Microcystis and ammonium

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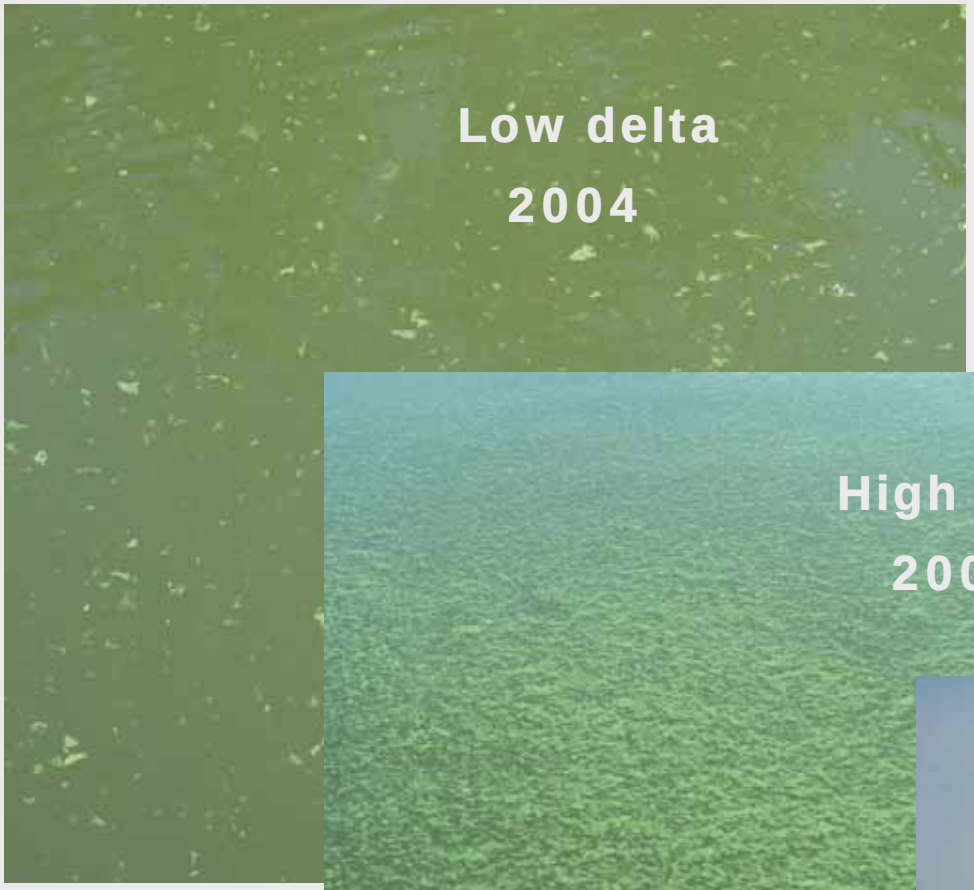

Low delta
2004

High delta
2008

Very high
Lake Taihu, China
115

Concerns

- **Food web**
  - Correlated with shift in phytoplankton species composition
  - Affects survival of zooplankton
  - Biomarkers in field and laboratory tested fish suggest it affects the health of fish, particularly males

- **Human health**
  - Cell abundance can exceed WHO guidelines for drinking water and recreation

Questions:

Will an increase in ammonium within the estuary affect chlorophyll *a* concentration ?

Will an increase in ammonium within the estuary increase *Microcystis* cell abundance ?

Nutrient bioassays

Methods

Addition and 50% dilution bioassays

- Fresh and brackish water: Mildred Is. & Antioch

– June, July, August and September 2008

– Additions: NO_3, NH_4, PO_4, NO_3+PO_4 on day 1

– In situ incubations of delta water in 4 L cubitainers for 5 days

– Measured chlorophyll *a* and nutrients daily and phytoplankton species and microcystins on alternate days

Ambient nutrients (mg/L) are high

Antioch				
variable	June	July	August	September
N	0.60	0.32	0.37	0.36
NH_4	0.07	0.04	0.05	0.04
P	0.08	0.06	0.07	0.08
Mildred Island				
N	0.62	0.41	0.26	0.29
NH_4	0.04	0.02	0.02	0.01
P	0.08	0.08	0.07	0.07

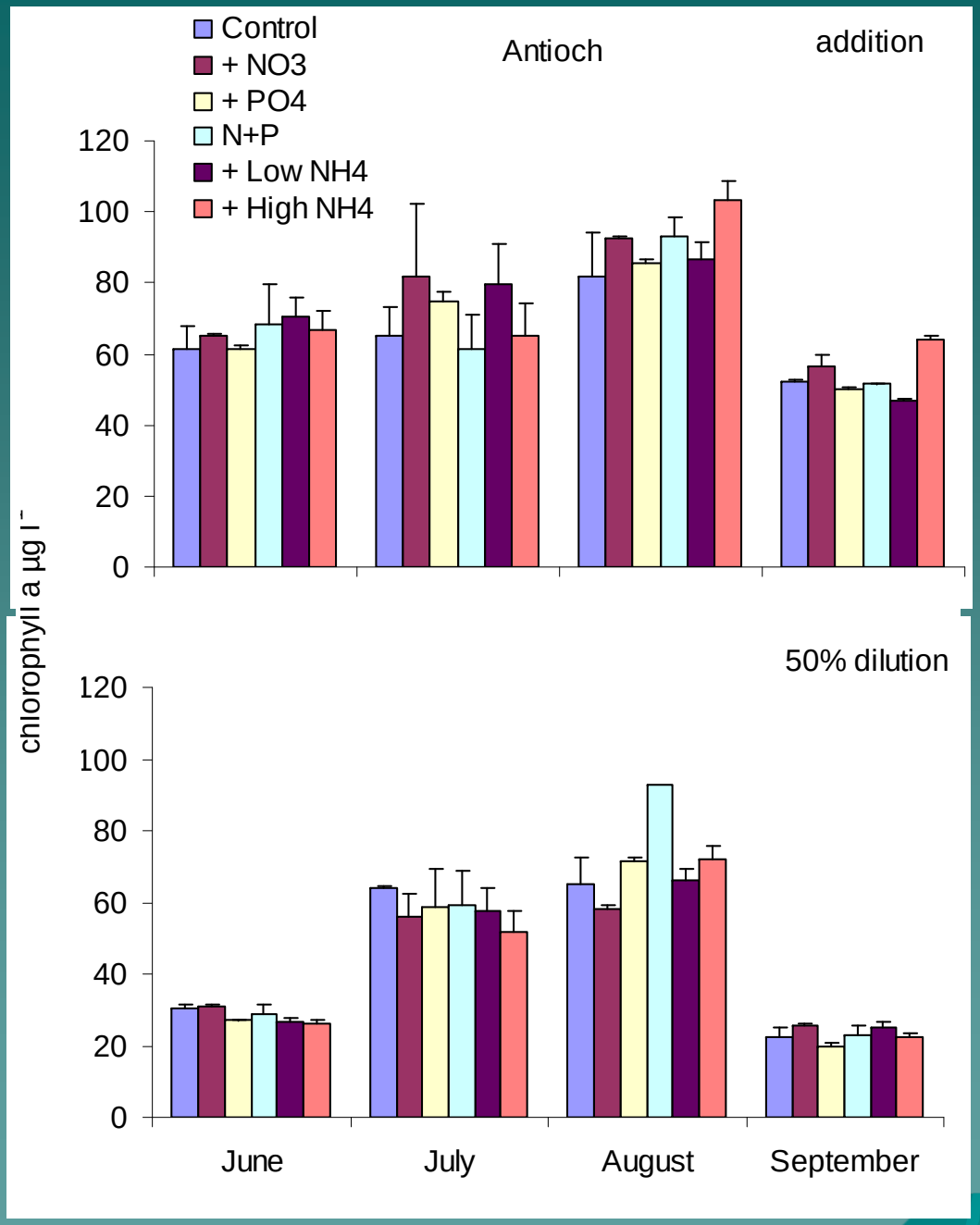
additions

	nitrate	low NH_4	high NH_4	soluble P	nitrate & soluble P
June (1X)	0.20	0.01	0.10	0.10	0.20, 0.10
July (2X)	0.40	0.02	0.20	0.20	0.40, 0.20
August (2X)	0.40	0.04	0.10	0.10	0.40, 0.10
September (8X)	1.60	0.02	0.08	0.80	1.60, 0.80

treatment N:P molar ratios

treatment	Antioch			
addition	June	July	August	September
initial	19	14	14	11
nitrate	25	29	27	57
ammonium low	19	14	15	12
ammonium high	22	21	17	14
soluble P	9	3	6	1
nitrate & soluble P	11	7	11	5
dilution				
initial	19	14	14	11
nitrate	31	44	40	103
ammonium low	20	15	16	13
ammonium high	25	29	20	16
soluble P	5	2	4	5
nitrate & soluble P	9	6	10	1

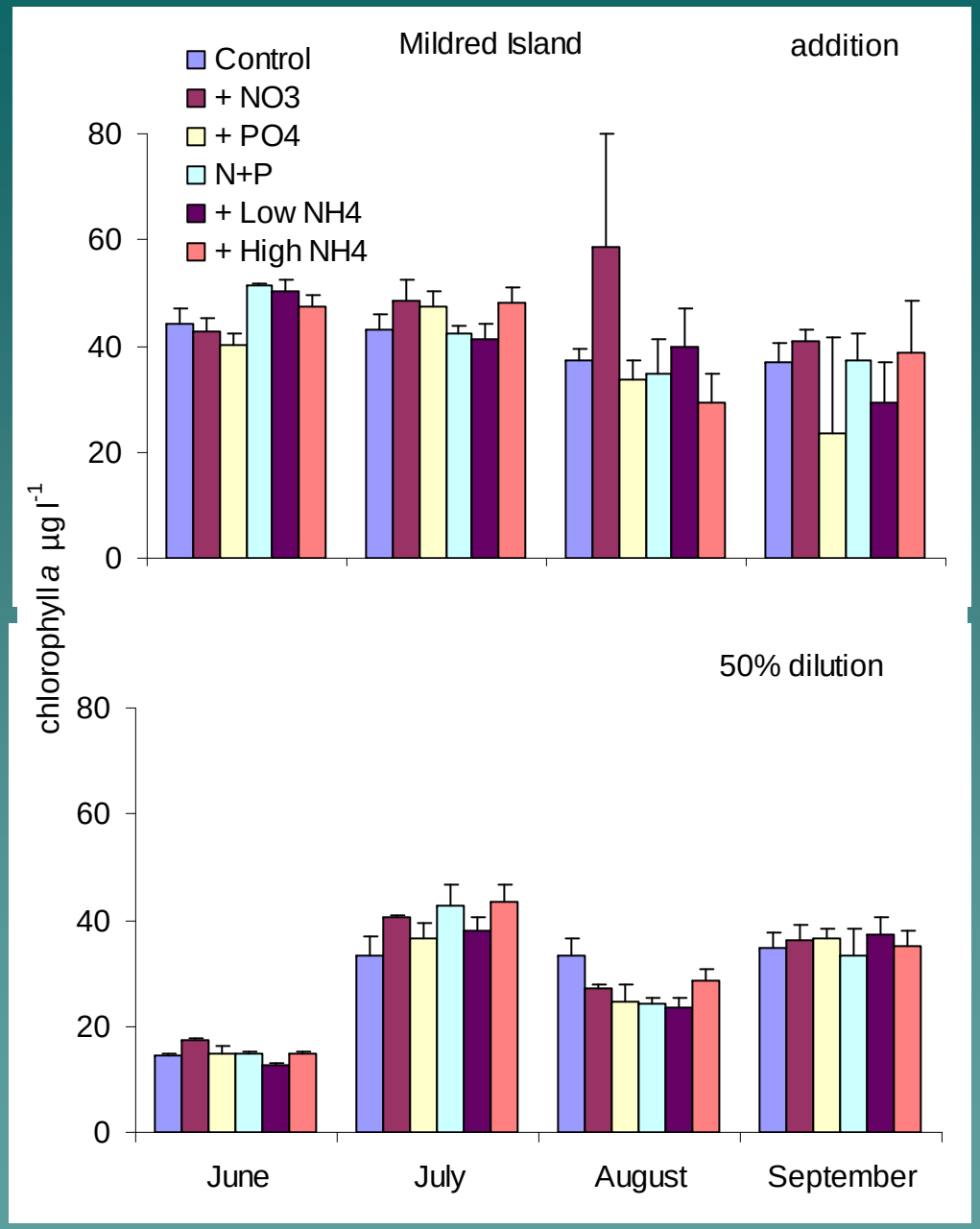
Antioch



Addition

50% Dilution

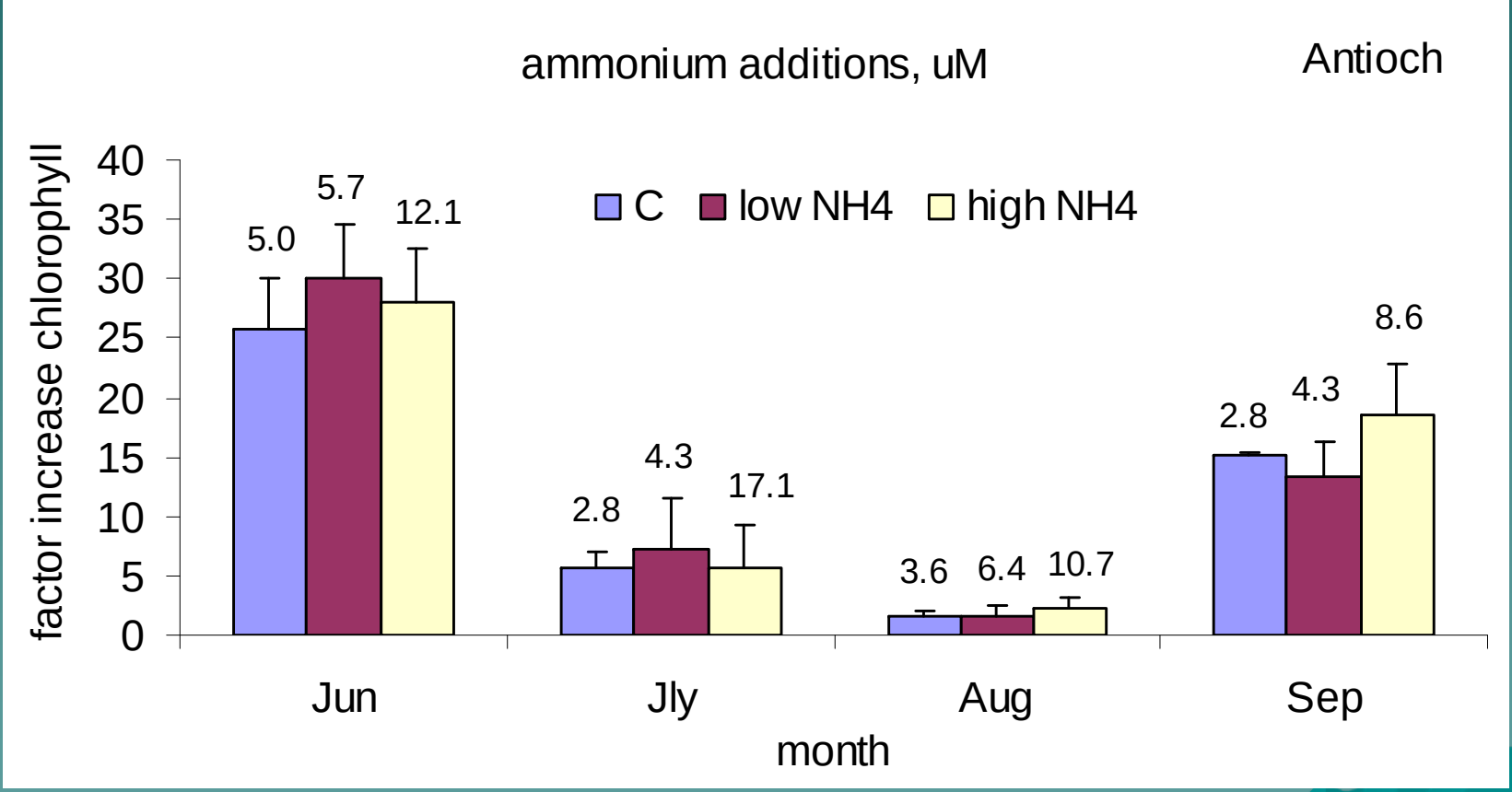
Mildred Island



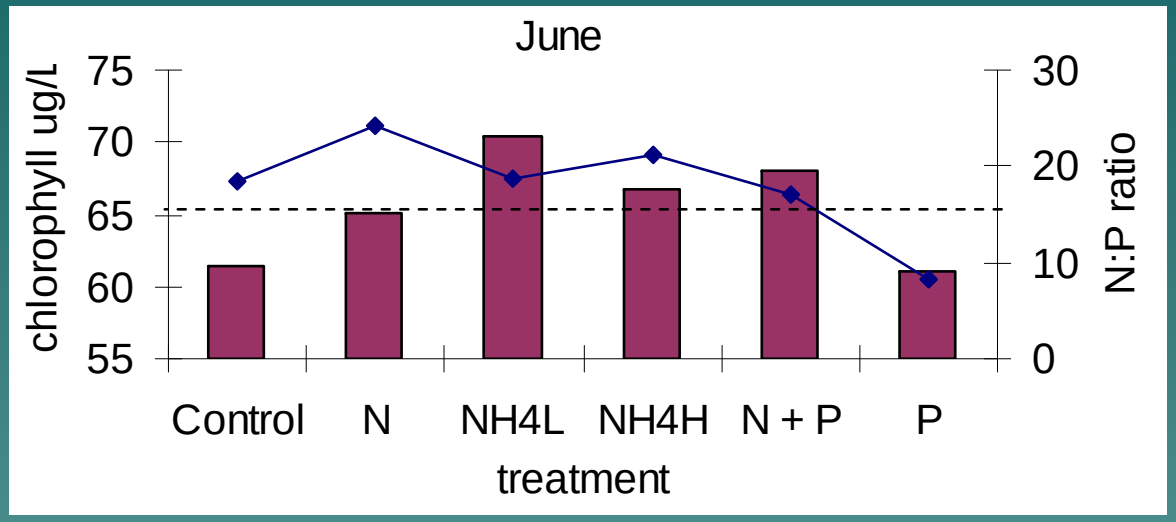
Addition

50 % Dilution

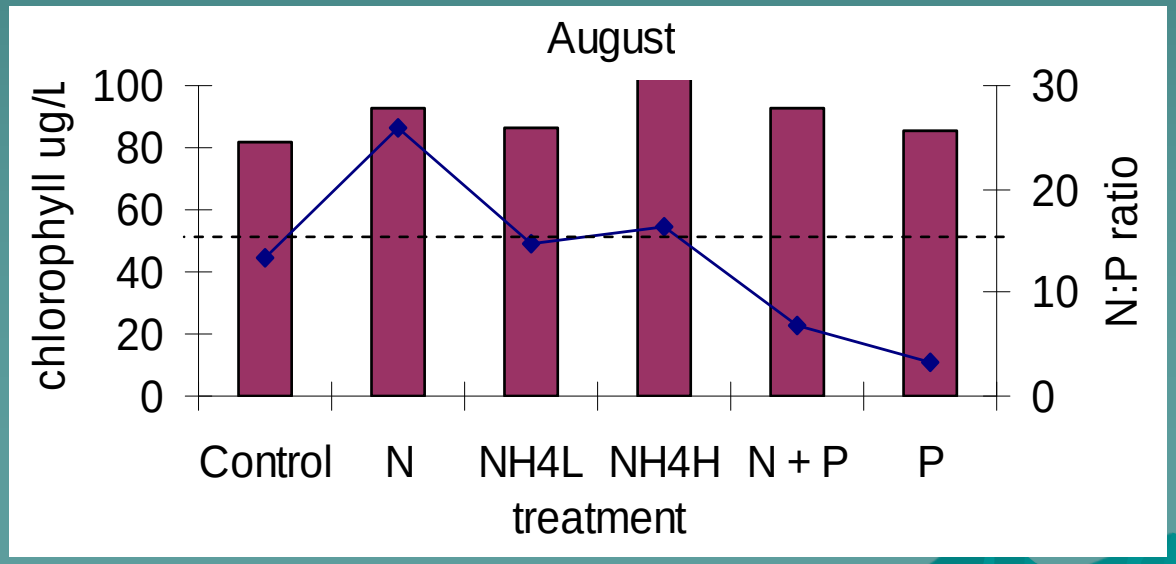
chlorophyll *a* and ammonium



nutrient ratios and chlorophyll



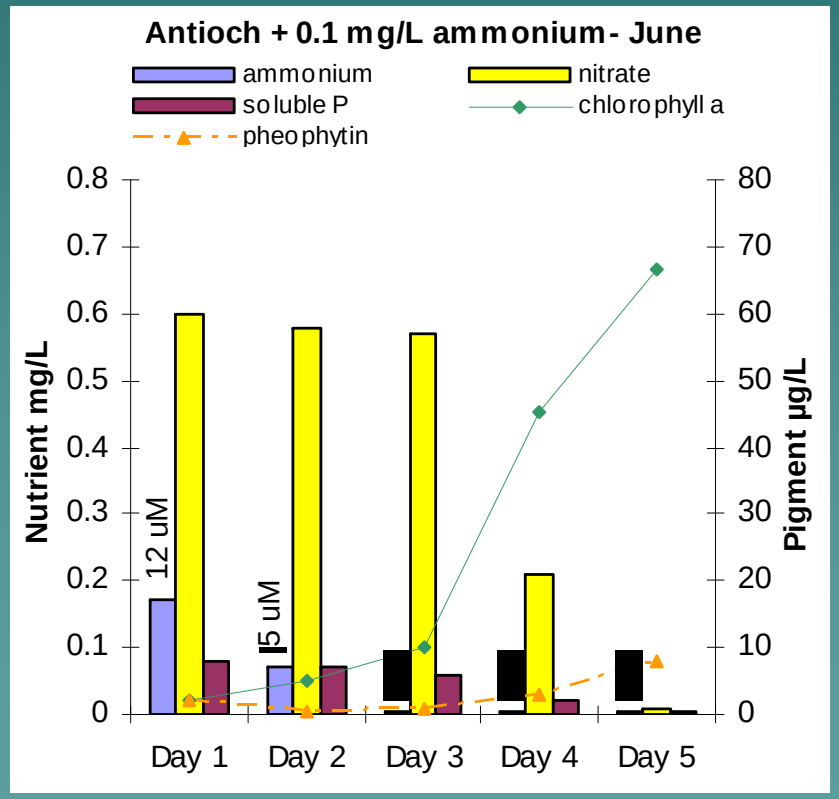
low *Microcystis*



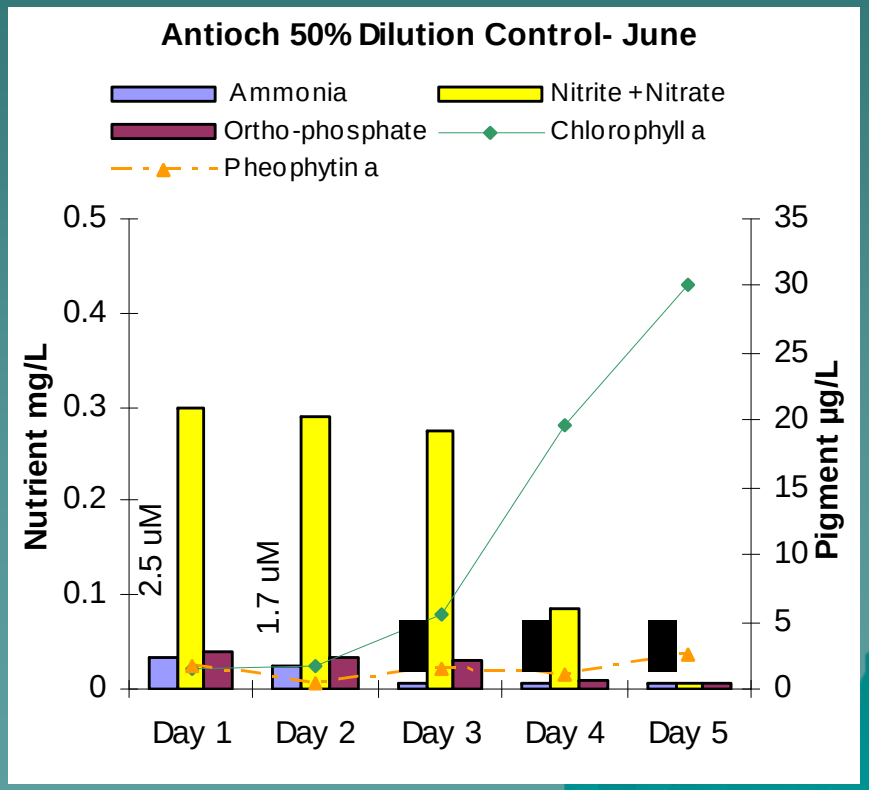
high Microcystis

Chlorophyll and ammonium June

addition bioassay

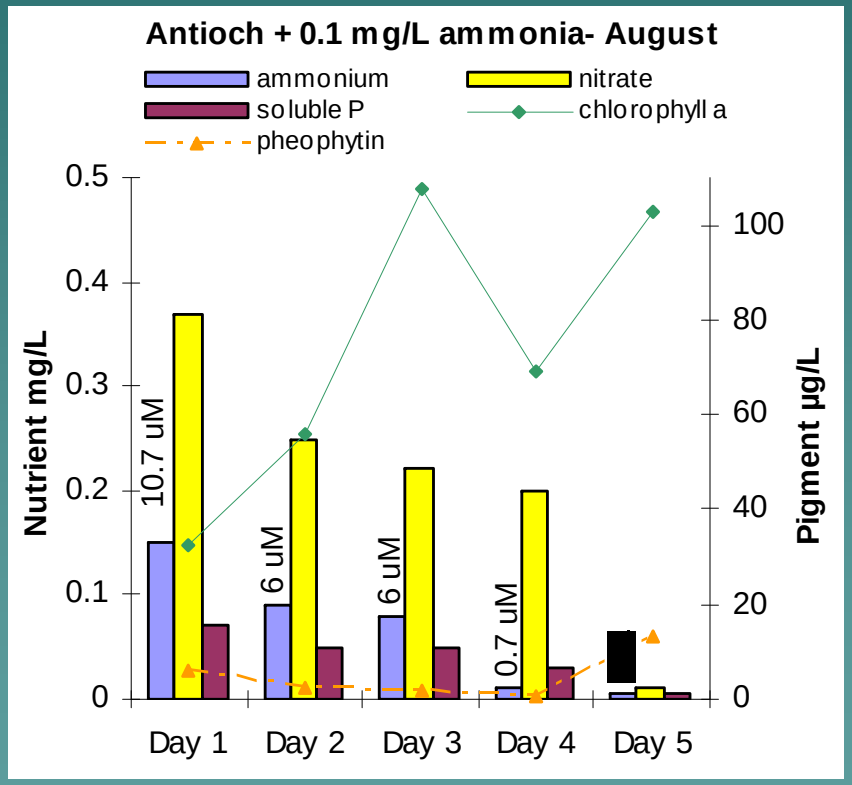


dilution bioassay

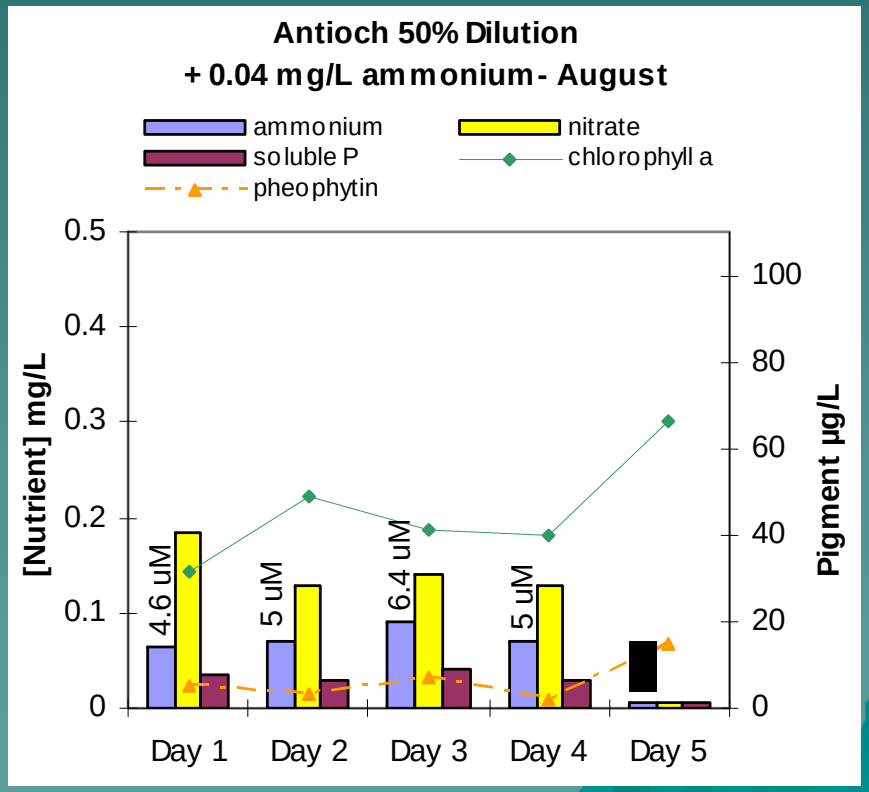


chlorophyll and ammonium August

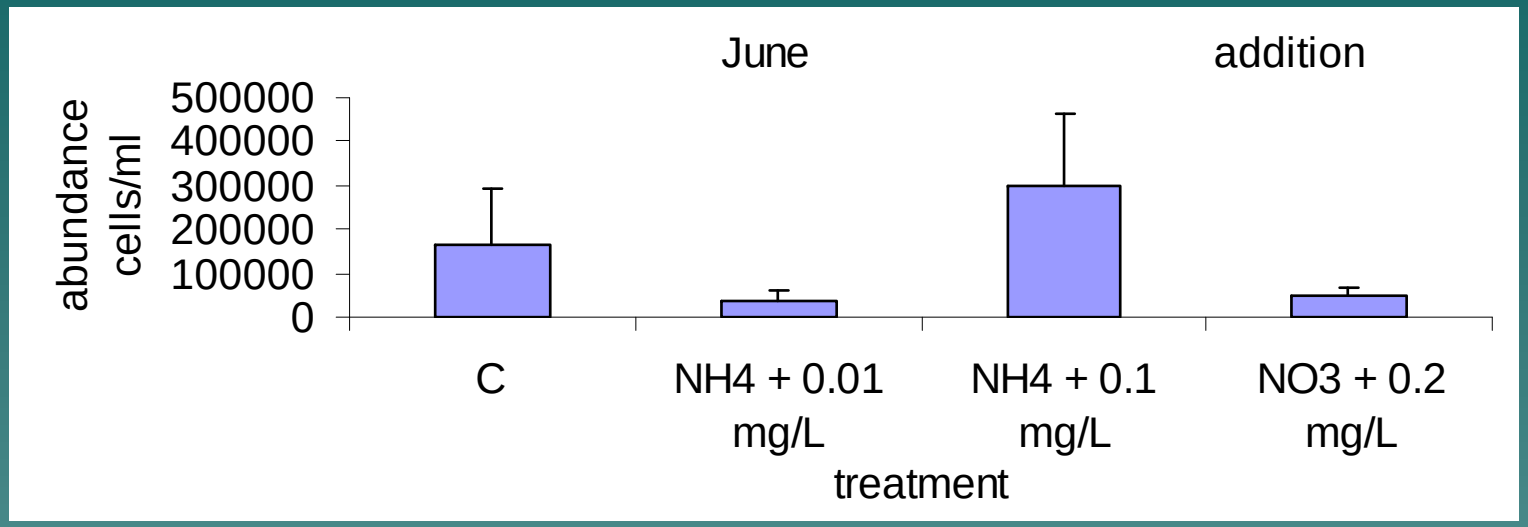
Addition bioassay

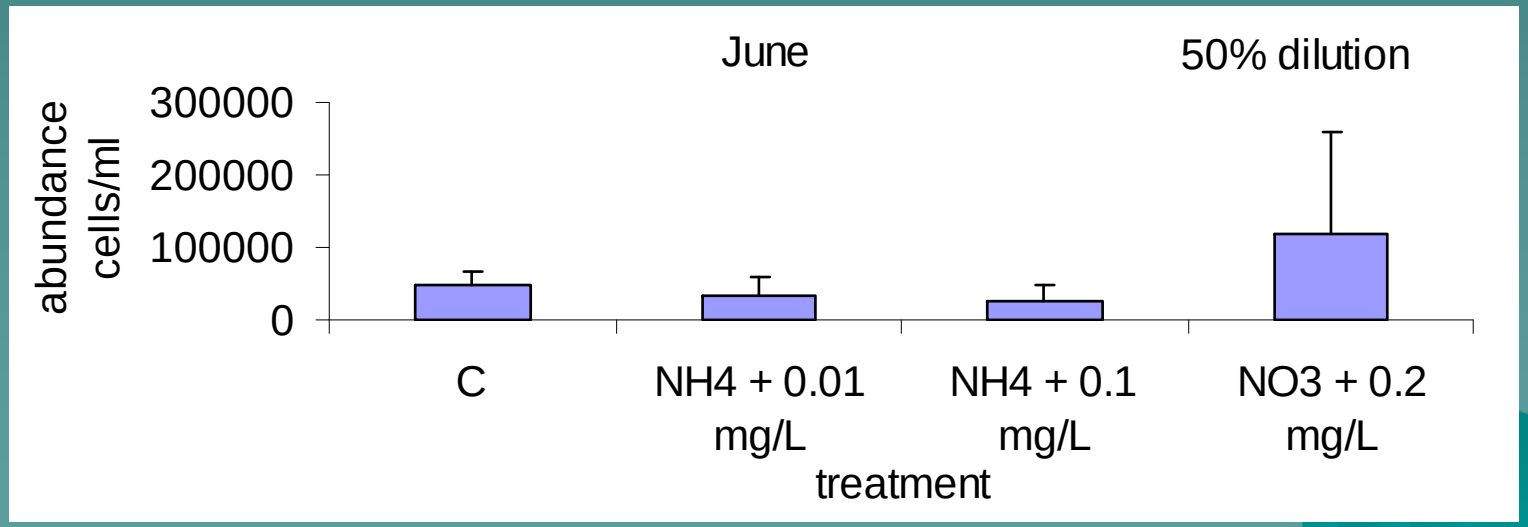


dilution bioassay

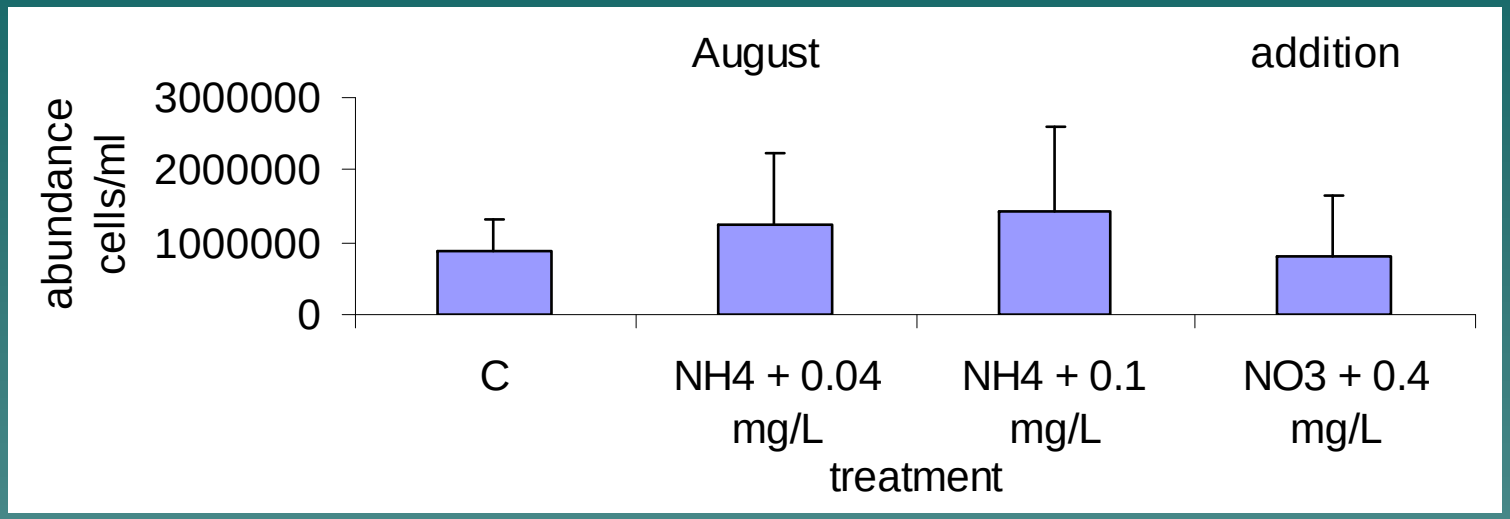


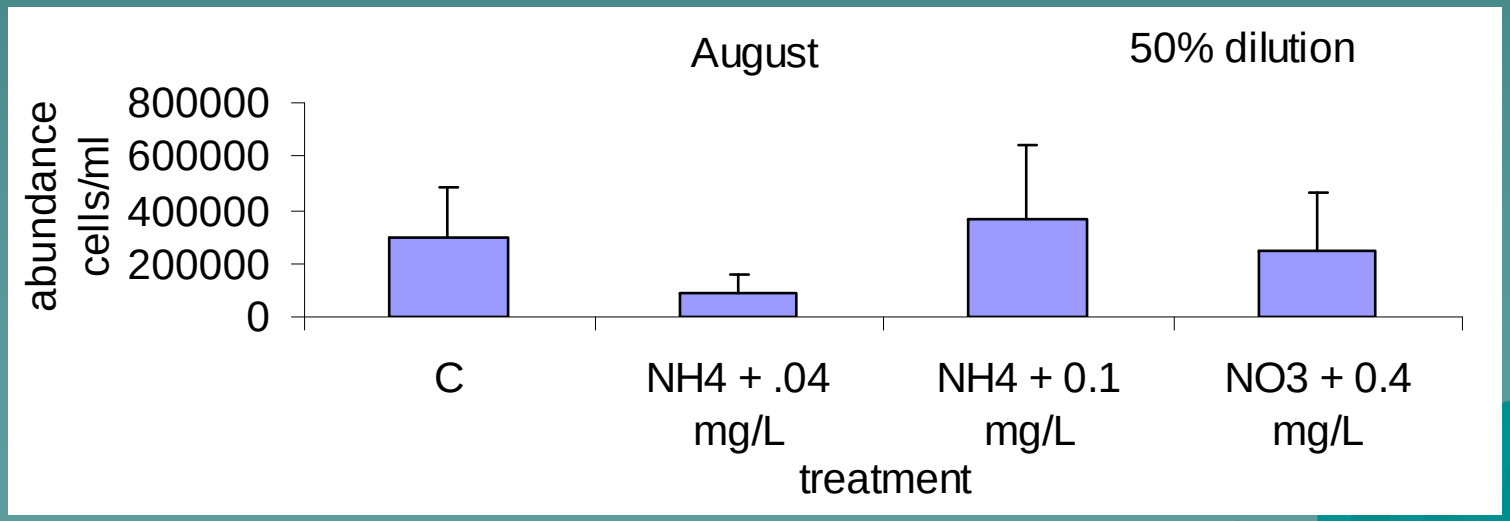
cell abundance June





cell abundance August





Initial Findings

- Chlorophyll *a* concentration in nutrient bioassays was not significantly decreased with additions of ammonium
- *Microcystis* cell abundance sometimes increased with additions of ammonium, but was highly variable