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A phylogenetic framework assessing metal uptake and translocation patterns across halophytic saltmarsh taxa globally (#158)

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Despite taxonomically diverse halophytic saltmarsh having huge ecological importance, they are under various human-driven pressures including metal contamination of saltmarsh sediment from industrial and urban sources. Due to the unique nature of saltmarsh sediment, metals might be bioavailable to saltmarsh vegetation. Existing literature suggests variability of metal accumulation and translocation among saltmarsh taxa and patterns of accumulation may vary with plant attributes. We amassed a dataset of saltmarsh taxa globally to explore the pattern of metal (Cu, Zn, Cd and Pb) root uptake and distribution in the plant quantitatively, and further, to explore the relationship of these patterns with halophytes' plant type, life form, habitat, salt excretion, salt tolerance and photosynthetic mode. Most halophytic saltmarsh exhibited greater root uptake for essential metals (Cu and Zn) and the non-essential metal Cd. Their subsequent mobility from roots to shoot was at or above unity (≥1), but less mobility was observed for Pb (BCF = 1.4; TF = 0.65). Similar patterns of accumulation were exhibited across halophyte families, excepting Cd in Juncaceae. Further, the pattern of uptake and translocation to shoots were broadly similar among halophyte plant traits. Only, significantly lower Zn accumulation and translocation was attributed to halophytes with salt glands and bladders, indicating co-excretion of monovalent Na and divalent Zn. Na^+ accumulation and consequent salinity tolerance to maintain osmoregulation has no relationship to metal uptake and translocation, likely due to the fact that Na^+ and metal transport are facilitated by different transporter assemblages. Higher Zn translocation was observed in response to lower sedimentary Zn doses ($p = 0.01$; $R^2 = 0.38$). Patterns of accumulation to roots and limited translocation to leaf tissue means that saltmarsh, as a group, could be classified as effective phytostabilisers rather than hyperaccumulating phytoextractive species.