

***Lithothamnion crispatum*: long lasting morphospecies of nongeniculate calcareous red algae**

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Lithothamnion crispatum is a nongeniculate coralline alga of the Hapalidiaceae family, with a cosmopolitan distribution. It occurs in the Mediterranean, in the Atlantic and Indian Ocean and in the Pacific Ocean along the Eastern coast of Australia (Basso et al. 2011). The plants either grow unattached, forming rhodoliths, or attached on hard substrate; they have been found from 2 to 80 meters of water depth (Keats et al. 2000; Nobregas-Farias et al. 2010; Basso et al. 2011). Until now *L. crispatum* has not been recorded in the fossil. A revision of fossil specimens, ranging in age from Eocene to Pleistocene, proved that this species has a long stratigraphic distribution, starting approximately 40 Ma ago, without significant morphological changes in both reproductive and vegetative structures (Fig. 1).

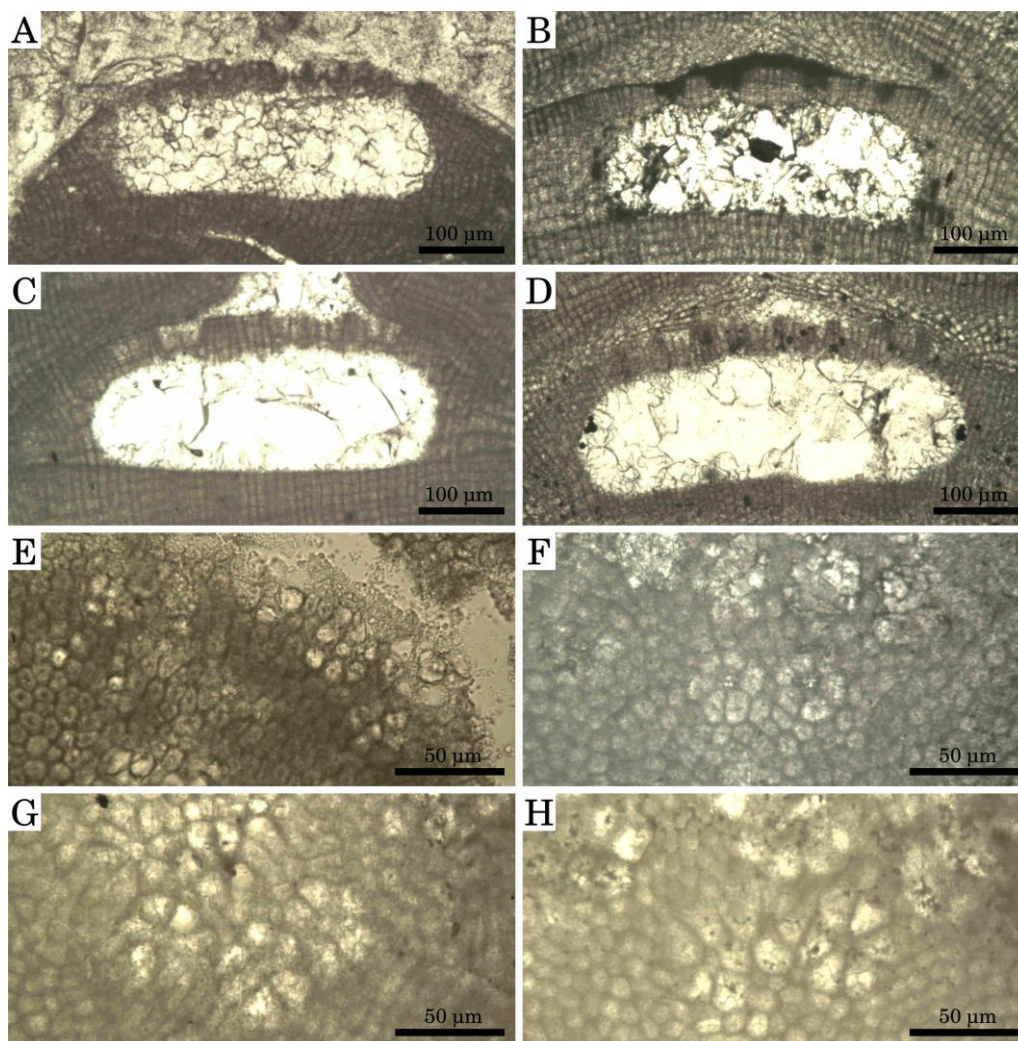


Figure 1 – *Lithothamnion crispatum*. A) Conceptacle, Lower Miocene, Tertiary Piedmont Basin. B) Conceptacle Pleistocene, Sicily. C) Conceptacle, Middle Miocene, Romania. D) Conceptacle, Middle Miocene, Czech Republic. E) Rosette cells, Lower Miocene, Tertiary Piedmont Basin. G) Rosette cells, Middle Miocene, Romania. H) Rosette cells, Middle Miocene, Romania.

The species has a fruticose to foliose growth form with a thallus organized in a plumose hypothallium (ventral core) and a zoned perithallium (peripheral zone). Perithallial and hypothallial cells are connected by cell fusions. Secondary pit connections and trichocytes have not been observed. Epithallial cells are flattened and flared; subepithallial initials are as long or longer than their derivatives. Tetra/bisporangial conceptacles are multiporate, their roof is slightly protruding above the surrounding thallus surface and is characterized by a depression on the top of pore canals (Fig. 1A-D). This depression is generated by the disintegration of the last cell of the roof, and the resulting pit overlays wedge-shaped

cells, which, in surface view, appear as a rosette bordering the pore canal (Fig. 1E-H). Conceptacle roofs pitted with depressions originating from the degeneration of the uppermost cells in filament bordering the pore canal is a unique diagnostic feature which distinguishes *L. crispatum* from other species of its genus (Wilks and Woelkerling 1995; Basso et al. 2011). This morphological character was used to merge *Lithothamnion indicum* and *Lithothamnion heteromorphum* into *Lithothamnion superpositum* (Nóbrega-Farias et al. 2010) and later to consider *L. superpositum* conspecific of *L. crispatum* (Basso et al. 2011). The biometric parameters preserved in the fossil specimens perfectly fit those of the modern species, both in range and in average values, showing no remarkable changes through time. Miocene samples, collected from different localities of the Tertiary Piedmont Basin, of the Alpine Foreland Basin and of the Paratethys, proved that no significant morphological variation existed between populations from different geographical areas. The only exception is a specimen from the Middle Miocene of Romania: while the main morphologic features (vegetative structure, length and width of vegetative cells, size and characteristics of asexual conceptacles) correspond to those of all the other samples, this one shows considerably larger and deeper pits on the conceptacle roof. No remarkable differences were observed between the samples of the Mediterranean Miocene and those of the Mediterranean Pleistocene even though the latter developed in cooler water. Morphologically speaking it is then safe to state that *L. crispatum* is much older than previously thought and that can be traced back to the Eocene. It occurs, without significant variations, in different geological epoch, and has a cosmopolitan distribution. Its presence in such a broad range of environments suggests that this species is highly adaptable. Moreover, although the advantage of its particular roof morphology is still unknown, it appears as a successful and persistent feature. Even if the morphological features does not allow the separation of the fossil and the recent material, neither according to their geographic provenance, nor by their age, the possibility that this morphological species could represent a group of diverse cryptic entities cannot be ruled out.

References

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