{rokbox title=| Bulk dark and putative anaplerotic DIC fixation by Alteromonas in the North Atlantic and the Pacific Ocean :: Image: Authors|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-major-contribution-anaplerosis-sintes-2026-thumb-et-al.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-major-contribution-anaplerosis-sintes-2026-et-al.jpg {/rokbox}

C. Amano, U. Willhelm, T. Koch, T. Reinthaler, R. L. Hansman, **Eva Sintes**, G. J. Herndl, J. M. González and F. Baltar,2026.
Major contribution of anaplerosis to inorganic carbon fixation in the dark ocean.
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Abstract:While CO2 fixation by photo- and chemolithoautotrophs is a central process of the global carbon cycle, many organisms also incorporate inorganic carbon into organic compounds through anaplerotic carbon fixation, a process that replenishes intermediates of central metabolic pathways. However, the active drivers and quantitative importance of anaplerotic carbon fixation in the oceanic carbon cycling remain poorly understood. Here, through analysis of global ocean multi-omics datasets, we identified widespread expression of enzymes involved in this process, especially phosphoenolpyruvate carboxylase. The heterotrophic bacterial genus Alteromonas, a globally distributed marine taxon lacking genes for autotrophic carbon fixation pathways, exhibited particularly high transcriptional and proteomic activity for this enzyme. Laboratory incubations confirmed that Alteromonas assimilated dissolved inorganic carbon (DIC) into biomass, with rates regulated by temperature and organic matter availability. Single-cell tracer analyses of the deep ocean microbial communities quantified Alteromonas's contribution at about 17% of total dark DIC fixation (median; confidence interval, 10–28%), equivalent to a potential global flux of about 0.2 PgC yr−1. These results reveal substantial DIC fixation via anaplerosis, indicating that dark carbon fixation is partly supported by heterotrophic metabolism and modulated by environmental conditions, with responses that may differ from those of canonical autotrophic processes.

Keywords:Carbon cycle,Marine biology,Microbial biooceanography,Microbial ecology.