

Project Summary

Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Environmental Stewardship through Discovery: A Molecular ATBI for Yellowstone Lake (PMIS # 154526)

Discipline: Natural Resources

Type of Project: Research

Funding Agency: National Park Service

Other Partners/Cooperators: Montana State University

Effective Dates: 5/1/2009 - 10/1/2011

Funding Amount: \$280,825

Investigators and Agency Representative:

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Project Abstract: This Molecular All-Taxa Biodiversity Inventory (MATBI) is a large scale, interdisciplinary study of the complexity of life in Yellowstone Lake. A main focus of the study is to understand the effect of environmental selection factors on genetic diversity. To perform the study, an interdisciplinary team is conducting research in an integrated way—from geophysics to geochemistry and biological diversity. Researchers take a series of cold-water lake samples at different locations and depths. This is followed by the launch of a Remote Operating Vehicle (ROV)—a submersible vehicle controlled by researchers in the boat. The ROV collects water and living samples from the geothermal vents and from the zone where hot and cold water are intermixing. Once the samples are collected, they must be analyzed to determine the identification of the microorganisms in the samples. Both prokaryotic and eukaryotic organisms will be identified through genetic analysis. The results, together with the geochemical analysis of the sample sites, will be used to construct a complete environmental profile of the lake, including creation of a "tree of life" that shows the evolutionary relatedness among lake organisms.

This agreement will expand the scope of the MATBI effort that the donation from the Gordon and Betty Moore Foundation is funding. The cooperators will provide the scientific expertise necessary to sample, analyze and understand the organisms and their unique relationship to their ecosystem. The park service will provide access to the study areas, safety protocols and assistance, and permits for research and sample collection. In addition, park staff will coordinate with the national ATBI effort and create information products about the MATBI. This task agreement specifically funds the following tasks: the 18s rRNA gene analysis for eukaryotic microorganisms, the geochemical analysis of the lake samples (cold water, hot vent water, and cold and hot mixing zone water) focusing on rare and toxic elements and compounds, the geochemical analysis of vent gases sampled for similar constituents, and the hiring of staff to coordinate the analysis and all aspects of data informatics.

Our specific objectives with this Task Agreement are to:

- Add 18S ribosomal gene sequencing to identify species in the Eucarya domain (currently, due to budget constraints, only 16S sequencing is being conducted, allowing species identification only in the Bacteria and Archaea domains)
- Connect the Yellowstone MATBI with the national ATBI database, the Encyclopedia of Life database, Genbank, and the Greater Yellowstone Science Learning Center (GYSLC) website
- Conduct geochemical analysis of water samples associated with sampling locations
- Complete species and ecological function descriptions

Outcomes with Completion Dates:

- 1). 1 June, 2009: Project Plan (2009) including schedule and tasks
- 2). 30 June, 2009 2nd Q '09 Progress report (April - June)
- 3). Oct, 2009: GYSLC products & 3rd Q progress report (July -Sept)
- 4). Jan, 2010: Project Plan (2010) & Annual Report (2009)
- 5). April, 2010: 1st Q '10 progress report (Jan - Mar)
- 6). July, 2010: 2nd Q '10 progress report (Apr - June)
- 7). Oct, 2010 GYSLC Products & 3rd Q progress report (Jul - Sept)
- 8). Jan 2011: Annual Report (2010) & Project Plan (2011)
- 9). 1 April, 2011: Draft Final Report
- 10). 1 May, 2011 Final Report & GYSLC products & YELL Science article

Keywords: Molecular All-Taxa Biodiversity Inventory (MATBI), Yellowstone Lake, Yellowstone National Park, Montana State University