

Competitive Strategies in Oceanic Carbon Cycling: Selfish, Sharing, and Scavenging Bacteria

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Heterotrophic bacteria drive the breakdown of phytoplankton-derived dissolved organic matter in the ocean. Their activity limits the sequestration of carbon to the deep sea and sediments. A significant component of the dissolved organic matter is glycans, which are degraded by the microorganisms using carbohydrate-active enzymes. Beyond the use of enzymes, we have also discovered three main ecological foraging strategies: sharing, selfish uptake, and scavenging. Each has a different enzyme cost and benefit, dependent on glycan complexity and availability.

To quantify the activity of each strategy in the water column, we use fluorescent substrate analogues. Furthermore, we identify active selfish bacteria via fluorescence *in situ* hybridisation. A standout finding: Bacteroidota, especially Flavobacteriia, are major players in selfish uptake. We complement our *in situ* observations with culture-based investigations to understand how genotypes become phenotypes and identify the drivers which select for each foraging strategy. Together, these insights show how microbial strategies control the breakdown of dissolved organic matter and how the fine line between sharing and selfishness drives carbon flow in the ocean.