



Do echinoderms store temperature changes in their skeleton?

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Echinoderms are abundant in a wide geographical range from tropical to Polar Regions and several species are rather long-lived (60 to 100y). They elaborate a high-magnesium calcite endoskeleton whose properties are tightly controlled by biological processes. Consequently, environmental conditions (temperature, salinity, etc..) are believed to weakly affect these properties (in particular the chemistry). However, studies on single species distributed along steep environmental gradients or experimental studies in controlled conditions are missing to confirm this statement. In the present study, we investigated the effects of temperature on the incorporation of minor and trace elements and on the $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ in the skeleton of the wide-ranged temperate starfish *Asterias rubens* (syn: *A. vulgaris*) and in closely related sea urchin species collected from boreal to tropical latitudes. Whole skeletons, series of sequentially grown plates and spine regenerates were analyzed by ICP-AES, ICP-MS, and IR-MS. A highly significant temperature effect on the Mg incorporation in the skeleton in both experimental and field conditions was evidenced. This effect was independent of growth rate, contrary to previous statements. The slope of relative $\delta^{18}\text{O}$ values versus temperature in skeletons of starfish is also highly significant and neatly matches slopes measured in corals or mollusks. Transfer functions are deduced from the experimental results and the possible use of the echinoderm skeleton from museum specimens as recorder of environmental parameters is discussed.