

Multidisciplinary Assessment of Deep-Water Coral Ecosystems: Tools to detect impacts of sub-lethal stress

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U.S. Geological Survey

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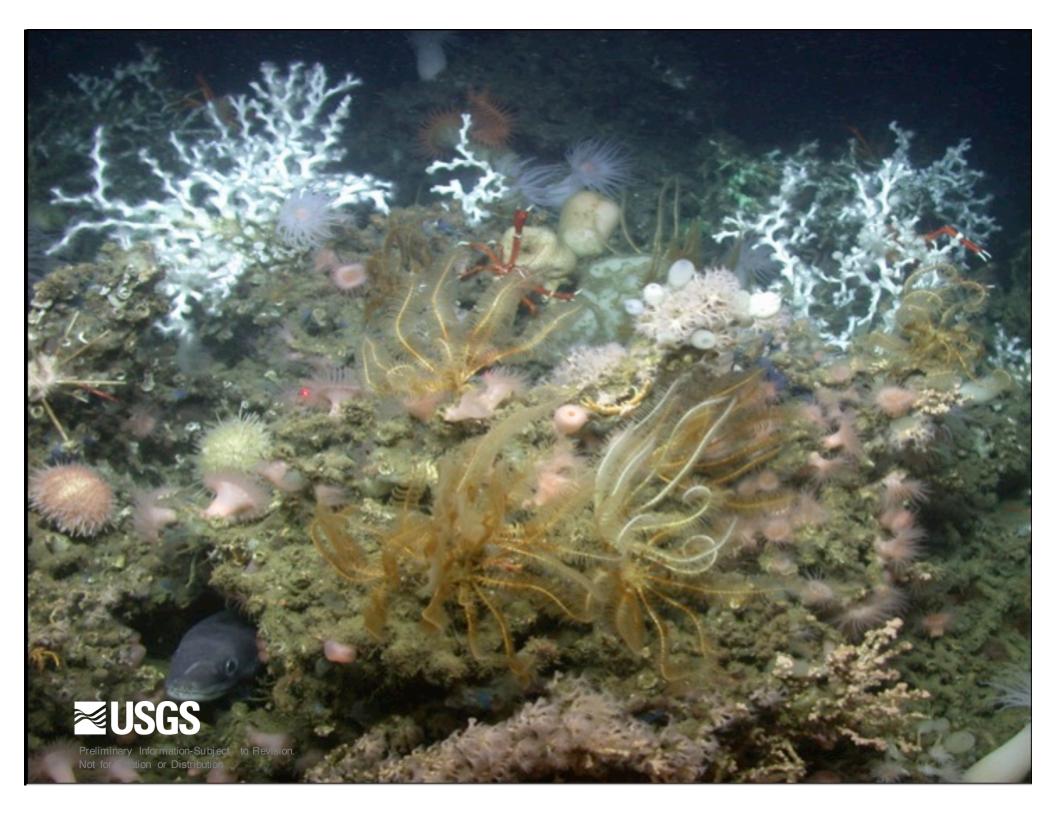
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Corals are bad patients





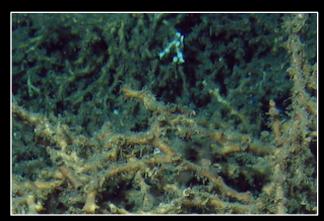
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Mortality is a poor metric



VS



- Provides no information about sub-lethal impacts of
 - oil spills
 - drilling mud plumes
 - environmental change
 - water temp
 - food supply



Biomarker Development

- Cheryl Morrison USGS Leetown Science Ctr
- Characterize functional genes in corals (transcriptomes) to develop biomarkers of coral health or sub-lethal stress.
 - Transcriptomics
 - qPCR

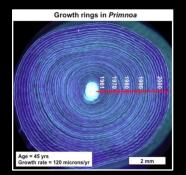






Nutrient Dynamics/Food Supply

- Nancy Prouty USGS Pacific Coastal and Marine Science Center
- Track changes in nutrient dynamics (e.g., changes in quality, quantity, and source) and impact of oil spill on biomass production. Obtain better estimates of coral ages, and define and trace isotopic composition of petro-basedcarbon into the GOM deep-sea coral food web.









Microbial Indicators

Chris Kellogg

– USGS St. Petersburg Coastal and Marine Science Center

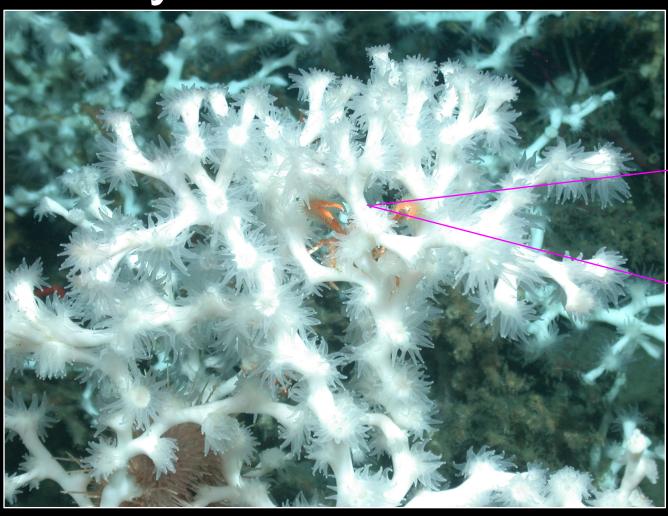
- Characterize taxonomic and functional genes in coral microbiomes to develop indicators of coral health or sub-lethal stress
 - Metagenomics

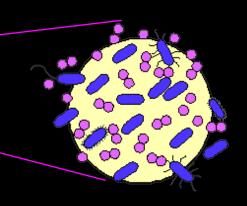






Why do the microbes matter?





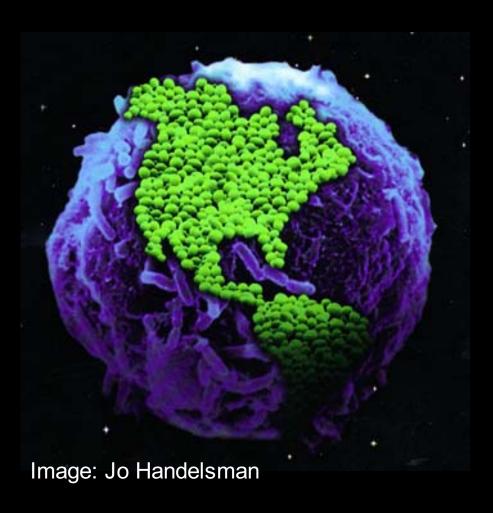


What is a Microbiome?

- (1) The microorganisms in a particular environment (including the body or a part of the body)
- (2) The combined genetic material of the microorganisms in a particular environment



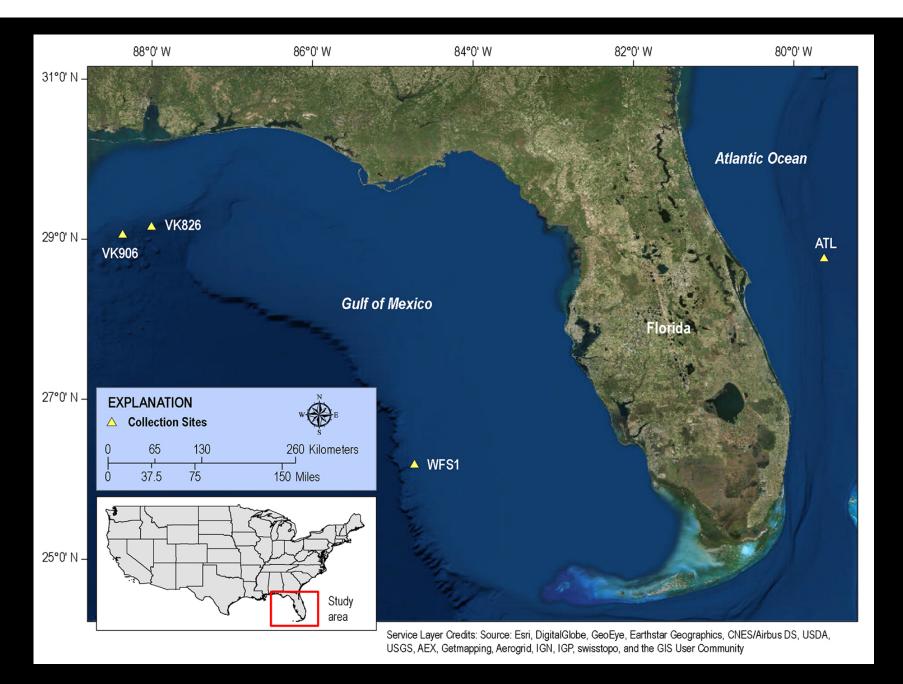
Small Things, Big Influence



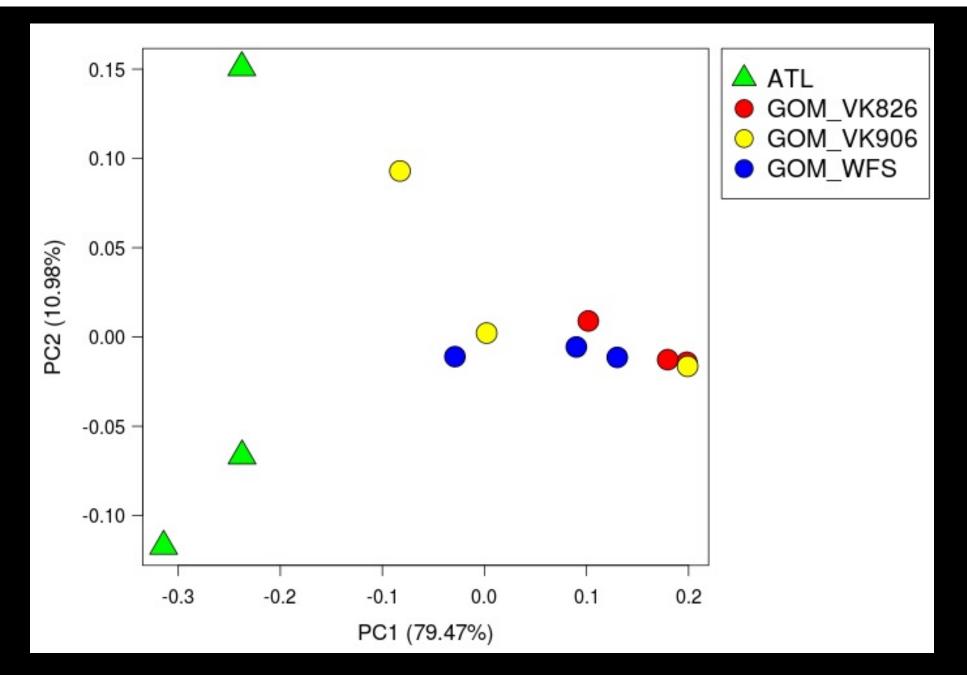
- Biological Services
- Diseases

- Rapid adaptation to environmental changes
 - Importance of having baselines

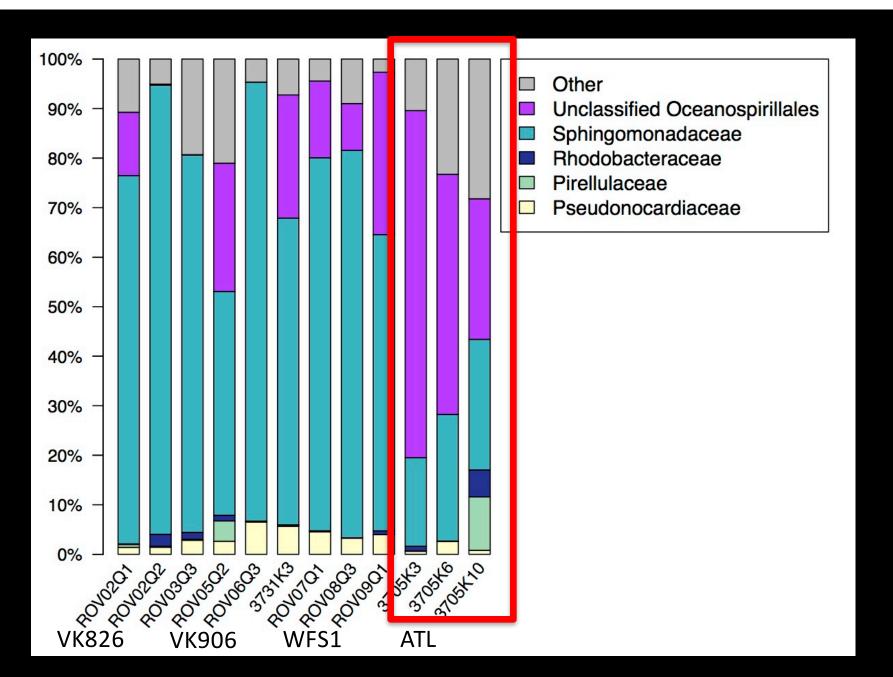










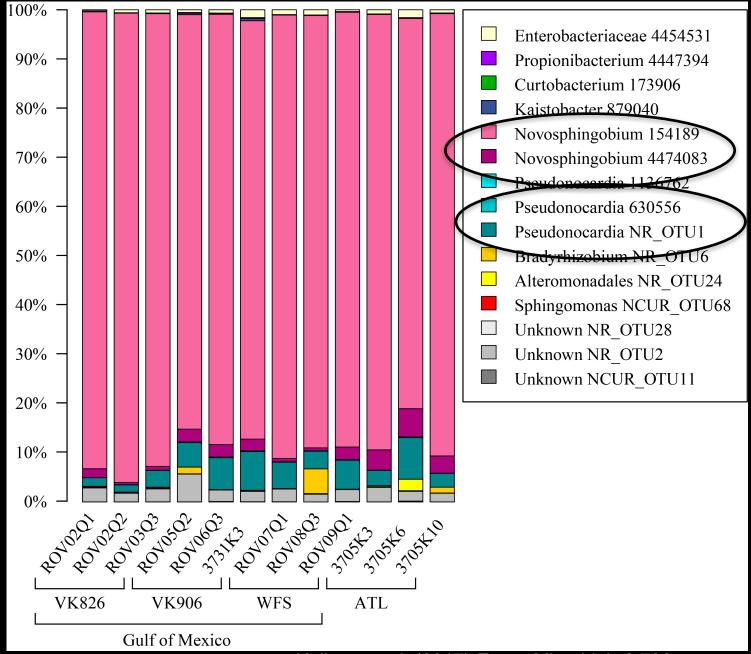




Core Microbiome

- Specific bacteria (sequences) found in all 12 Lophelia samples, no matter the site of origin
 - 15 conserved sequences
 - Conserved across individuals and geography suggests important role
 - Potential targets as microbial biomarkers







Kellogg et al. (2017) Front. Microbiol. 8:796

Taxonomic -> Functional

- In corals, there is a lot of microbial diversity, so sometimes the same 'who' won't be present, but the important biological service is still being performed
- Use metagenomics to look at functional genes to identify important biological functions



Study Results

- Largest taxonomic survey of Lophelia pertusa bacterial microbiome (>40,000 sequences per sample x 12 samples)
 - 1st to examine biogeographic regional differences
 - 1st to identify core microbiome
- First deep-sea coral metagenome (Lophelia)
 - Functional genes
 - Bacterial, Viral, Fungal, Archaeal



Why are these data important?

Baselines are critical to monitoring environmental health







 Baselines to document change & provide benchmark for restoration goals





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