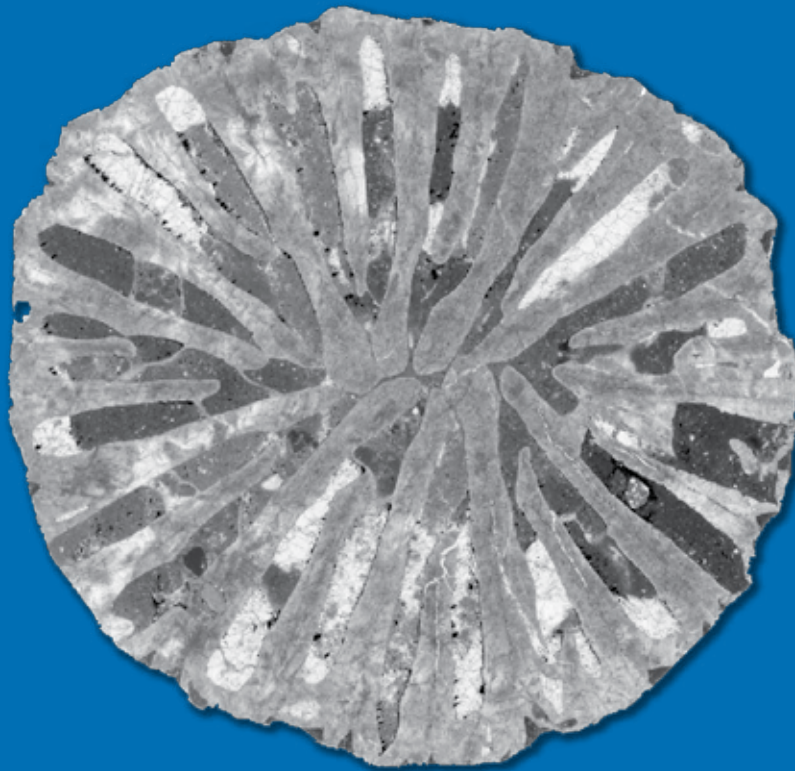


Zitteliana

An International Journal
of Palaeontology and Geobiology

Series A/Reihe A
Mitteilungen der Bayerischen Staatssammlung
für Paläontologie und Geologie

53



München 2013



Bayerische
Staatssammlung
für Paläontologie und Geologie

- Zitteliana A 53, 15 – 22
- München, 31.12.2013
- Manuscript received
10.11.2012; revision
accepted 29.04.2013
- ISSN 1612 - 412X

***Lovcenipora iranica* nov. sp., an unusually large chaetetid sponge from the Upper Triassic (Howz-e Khan member, Nayband Formation) of northeast Iran**

Baba Senowbari-Daryan^{1*} & Fatemeh Amirhassankhani²

¹Geozentrum Nordbayern, FG Paläoumwelt, Universität Erlangen-Nürnberg, Loewenichstraße 28, D-91054 Erlangen, Germany

²Department of Geology, Science and Research branch, Islamic Azad University, Tehran, Iran

*Author for correspondence and reprint requests; Email: basendar@pal.uni-erlangen.de

Abstract

Sponges are the most important reef builders in the bio-constructions imbedded within the Norian-Rhaetian Nayband Formation at various localities exposed in central Iran. Besides sphinctozoans and inozoans, hypercalcified sponges, i. e. chaetetids and spongimorphids, are relatively abundant in some biohermal and biostromal reef structures. In these reefs, chaetetids are usually small (<10 cm). However, an unusually large species was found in the reefs near the village Hassan-Abad in the Ferdows area, northeast Iran. This species is described as *Lovcenipora iranica* nov. sp. Associated organisms are usually fragments of small-sized dendroid spongimorphids.

Key words: *Lovcenipora*, chaetetid sponge, Triassic, Nayband Formation, Iran

Kurzfassung

Schwämme sind die wichtigsten Riffbildner in den Biokonstruktionen, die verschiedentlich in die Nayband Formation im Zentraliran eingebettet sind. Neben Sphinctozoen und Inozoen sind in einigen biohermen und biostromen Riffstrukturen hyperkalzifizierte Schwämme (Chaetetiden und Spongimorphiden) relativ häufig. Die Chaetetiden dieser Riffe sind üblicherweise klein (<10 cm). Allerdings wurde ein ungewöhnlich großes Exemplar in einem Riff nahe des Dorfes Hassan-Abad in der Gegend von Ferdows, NO Iran, gefunden. Dieser Schwamm wird hier als neue Art, *Lovcenipora iranica* nov. sp., beschrieben. Mit dem Fossil assoziiert sind Fragmente von kleinwüchsigen dendroiden Spongimorphiden.

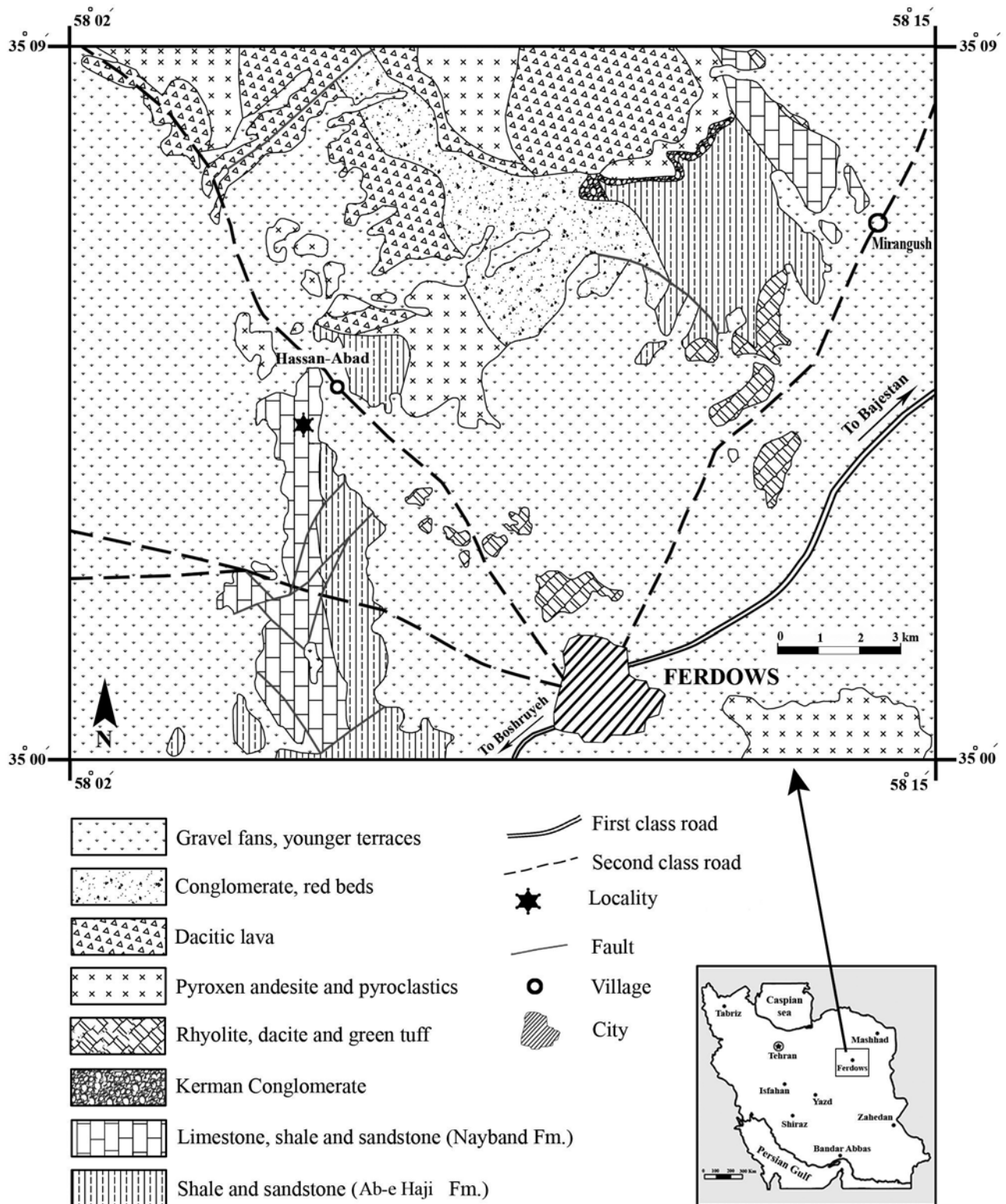
Schlüsselwörter: *Lovcenipora*, chaetetid sponge, Triassic, Nayband Formation, Iran

1. Introduction

The problematic Chaetetida were historically attributed to various groups or phyla, including sponges, coelenterates, bryozoans, and even algae (see Sokolov 1955, 1962; West & Clark 1984; West 2011). Hill (1981) classified the Paleozoic chaetetids as tabulate corals, mentioning that the post-Paleozoic chaetetids might be sclerosponges (Hartman & Goreau 1970, 1972, 1975). Chaetetids are composed of small tubes (calicles) that are usually oriented parallel to each other and have a circular, oval or polygonal outline in transverse section. They range from the Ordovician to Miocene (West & Clark 1984; Wood 1990) or Recent (Hartman & Goreau 1972, 1975) and are very common in the late Paleozoic. Chaetetids are – like other groups of hypercalcified sponges – polyphyletic, exhibiting affinities to other

groups of sponges (Reitner & Wörheide 2002; Finks & Rigby 2004). The growth forms of chaetetids are laminar, domical, bulbous, columnar, club-shaped or branching (for summary see Kershaw & West 1991).

Triassic chaetetids were usually termed “Tabulozoans” (Kühn 1942) in earlier publications, and have been revised by Fischer (1970). They are small organisms (mostly less than 5 cm in diameter) with mushroom-shaped or bulbous growth morphology. Large (up to 15 cm) chaetetids occur in the Late Jurassic (personal observation BSD in Iran) but are rare in the Triassic (Senowbari-Daryan & Maurer 2008). Triassic chaetetids were described by Giattini (1902) from Montenegro, Vinassa de Regny (1908, 1915) from Timor, Cuif et al. (1972), Cuif & Fischer (1974), Dieci et al. (1977), Bizzarini (1987), Bizzarini & Braga (1978, 1988), Boiko (1979), Cremer (1994, 1995) and Senowbari-Daryan & Maurer (2008). For additional

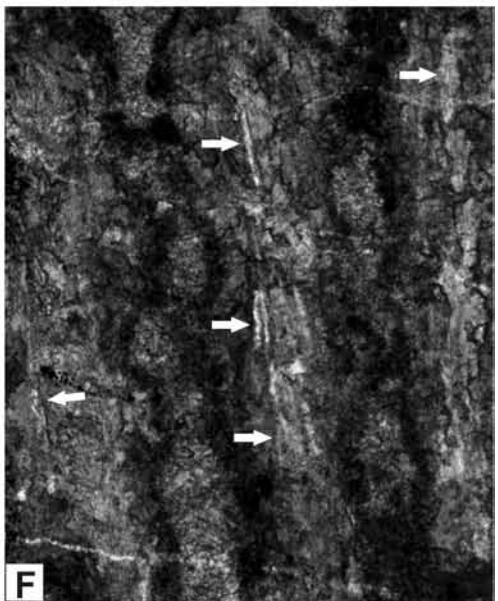
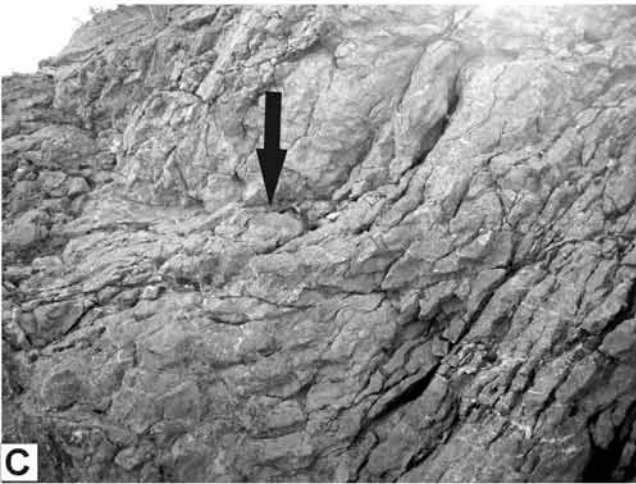
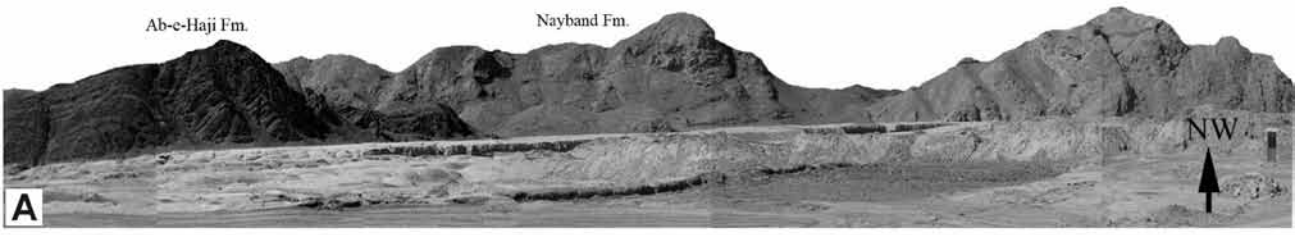


Textfigure 1: Geographic position of the source locality of *Lovcenipora iranica* nov. sp.

data on the occurrence of chaetetids and their importance in Late Triassic reefs in the Alps refer to Zankl (1969) and Schäfer (1979).

During a field trip to an Upper Triassic section

exposed near the village of Hassan-Abad (Ferdows area), an unusually large chaetetid sponge of 34 x 20 cm was discovered that is described in this paper.



2. Geological setting

The type locality of the chaetoid described in this paper is situated in an area exposing deposits of the Late Triassic Nayband Formation and the Jurassic Ab-e Haji Formation. This section is called Hassan-Abad section in this paper. The section is located ~3 km northwest of the town of Ferdows, near the village of Hassan-Abad in northeast Iran (Textfig. 1; Pl. 1, Figs. A-B). The oldest rocks in this area are the deposits of the Nayband Formation that are exposed in the core of an anticlinal structure with north-south depping. The strata of the Nayband Formation are overlain by sandstones and shales, containing plant fossils suggestive of a Jurassic age (Eftekhari-Nejad et al. 1977; Purlatifi 2001). The thickness of the Late Triassic deposits of the Hassan-Abad section range is ~120 m. The section shows an alternating sequence of reef carbonates including massive and bedded carbonates and well as greenish shales. The reef carbonates contain a rich macro- and micro-fauna such as hypercalcified sponges (including sphinctozoans, inozoans, chaetetids and spongiomorphids), scleractinian corals, sphaerical hydrozoans (*Heterastriidium*), foraminifers, algae, gastropods, bivalves etc. A considerable part of the section consists of grey reef carbonates containing abundant small dendroid spongiomorphids (Pl. 1, Fig. E) that are mostly fragmented. They seem to represent the most important reef organisms in this part of the section. Small chaetetids and other hypercalcified sponges are the most important contributors to the reef carbonates. The lower contact of the Nayband Formation exposed at the Hassan-Abad section remains unknown.

Approaching to the younger part of the Nayband Formation, the carbonate rocks decrease while intercalations of green shales increase gradually. The uppermost beds of the measured section are composed of well-sorted red sandstones with iron oxides. The boundary of the Nayband Formation with the Early Jurassic sandstones representing the Ab-e Haji Formation is continuous (Pl. 1, Fig. B).

Based on the abundant occurrence of *Heterastriidium coglobatum* and *H. lobatum*, the index fossils of the Late Triassic (Norian-Rhaetian?), the section has been dated as Norian in age (Bidestan Member). However, based on the stratigraphic position (continuous transition to the Jurassic Ab-e Haji Formation) and lithology (carbonates and sandstones), this section corresponds to the Howz-e Khan Member, which is known from its type locality on the southern

flank of the Kuh-e Nayband (geol. map J8 of Naybandan: Kluyver et al. 1983). This discrepancy perhaps reflects a different depositional environment of the Hassan-Abad section, which belonged to the Lute Block during the Late Triassic. As a result, Aghanabati (2004, 2010) suggested to use the informal name "Ferdows Member" for this part of the Nayband Formation.

Specimen repository: All illustrated thin-sections are from the holotype and paratype. Specimens and thin sections are deposited in the collection of the Bayerische Staatssammlung für Paläontologie und Geologie (BSPG), Munich, Germany, under accession number BSPG 2011 I 140–143.

3. Systematic paleontology

Class Demospongia Sollas, 1885
Order and Family uncertain

Genus *Lovcenipora* Giattini, 1902

Remarks: As noted by Senowbari-Daryan & Maurer (2008), *Lovcenipora* had been regarded as a genus of uncertain systematic position by Hill & Wells (1956: 88). Fischer (1970) excluded the taxon from the chaetetids. Following Hill & Wells (1956), Fischer (1970) and Balters (1973) listed *Lovcenipora dobrogiaca* Simionescu (1926) from the Upper Cretaceous of Romania as *incertae sedis*. According to Senowbari-Daryan & Maurer (2008: 451), the skeletal elements of *Lovcenipora* and the definition of this genus by Vinassa de Regny (1915) justify classification as a chaetetid.

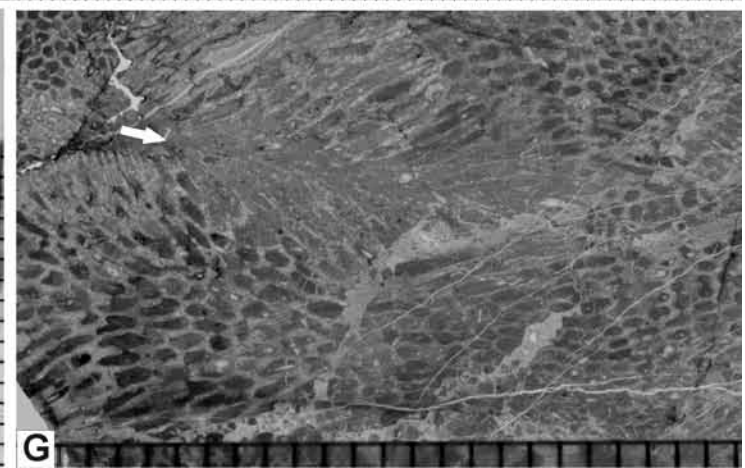
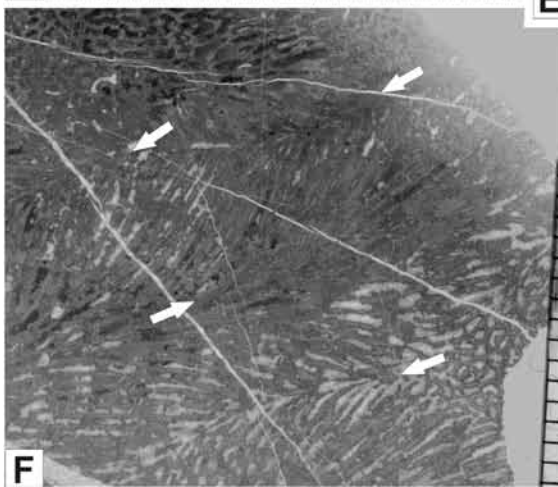
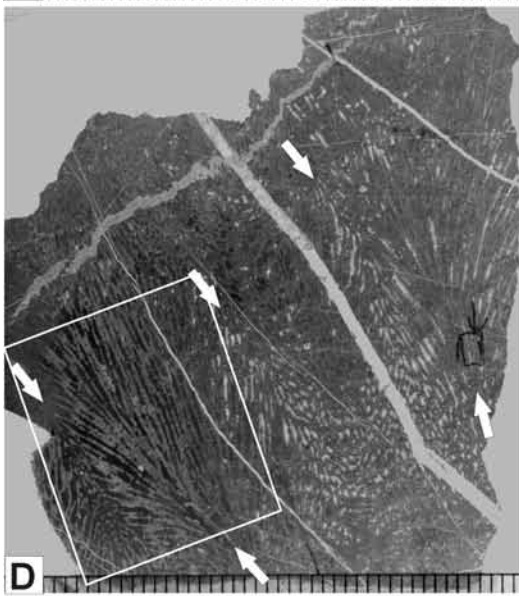
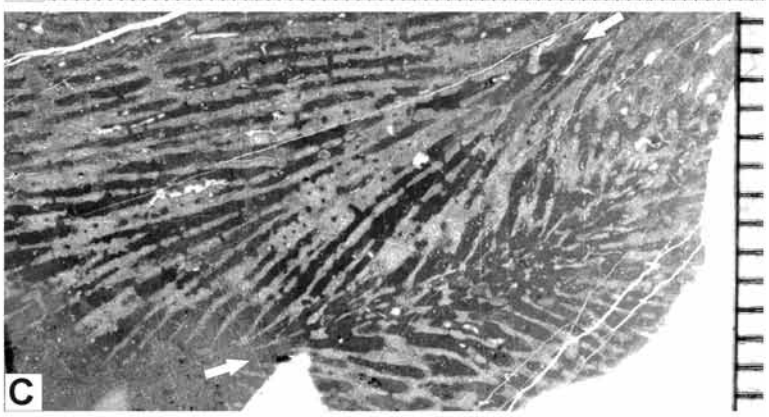
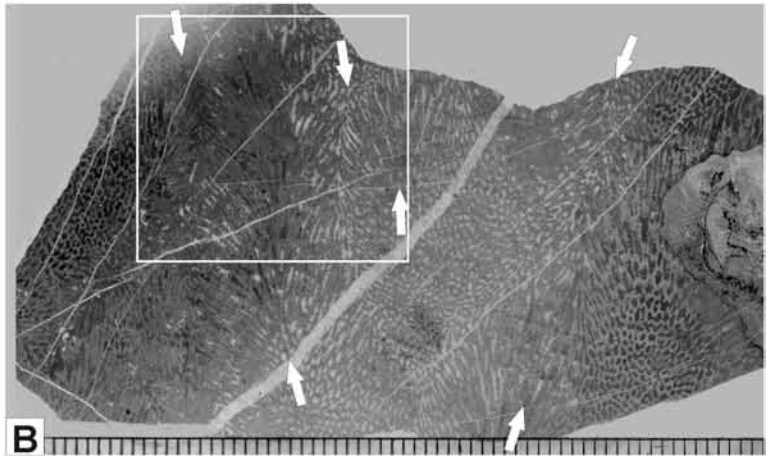
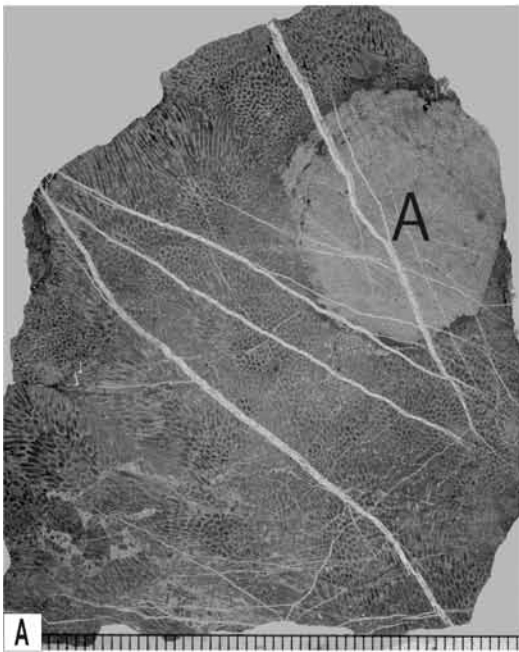
Lovcenipora iranica nov. sp.
Pl. 1, Figs C–F; Pl. 2, Figs A–G

Derivatio nominis: Named for the occurrence of this sponge in Iran.

Holotype: BSPG 2011 I 140, 141. It was not possible to extract the complete holotype illustrated in Pl. 1, Figs C–E/A (remains left in the field). From the holotype, two pieces were broken off and three thin-sections were prepared (Pl. 2, Figs A, C, D, G).

Paratype: BSPG 2011 I 142, 143. Like with the holotype, it was impossible to recover the paratype

← **Plate 1:** (A) Panorama of the Hassan-Abad section from southeast to northwest, showing the Upper Triassic Nayband Formation in the background and darker-appearing Jurassic Ab-e Haji Formation in the front. (B) Panorama of the Nayband Formation with massive reef carbonates in the front, overlain by the Jurassic Ab-e Haji Formation. The Triassic/Jurassic-boundary is marked by a thin line. The white arrow indicates the spot from which *Lovcenipora iranica* nov. sp. was collected. (C) Field photograph of the holotype of *Lovcenipora iranica* and surrounding massive rocks of the Nayband Formation. (D) Detail of Pl. 1, Fig. E, showing the mushroom-shaped holotype of *L. iranica*. (E) Position of the holotype (A) and paratype (B) of *L. iranica* and the surrounding rocks with fragments of dendroid spongiomorphids (C). (F) Holotype (BSPG 2011 I 141); longitudinal section through three white-appearing tube walls exhibiting small, white appearing rod-like elements (arrows) arranged more or less parallel to the tube axis.



from the field intact. We took three pieces from the paratype (Pl. 1, Fig. E/B). The corresponding thin-sections of the paratype are illustrated in Pl. 2, Figs B, E, F.

Locus typicus: Nayband Formation near the village of Hassan-Abad (Textfig. 1; Pl. 1, Fig. B). The spot from which both specimens were collected is marked with a white arrow in Pl. 1, Fig. B.

Stratum typicum: Late Triassic, Nayband Formation (Norian/Rhaetian).

Diagnosis: Unusually large chaetetid sponge with repeated changes of direction of the fan-shaped groups of tubes; tubes oriented parallel to each other within a fan, but converse to the tubes forming neighbouring fans; tubes within a fan showing a water-jet-like pattern originating from a single tube at the base of fan; tube interiors lack tabulae.

Material: Two specimens were discovered, but it was not possible to remove them from the surrounding rocks intact. Several pieces were therefore broken off from the specimens and used for microscopic analysis. These rock pieces and the thin-sections represent type material.

Description: The holotype specimen (Pl. 1, Figs C–E) is 200 mm high, with a diameter of 340 mm, and has grown on and around a coral colony of *Astraeomorpha* sp. The main part of the second specimen (paratype) is embedded in the surrounding rocks, and only a part of it was visible in the field (Pl. 1, Fig. E). Both specimens are composed of numerous tubes with a diameter of 0.4–0.5 mm. The tubes are circular to oval in cross section. In some parts of the skeleton, the tubes show a meandroid appearance. Tube walls possess small openings 0.14–0.20 mm in diameter. The distribution of these openings and the distance between two pores are variable. In some of the tube walls, three pores were counted in a distance of 2 mm, but in other tube walls or other portions of the walls, the walls are imperforate over a distance of about 5 mm. The most characteristic feature of the new species is the fan-shaped (water-jet-like, trabecular) arrangement of the tubes originating from a single tube at the base. Within each fan, tubes are parallel to each other, but tubes of neighbouring fans show an oblique orientation (not parallel). The tubes lack cross partitions or tabulae.

For comparison, biometric measurements of tubes and other characteristic skeletal elements of *L. iranica* nov. sp. and three other comparably large Triassic chaetetid sponges are compiled in Table 1.

The main part of the second specimen (paratype) is embedded in the surrounding rock and only a part of about 10 cm was visible in the field (Pl. 1, Fig. E/B). The diameter of the tubes, the orientation of the tube-fans and other biometric data of the paratype correspond to the holotype.

Preservation of the internal skeleton (microstructure) is poor in both specimens. Relics of an upward-diverging structure within the tube walls are indicative of a fascicular fibrous (water-jet, clinogonal, trabecular: Boury-Esnault & Rützler 1997) microstructure of the skeleton (probably primary aragonite). Investigation of a single small piece by SEM was not successful and no spicules were found. Under the microscope, however, in two small areas a few putative monaxonid spicules were observed (Pl. 1, Fig. F).

4. Comparison

The biometric data of all the known species of *Lovcenipora* are listed in Senowbari-Daryan & Maurer (2008). As noted previously, large chaetetids such as *L. iranica* nov. sp. were unknown from reefs of the Nayband Formation prior to the present study. Senowbari-Daryan & Maurer (2008) described large chaetetids (60 x 50 mm) from the Norian of Musandam Peninsula (United Arab Emirates and Oman) as *Lovcenipora musandamensis* and *Lovcenipora* sp. *L. chaetetiformis* from the same locality reaches dimensions of 100 x 60 mm and, according to Senowbari-Daryan & Maurer (2008), *L. vinassai* may grow up to 40 x 80 mm. Nevertheless, these species all are much smaller than *L. iranica* nov. sp. (Tab. 1).

The most significant character of the new species is the orientation of fan-shaped groups of tubes. This feature has not been observed in any other Triassic chaetetid. Fan-shaped tubes seem to occur in *Lovcenipora* sp. described by Senowbari-Daryan & Maurer (2008: fig. 11/g) from the Norian carbonates of Musandam Mountains (Emirates and Oman), but the change of direction of the fans was not observed in this species. It is possible that *Lovcenipora* sp. from Musandam Mountains is identical (because of fan-shaped orientation of the tubes) with the present Iranian species *L. iranica* nov. sp.

← **Plate 2: (A–G)** *Lovcenipora iranica* nov. sp., Nayband Formation near Hassan-Abad; scales in all figures in mm; (A, C–D, G) holotype, (B, E, F) paratype. **(A)** Holotype specimen growing on *Astraeomorpha* sp. (indicated with A); BSPG 2011 I 140. **(B)** Paratype, similar section as in Pl. 2, Fig. A, showing several tube-fans; white arrows indicate directions of fans; BSPG 2011 I 142. **(C)** Detail of Pl. 2, Fig. D, showing two tube fans (indicated with small white arrows), with the pores in the walls clearly recognizable. **(D)** Holotype; section showing tube-fans with almost the different orientation as in Pl. 2, Fig. B; arrows indicating growth direction of fans; BSPG 2011 I 141. **(E)** Paratype; section oriented more or less perpendicular to the tubes showing them in cross and oblique section; BSPG 2011 I 143. **(F)** Detail of Pl. 2, Fig. B (rectangle); white arrows indicate growth direction of the tube-fans. **(G)** Oblique section perpendicularly to some of the fans, showing tubes in cross and oblique sections; BSPG 2011 I 140.

Table 1: Measurements of skeletal elements of *Lovcenipora iranica* nov. sp. and three other Triassic *Lovcenipora* species. HS) height of colonies, DS) diameter of colonies, DT) diameter of individual tubes, DTB) diameter of tubes at base of fans, TTW) thickness of tube wall, DP) diameter of pores in tube walls, OT) outline of tubes in cross section, T) tabulae within tubes. *) Large-scaled species of *Lovcenipora* listed in Senowbari-Daryan & Maurer (2008). All data in mm.

Species	HS/DS	DT	DTB	TTW	DP	OT	T
<i>L. iranica</i> (holotype)	200/340	0.4-0.5	0.8-1.2	0.14-0.20	0.2-0.3	circular-oval	No
* <i>L. vinassai</i>	40/80	0.5-0.7	--	?	?	polygonal	Rare
* <i>L. chaetetiformis</i>	100/60	0.7-1.0	--	0.02-0.2	0.1-0.2	polygonal	No
* <i>L. musandamensis</i>	60/50	0.6	--	0.01-0.02	0.1-0.2	polygonal	Rare

Acknowledgements

We thank M. Nose (Munich, Germany) for his constructive review and A. Nützel (Munich, Germany) for proof-reading the manuscript.

5. References

- Aghanabati A. 2004. Geology of Iran. Teheran, Geological Survey of Iran, 586 p.
- Aghanabati A. 2010. Stratigraphic Lexicon of Iran, vol. 3 (Triassic). Tehran, Geological Survey of Iran, 727 p.
- Balters A. 1973. Inventarul Hydrozoarelor si Chaetetidelor din Romania. Daride seama ale sedinfelor, 3. Paleontologiei 49, 1–43.
- Bizzarini F. 1987. Il genere *Atrochaetetes* (Porifera) nella Formazione di S. Cassiano (Triassico Superiore) dell'Alpe di Stolla (Dolomiti di Braies, Italia). Lavori Società Veneziana Scienze Naturali 12, 149–158.
- Bizzarini F, Braga G. 1978. Upper Triassic new genera and species of fair and questionable Bryozoa and Chaetetida from the S. Cassiano Formation of the Dolomites (eastern Alps). Bollettino della Società Paleontologica Italiana 17, 28–38.
- Bizzarini F., Braga G. 1988. Osservazioni su alcuni chaetetidi di Liasici delle Prealpi Veneto. Annali dei Museo Civico di Rovereto, Sezione Archeologia, Storia e Scienze Naturali 4, 137–158.
- Boiko EV. 1979. Pozdnetriassovi Hydrozoa Jugo. Vostocuogo Pamira, Donit, Dushanbe, 113 p. (in Russian).
- Boury-Esnault N, Rützler K. 1997. Thesaurus of sponge morphology. Smithsonian Contributions to Zoology 595, 3–55.
- Cremer H. 1994. Zwei neue chaetetide Schwämme aus der Obertrias (Nor) von Südanatolien. Abhandlungen der Geologischen Bundesanstalt in Wien 50, 89–96.
- Cremer H. 1995. Spicules pseudomorphs in Upper Triassic (Norian) chaetetid sponges from the Western Taurids (Antalya-Region, SW Turkey). Geobios 28, 163–174.
- Cuif JP, Fischer JC. 1974. Étude systématique sur les Chaetetida du Trias de Turquie. Annales de Paléontologie 60, 1–4.
- Cuif JP, Fischer JC, Marcoux J. 1972. Découverte d'une faune des chaetetides (Cnidaria, Hydrozoa) dans le Trias supérieur de Turquie. Comptes Rendus de l'Académie des Sciences, Séries D 275, 185–188.
- Dieci G, Russo A, Russo F, Marchi MS. 1977. Occurrence of spicules in Triassic chaetetids and ceratoporellids. Bollettino della Società Paleontologica Italiana 16, 229–238.
- Eftekhari-Nejad D, Valeh R, Ruttner A, Nabavi MH, Maieni N, Haghypour N. 1977. Geological of Ferdows Quadrangle Map, 1:250000. Tehran, Geological Survey of Iran.
- Finks RM, Rigby JK. 2004. Hypercalcified sponges. In: RL Kaesler (Ed.), Treatise on Invertebrate Paleontology, Part E, Porifera, Revised, Vol. 3, 585–872.
- Fischer JC. 1970. Révisione et essai de classification des Chaetetida (Cnidaria) Post-Paléozoïque. Annales de Paléontologie 56, 149–233.
- Giattini GB. 1902. Fossili de Lovcen nel Montenegro. Rivista Italiana di Paleontologia e Stratigrafia 8, 62–66.
- Hartman WD, Goreau TF. 1970. Jamaican coralline sponges: Their morphology, ecology and fossil relatives. Symposia of the Zoological Society of London 25, 205–243.
- Hartman WD, Goreau TF. 1972. *Ceratoporella* (Porifera: Sclerospongiae) and the chaetetid "Corals". Transactions of the Connecticut Academy of Arts and Sciences 44, 133–148.
- Hartman WD, Goreau TF. 1975. A Pacific tabulate sponge, living representative of a new order of sclerosponges. Postilla 167, 1–21.
- Hill D. 1981. Rugosa and Tabulata. In: C Teichert (Ed.), Treatise on Invertebrate Palaeontology, Part F, Coelenterata Supplement, 1, 2 vol. Lawrence KS, University of Kansas Press, 762 p.
- Hill D, Wells JW. 1956. Hydroida and Spongiomorpha. In: RC Moore (Ed.), Treatise on Invertebrate Paleontology, Part F, Hydroida. Lawrence KS, University of Kansas Press, 81–90.
- Kershaw S, West R. 1991. Chaetetid growth form and its controlling factors. Lethaia 24, 333–346.
- Kluyver HH, Tirrul R, Chance PN, Jones GW, Meixner HM. 1983. Explanatory text of the Naybandan Quadrangle Map 1:25000. Teheran, Geological Survey of Iran, 143 p.
- Kühn O. 1942. Zur Kenntnis des Rhät von Vorarlberg. Mitteilungen des Alpenländischen Geologischen Vereins 33, 111–157.
- Purlatifi A. 2001. Ferdows Geological Map, 1:100000. Teheran, Geological Survey of Iran.
- Reitner J, Wörheide G. 2002. Non-lithistid fossil Demospongiae – origins of their palaeobiodiversity and highlights in history of preservation. In: JNA Hooper, RWM van Soest (Eds), System Porifera: A Guide to the Classification of Sponges. New York, Kluwer Academic/Plenum Publishers, 52–70.
- Schäfer P. 1979. Fazielle Entwicklung und palökologische Zonierung zweier obertriadischer Riffstrukturen in den Nördlichen Kalkalpen ("Oberhät"-Riff-Kalke, Salzburg). Facies 1, 3–245.
- Senowbari-Daryan B, Maurer F. 2008. Upper Triassic (Norian) hypercalcified sponges from the Musandam Peninsula (United Arab, Emirates and Oman). Facies 54, 433–460.
- Simionescu I. 1926. Sur quelques fossils rares dans le Trias et le Crétacé Inférieur de Roumanie. Bulletin de la Section Scientifique de l'Académie Roumaine, X-eme Année 4, 102–109.
- Sokolov BS. 1955. Tabulyaty Palaozoya europeysky chasti SSR. Trudy Vnigri 85, 257 p. (in Russian)
- Sokolov BS. 1962. Gruppo Chaetetida. In: YA Orlov (Ed.), Osnovy Paleontologii. Academia Nauk SSSR, vol. 2, 259–270.

- Sollas WJ. 1885. A classification of the sponges. *Annals and Magazine of Natural History*, series 5 16, p. 395.
- Vinassa de Regny P. 1908. Neue Schwämme, Tabulaten und Hydrozoen aus dem Bakony. *Resultate der wissenschaftlichen Erforschung des Balatonsees*, Bd. 1, Teil 1, Paläontologischer Anhang, 1–17.
- Vinassa de Regny P. 1915. Triadische Algen, Spongien, Anthozoen und Bryozoen aus Timor. *Paläontologie von Timor* 4, 75–117.
- West RR. In press. Classification of the Fossil and Living Hypercalcified Chaetetid-Type porifera (Demospongiae). *Treatise online*, Nummer 22 (accessible online at: <http://paleo.ku.edu/treatiseonline>).
- West R, Clark GR. 1984. Palaeobiology and biological affinities of Paleozoic chaetetids. *Palaeontographica Americana* 54, 337–348.
- Wood R. 1990. Reef-Building Sponges. *American Scientist* 78, 224–235.
- Zankl H. 1969. Der Hohe Göll. Aufbau und Lebensbild eines Dachsteinkalk-Riffes in der Obertrias der nördlichen Kalkalpen. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 519, 1–123.
-