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Lithium isotopes in marine food webs

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Lithium (Li) production has massively increased over the past decades and is essentially used for batteries, ceramics, and medicine [1-2]. However, Li concentrations and its isotopic compositions (δ^7Li) are poorly documented in aquatic ecosystems, despite its accumulation in marine organisms, especially at the base of the trophic webs [3]. Here, we present field and laboratory studies reporting δ^7Li in various organs and whole organisms of marine plankton, bivalves, cephalopods, crustaceans, and fish collected in different biogeographical regions (the Mediterranean Sea, Bay of Biscay (BB), New Caledonia (NC), and Kerguelen Islands). The main aim of the study was to assess the role of ecological and environmental parameters on δ^7Li values.

δ^7Li values ranged from 4.6 ‰ (digestive gland of bivalves) to 31.7 ‰ (>35 µm plankton). Seawater δ^7Li being homogeneously distributed at ~ 31.2 ‰, marine organisms thus fractionate Li isotopes in favor of the light isotope (^{6}Li). There are no trends in δ^7Li values with the trophic position. However, when the same organs from similar organisms (bivalves, cephalopods, crustaceans, and fish) are compared, lower δ^7Li are systematically found in NC compared to BB, overall suggesting an influence of the environmental conditions on δ^7Li. Moreover, cultured organisms Li isotope fractionation increases when facing high Li levels in water.

Within the same taxonomic group, significant differences were also observed among organs with the lowest δ^7Li values in gills for fish and in the digestive gland for bivalves. This indicates a key role of physiology on Li isotopes distribution. A trend with Na contents supports an intimate link between Li transport and regulation and the activity of Na-H Exchangers [4]. Overall, the work highlights the interest of δ^7Li to investigate Li ecotoxicology and physiology. It may also help to unravel the magnitude of biological activity (“vital effects”) on δ^7Li measured in fossil biogenic carbonates.

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