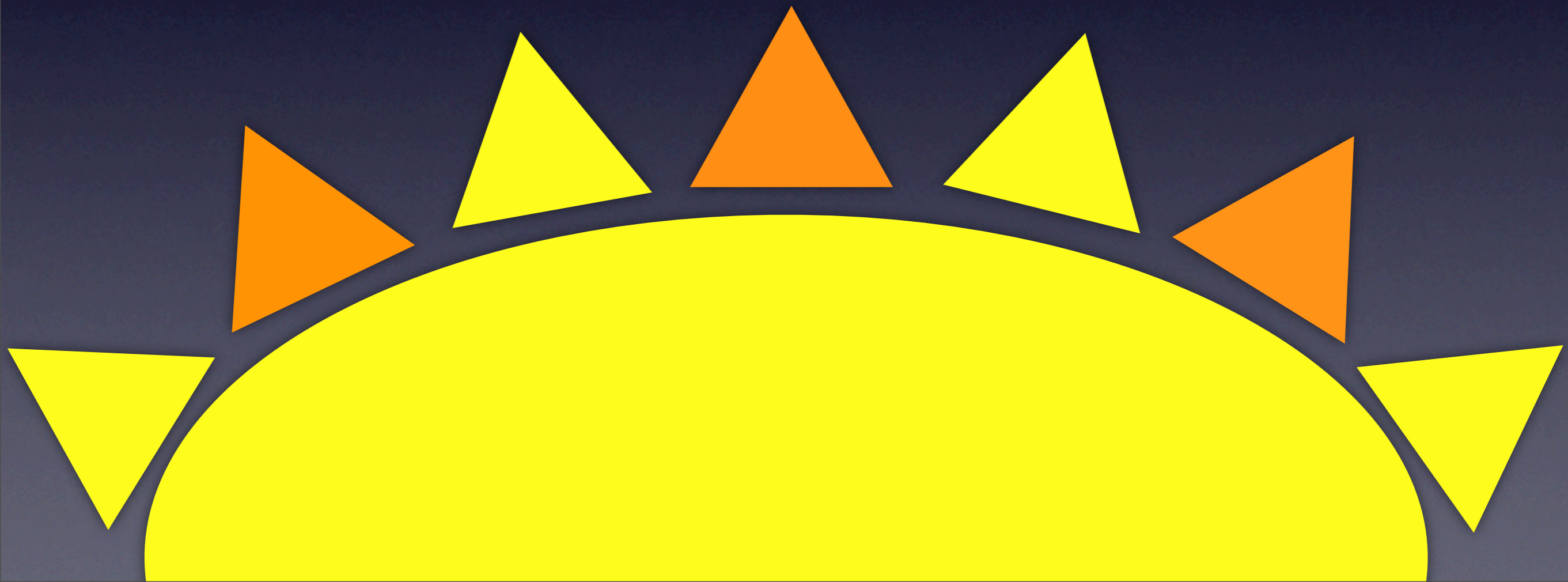


Community Response to
Organic Nutrient Amendment
CORONA



Sampling

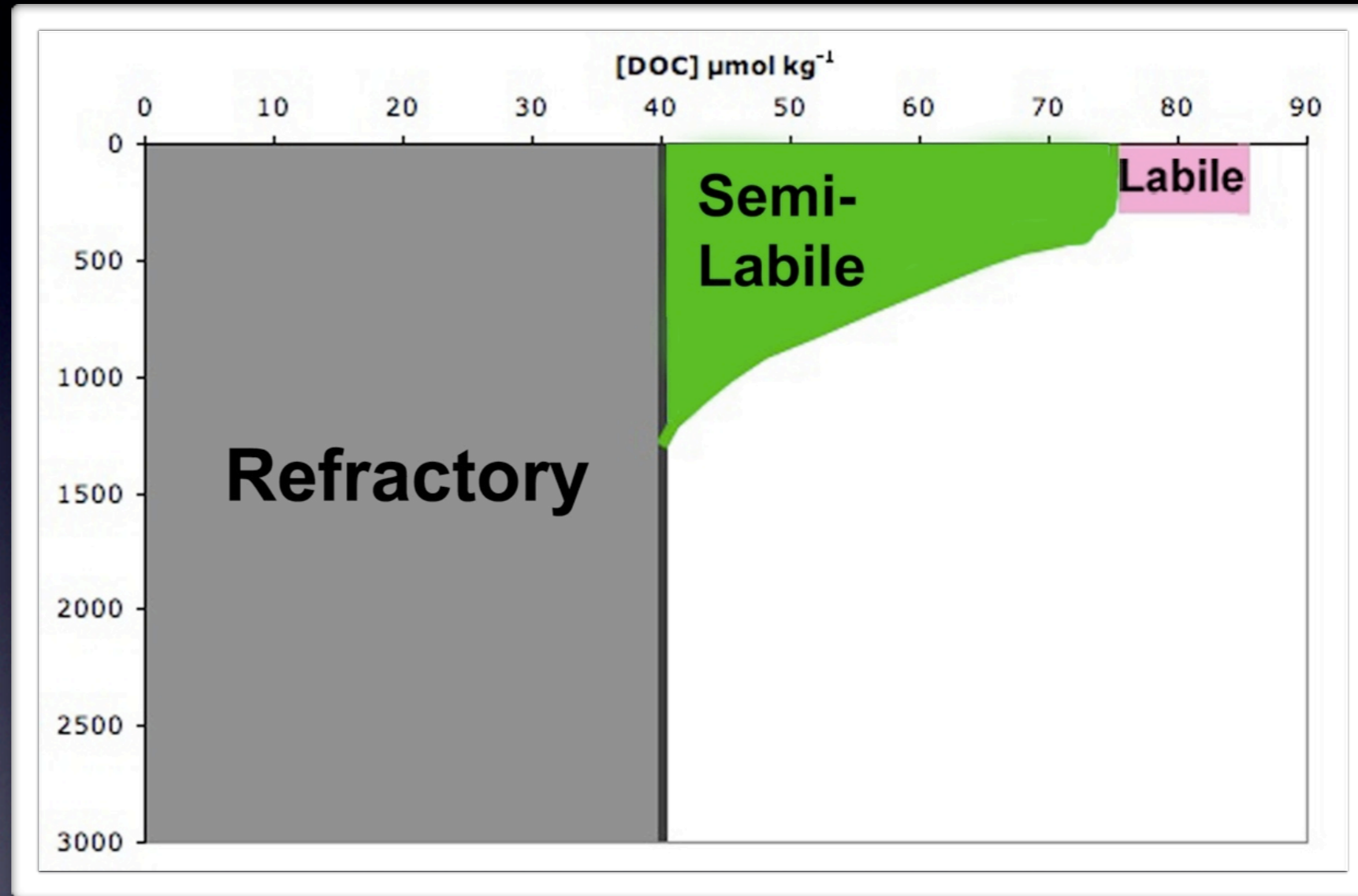
Agouron cruise, University of Hawaii

R/V Kilo Moana, Jun 15-23, 2008



Background

- Bacterial growth limitation
 - Organic vs Inorganic
- Organic Carbon Quality / Lability



Background

	C	N	P	C:N
HOT DOM	385	25	1	15:1
S6, 25m, DOM	435	21	1	20:1

HOT POM	155	22	1	7:1
S6, 25M, POM	21	3	1	6:1

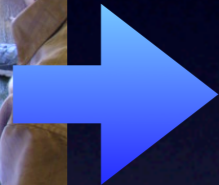
Perturbation Experiment

		C	N	P	C:N
Substrate	DNA	10	4	1	2.5:1
	Glycolate	10			
	Methionine	10	2		

Carboy, T0	DNA	65	6	1	10:1
	Glycolate	502	21	1	24:1
	Methionine	502	35	1	15:1

Experimental flow

Sampling



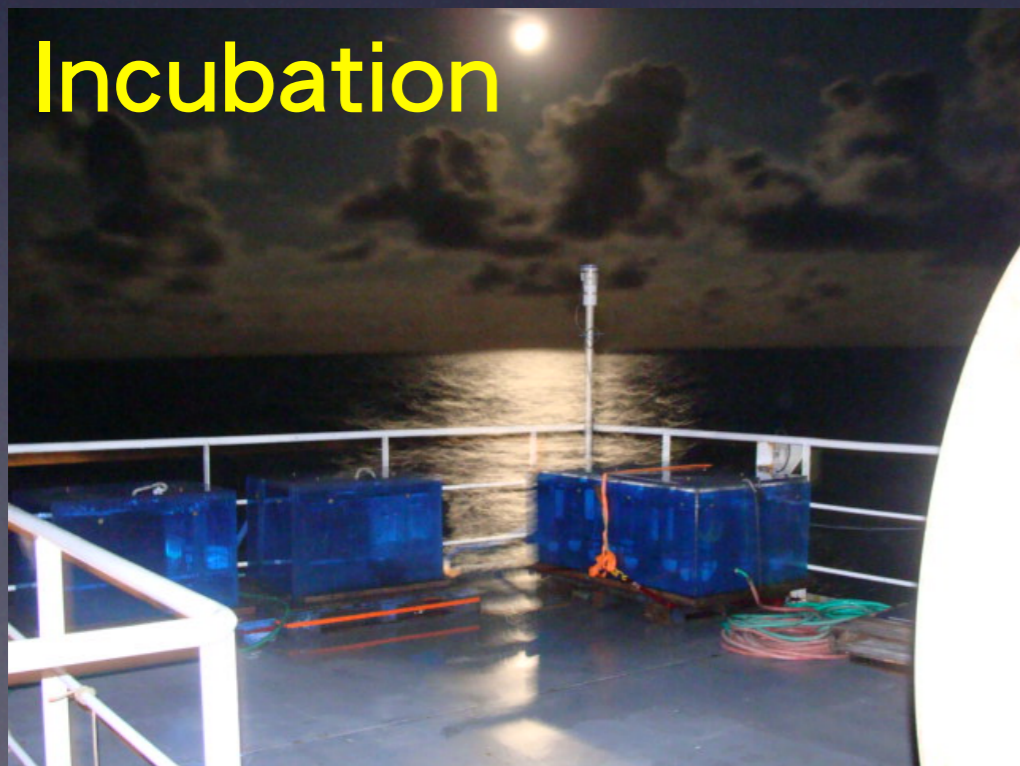
Add Substrates



Mix?



Incubation



Materials and Methods



Sampling (T0 \rightarrow T5, day)

Community structure (T-RFLP)*

Biomass : TDP*, PP04*, SRP*, DOC*, ATP*, LLN*, LLSi*, PPO4*, NO3*, Chl

Enumeration: Bacteria, Picoeukaryotes, Virus

Activities: Bacterial production, Primary production

*sampled every 2 days

Results Overview

1. Follow the Carbon Road...

A. Timepoint Trends

- Primary Production
- Increase in mortality
- Primary production consistent (except DNA)
- High respiration

B. DNA Treatment

- Most productive
- Driven towards N-Limitation?

C. Other treatments

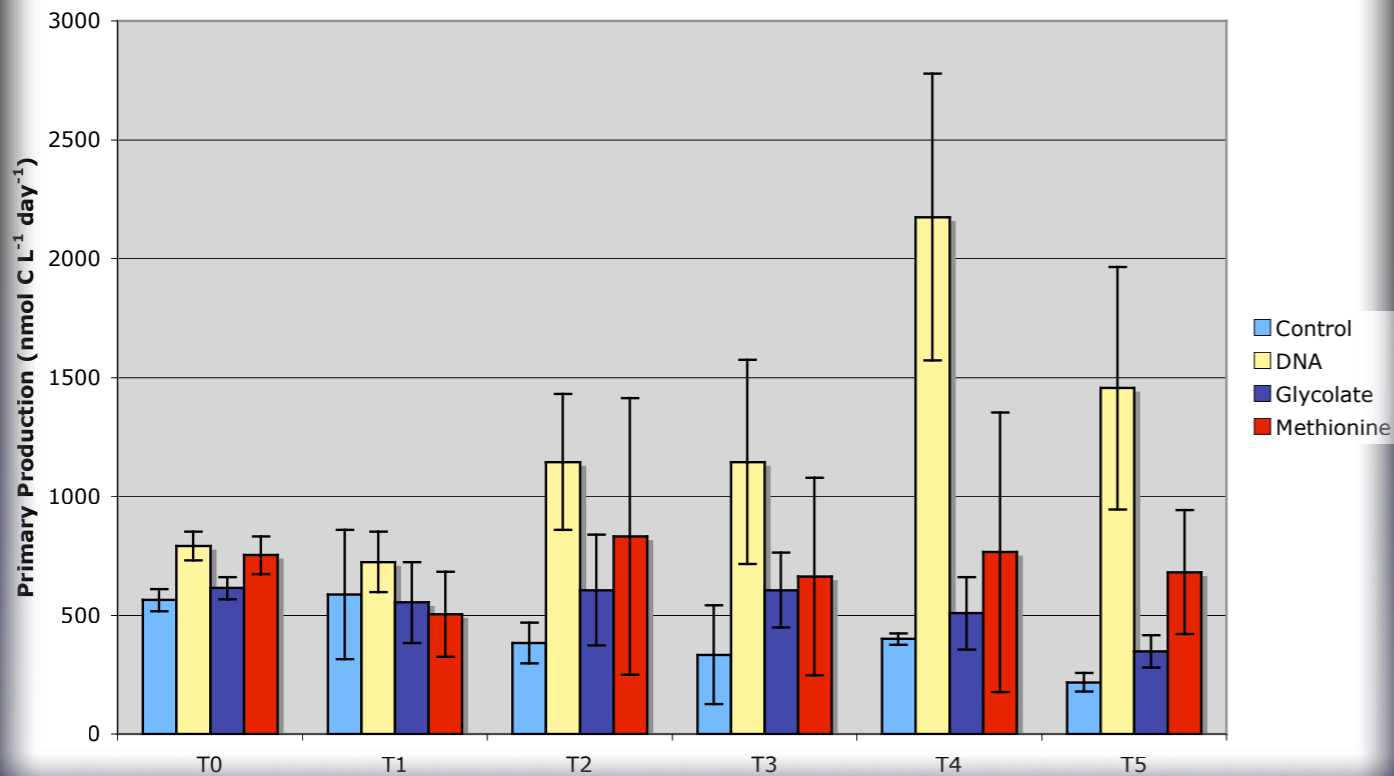
- P-limitation?

2. Community Shift

- Prochlorococcus → Eukaryotes (Picoeukaryotes & Diatoms)
- Divergence

Timepoint Trends

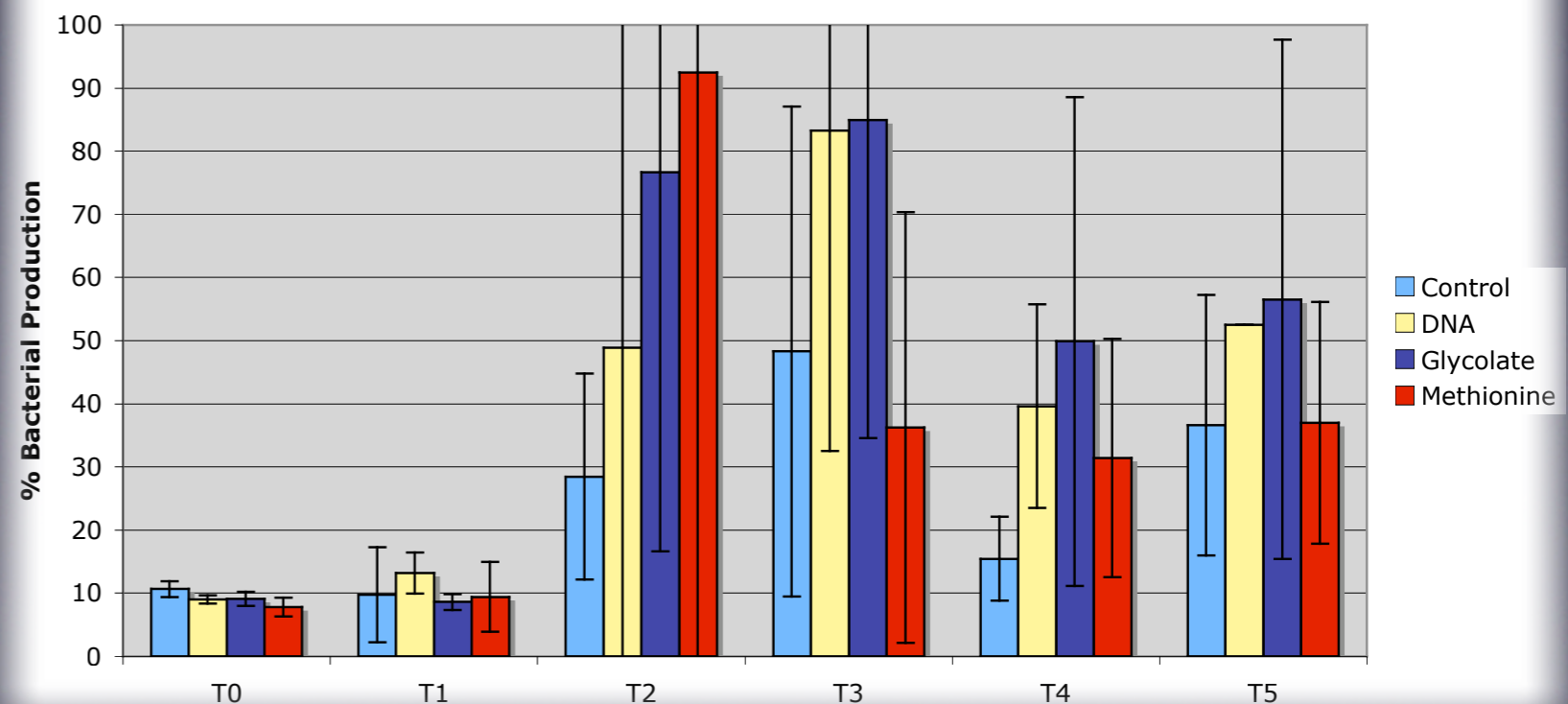
Incubation Experiment Primary Production



● Increase in DNA Treatment 1^o Production

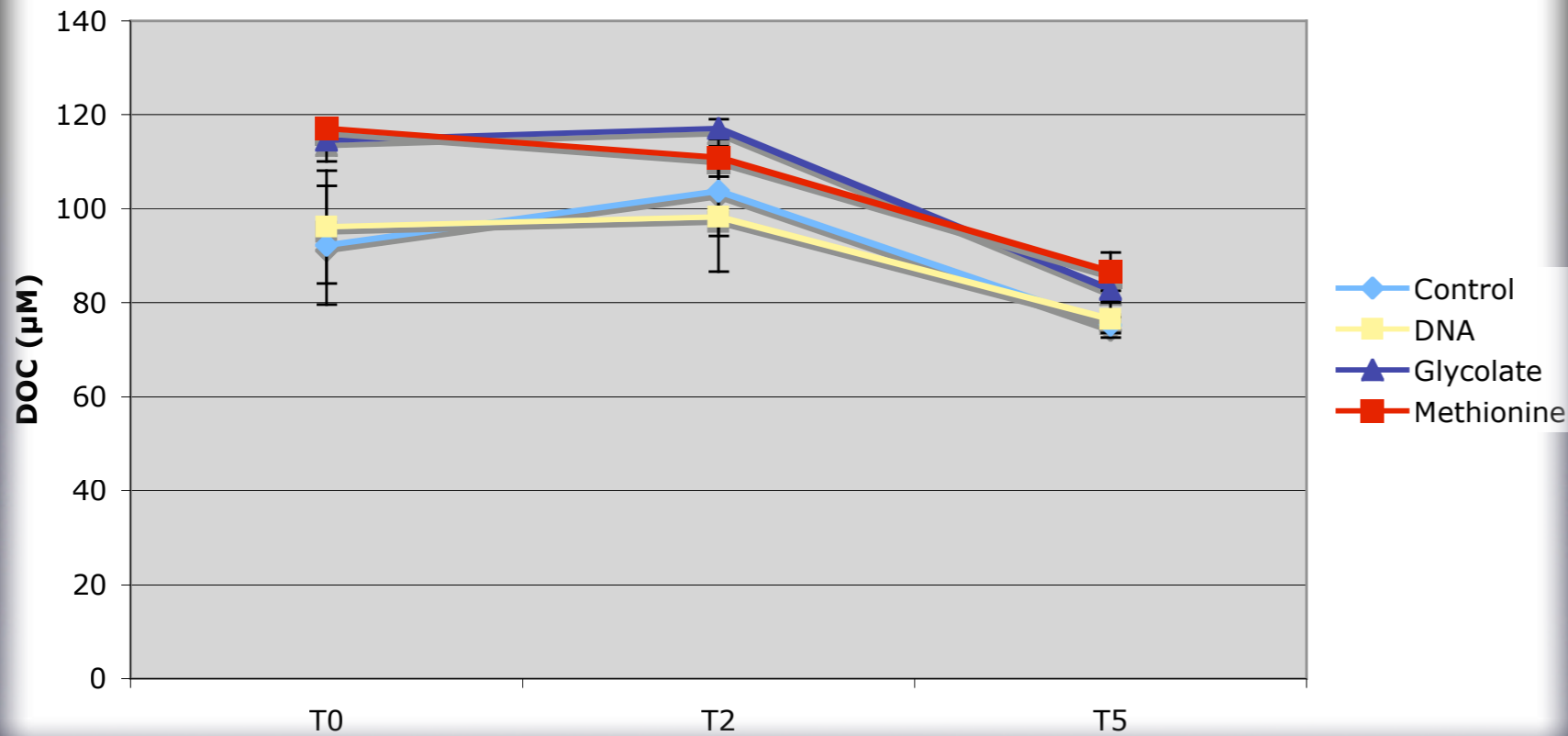
● Increase in bacterial production supported by 1^o Production

Bacterial Production Percentage of Primary Production



Follow the Carbon Road...

Dissolved Organic Carbon

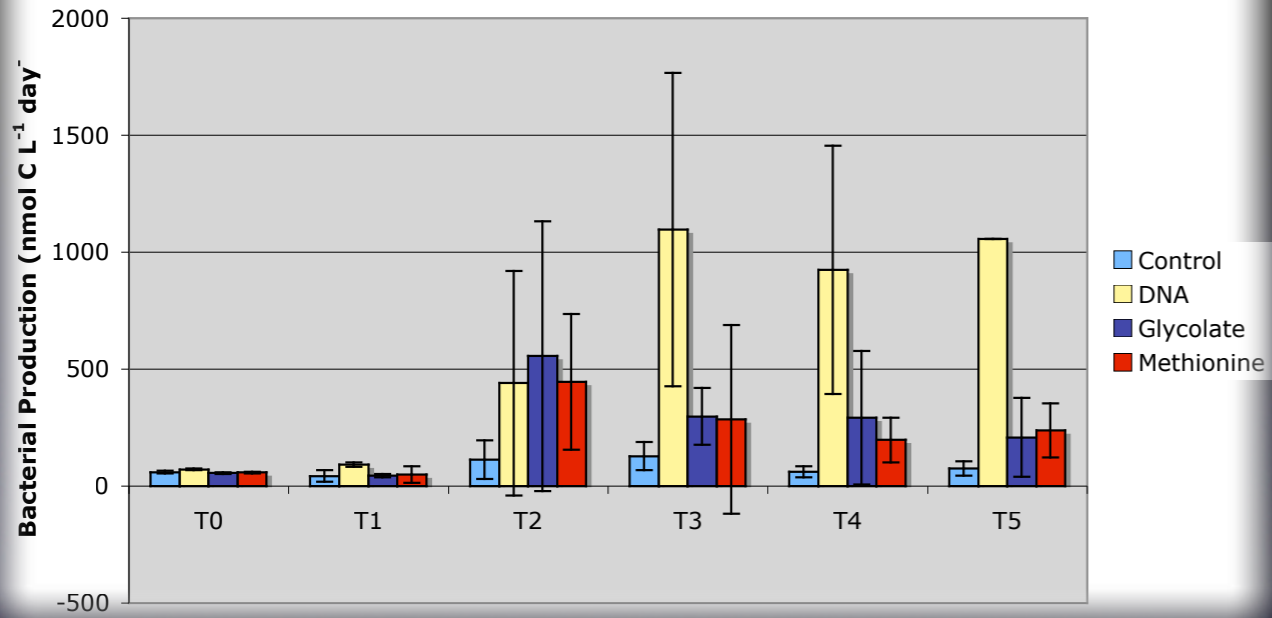


- No significant change in POC
- Complete use of labile substrate + some of semi-labile pool

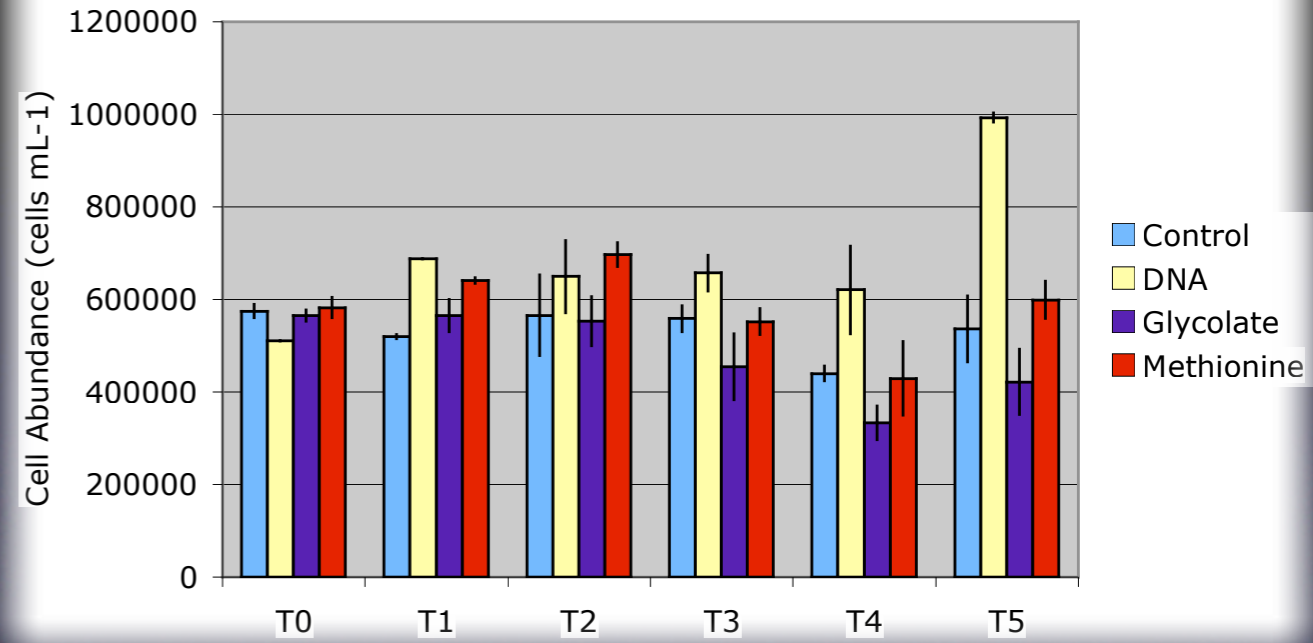
	DOC Consumed (μM)
Control	17
DNA	20
Glycolate	32
Methionine	30

Timepoint Trends

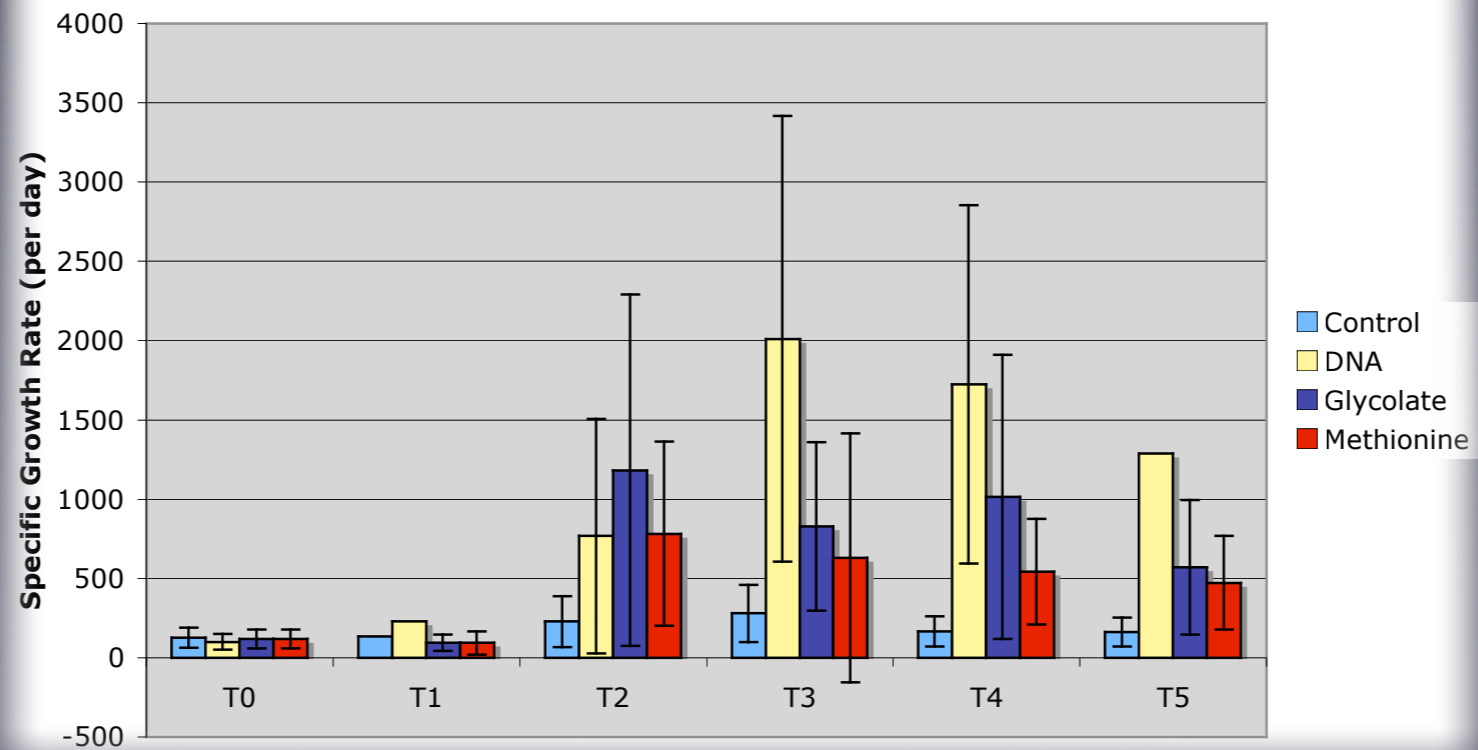
**Bacterial Production
Leucine-Dark**



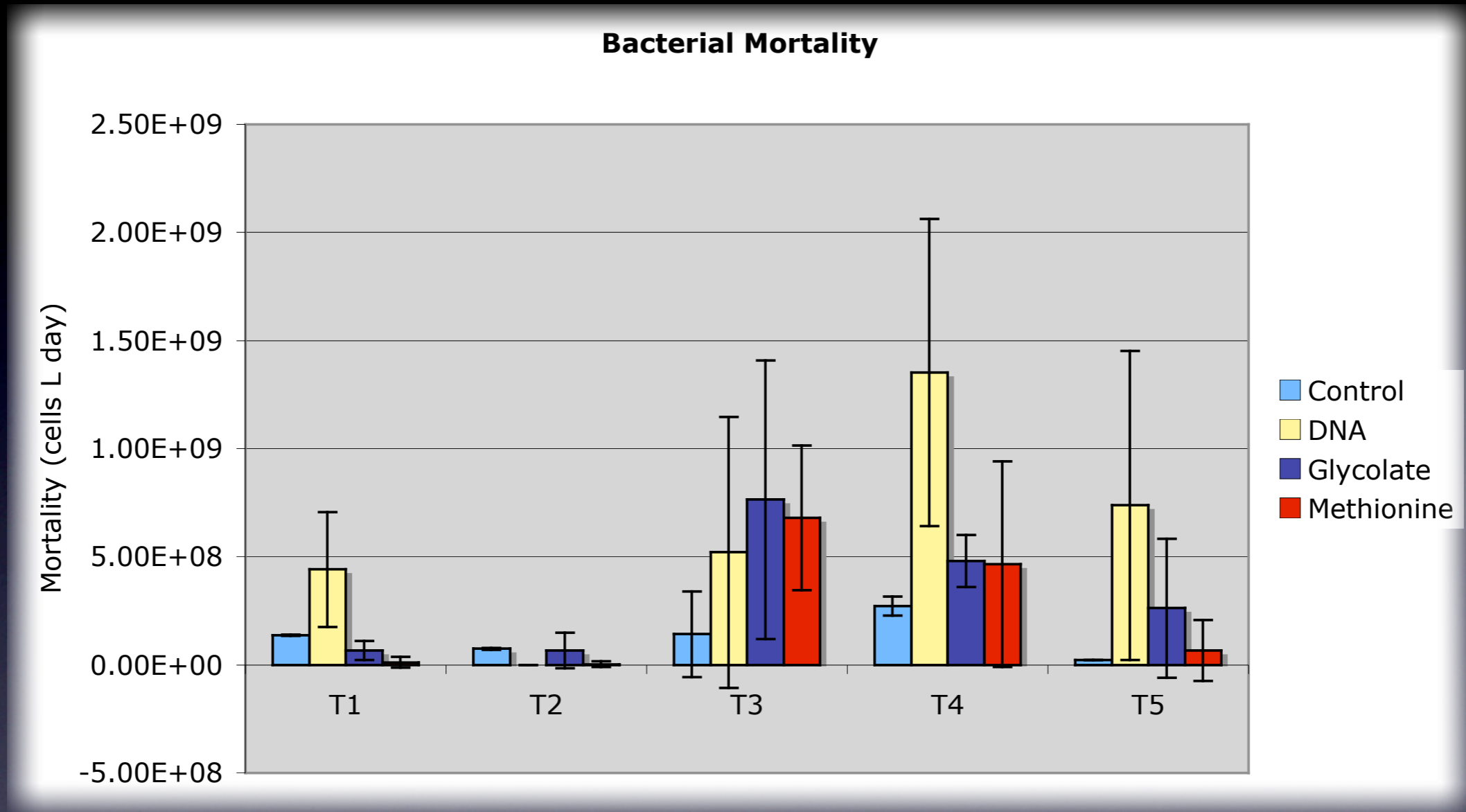
Heterotroph Cell Abundance



Bacterial Specific Growth Rate



Timepoint Trends



Constant Specific Growth & Increasing Production →
Mortality (Grazing + Viral Lysis)

Bacterial Growth Efficiency

$$\text{BGE} = \frac{\text{BP}}{\text{BP} + \text{BR}} = \frac{\text{BP}}{\Delta\text{DOC}}$$

	BGE
Control	2
DNA	15
Glycolate	4
Methionine	3.5

High Respiration

DNA Most Readily Available

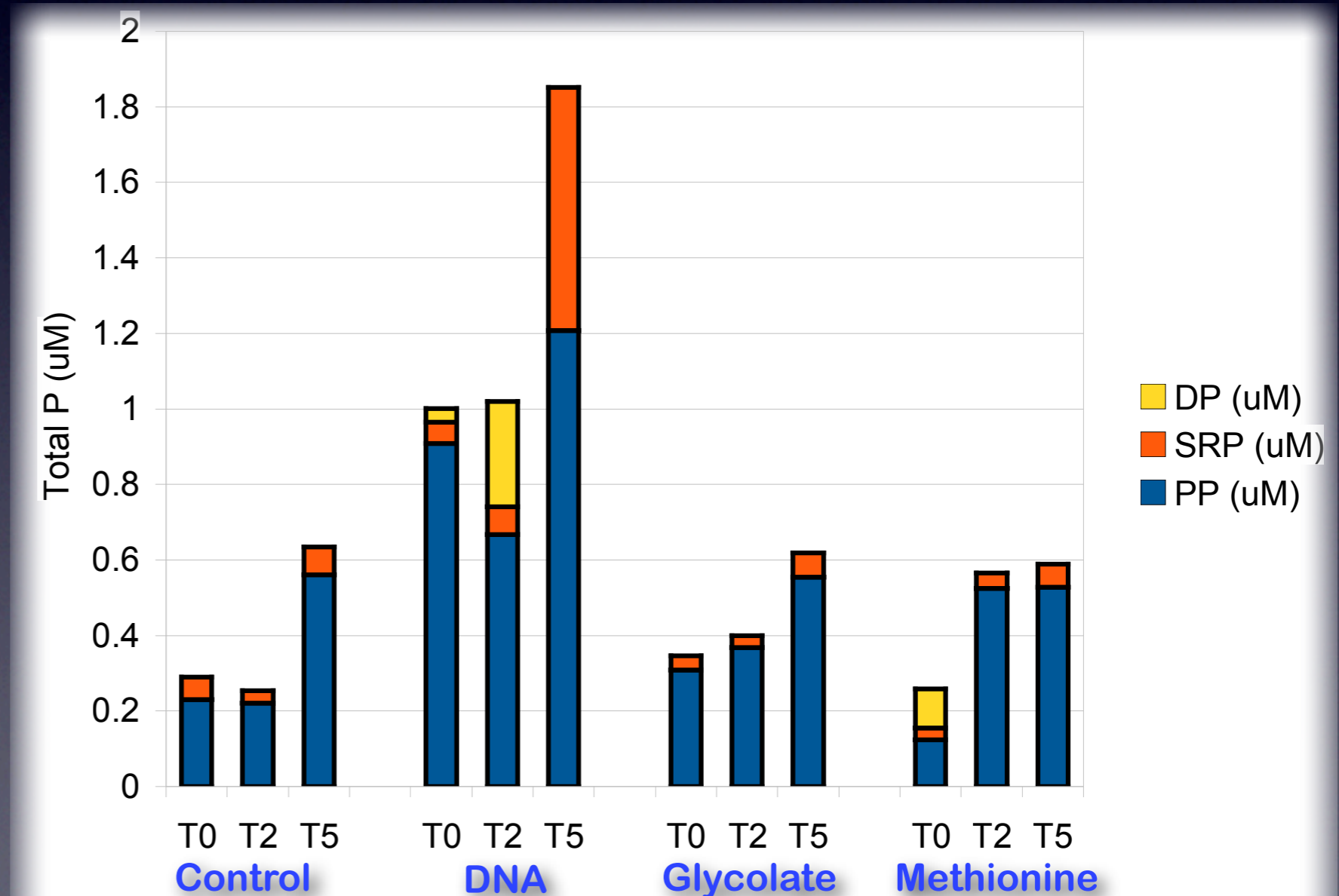


DNA Story

- Most N,P-enriched substrate
- Highest Stimulation of Production
- Driven to N-limitation
 - P-replete

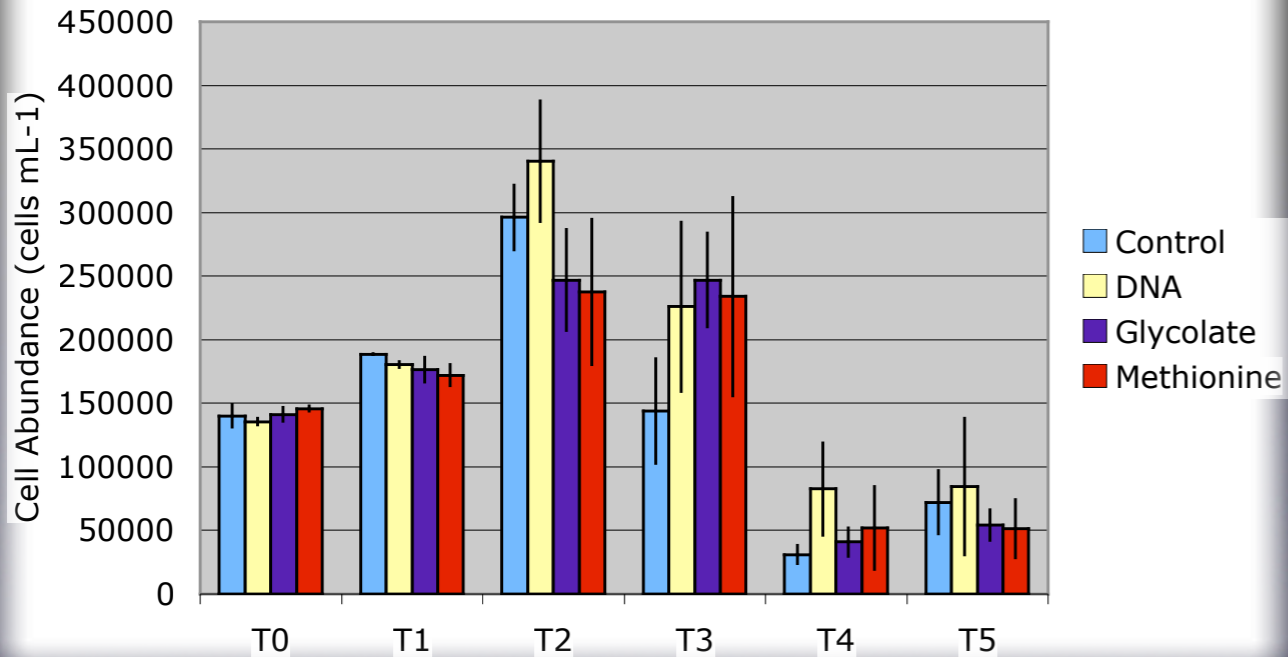
Glycolate and Methionine

- P-limitation
 - Low production relative to DNA

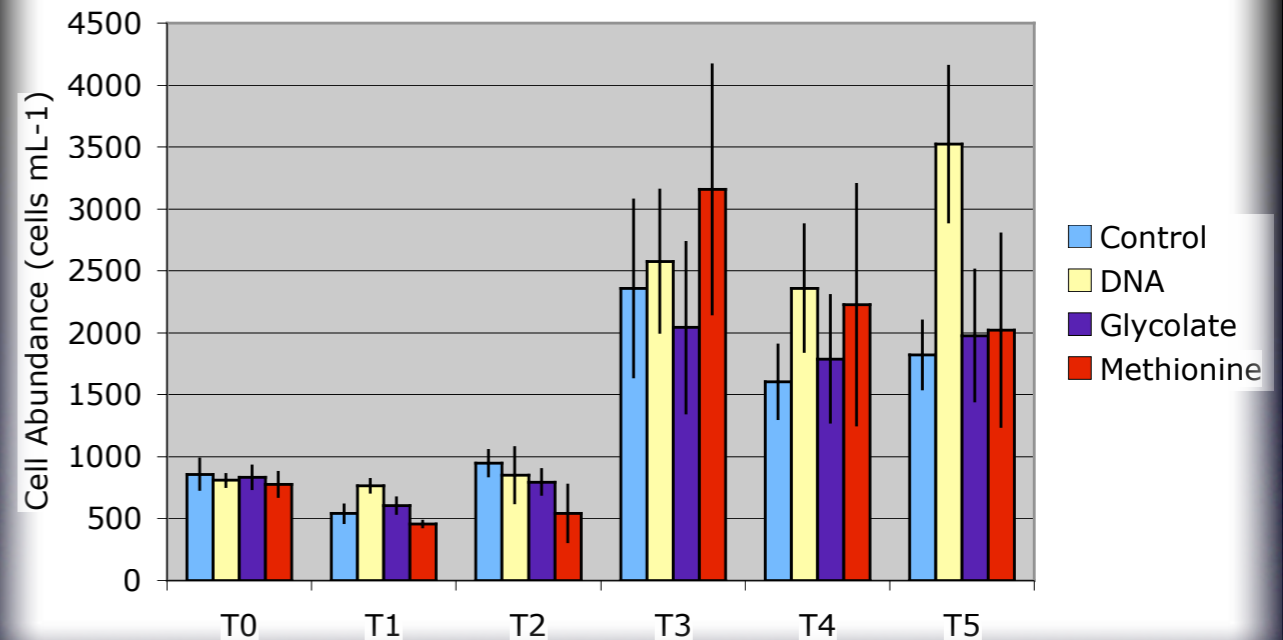


Community Shift

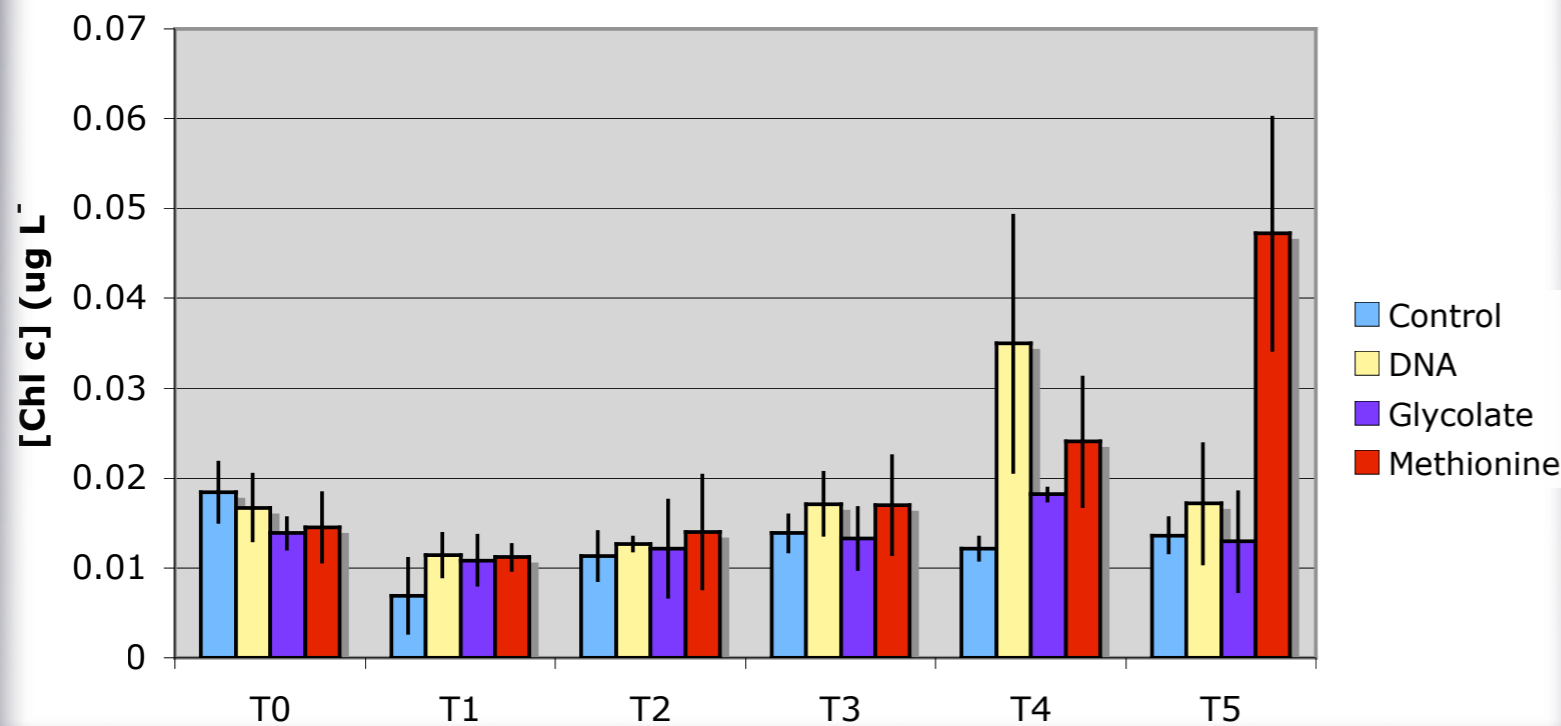
Prochlorococcus Cell Abundance



Picoeukaryote Cell Abundance



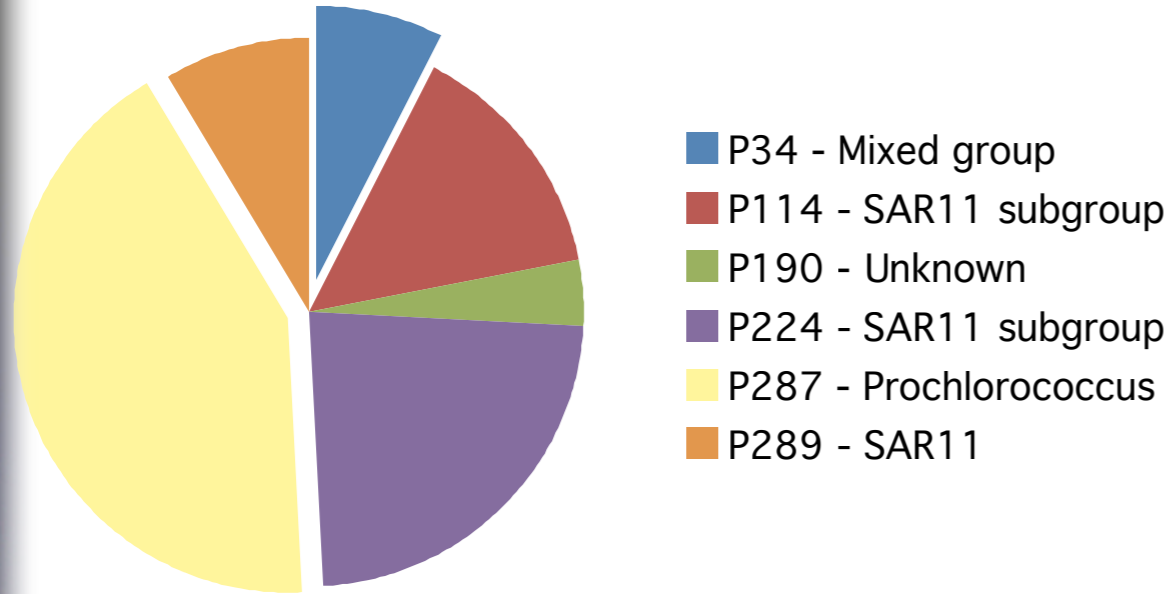
Incubation Experiment
Chlorophyll c Concentration



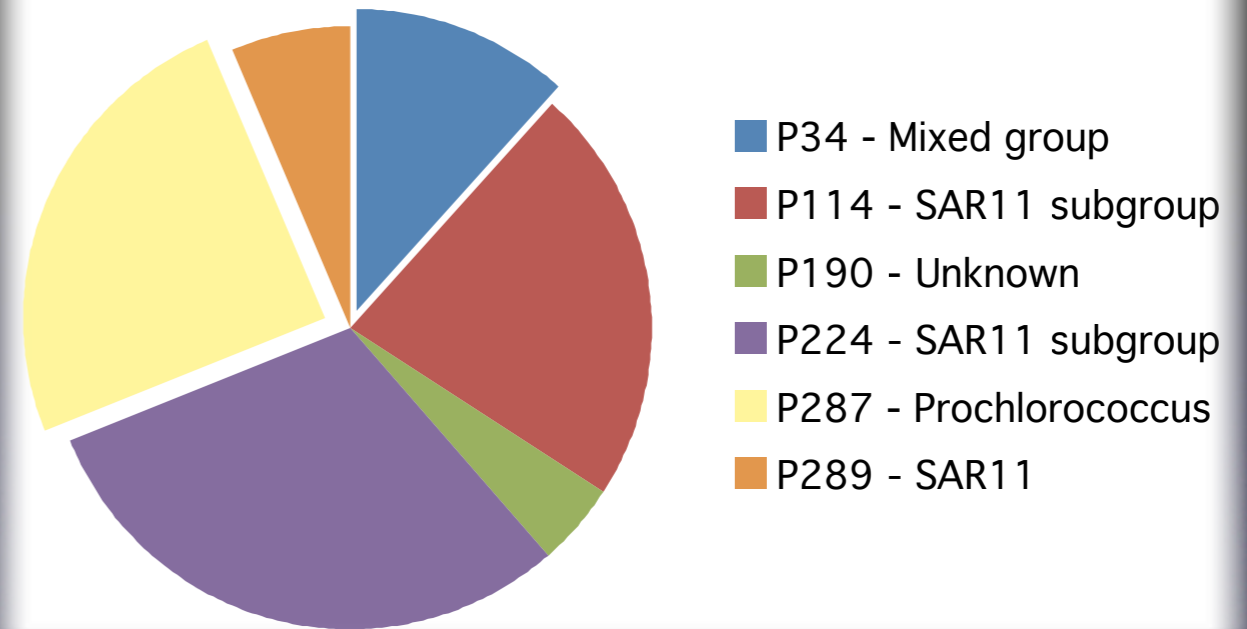
- Methionine diatom bloom
- Photoheterotrophy
- Amino acid transporter

Community Shift

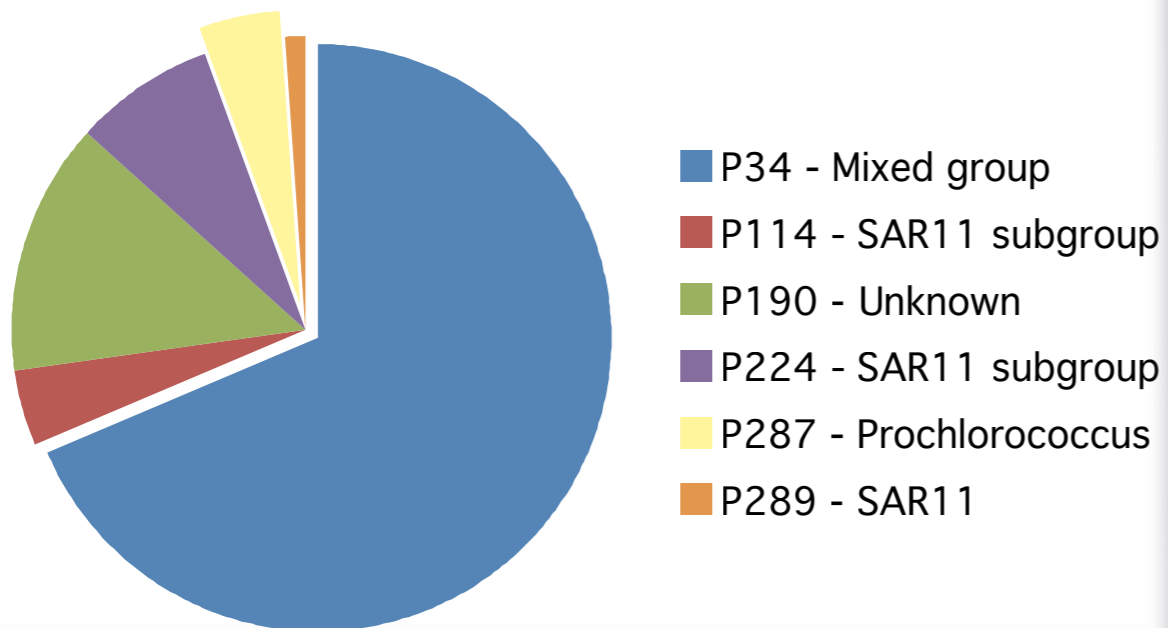
T=0



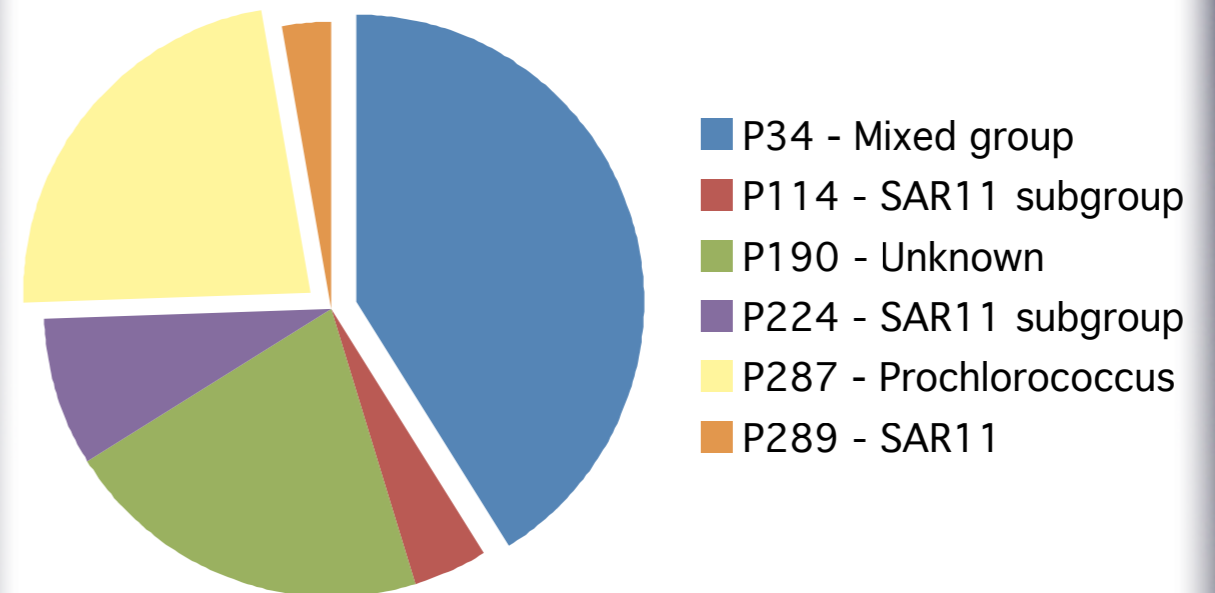
Control T=5



DNA T=5



Glycolate T=5



Conclusions - A Carbon Story...

- High respiration throughout
 - DNA has greatest assimilation
- Mortality increase
 - Grazing + Viral Lysis
- Community shift
 - Prochlorococcus → Eukaryotes
 - Nutrient Uptake (SA/V)
- DNA...The choice of microbes everywhere
 - Phosphorus is key
- Stimulated use of semi-labile DOC pool by organic substrate addition