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Anaerobic oxidation of hydrogen sulfide coupled to nitrate reduction in Namibian Coastal waters.

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The episodic appearance of hydrogen sulfide in the coastal waters on the Namibian shelf has been suggested to be an important factor controlling the regions fisheries by erasing whole generations of juvenile fish as well as the benthic fauna not able to escape the toxic H2S-gas. During a NAMIBGAS cruise with the R/V Alexander von Humboldt in January 2004, we observed H2S concentrations $>25\mu$M in the bottom waters over a $\sim$5000 km^2 area of the Namibian shelf. We investigated the role of pelagic microorganisms in the detoxification of these sulfidic shelf waters. High resolution (1m) chemical profiles showed that H2S disappeared well below ($>$40 m) the oxic zone indicating that sulfide was not oxidized aerobically. Instead, chemical profiles, 15N-tracer experiments and cell counts (FISH) indicate that hydrogen sulfide diffusing into the water column from the sediments was consumed by nitrate reducing sulfide oxidizing bacteria. During this process nitrate and sulfide were converted to N2 and elemental sulfur (S0), respectively. In situ hybridization with specific oligonulceotide probes revealed a high relative abundance in a cluster of uncultured γ-proteobacteria (GSO, $\sim$10%) and ε-proteobacteria belonging to the arcobacter group ($\sim$10%), which are closely related to known nitrate reducing and sulfide oxidizing bacteria, in the sulfidic waters,. This is the first evidence for bacterial detoxification of sulfidic waters in an open ocean setting.