Appendix E. Predicted parameters for all response variables from top models. For models with >1 top model, the top 2 models are presented. For all variables not presented in Figs 1-4, the observed and predicted values are presented graphically. Response values are grouped by nutrient (AMBIENT, + NUTRIENT) and macroalgal (REMOVAL, ADDITION, CONTROL, MIMIC) treatments. Observed changes are points (AMBIENT = open circles, + NUTRIENT= x's). Observational data presented averaged to the level of the random effect determined from model selection. Predicted changes are lines based on the best fit (AIC-based) models to the data (solid line = AMBIENT, dashed line = + NUTRIENT), with bands indicating ± SE. For models with evidence supporting for >1 model: black line = best supported model, gray line = secondary model with strong support (Appendix C).

Macroalgal volume

Field experiment (mL rep^{-1})

Estimated parameters for model (N+M) with strongest support (AIC-based):
Macroalgal volume ~ Nutrient + Macroalgae

See Fig. 1A for graph of observed vs. predicted values

Control Ambient intercept: 430.28
Control + Nutrient intercept: 623.10
Removal Ambient intercept: 240.51
Removal + Nutrient intercept: 433.33
Addition Ambient intercept: 890.78
Addition + Nutrient intercept: 1083.60
Mimic Ambient intercept: 174.58
Mimic + Nutrient intercept: 367.41

See Appendix D for differences between treatments (effect sizes)

Mesocosm experiment (mL rep^{-1})

Estimated parameters for model (T) with strongest support (AIC-based):
Macroalgal volume ~ Time

See Fig. 1B for graph of observed vs. predicted values

Intercept 1975.87
Slope 977.35

No evidence for difference amongst nutrient treatments for macroalgal additions across measurement dates (Appendix D)

Eelgrass Density

Field experiment central quadrat (% change shoots rep^{-1})

Estimated parameters for models (N, Null) with strongest support (AIC-based)
N: Eelgrass density % change ~ Nutrient
Null: Eelgrass density % change ~ 1 (intercept)

See Fig. 2A for graph of observed vs. predicted values

N (black line):
Control/Removal/Addition/Mimic Ambient intercept: -18.48
Control/Removal/Addition/Mimic Ambient intercept: -34.41

Null (grey line):
Intercept: -15.33

No evidence for difference amongst nutrient treatments (Appendix D)

Field experiment haphazard quadrat samples (% change shoots rep^{-1})
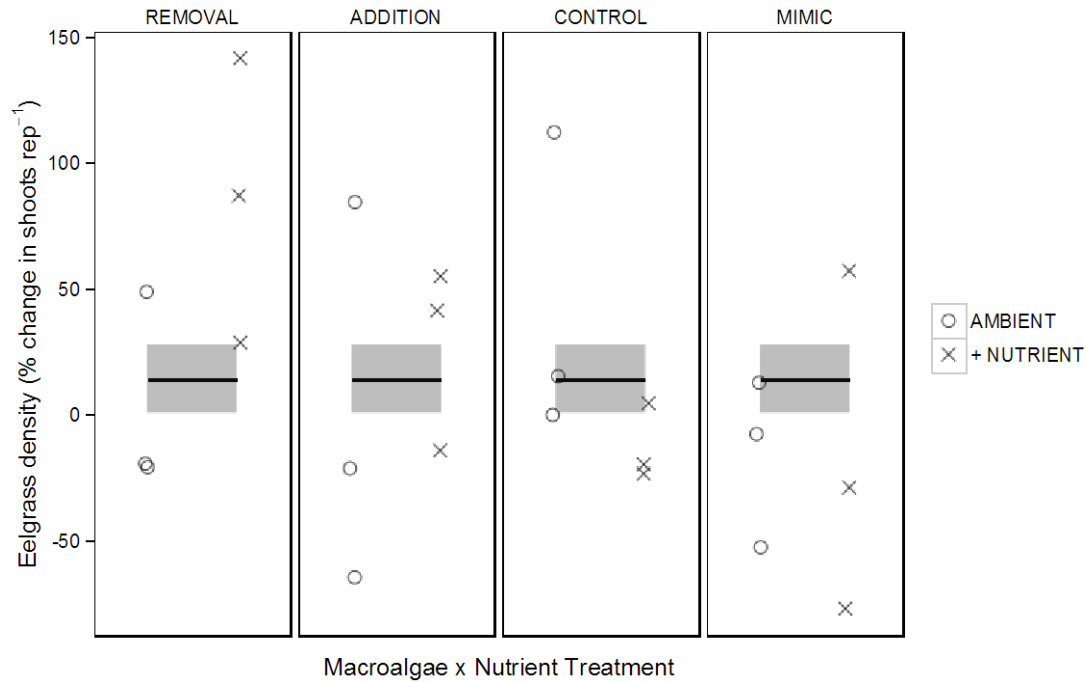
Estimated parameters for model (N) with strongest support (AIC-based): Null model
Eelgrass density % change ~ 1 (intercept)

Intercept: 14.11

No evidence for difference amongst nutrient treatments (Appendix D)

Fig. E1. Observed vs. predicted values of field experiment eelgrass density (% change in shoots rep^{-1})

Mesocosm experiment (% change shoots rep^{-1})

Estimated parameters for models (N+M, M) with strongest support (AIC-based):
N+M: Eelgrass density % change ~ Nutrient + Macroalgae
M: Eelgrass density % change ~ Macroalgae

See Fig. 2B for graph of observed vs. predicted values

N+M (black line):
Removal Ambient intercept: -2.85
Removal + Nutrient intercept: -8.10
Addition Ambient intercept: -32.47
Addition + Nutrient intercept: -37.73
Mimic Ambient intercept: -11.93
Mimic + Nutrient intercept: -17.19

M (gray line):
Removal/ Removal + Nutrient intercept: -5.48
Addition/ Addition + Nutrient intercept: -35.10
Mimic/ Mimic + Nutrient intercept: -14.56

See Appendix D for differences between treatments (effect sizes)

Eelgrass Biomass

Field experiment (g dry weight rep^{-1})

Estimated parameters for model (Null) with strongest support (AIC-based):
Eelgrass Biomass ~ 1 (intercept)

See Fig. 3A for graph of observed vs. predicted values

Intercept: 25.95

No evidence for difference amongst treatments (Appendix D)

Mesocosm experiment (g dry weight shoot^{-1})

Estimated parameters for model (NxM) with strongest support (AIC-based):
Eelgrass Biomass ~ Nutrient x Macroalgae

See Fig. 3B for graph of observed vs. predicted values

Removal Ambient intercept: 0.24
Removal + Nutrient intercept: 0.18
Addition Ambient intercept: 0.04
Addition + Nutrient intercept: 0.04
Mimic Ambient intercept: 0.08
Mimic + Nutrient intercept: 0.07

See Appendix D for differences between treatments (effect sizes)

Trimmed eelgrass biomass

Mesocosm experiment (g dry weight rep^{-1})

Estimated parameters for model (NxMxT) with strongest support (AIC-based):
Trimmed Biomass ~ Nutrient x Macroalgae x Time

Removal Ambient intercept: 1.28
Removal Ambient slope: -45.56
Removal + Nutrient intercept: 1.62
Removal + Nutrient slope: -0.01
Addition Ambient intercept: 1.48
Addition Ambient slope: -0.11
Addition + Nutrient intercept: 1.42
Addition + Nutrient slope: -0.09
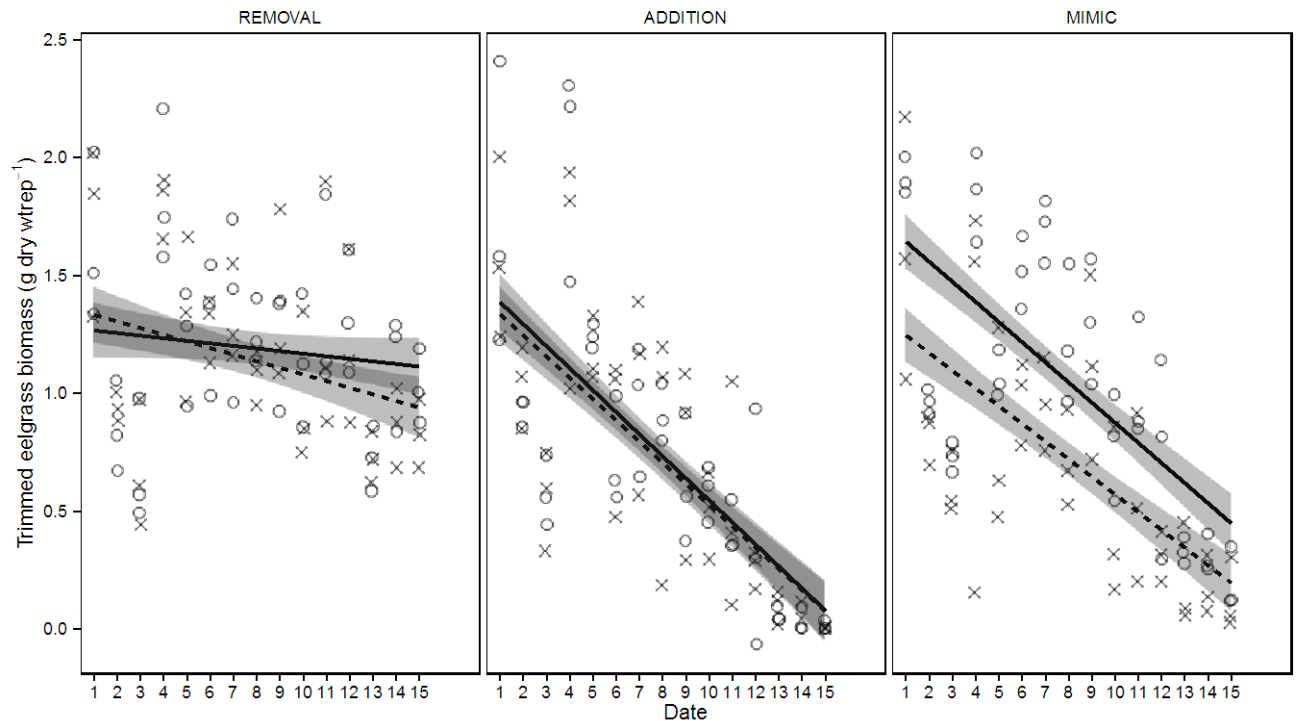Mimic Ambient intercept: 1.73
Mimic Ambient slope: -0.09
Mimic + Nutrient intercept: 1.13
Mimic + Nutrient slope: -0.09

See Appendix D for differences between treatments (effect sizes)

Fig. E2. Observed vs. predicted values of mesocosm trimmed eelgrass biomass (g dry weight rep^{-1})

Dates: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 = Jun.2, Jun.29, Jul.04, Jul.11, Jul.16, Jul.23, Jul.29, Aug.05, Aug.11, Aug.17, Aug.24, Aug.31, Sep.08, Sep.15, Sep.24, Oct.03

Sloughed eelgrass biomass

Mesocosm experiment (g dry weight rep^{-1})

Estimated parameters for model (MxT) with strongest support (AIC-based):
Trimmed biomass ~ Macroalgae x Time

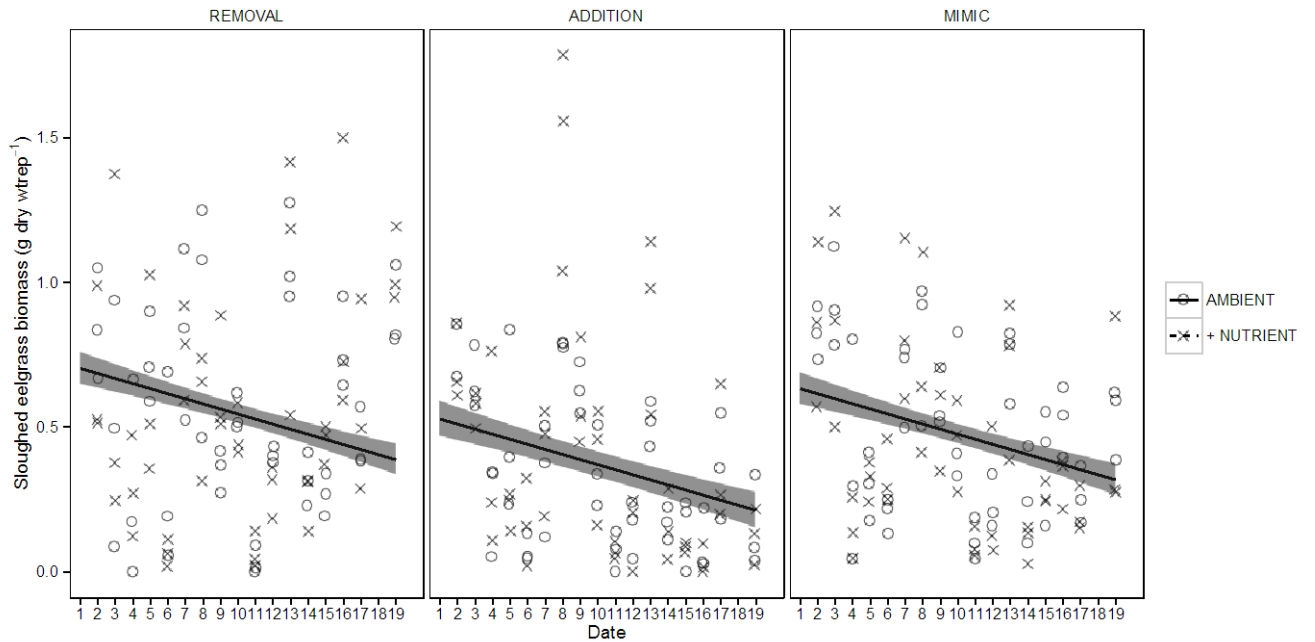Removal Ambient / Removal + Nutrient intercept: 0.72
Addition Ambient / Addition + Nutrient intercept: 0.55
Mimic Ambient / Mimic + Nutrient intercept: 0.65
Slope: -0.02

See Appendix D for differences between treatments (effect sizes)

Fig. E3. Observed vs. predicted values of mesocosm experiment sloughed eelgrass biomass (g dry weight rep^{-1})

Dates: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19 = Jul.04, Jul.11, Jul.16, Jul.23, Jul.29, Aug.05, Aug.11, Aug.17, Aug.24, Aug.31, Sep.08, Sep.15, Sep.24, Sep.27, Oct.03, Oct.18

Eelgrass shoot length

Field experiment (% change in cm rep^{-1})

Estimated parameters for models (Null, N) with strongest support (AIC-based):
Null: Shoot length % change ~ 1 (intercept)
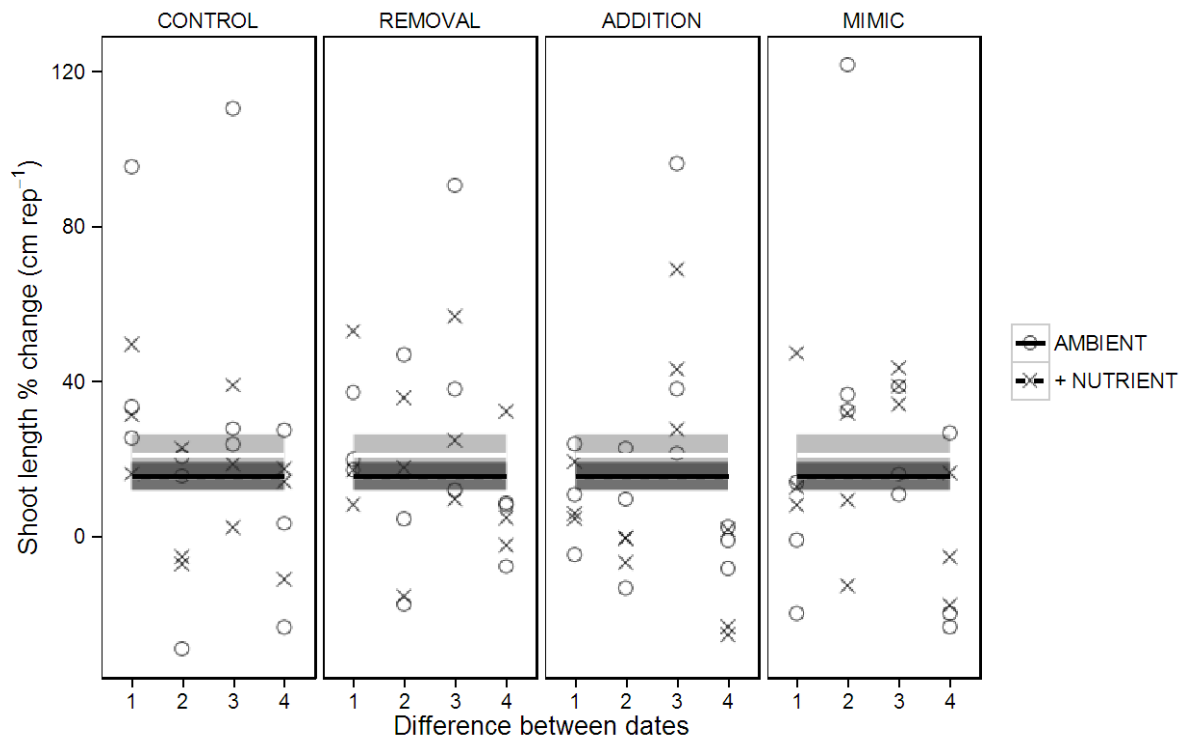N: Shoot length % change ~ Nutrient

Null (black line)
Intercept: 15.50

N (gray line)
Ambient Intercept: 20.94
+ Nutrient Intercept: 15.37

See Appendix D for differences between treatments (effect sizes)

Fig. E4. Observed vs. predicted values of field experiment % change in shoot length (cm rep^{-1})

Date differences: 1 = Jun. 22-Jul.23, 2=Jul. 23-Aug.20, 3=Aug.20-Sep.16, 4=Oct.07-Sep.16

Mesocosm experiment (% change in cm rep^{-1} bucket^{-1})

Estimated parameters for models (MxT, M+N+T) with strongest support (AIC-based):
M x T Shoot length % change ~ Macroalgae x Time
M+N+T: Shoot length % change ~ Macroalage + Nutrient + Time

MxT (black line)
Removal Ambient / Removal + Nutrient intercept: 2.88
Removal Ambient / Removal + Nutrient slope: 1.95
Addition Ambient / Addition + Nutrient intercept: 5.54
Addition Ambient / Addition + Nutrient slope: -16.74
Mimic Ambient / Mimic + Nutrient intercept: 5.55
Mimic Ambient / Mimic + Nutrient slope: -9.66

M+N+T (gray line)
Removal Ambient intercept: 9.17
Removal + Nutrient intercept: 7.15
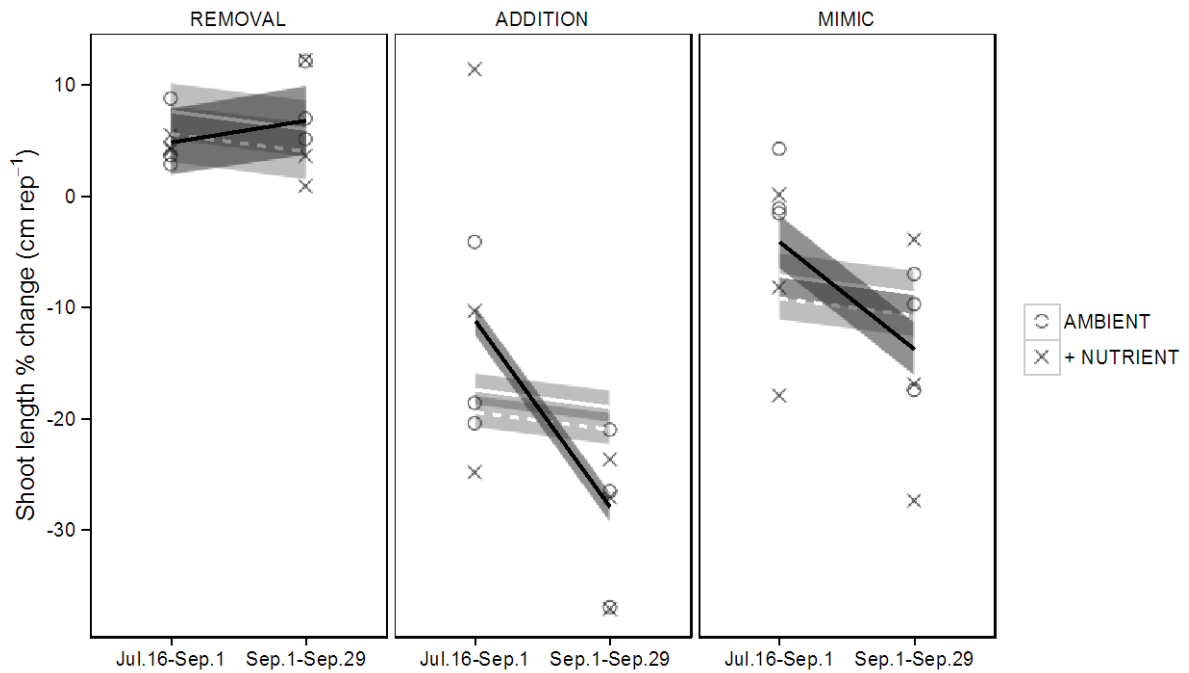Addition Ambient intercept: -15.81
Addition + Nutrient intercept: -17.83
Mimic Ambient intercept: -5.57
Mimic + Nutrient intercept: -7.59
Slope: -1.57

Fig. E6. Observed vs. predicted values of mesocosm experiment % change in shoot length (cm rep^{-1})

Eelgrass sheath length (% change in cm rep^{-1})

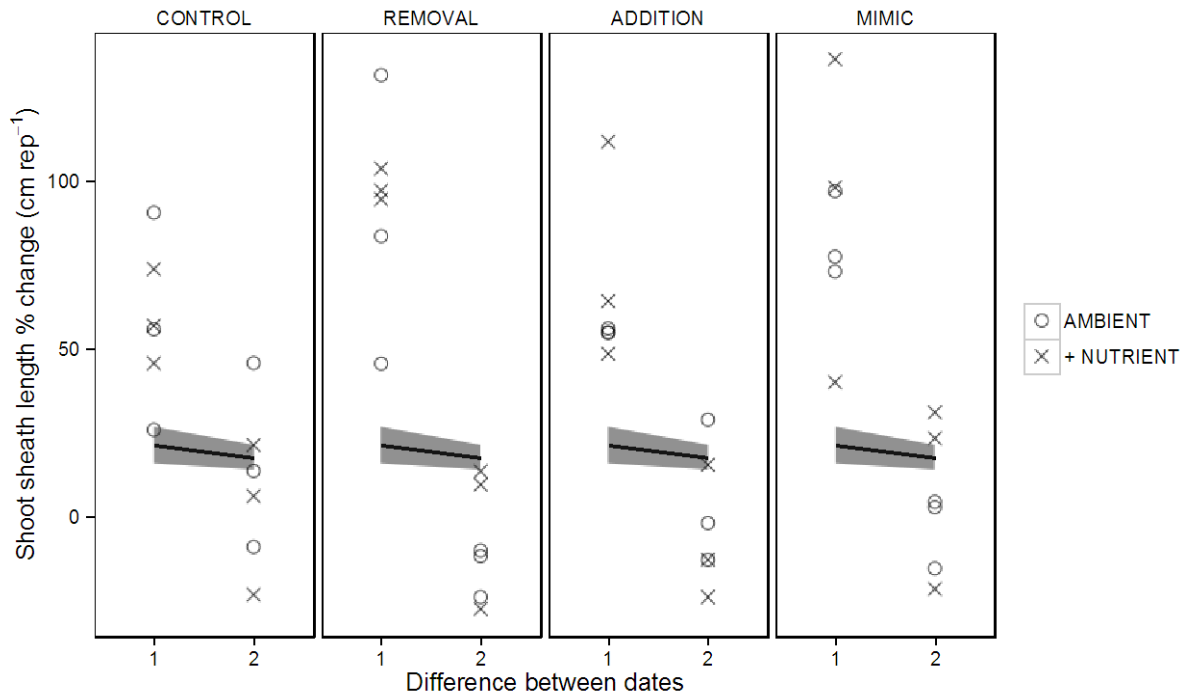*Field experiment (% change in cm rep^{-1})*

Estimated parameters for models (Time) with strongest support (AIC-based):

Intercept: 25.10
Slope: -3.72

No evidence for difference amongst treatments (Appendix D)

Fig. E7. Observed vs. predicted values for field experiment % change in sheath length (cm rep^{-1}).

Date differences: 1 = Jul.05-Aug.22, 2=Aug.22 – Oct.10

Mesocosm experiment (% change in cm rep^{-1} bucket^{-1})

Estimated parameters for models (M+N+T, MxT) with strongest support (AIC-based):
M+N+T: Sheath length % change ~ Macroalgae x Nutrient x Time
MxT: Sheath length % change ~ Macroalage x Time

M+N+T (black line)
Removal Ambient intercept: 8.71
Removal + Nutrient intercept: 4.07
Addition Ambient intercept: 32.71
Addition + Nutrient intercept: 36.78
Mimic Ambient intercept: 17.83
Mimic + Nutrient intercept: 21.9
Slope: -24.67

MxT (gray line)
Removal Ambient / Removal + Nutrient intercept: 18.34
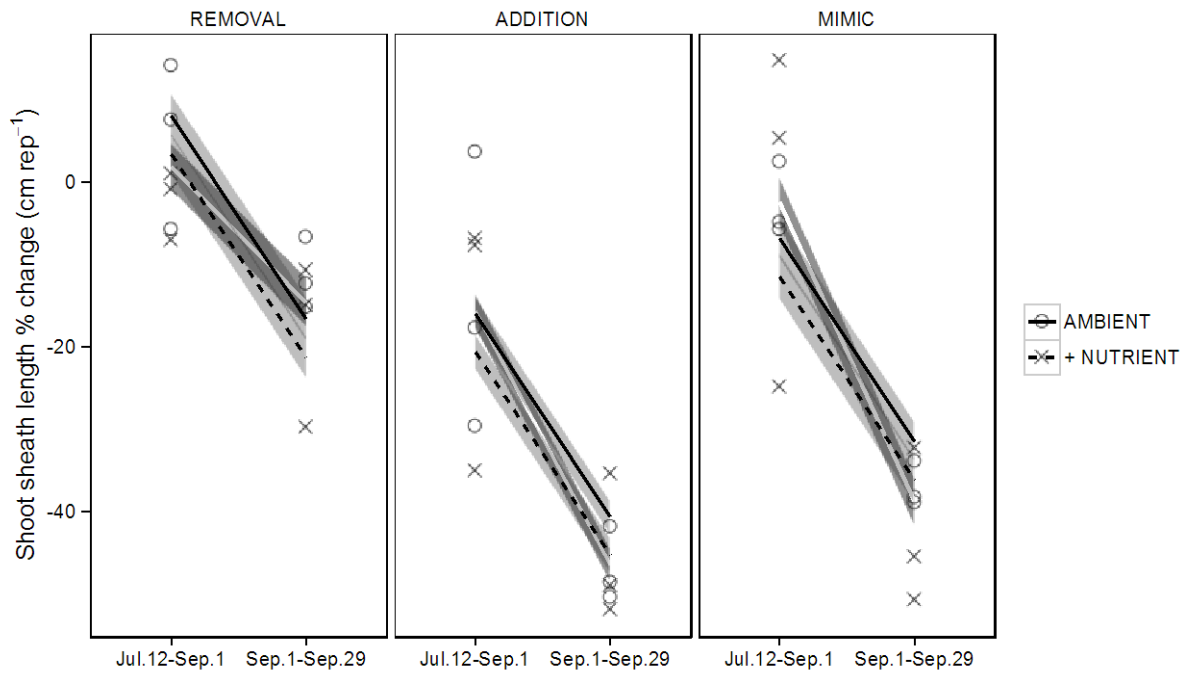Removal Ambient / Removal + Nutrient slope: -16.47
Addition Ambient / Addition + Nutrient intercept: 15.13
Addition Ambient / Addition + Nutrient slope: -30.78
Mimic Ambient / Mimic + Nutrient intercept: 33.98
Mimic Ambient / Mimic + Nutrient slope: -36.37

Fig. E8. Observed vs. predicted values of mesocosm experiment % change in shoot sheath length (cm rep^{-1})
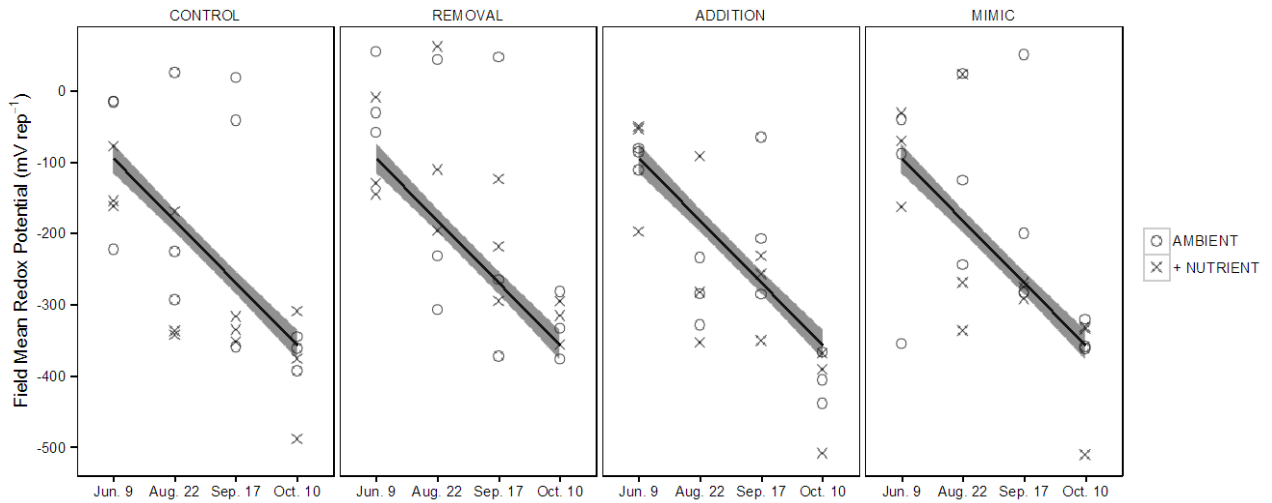

Redox potential

Field experiment (mV rep^{-1})

Estimated parameters for model (T) with strongest support (AIC-based):
Redox potential ~ Time

Intercept: -7.70
Slope: -87.29

Fig. E9. Observed vs. predicted values for field experiment redox potential (mean mV rep^{-1}) measurements.

Mesocosm experiment (mV rep⁻¹)

Estimated parameters for model (N x M x T) with strongest support (AIC-based):
Redox potential ~ Nutrient x Macroalgae x Time

See Fig. 4A for graph of observed vs. predicted values

Removal Ambient intercept: -148.3
Removal Ambient slope: -45.56
Removal + Nutrient intercept: -78.8
Removal + Nutrient slope: -74.31
Addition Ambient intercept: -70.65
Addition Ambient slope: -82.69
Addition + Nutrient intercept: -49.19
Addition + Nutrient slope: -93.16
Mimic Ambient intercept: -63.60
Mimic Ambient slope: -66.82
Mimic + Nutrient intercept: -154.38
Mimic + Nutrient slope: -55.27

See Appendix D for differences between treatments (effect sizes)

Light readings (rep⁻¹)

Field experiment PAR irradiance readings (μmol photon $m^{-2} s^{-1}$)

Estimated parameters for model (Null) with strongest support (AIC-based):
Light (PPFD) ~ 1 (intercept)

Intercept: 203.36

No evidence for difference amongst nutrient treatments (Appendix D)

Fig. E10. Observed vs. predicted values of field experiment light attenuation (µmol photon $m^{-2} s^{-1} rep^{-1}$) measurements.
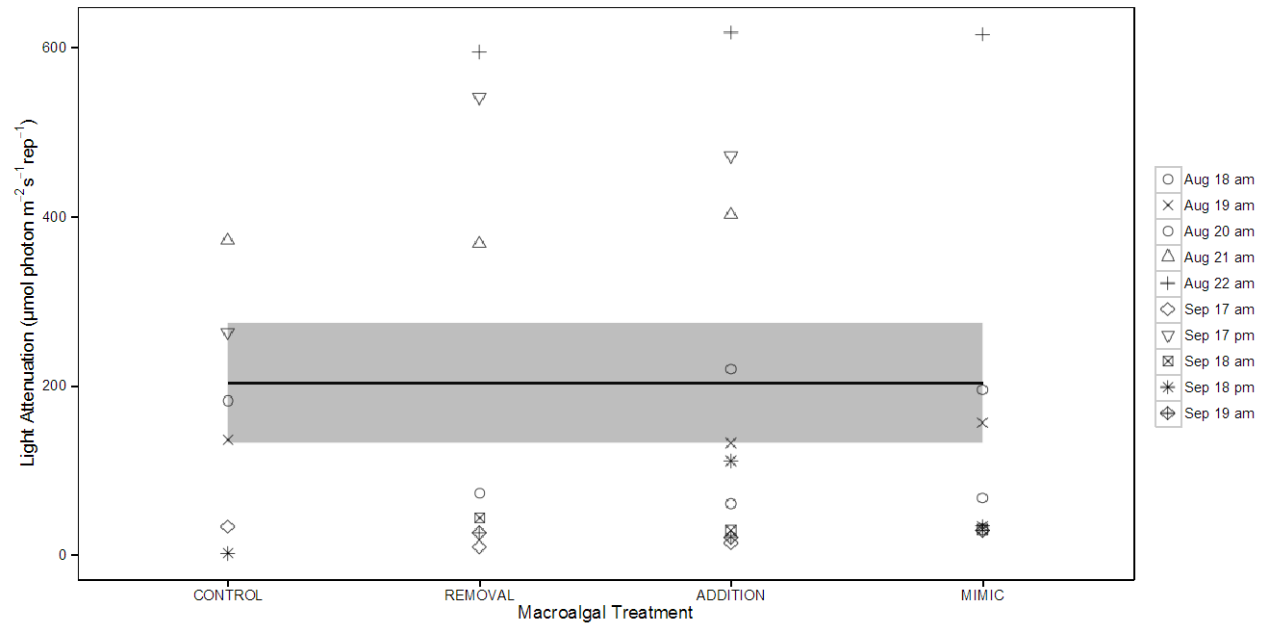
Mesocosm experiment mean total light attenuation

Estimated parameters for model (MxT, N+M+T) with strongest support (AIC-based):
MxT: Total light attenuation ~ Macroalgae x Time
N+M+T: Total light attenuation ~ Nutrient + Macroalgae + Time

See Fig. 4B for graph of observed vs. predicted values

MxT (black line)
Removal Ambient / Removal + Nutrient intercept: 65.32
Removal Ambient / Removal + Nutrient slope: 274.69
Addition Ambient / Addition + Nutrient intercept: 420.65
Addition Ambient / Addition + Nutrient slope: 306.38
Mimic Ambient / Mimic + Nutrient intercept: 105.03
Mimic Ambient / Mimic + Nutrient slope: 383.18

N+M+T (gray line, dashed and solid)

Addition Ambient intercept: 386.54
Addition + Nutrient intercept: 445.54
Removal Ambient intercept: -54.24
Removal + Nutrient intercept: 4.76
Mimic Ambient intercept: 275.6
Mimic + Nutrient intercept: 334.6

Slope 308.85

See Appendix D for differences between treatments (effect sizes)

Temperature

Mesocosm experiment (°C rep^{-1})

Estimated parameters for models (M, N + M) with strongest support (AIC-based):
M: Temperature ~ Macroalgae
N+M: Temperature ~ Macroalgae

M (black line)
Removal Ambient / Removal + Nutrient intercept: 12.44
Addition Ambient / Addition + Nutrient intercept: 12.40
Mimic Ambient / Mimic + Nutrient intercept: 12.22

N+M (gray line)
Removal Ambient intercept: 12.47
Removal + Nutrient intercept: 12.41
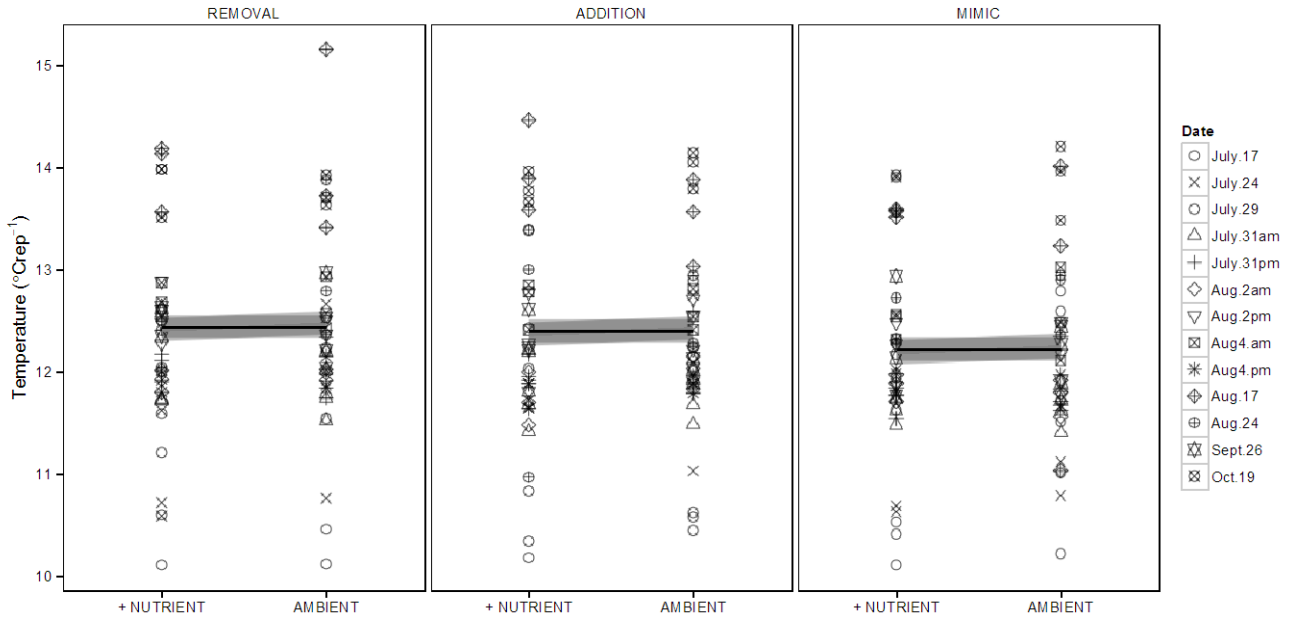Addition Ambient intercept: 12.43
Addition + Nutrient intercept: 12.37
Mimic Ambient intercept: 12.25
Mimic + Nutrient intercept: 12.19

No differences between treatments across measurement dates (Appendix D)

Fig. E11. Observed vs. predicted values of mesocosm experiment temperature (°C rep^{-1}) measurements.

Note: M model (black line) overlies N+M model (gray line)
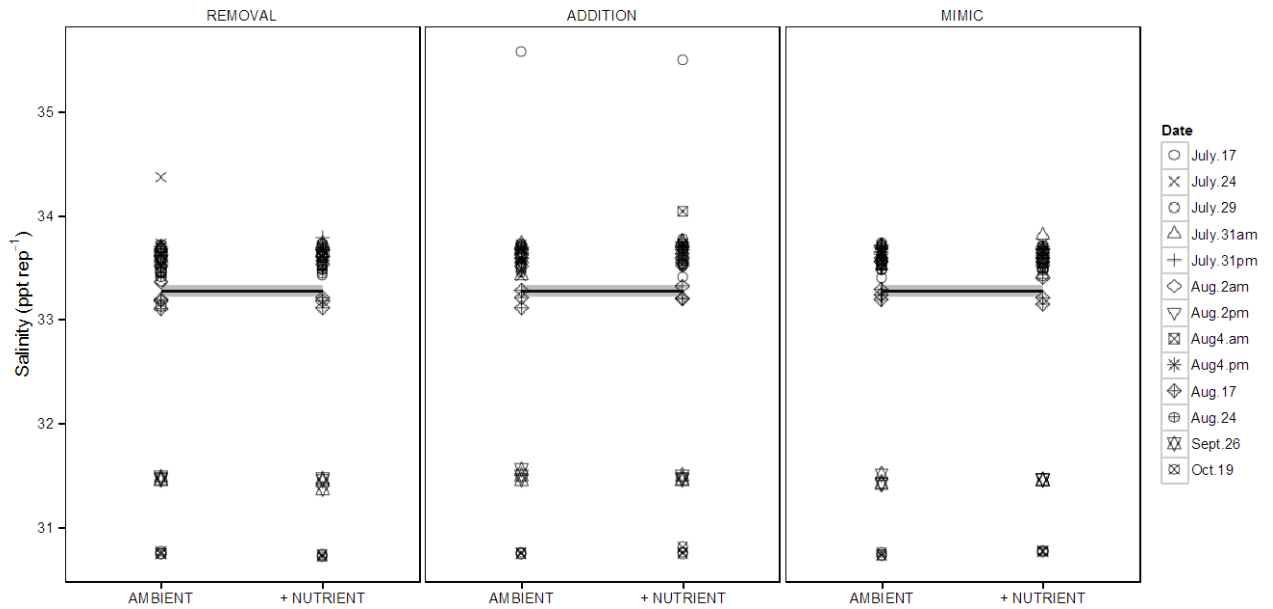
Salinity

Mesocosm experiment (ppt rep^{-1})

Estimated parameters for model (Null) with strongest support (AIC-based):
Temperature ~ 1 (intercept)

Intercept: 33.27

No differences between treatments across measurement dates (Appendix D)

Fig. E12. Observed vs. predicted values for mesocosm experiment salinity (ppt rep^{-1}) measurements.

Dissolved oxygen

Mesocosm experiment (mgL^{-1} rep^{-1})

Estimated parameters for model (M) with strongest support (AIC-based):
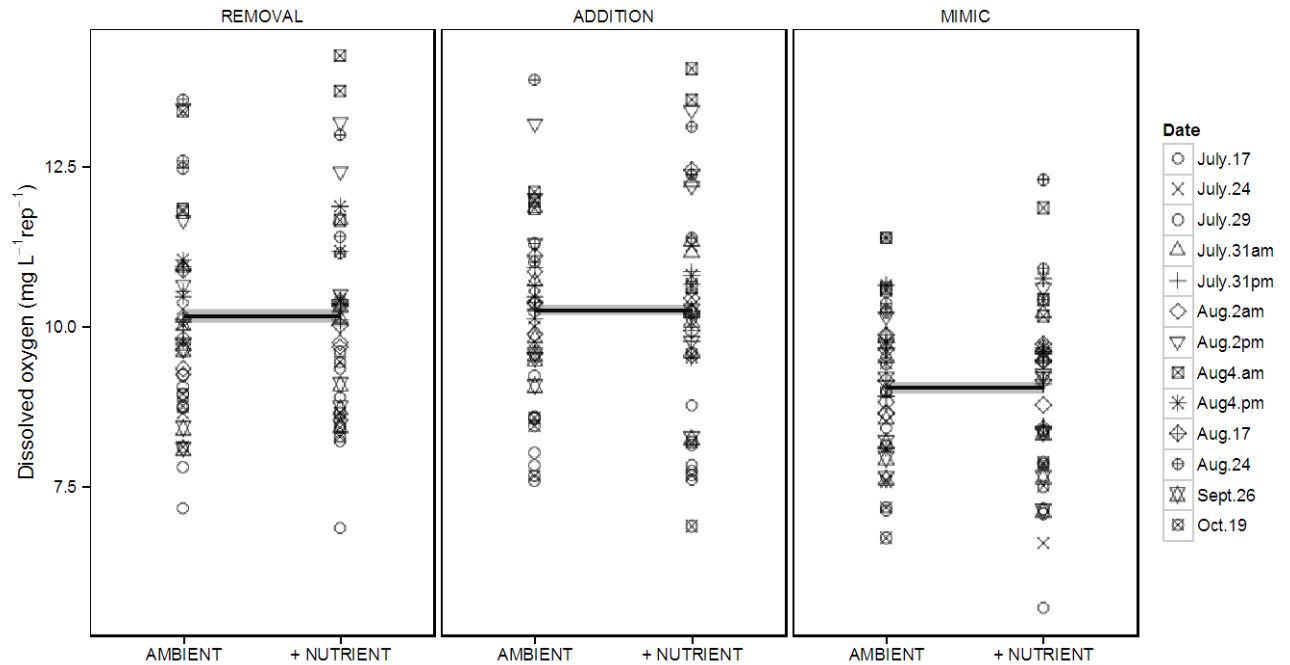Dissolved oxygen ~ Macroalgae

Removal Ambient/ + Nutrient intercept: 10.14
Addition Ambient/ + Nutrient intercept: 10.19
Mimic Ambient/ + Nutrient intercept: 8.98

See Appendix D for differences between treatments (effect sizes)

Fig. E13. Observed vs. predicted values for mesocosm experiment dissolved oxygen (mgL^{-1} rep^{-1}) measurements.

pH

Mesocosm experiment (rep^{-1})

Estimated parameters for model (M, N+M) with strongest support (AIC-based):
M: Dissolved oxygen ~ Macroalgae
N + M: Dissolved oxygen ~ Nutrient + Macroalgae

M (black line)
Removal Ambient / + Nutrient intercept: 8.07
Addition Ambient / + Nutrient intercept: 8.10
Mimic Ambient / + Nutrient intercept: 7.97

N+M (gray line)
Removal Ambient intercept: 8.07
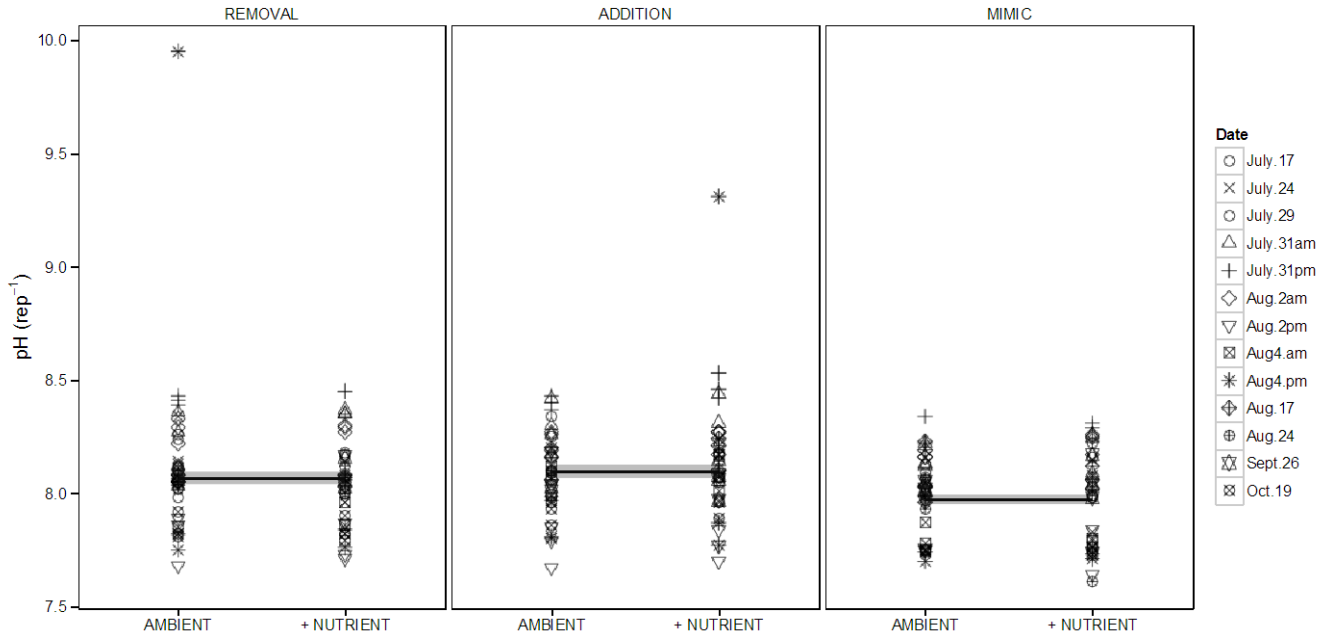Removal + Nutrient intercept: 8.08
Addition Ambient intercept: 8.09
Addition + Nutrient intercept: 8.10
Mimic Ambient intercept: 7.97
Mimic + Nutrient intercept: 7.98

See Appendix D for differences between treatments (effect sizes)

Fig. E14. Observed vs. predicted values for mesocosm experiment pH (rep^{-1}) measurements.

Note: M model (black line) overlies N+M model (gray line)