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Edgcomb Laboratory: Symbionts of Ciliates & Flagellates

Sulfide-rich conditions are likely to have existed in the oceans into the late Proterozoic, during the origin and early diversification of eukaryotes. Indeed, the sulfur cycle has been implicated in the origin of eukaryotes. Marine micro-oxic (severely depleted but still detectable oxygen) to sulfidic environments are sites of intensive biogeochemical cycling and elemental sequestration, where prokaryotes are major driving forces mediating carbon, nitrogen, sulfur, phosphorus, and metal cycles. Thus, micro-oxic sulfide-enriched habitats are important from both biogeochemical and evolutionary perspectives. Associations between single-celled eukaryotes and prokaryotes are common in these environments, most notably among flagellates and ciliates.

Our group has been involved in collaborative investigations of symbioses between various ciliates and flagellates and their bacterial and archaeal partners. Our two main study sites have been the Cariaco Basin, Venezuela, and Santa Barbara Basin, CA, USA (with J. Bernhard, WHOI). Both of these sites are characterized by low oxygen and anoxic/sulfidic water columns and sediments. Understanding more about the nature of the protist-prokaryote symbioses that appear so common in these types of environments is our primary goal. In some cases, the symbioses appear mutualistic and nutritionally-based, while in other cases, symbioses appear to also play a role in detoxification of the immediate surroundings for the protist host. Given the abundance of symbioses between protists and bacteria and/or archaea in low oxygen/anoxic marine habitats, we are working to understand their impact on marine biogeochemical cycles.

We are initiating studies of methanogen-hosting ciliates in a coastal oxygen minimum zone off the island of Vancouver, BC, Saanich Inlet. This project is a collaboration with the laboratories of Steven Hallam and Sean Crowe at UBC, and Rebecca Gast at WHOI, and is being lead by postdoc Roxanne Beinart. Roxanne is also investigating symbioses between protozoa and prokaryotes in a stratified coastal pond in Falmouth MA, Salt Pond.

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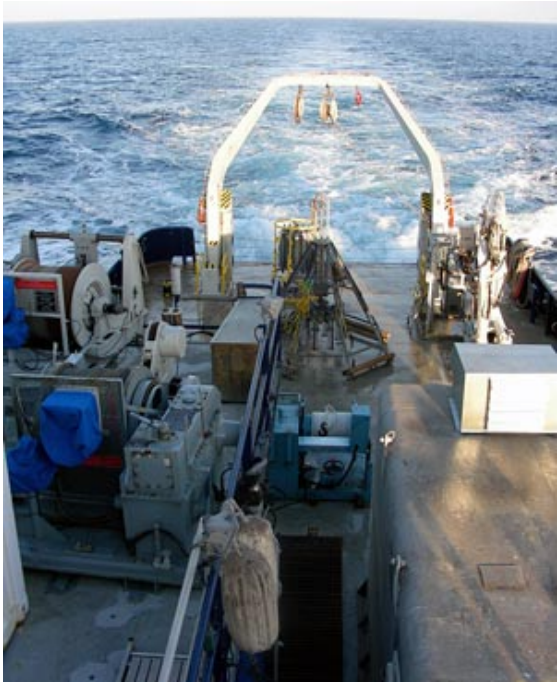
(Courtesy William Orsi)



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Roxanne Beinart and Alec Cobban (Falmouth Academy) sample Salt Pond

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Roxanne Beinart (WHOI) and Alec Cobban (Falmouth Academy) sample Salt Pond protists

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