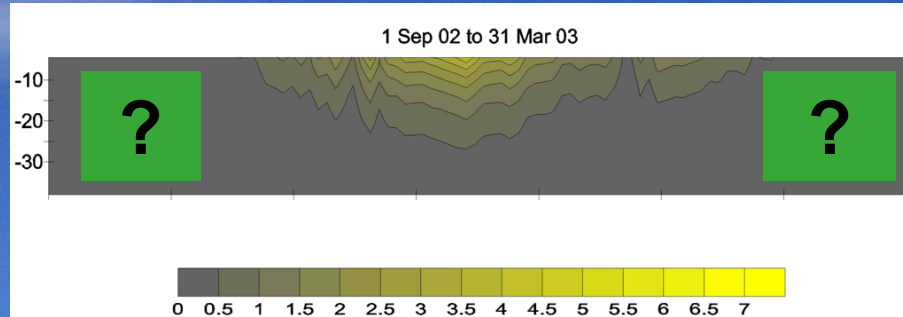


# Adaptation of Dry Valley Lake Phytoplankton to the Polar Night



**Natural Phytoplankton  
Communities**

***C. raudensis* transplant**

**Ecophysiological Models  
During Summer-Winter Transition**

# Sample Summary

Date	Sample #	PAR	Transpl ELB 17m	ELB				WLB			
				6m	10m	18m	20m	10m	13m	15m	20m
	T0	2.55		X	X	X	X				
	T1	2.68	X	X	X	X	X	X	X	X	X
	T2	2.4	X	X	X	X	X	X	X	X	X
	T3	0.82	X								
	T4	0.78	X	X	X	X	X	X	X	X	X
	T5	0.32	X	X	X	X	X	X	X	X	X
	T6	0.46		X	X	X	X				

# Data Summary

## 1. *C. raudensis* transplant

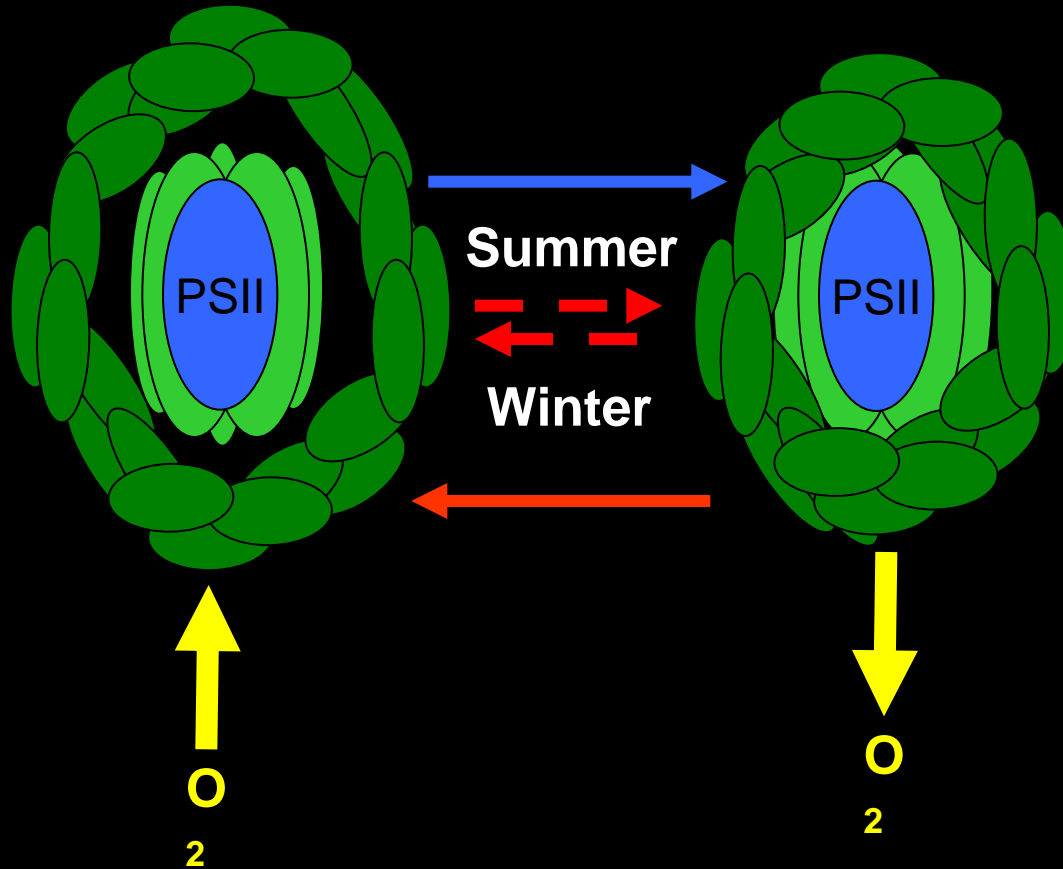
1. Chlorophyll, total protein
2. Protein – RubisCO (RbcL), PS II (PsbA)
3. Gene Copy # - *rbcL*, *psbA*
4. Gene Expression – *rbcL*, *psbA*

## 2. Environmental Samples (EB, WB)

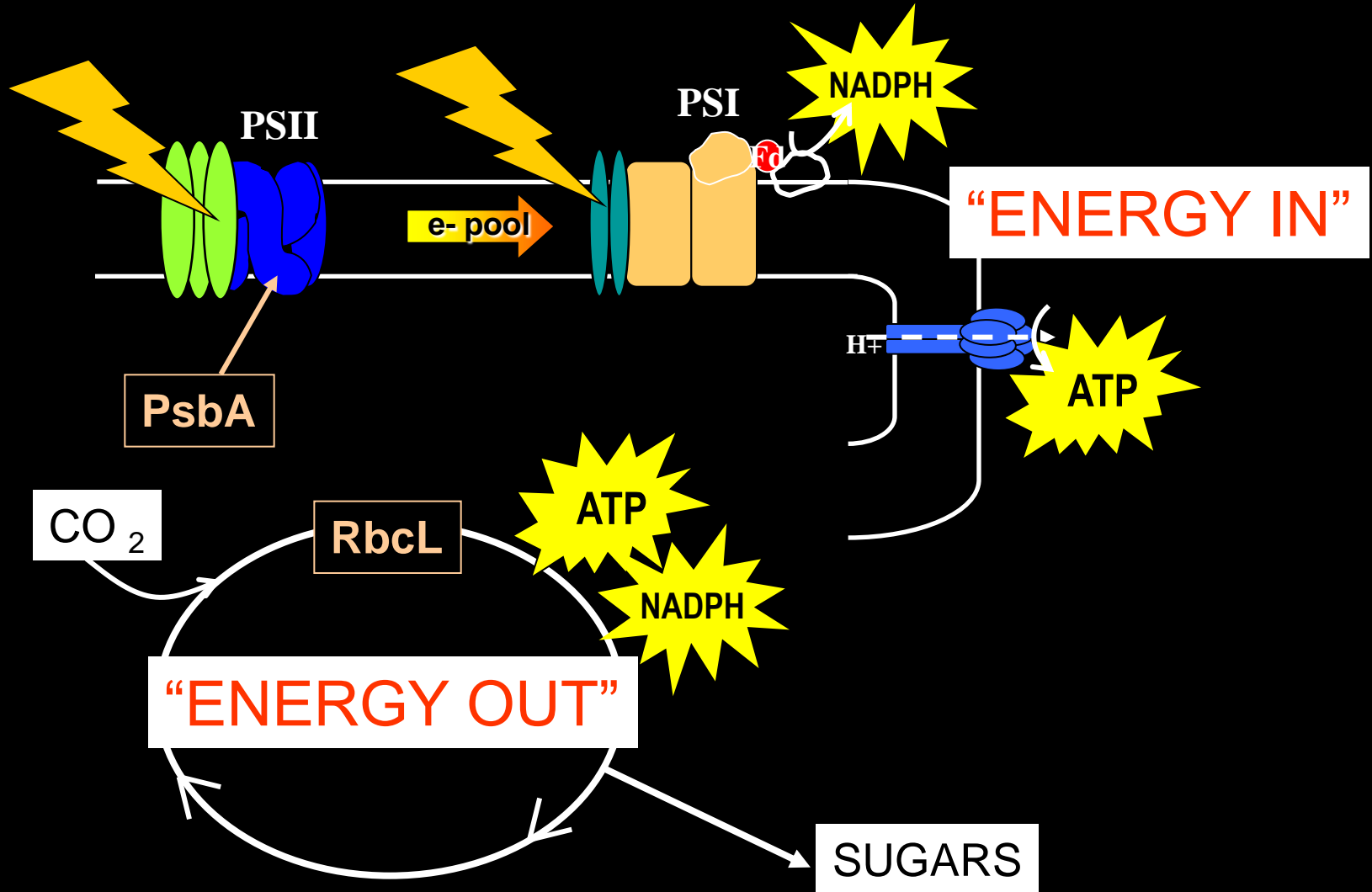
1. 18S rRNA phylogeny/distribution
2. Gene copy #/gene expression Form IA/B & Form ID *rbcL*
3. *rbcL* phylogeny

# Adaptation to the Polar Night

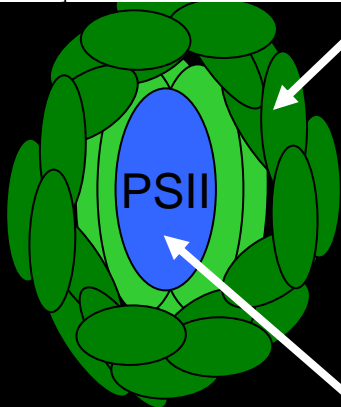
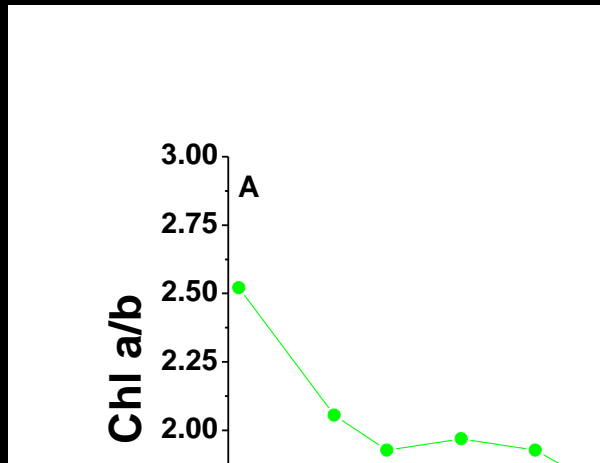
## POLAR NIGHT ADAPTATION



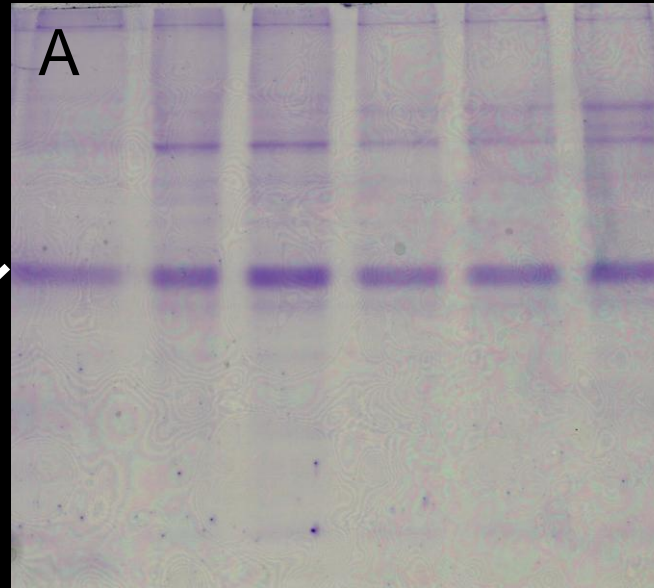
# Balancing the Energy Budget



# From the Laboratory to the Field: Protein Expression



2.5 2.7 2.4 0.82 0.78 0.32 PAR  
0 1 2 3 4 5 Weeks of incubation

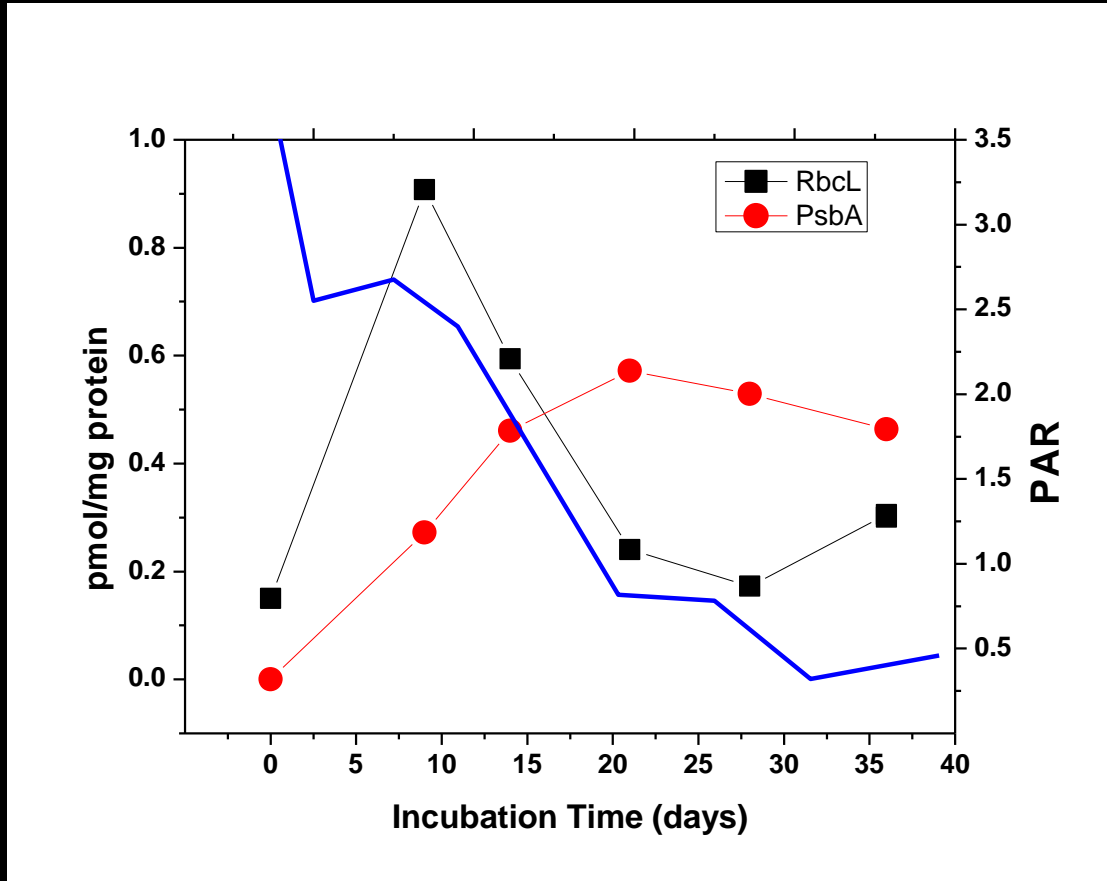


← LHCII

RbcL

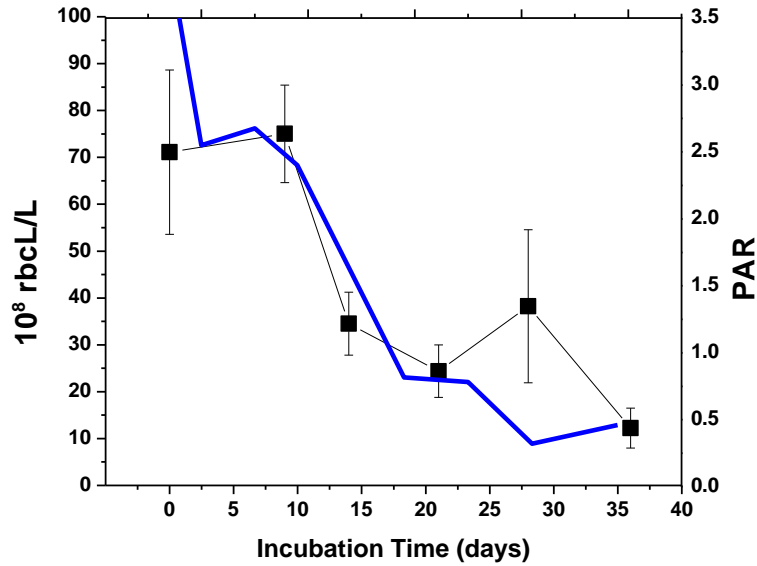
PsbA

# From the Laboratory to the Field: RbcL & PsbA Protein Levels

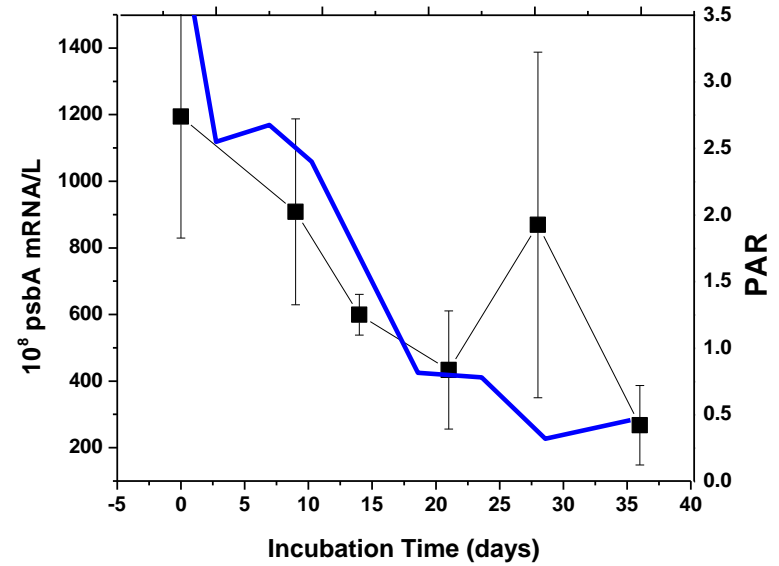


# From the Laboratory to the Field: *psbA* & *rbcL* Gene Expression

## *rbcL*



## *psbA*

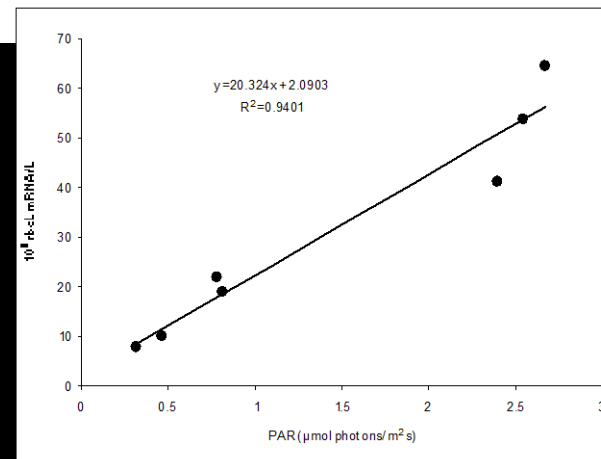
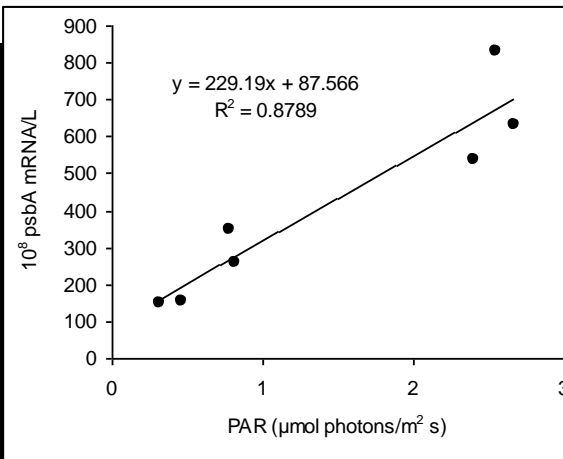
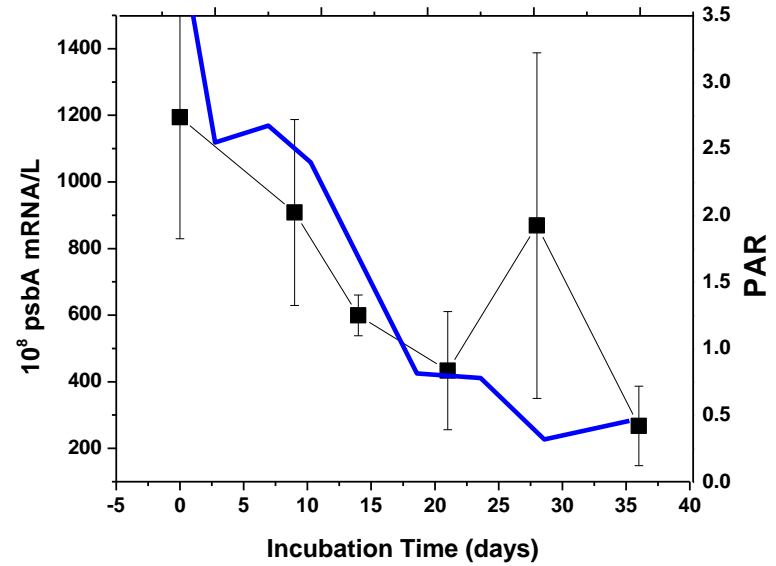
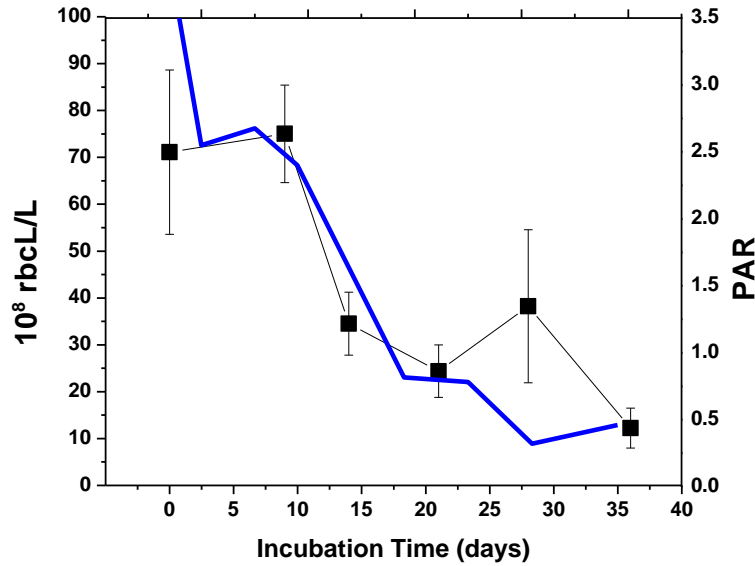




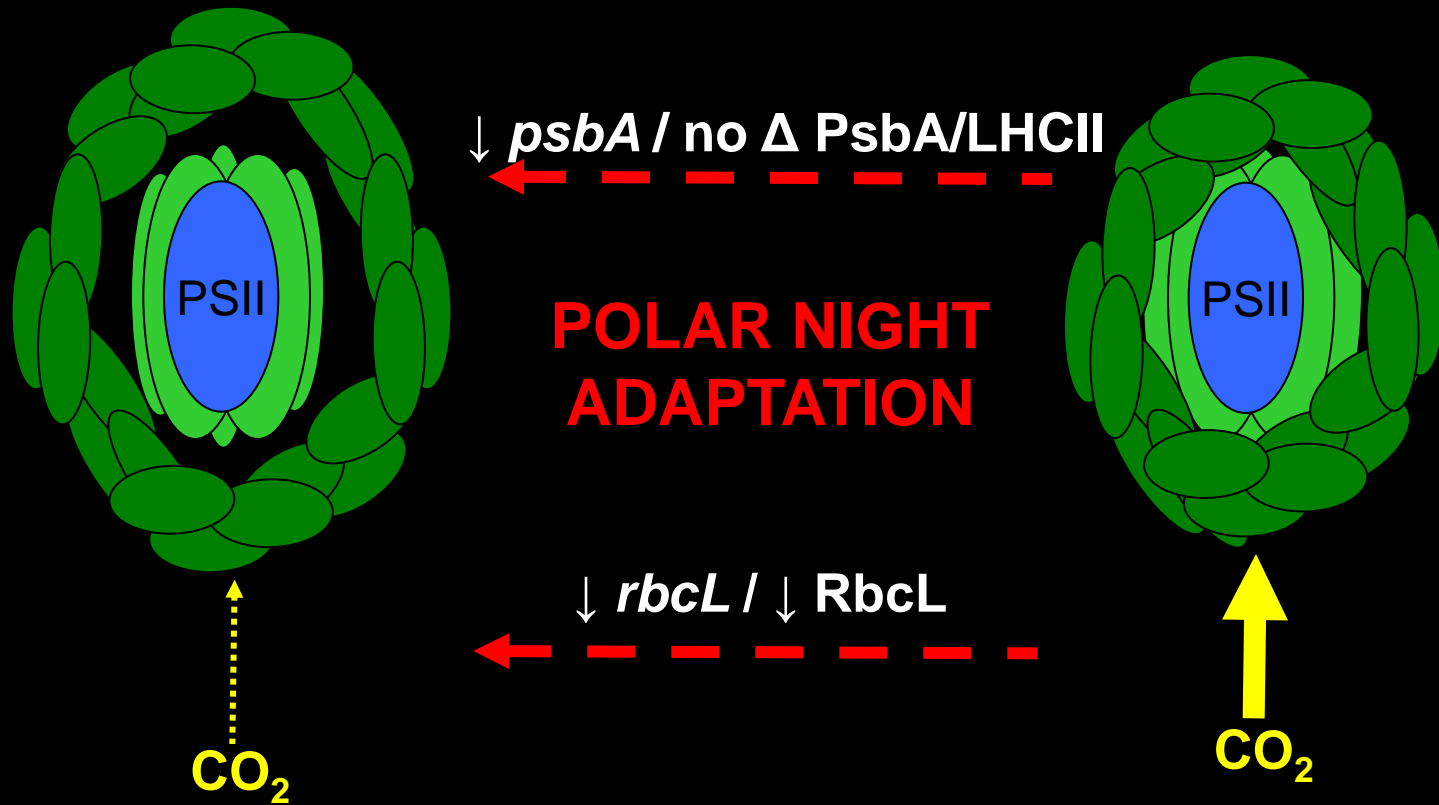
# From the Laboratory to the Field: *psbA* & *rbcL* Gene Expression

## *rbcL*

## *psbA*



# From the Laboratory to the Field: Adaptation to the Polar Night



# Remaining Experiments: Transplant

- 18 rRNA real time PCR
  - Ribosomes
  - Comparison with environmental samples

# WB vs. EB 18S rDNA

- 1059 clones screened (sequencing/RFLP)
- 46 unique phylotypes
- 22 uncultured representatives (< 10% total clones)

## Top 5 nearest neighbors (~75% total clones):

*Geminigera cryophila* (cryptophyte)

*Nannochloropsis* sp. (stramenopile)

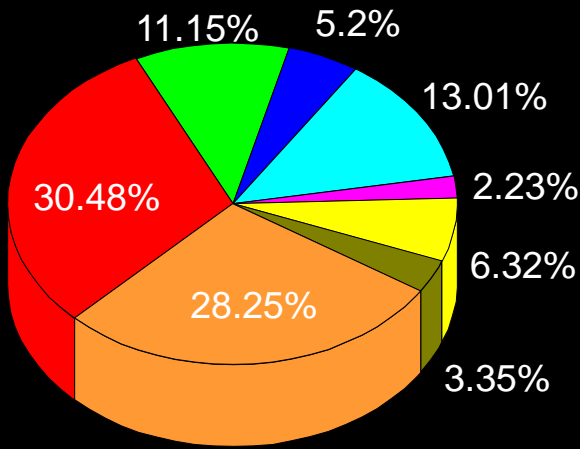
*Chlamydomonas* ICE-W (chlorophyte)\*

*Isochrysis litoralis* (prymnesiophyte)

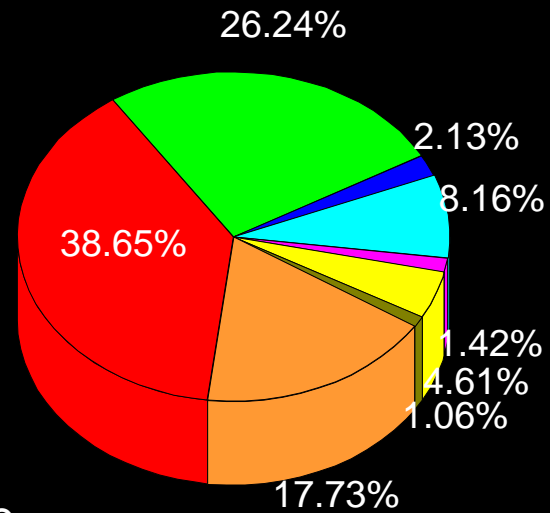
*Chrysophyceae* sp. (chrysophyte)\*

# 18S rDNA Clone Distribution

**ELB**

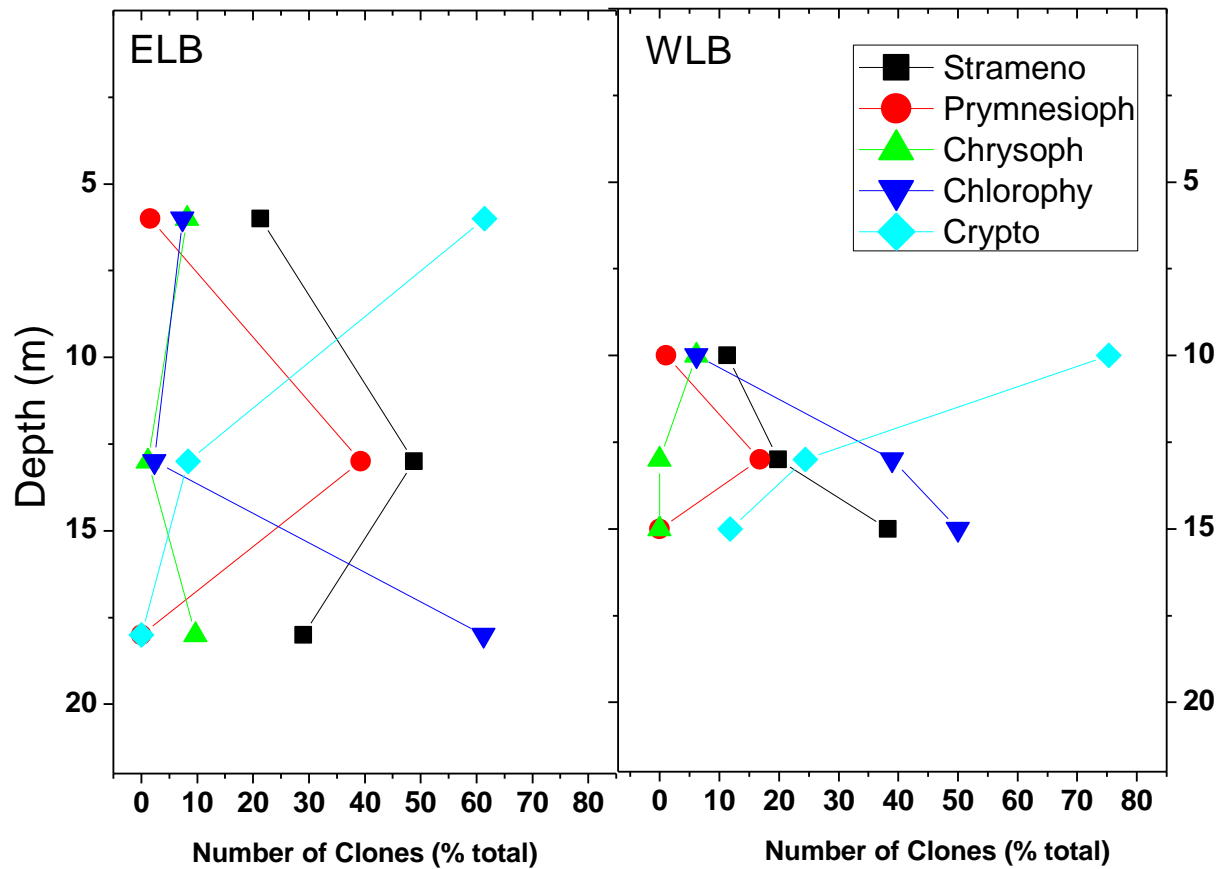


**WLB**



- Stramenopile
- Cryptomonad
- Chlorophyte
- Chrysophyte
- Prymnesiophyte
- Ciliate
- Chanoflagellid
- Alveolate

# 18S rDNA Clone Distribution:

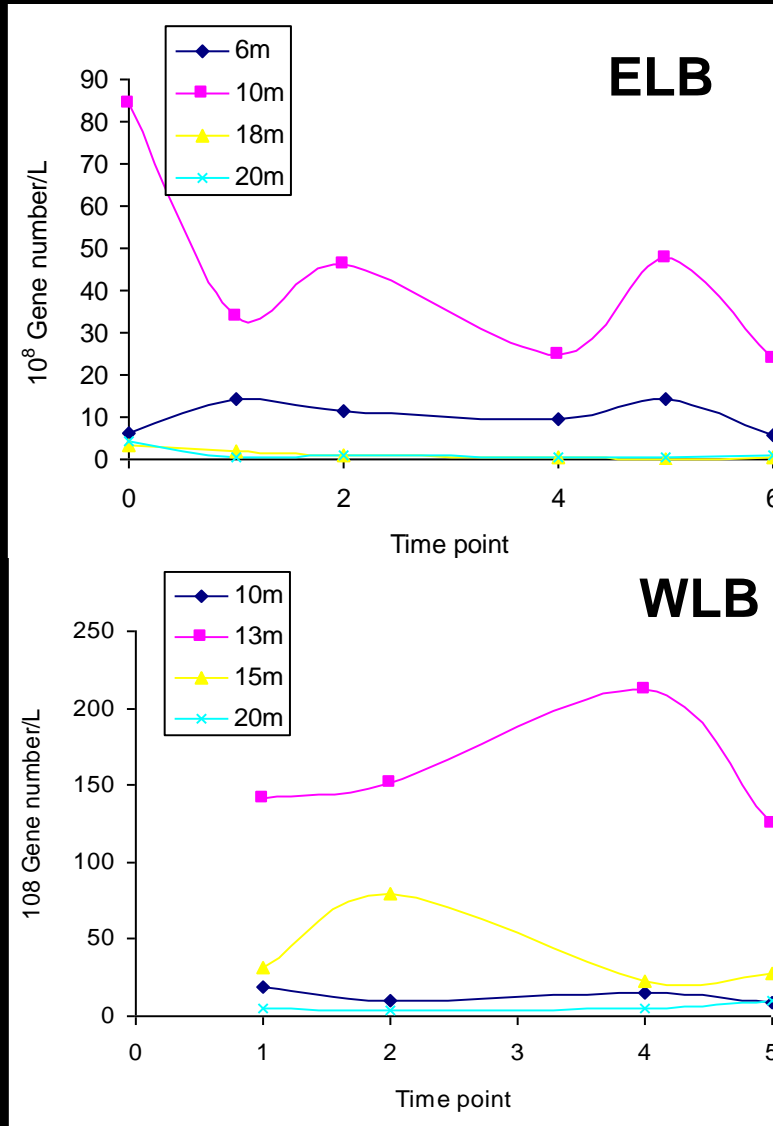


# WB vs. EB RubisCO

- Real Time PCR (*rbcL*)
  - Gene copy number (DNA)
  - Gene expression (cDNA)
- Two major forms
  - Form IA/B – cyanobacteria, plants, green algae
  - Form ID – cryptophytes, chrysophytes, prymnesiophytes

# Real Time PCR: rbcL Form ID

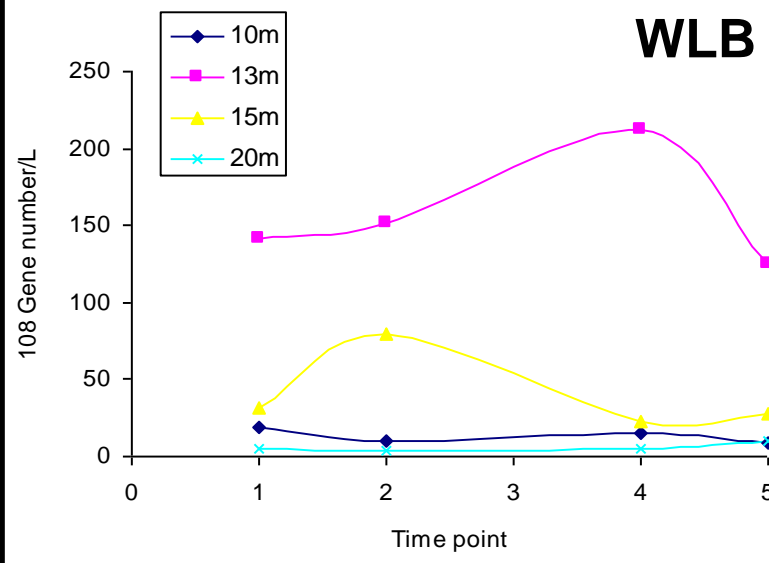
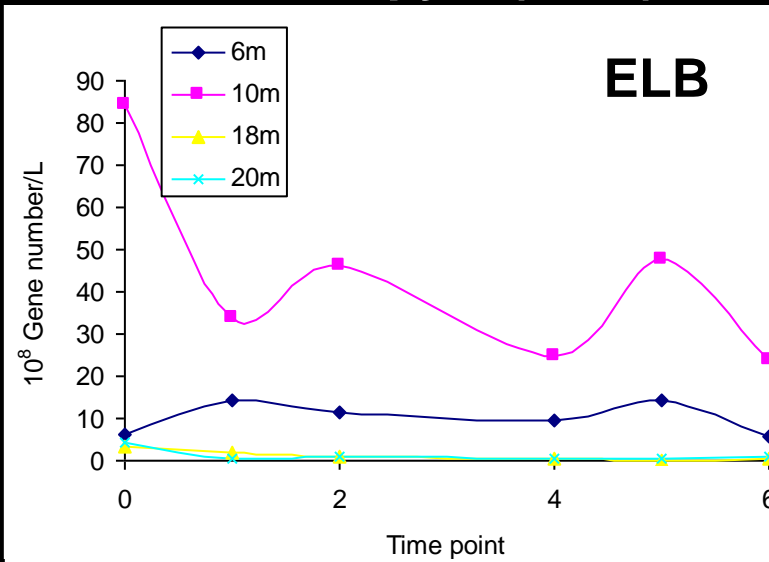
## Gene Copy # (DNA)



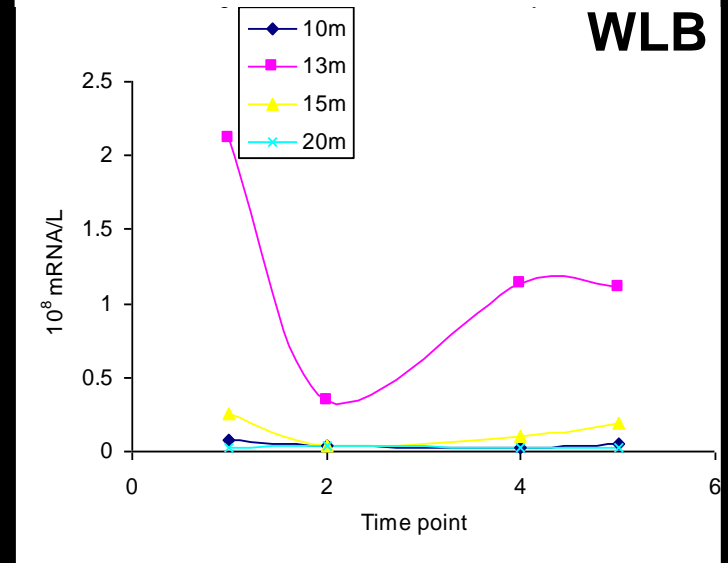
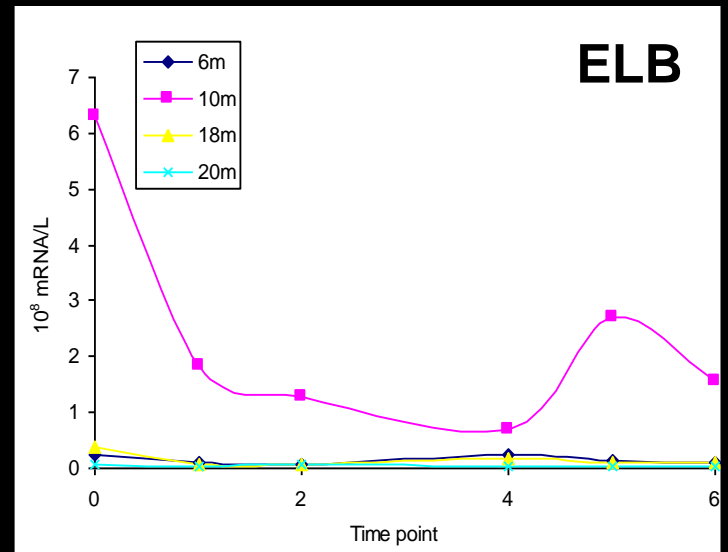


# Real Time PCR: rbcL Form ID

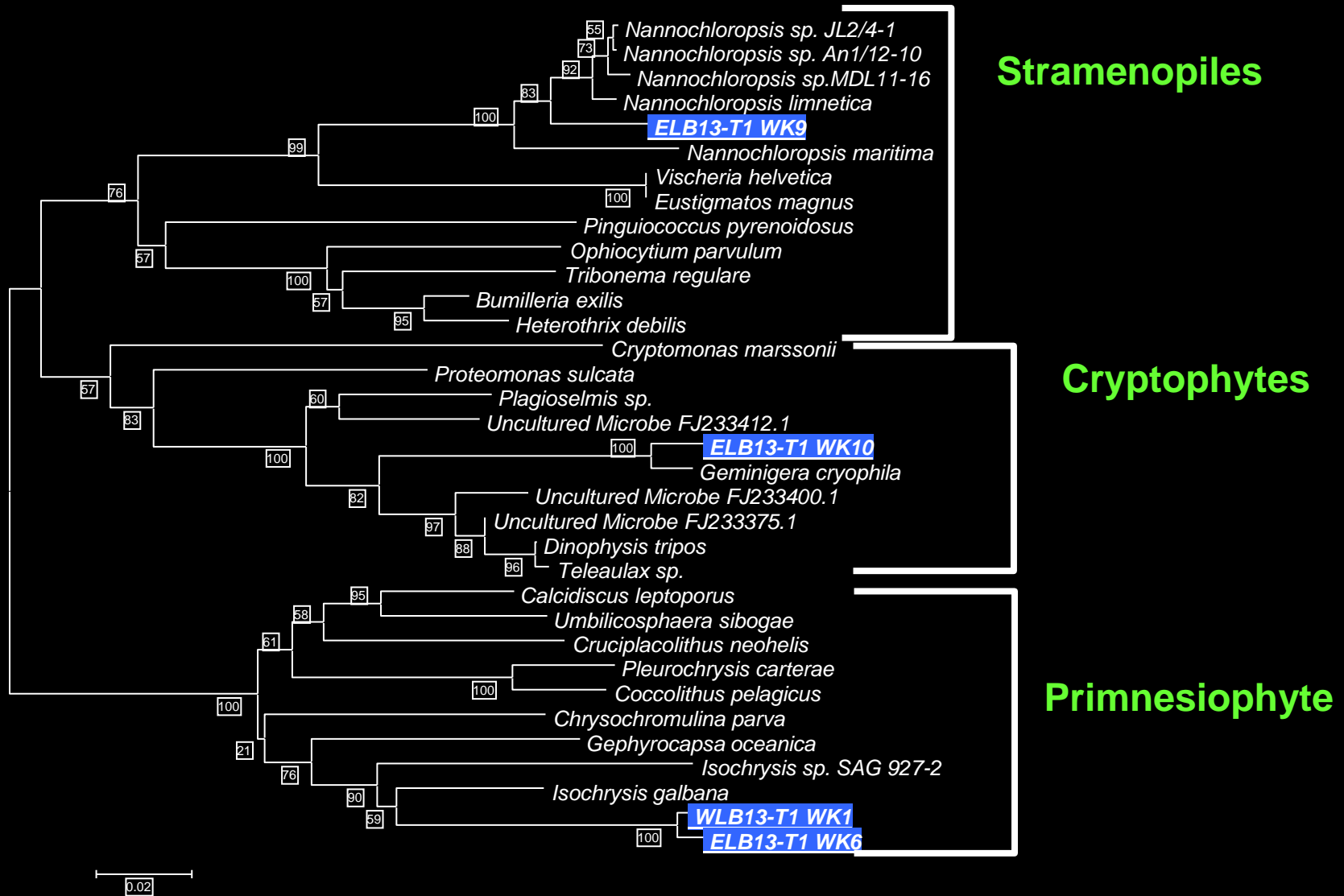
## Gene Copy # (DNA)



## Gene Expression (cDNA)



# RbcL Form 1D Phylogenetics



# Conclusions

- EB & WB are dominated by 4-5 algal groups with 1-2 representatives
- Algae with form 1D RubisCO dominate both lakes at mid-depths
- Form 1D *rbcL* abundance/expression during Polar Night differs between WB vs. EB

# Remaining Experiments: Environment

- Finish 18S clone libraries
- 18S rDNA & rRNA real time PCR
  - Normalize 18S rDNA libraries (rDNA)
  - Correlate with transplant exp (rRNA)
- Finish rbcL form IA/B real time PCR
- rbcL form ID & IA/B clone libraries
  - Phylogenetics
  - Distribution of DNA vs. cDNA (RFLP)

# RbcL Expression: Transplant vs. Environment

