 chambers. The branching pores are well visible in the chamber walls in middle and youngest chambers. Thin section FS 624, X 3.

Fig. 2 - *Amblysisiphonella* sp. (A, parallel section to fig. 1) and several specimens of *Deningeria iannacei* n. sp. Thin section FS 624, X 1.3.

Fig. 3 - *Deningeria iannacei* n. sp. Longitudinal section through a specimen with barrel-like chambers. Thin section FS 624, X 2.8.

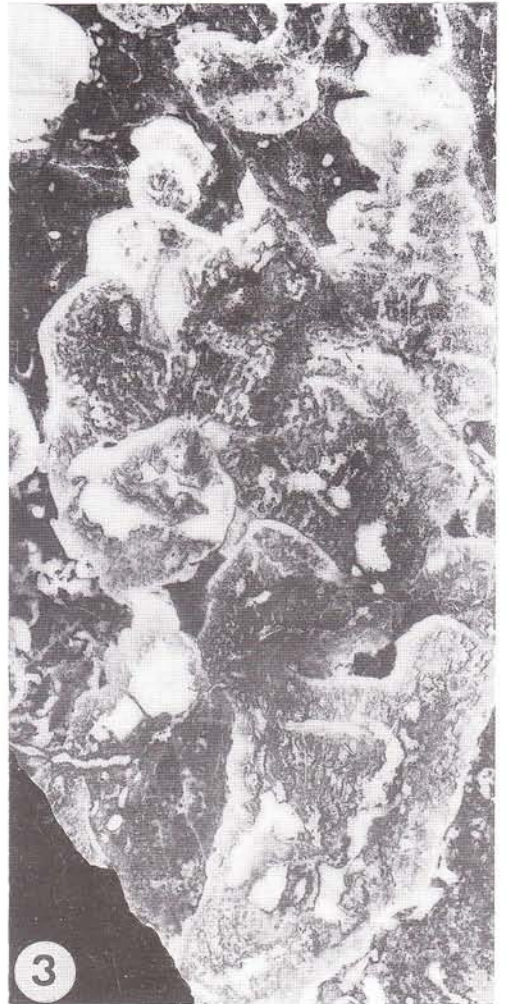
Fig. 4 - Section through two branches of *Colospongia* sp. The multibranched pores of the chamber walls are well recognizable. Thin section FS 624, X 4.

Fig. 5 - *Colospongia* sp. (A) and *Deningeria iannacei* n. sp. (B). Thin section FS 624, X 1.1.

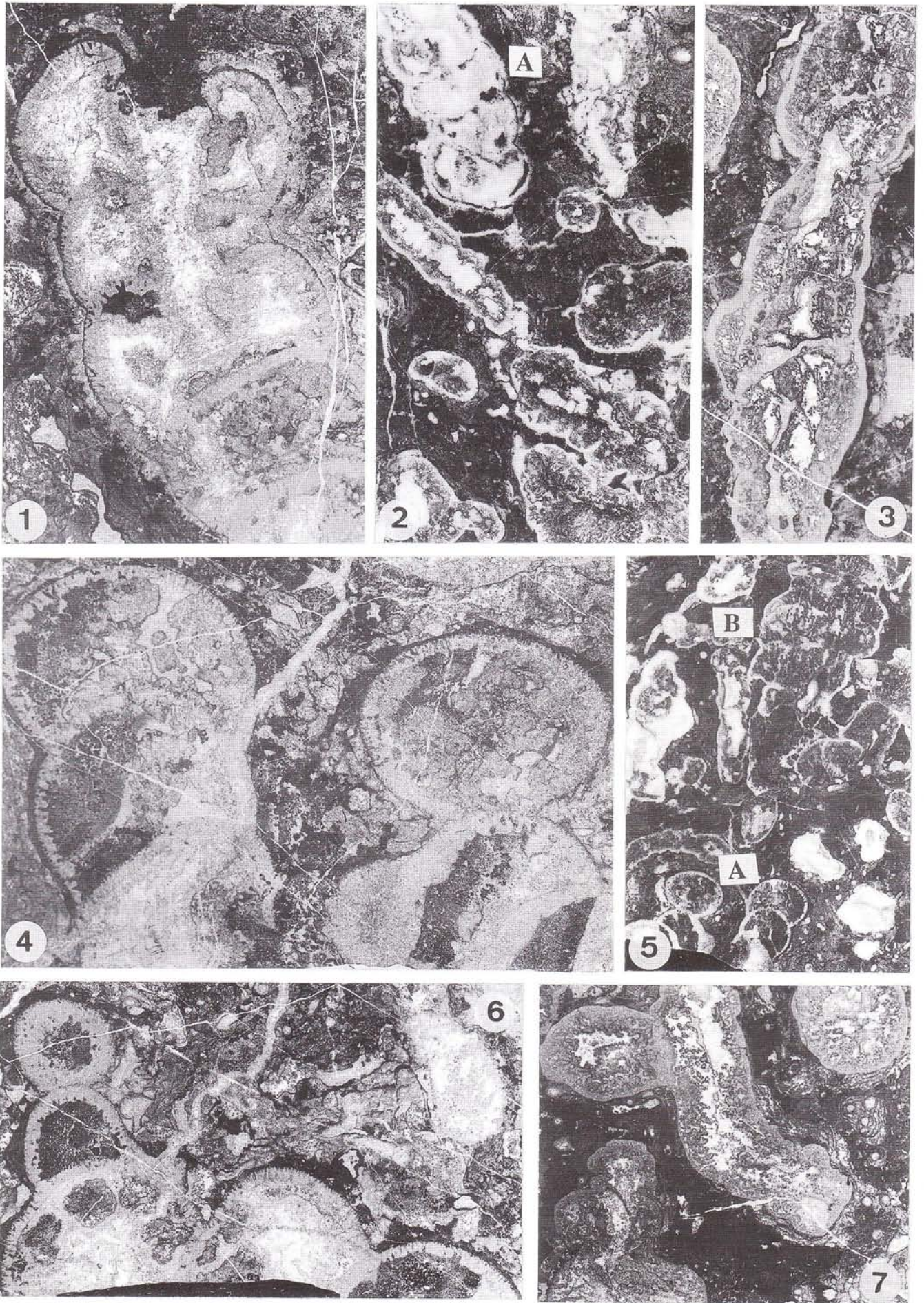
Fig. 6 - Section through several chambers of a branched *Colospongia* sp. Thin section FS 624, X 3.

Fig. 7 - *Deningeria iannacei* n. sp.. Oblique and transversal sections through 4 specimens. Thin section FS 624, X 2.5.











of the cements as simulating an axial canal (Pl. 1, fig. 1). In reality an axial canal or spongocoel is absent. Vesiculae are extremely rare or absent.

The holotype is a relatively well preserved moniliform stem, being figured in two sections in Pl. 1, fig. 1, n. FS 624. It is at least 60 mm long and is composed of numerous chambers of maximally 14 mm in diameter. One chamber in the middle part of the holotype exhibits the trabecular filling structure characterizing the peripheral part of the chambers.

Discussion. As mentioned above, five species are assigned to the genus *Deningeria*. *Deningeria iannacei* differs from *D. camerata* Wilckens and *D. mirabilis* Wilckens by the dimensions of the sponge, the irregular arrangement of the chambers and especially the trabecular filling skeleton at the peripheral part of the sponge. The distinction made by Wilckens of two species - *D. camerata* and *D. mirabilis*, should be checked again. Most probably they represent one and the same species.

The Jurassic species *D. tmeticus* (Hurcewicz, 1975) differs from our species by its very regular chambers and their strong moniliform arrangement. The allocation of the Jurassic species *D. tmeticus* to the Triassic genus *Deningeria* is not yet clear.

*D. iannacei* can be differentiated from both Anisian species (*D. tenuiparietalis* and *D. crassiparietalis*) of the Olang Dolomites (Southern Alps/Italy), described by Senowbari-Daryan et al. (1993), by the dimensions of the sponge, chamber size and the skeletal elements.

Organism-Association. *D. iannacei* n. sp. is associated with other sphinctozoid sponges *Colospongia* sp., *Amblysiphonella* sp., described in the following text, and with other sponges (at the moment not described), (inozoans and "sphinctozoans", Pl. 3) large colonial biota (chaetetids and "hydrozoans"), "microproblematica", abundant worm tubes, some sessile and vagile agglutinated foraminifers (Nubecularids, Ammodiscids, *Aulotortus*, *Kaeveria*), biogenic crusts and rare, very strongly recrystallized dasycladacean algae.

Family *Sebargasiidae* Laubenfels, 1955

Subfamily *Sebargasiinae* Senowbari-Daryan, 1990

Genus *Amblysiphonella* Steinmann, 1882

***Amblysiphonella* sp.**

(Pl. 2, fig. 1-2)

Type species. *Amblysiphonella barroisi* Steinmann, 1882.

Material. Only one sample, split into two halves, one studied in thin section and another half in the polished slab.

Description. The only one specimen in the collection has a length of 30 mm and a diameter of 15 mm across youngest chamber. The sponge could be a little longer than 30 mm because its initial part has been broken. The specimen is composed of five subspherical ring-shaped chambers arranged catenulate one above the other. The chamber interior contain rare vesiculae.

The chamber walls are pierced by regularly distributed small pores. The pores are branched dichotomously to the outside of the chamber walls. At the inner side of the chamber walls the pores (first order) are 0.15-0.3 mm in diameter, on the outer side the branching pores (second order) are 0.10 - 0.12 mm in diameter. Locally we recognized, a quite poorly preserved, third order of the pores. The chamber walls are 0.6-0.8 mm thick. The endowall (wall of spongocoel) is a little thinner than the outer walls (exowalls). The wall between the chambers (interwalls) is simple and not two-layered.

A spongocoel of retrosiphonate type passes through the whole sponge. The osculum at the summit of the sponge is about 4 mm in diameter. However, due to the oblique section, the diameter of the spongocoel is about 2.5-3 mm in the middle part.

Remarks. More than 50 species of the genus *Amblysiphonella* have been described from the Palaeozoic and Triassic. The species described up to 1990 are listed by Senowbari-Daryan (1990, p. 62). After this time the following additional species of *Amblysiphonella* have been established:

- A. benschae* Zhuravleva (in: Boiko et al., 1991).
- A. obichingouensis* Boiko (in: Boiko et al., 1991).
- A. eleganta* Belyaeva (in: Boiko et al., 1991).
- A. sabrajensis* Belyaeva (in: Boiko et al., 1991).
- A. tenuiramosa* Boiko (in: Boiko et al., 1991).
- A. tubifera* Senowbari-Daryan, 1994.
- A. omanica* Weidlich & Senowbari-Daryan, 1996.

Due to the limited material and its poor preservation we describe this sponge without a species determination.

Organism-Association. See organism-association of *Deningeria iannacei* n. sp.

Family *Colospongiidae* Senowbari-Daryan, 1990

PLATE 3

The reef assemblage with large biota ("sphinctozoan"-sponges, chaetetids), biogenic crusts, from Upper Triassic of Argentino valley, Northern Calabria Italy. Thin section FS 624a, X 2.5.







Synonym. Colospongiidae Boiko & Belyaeva, 1991 (for discussion see Senowbari-Daryan & Ingavat-Helmcke, 1994).

genus *Colospongia* Laube, 1965

Type species: *Manon dubium* Münster, 1841.

### *Colospongia* sp.

(Pl. 2, fig. 4-6)

**Description.** Only one sample containing this sponge was found, from which two thin sections were made and the remaining material was studied in polished slab. This sponge is branching and consists of several spherical chambers of approximately 12 mm in diameter. The chamber interior, especially the older chambers, contain some vesiculae.

The exowalls and endowalls of the chambers have a thickness reaching from 0.65 to 0.85 mm. The walls are pierced by numerous small pores which are branched to the surface of the sponge. The pores are about 0.2 - 0.25 in diameter in the inner part of the walls but only about 0.1 on the surface of the chambers.

**Remarks.** *Colospongia* is also one of the multispecies genera known from Carboniferous to Triassic. More than 25 species known up to 1990 are listed by Senowbari-Daryan (1990, p. 65). Belyaeva, 1987 (cited in: Boiko et al., 1991) described the species *C. nachodkiensis*, not listed in Senowbari-Daryan (1990). Additionally, the following species have been described from the former Soviet Union:

*C. globosa* Belyaeva (in: Boiko et al., 1991)

*C. composita* Belyaeva (in: Boiko et al., 1991)

*C. regularia* Zhuravleva (in: Boiko et al., 1991)

? *C. polytholosaformis* Boiko (in: Boiko et al., 1991).

Because of the presence of some nodular filling skeleton within the chamber interior of the ? *C. polytholosaformis*, this species cannot be assigned to the genus *Colospongia* Laube. The other species from the former Soviet Union are not well documented.

Because of the identical size of the pores of the chamber walls and because of the similar size of the chambers our *Colospongia* could be a marginal section of *Amblysiphonella*, described above, but the dimensions of the chamber do not support this assumption. The species from Calabria is differentiated from all other Triassic *Colospongia* species by its dichotomously branched pores, similar to *C. cortexifera*, described from the Upper Permian of Djebel Tebaga (Tunisia) by Senowbari-Daryan & Rigby (1988). Fois (in: Fois & Gaetani, 1981) has described from the Ladinian of the Dolomites (Italy) a species of *Colospongia* as *C. n. sp. 1* which is

very similar to our species from Calabria, but the Ladinian species has very small chambers. Most probably the Calabrian specimen represents a new species.

**Organism-Association.** See organism-association of *Deningeria iannacei* n. sp.

### **Discussion.**

Considering the whole association of the described sponges, the investigated material should be referred as belonging to reefal facies. The assemblage corresponds to a Norian-Rhaetian platform margin community; in fact it shares many similarities to the typical reef associations well known from the Upper Triassic of the western Tethys (Flügel, 1981; Fagerstrom, 1987; Flügel & Senowbari-Daryan, 1996). The described association represents the first known occurrence of a similar assemblage in the Southern Apennines.

However, strikingly different platform margin communities have also been found in the Upper Triassic dolomites of Northern Calabria (Iannace et al., 1994; Climaco et al., 1997). These assemblages are characterized by the dominance of microbial crusts and are characteristically associated with abundant gregarious serpulids and small, monospecific associations of sponges. According to Zamparelli et al. (1996, 1997), these peculiar communities are an ecological adaptation to restricted circulation in an intraplatform basin formed during the Upper Triassic on the large Dolomia Principale platform.

The loose boulder with the reefal community, occurring in the Argentino river valley, may have been derived either from the Upper Triassic successions immediately nearby, or may have undergone some transport from its source. However, its paleontological content clearly differentiates this lithotype from others belonging to the classic, so far described, "Verbicaro" serpulid associations.

This raises the problem as to explain the presence of two ecologically different communities in the same region. Considering the substantial compressional tectonics which affected the Southern Apennines in the Neogene, the simplest explanation is that the biota described here come from a different palaeogeographic domain with respect to the Upper Triassic of the classical "Verbicaro" outcrops.

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