**ABSTRACT**

As one component of a marine community-based study of shelf and slope waters west of the Antarctic Peninsula, our project is focused on integrating and organizes carbon assimilation (net primary production - NPP) and microbial community structure and function. An experimental approach is designed to dissect the coupling between photosynthetic carbon production and heterotrophic carbon utilization by examining various components of the microbial loop, including standing stocks, production rates, and the role of marine viruses in the microbial balance. This framework provides a basis for understanding the coupling between primary productivity and heterotrophic bacterial production. The proximate controls on the abundance and productivity of heterotrophic bacteria are still not well understood, but bacteria in the Palmer LTER region are resource-limited. An integrative approach to observations from measurements of the activity of two key ectoenzymes in heterotrophic nanoflagellates (leucine aminopeptidase [LAPase] and beta-glucosidase [BGase]) reveals fundamental differences among microbial assemblages sampled from different regions and in the case of Southern Ocean habitats (see below). Our results indicate the abundance of BHNF may be controlled by the availability of metabolic resources with the heterotrophic bacteria. We have collected several empirical relationships (see A) between bacterial substrate limitation and DON concentrations. These relationships are used to assess the capacity of bacteria to utilize high molecular weight (HMW)-DOC. Also shown in the microbial web are viruses and the prokaryotes. This study is located in a climate sensitive region (45°N, Palmer LTER) and is focused on understanding carbon-oxygen inventories and fluxes for the Northern Hemisphere.

**MAJOR RESEARCH FOCI**

- Carbon transformations and fluxes
- Microbial community structure and function
- Comparative excursion analyses

**KEY MICROBIAL PARAMETERS AND PROCESSES: MATERIALS AND METHODS**

- Community composition
- Microbial carbon stock and flow
- Fractionation isotope biologues with ABA (regional perspective and global)
- Stable carbon and hydrogen isotopes
- Subsurface bacterial production (LBMP)
- Microbial biomass, "chloro" calculations (FRC, ATP, HCN)
- Production rates
- Anabolic/chloroplastic flow
- Organic nutrient consumption
- Community metabolism
- O dynamics and fluxes
- Production and mortality

**BACTERIAL CULTURE-RELATED RELATIONSHIPS**

- Bacterial culture and physiologically related bacteria are typically highly correlated in aquatic environments. The Smith-Fry and Smith-Fry understanding of the microbial loop: phytoplankton produce organic matter that is utilized by bacteria. Several empirical relationships (see A) between bacterial substrate limitation and DON concentrations. These relationships are used to assess the capacity of bacteria to utilize high molecular weight (HMW)-DOC. Also shown in the microbial web are viruses and the prokaryotes. This study is located in a climate sensitive region (45°N, Palmer LTER) and is focused on understanding carbon-oxygen inventories and fluxes for the Northern Hemisphere.

**DISCOVERY OF ARCHAEAL**

We have recognized three domains of life. Archaea, Bacteria and Eucaryotes (right). Until recently, planktonic archaea were not even recognized. High molecular weight (HMW)-DOC. Also shown in the microbial web are viruses and the prokaryotes. This study is located in a climate sensitive region (45°N, Palmer LTER) and is focused on understanding carbon-oxygen inventories and fluxes for the Northern Hemisphere.

**CONCLUSIONS**

- We have learned a dramatic uncoupling of bacterial and archaeal processes: Microbial loop processes appear to be coupled to changes in the magnitude of water phytoplankton carbon fluxes. The combined effect of organic carbon availability, grazing and temperature appears to be terrain's key explanation for our field observations. Our results indicate that bacteria in the Palmer LTER region are resource-limited. An integrative approach to observations from measurements of the activity of two key ectoenzymes in heterotrophic nanoflagellates (leucine aminopeptidase [LAPase] and beta-glucosidase [BGase]) reveals fundamental differences among microbial assemblages sampled from different regions and in the case of Southern Ocean habitats (see below). Our results indicate the abundance of BHNF may be controlled by the availability of metabolic resources with the heterotrophic bacteria. We have collected several empirical relationships (see A) between bacterial substrate limitation and DON concentrations. These relationships are used to assess the capacity of bacteria to utilize high molecular weight (HMW)-DOC. Also shown in the microbial web are viruses and the prokaryotes. This study is located in a climate sensitive region (45°N, Palmer LTER) and is focused on understanding carbon-oxygen inventories and fluxes for the Northern Hemisphere.

**NOT EVEN THE TIP OF THE ICEBERG!**

- Less than 1% of species in culture
- New "candid" species (Y, X, Z)

**SELECTED REFERENCES**
