# Lithium isotope composition of scleratinian corals is sensitive to internal pH regulation

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The geochemistry of coral skeletons is classically used for paleo-environmental reconstructions, and, more recently, for understanding how their growth rate will be affected by climate change and ocean acidification. Among the various proxies investigated in corals, lithium isotopes are perhaps the least understood. The few published data mostly rely on laboratory experiments, the role of ocean temperature and pH remaining to be evaluated in their natural environment.

In this study, we analysed eight different species of scleratinian corals collected in Papua New Guinea, near $CO_2$ vents, where mean seawater pH is down to ~ 7.7. The same species were also collected in a control site located nearby (pH 8.15). After removing all traces of organics, we extracted Li and determined the skeleton $\delta^7$Li values by MC-ICP-MS. Data interpretation benefited from previous boron isotopes and major/trace elements measurements. For Li, between two and five pieces of skeleton per specie were analysed and yielded standard deviations of about 0.3‰. All coral species were strongly enriched in $^6$Li compared to the ocean (31.2‰): the average $\delta^7$Li values for species from the reference site range between 18.9‰ and 20.4‰. This confirms the small $\delta^7$Li range between species previously displayed by aquarium corals [1]. Three of the corals from the vents displayed $\delta^7$Li values similar to the control. The other 5 species were significantly enriched in $^6$Li (from -0.4‰ to -2.1‰), indicating a small but significant effect of external pH. This difference correlates with all proxies of carbonate chemistry parameters of the internal calcifying fluid, independantly determined ($DIC_{CF}$, $pH_{CF}$, $\delta^{11}$B) [2]. $\delta^7$Li values were more fractionated in corals from the vent site able to maintain elevated $pH_{CF}$ This is consistent with Li transport at the cellular level and related isotope fractionation, and strongly suggests that some corals activated specific pH-regulating exchangers when facing acidification. Thus, the coupling of B and Li isotopes provides a new promising proxy for detecting metabolic effects related to ocean acidification.

*[1] Bastian et al., GGR 42, 2018 [2] Comeau et al., GCB 24, 2018*