Skeletal Calcium Carbonate Phase Polymorphism in Two Temperate Scleractinians

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In 1975 evidence of magnesium-calcite in the first skeletal parts deposited after coral settlement, and up to 46% magnesium-calcite in the aragonitic skeleton of adult *Porites* was found. In 1976, it was stated that magnesium-calcite was a contamination deposited by microborers, rather than biomineralized by the corals. Since then, further investigations are rare. This study investigates the calcium carbonate polymorphism in two Mediterranean solitary scleractinians, *Balanophyllia europaea* and *Leptopsammia pruvoti*. Specimens were collected on the Italian coasts along a latitudinal gradient and dated using computerized tomography-based growth bands analysis. Powder x-ray diffraction (XRD) was performed on three corallite sections (base, intermediate, apex), to identify and quantify calcium carbonate phases. Scanning electronic microscopy (SEM) was performed on corallite sections, and the presence of magnesium was detected. XRD analyses on both species' corallites showed up to 12% magnesium-calcite content. *B. europaea* XRD data analyses showed a decreasing magnesium-calcite content from young (4-5%) to old individuals (2-3%) and from corallite base (6-16%) to apex (0-1%), while in *L. pruvoti* it was age-independent. Decreasing magnesium-calcite content as mean annual sea surface temperature increases was found, similarly to some mussel shells. SEM images of *B. europaea* did not show evidences of microborers contamination, and showed skeletal morphological differences: corallite basis was composed of regularly disposed open chambers, with a high magnesium content; corallite apex was compact with no detectable magnesium content, confirming XRD findings on phase distribution. These preliminary data indicate that: both species' corallites have a significant content of magnesium-calcite; in *B. europaea* magnesium-calcite deposition is a polyp-controlled age-dependent phenomenon. The presence of a mixture of aragonite and magnesium-calcite in *B. europaea*

corallite base may provide a better mechanical resistance to water movement and wave action, as composite materials are more elastic than pure ones.