How marine cyanobacteria deal with zinc in an ocean desert

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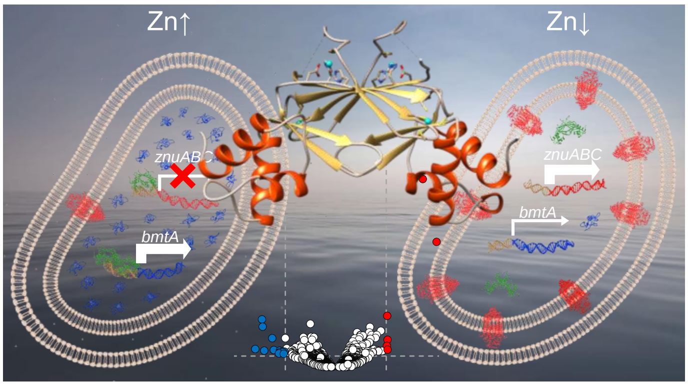
Trace metals such as iron, manganese, and zinc, are critically essential for all major biogeochemical cycles, including those for carbon, nitrogen, and phosphorus. Their availability in large swathes of the global oceans is often extremely low. Since consequently, biomass is very low in such regions, these have been dubbed "ocean deserts". However, like real deserts, they are not completely without life, but are populated by a few specialists. As photoautotrophs at the base of the marine foodweb, pico-cyanobacteria of the genera *Synechococcus* and *Prochlorococcus* occupy a particularly important role here; indeed, they are thought to account for the majority of CO_2 fixation in these regions.[1] The latter process requires carbonic anhydrases, and those require a d-block metal, most frequently zinc.

Using a Zur-deficient mutant strain, RNA-sequencing, X-ray crystallography and a range of biophysical techniques, we show how the model strain *Synechococcus* sp. WH8102 employs a streamlined portfolio of proteins for zinc homeostasis to survive under conditions of both zinc excess and starvation: one sensor, two uptake systems, and one metallothionein.



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[1] P. Flombaum *et al., Proc. Natl. Acad. Sci. U. S. A.* 2013, *110*, 9824–9829.