

Ocean Alkalinity Enhancement Promotes the Proliferation of Marine Parasites and Alters Seasonal Microbial Communities: Insights from Mesocosm Experiments in the California Coastal Upwelling System

JAMES A GATELY¹, SYLVIA M KIM¹, ZOE S WELCH¹,
JOAQUÍN MARTÍNEZ MARTÍNEZ², DYLAN CATLETT¹,
BENJAMIN JIN³, MADELINE MANZAGOL¹, ANGELA
LARSON¹, MARK A BRZEZINSKI¹ AND DÉBORA
IGLESIAS RODRIGUEZ¹

¹University of California, Santa Barbara

²University of Maryland Center for Environmental Sciences

³University of California, Berkeley

Marine carbon dioxide removal (mCDR) strategies will likely be necessary for the adequate removal of legacy carbon dioxide emissions. Ocean alkalinity enhancement (OAE) is a rapidly developing abiotic mCDR approach that aims to accelerate the natural Earth process of rock weathering, but its impact on marine ecosystems remains uncertain. Here we use mesocosm experiments to investigate the effects of limestone-inspired and NaOH alkalinity additions (~750 $\mu\text{mol kg}^{-1}$) on seasonal marine microbial communities (i.e., phytoplankton, bacteria) collected from the Santa Barbara Channel using 18S SSU rRNA high-throughput amplicon sequencing and flow cytometry. OAE exerted a stronger influence on microbial community composition under low-nutrient conditions and appeared to promote the proliferation of the obligate parasitic class Syndiniales. Our results suggest that alkalinization could potentially result in cascading ecosystem effects and highlight the need for additional research – and an expansive environmental monitoring program – prior to the implementation of OAE technologies.