

***Bathysiphon* microfacies and trace fossils association of the Lower Jurassic Fleckenmergel marly limestone from the Central Western Carpathians, the Pieniny Klippen Belt and the Betic Cordillera**

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Agglutinated tests of foraminifera *Bathysiphon* sp. are highly abundant in bioturbated Lower Jurassic (Uppermost Sinemurian to Uppermost Pliensbachian) limestones in the Central Western Carpathians (Šimo & Tomašových 2013) and in the Pieniny Klippen Belt. Similar fragments of agglutinated test have been found in the Betic Cordillera at the Fuente Vidriera section (External Subbetic) and at the Arroyo Mingarrón section (Median Subbetic). Occurrences of isolated pyritic pseudomorphs of siliceous sponge spicules (Mišík 1959) and pyritized radiolarians (Reolid 2014) are typical of the Fleckenmergel facies both in the Betic Cordillera and in the Western Carpathians. Agglutinated *Bathysiphon* tests are mainly formed by pyritized sponge spicules and rarely by other bioclasts (Fig. 1). The tests of *Bathysiphon* sp. are strongly silicified. Many clusters of pyritic sponge spicules in thin sections probably belong to fragments of tests of these agglutinated foraminifers. Sponge spicules arrangement within the walls is random but inner walls of lumen are characteristically smooth. In contrast, the outer side of the wall test is bristly and contains spicules that project out of the wall. *Bathysiphon* tubular tests are oriented either horizontally or vertically/subvertically relative to the bedding planes. Horizontally-oriented tests are probably affected by postmortem displacement owing to bioturbation whereas vertically/subvertically oriented tests are preserved in living position. A diameter of agglutinated tubular test is 1.4 to 6.8 mm. Their length varies from few millimeters to 28 mm in thin sections. The original length thus probably attained several tens millimeters. Diameters of internal lumen vary from 0.4 to 3.6 mm. Width of the test wall is between 0.2 to 2 mm. *Bathysiphon major* (Gooday 1988) has similar morphological parameters with here described *Bathysiphon* sp. *Bathysiphon* microfacies is an important feature on the ichnofacies background of bioturbated Lower Jurassic limestones that contain almost identical trace fossils in the Central

Western Carpathians and the Betic Cordillera. This association of trace fossils is typical for the Lower Jurassic bioturbated Fleckenmergel and Fleckenkalk marls and limestones. Trace fossils association co-occurring with *Bathysiphon* contains *Chondrites intricatus*, *C. targionii*, *Lamellaeichnus imbricatus*, *Nereites* isp., *Paleophycus heberti*, *Pilichnus dichotomus*, *Planolites* isp., *Teichichnus* isp., *Thalassinoides* isp., *Trichichnus simplex*, *Zoophycos* isp. *Nereites* isp. occurs in the Betic only, but *Lamellaeichnus imbricatus* and *Teichichnus* isp. can be considered as characteristic and the most common ichnofacies components of the Lower Jurassic Fleckenmergel type of rock in the Central Western Carpathians, the Pieniny Klippen Belt and the Betic Cordillera. The Central Western Carpathians and the Pieniny Klippen Belt were situated at northern passive margin of the Tethys during Lower Jurassic (Golonka & Wierzbowski 2006). The Betic Cordillera palaeogeographic area was situated in the westernmost part of the Tethys (Bassoulet et al. 1993). Comparison of these distant palaeogeographic areas on the basis of ichnofacies analysis and on the basis of the unique *Bathysiphon* microfacies improves the reconstruction of low-energy palaeoenvironments dominated by the deposition of bioturbated marls and marly limestone during Lower Jurassic.

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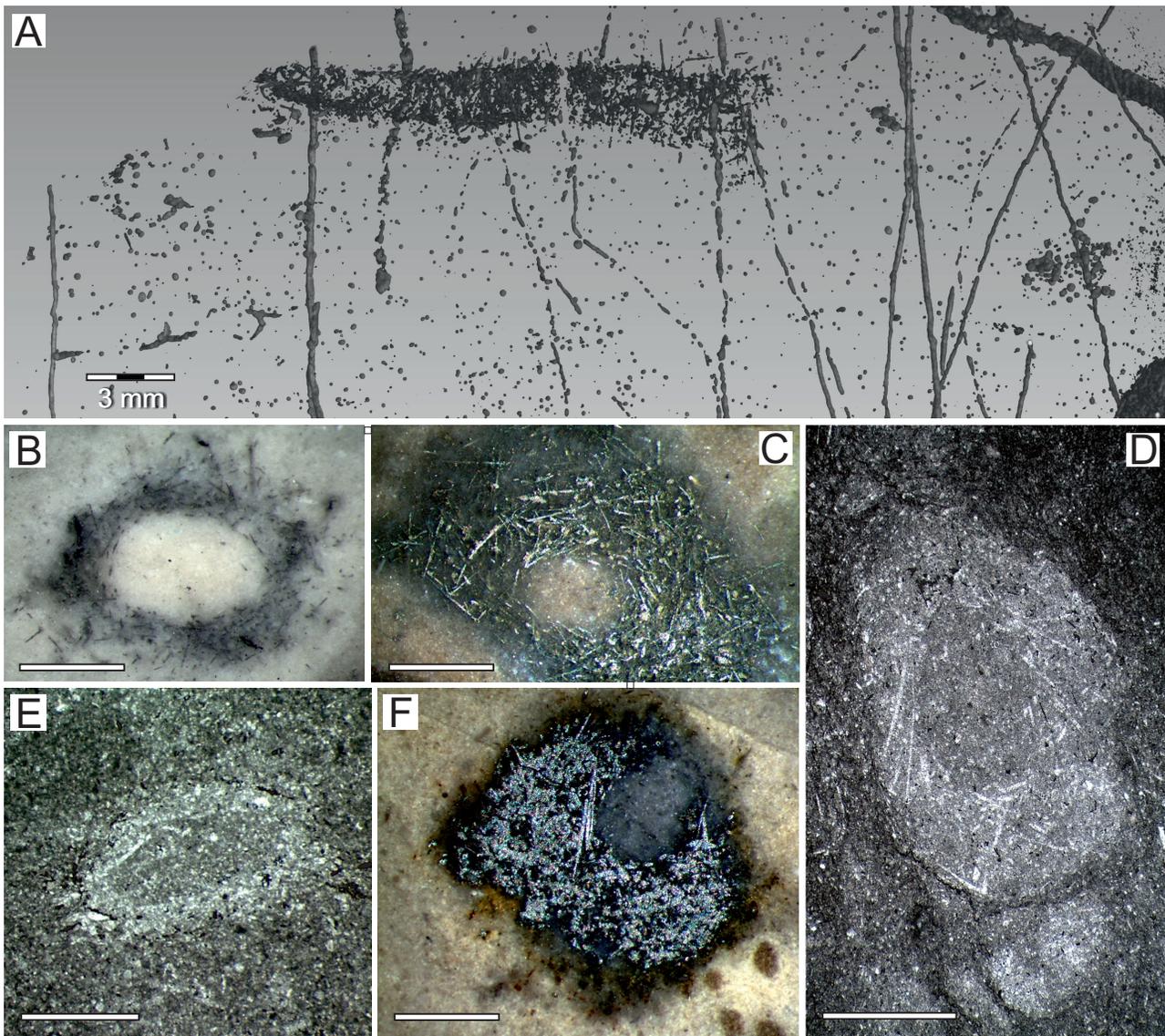


Fig. 1. *Bathysiphon* sp. from the Lower Jurassic Fleckenmergel marly limestone of the Central Western Carpathians, the Pieniny Klippen Belt and Betic Cordillera. **A** — Micro computed tomography of sample from the Priborzhavskoe Quarry (Uppermost Sinemurian, Pieniny Klippen Belt, Transcarpathian, Ukraine). *Bathysiphon* sp. is presented as horizontal cylindrical cluster composed from sponge spicules mostly. *Bathysiphon* sp. is situated on the top of the picture. *Trichichnus simplex* is presented by vertically situated wires. **B** — Cross-section of *Bathysiphon* sp. A wall of the lumen is smooth. Internal fill is pale in contrast with background limestone. Pyritic sponge spicules are dark and irregularly arranged. External side of the test has prickly view. (Uppermost Sinemurian, Pieniny Klippen Belt, Transcarpathian, Ukraine). **C** — Cross-section of *Bathysiphon* sp. Pyritic sponge spicules are preserved with central lumen obviously. The Skladaná Skala Quarry, the Veľká Fatra Mts., Central Western Carpathians, Slovakia (Pliensbachian). **D** — Cross-section of *Bathysiphon* sp. not pyritic agglutinated test. The Skladaná Skala Quarry (Pliensbachian). Sponge spicules are light long and thin. **E** — Cross section of not pyritic *Bathysiphon* sp. from the Arroyo Mingarrón locality (Median Subbetic, Uppermost Pliensbachian–Lower Toarcian, Spain). **F** — Sectioned *Bathysiphon* sp. test. With strongly pyritized sponge spicules. Kamenná Poruba (Malá Fatra, Pliensbachian, Central Western Carpathians, Slovakia). *Chondrites intricatus* is presented as a dark spots around the agglutinated test. Scale bars for B–F is 1 mm long.