

UNIVERSITY OF MIAMI

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THE EFFECTS OF ENVIRONMENTAL STRESSORS ON THE DYNAMICS OF  
THREE FUNCTIONAL GROUPS OF ALGAE IN *THALASSIA TESTUDINUM*  
HABITATS OF BISCAYNE BAY, FLORIDA: A MODELING APPROACH

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The effects of stressors related to canal discharges on near-shore, shallow-water tropical macroalgae occurring in *Thalassia testudinum* (turtlegrass) ecosystems were investigated. Three functional groups of macroalgae (drift algae, rhizophytic algae, and seagrass epiphytes) contribute to seagrass system structure and function. Drift algae and epiphytes have the potential to shade seagrasses under conditions of elevated water-column nutrients. Within Biscayne Bay, seasonal and spatial changes in the macroalgal community may be related to canal discharges. Drift algae dominated in canal influenced sites, while rhizophytic algae were dominant in oceanic sites. Epiphytes were found in both conditions with filamentous species in canal sites, whereas calcareous forms dominated in oceanic sites.

The physiological responses by the macroalgae to environmental variables including light, temperature, salinity, nutrients, and hydrodynamic regime were investigated. Temperature was found to drive seasonal changes in abundance, whereas salinity and nutrients were important determinants of the spatial distribution of the three functional groups within the Bay. Low-salinity stress from canal discharges had a negative impact on growth, while nutrient addition (primarily ammonia-nitrogen) had a stimulating effect. Bay-wide tidal circulation patterns were found to affect the distribution of drift algae, with accumulation occurring along the mainland coastline, and removal of drift algae occurring in the high-flow conditions typical of the oceanic inlets.

A simulation model of algal productivity was developed to augment a pre-existing primary production model for seagrass systems. The algal productivity models were

modified and parameterized with data from field and experimental investigations in Biscayne Bay, as well as from pre-existing literature data available for similar tropical seagrass systems. The models were validated for a select number of sites (canal, sheet-flow and oceanic) representing the range of environmental regimes present in Biscayne Bay. Predicted simulation results agreed closely with the observed field data for both drift and rhizophytic algae, but less so for the epiphytes. In canal-influenced portions of the Bay, rhizophytic algae had reduced biomass because of low-salinity stress, drift algae bloomed under favorable temperature conditions because of the high nitrogen loadings, and filamentous epiphytes were favored over calcareous forms.

# CONTENTS

INDEX OF FIGURES	xi
INDEX OF TABLES	xiv
<b>1. INTRODUCTION</b>	1
A Regional Context: South Florida, the Everglades, and Biscayne Bay	3
Algae in Seagrass Habitats	
1. <i>Structural aspects</i>	7
2. <i>Functional aspects</i>	9
3. <i>Identification of Functional Groups</i>	10
Overview of Ecological Modeling and Development of Algal Models	
1. <i>Modeling methodology</i>	12
2. <i>Development of Algal Models</i>	16
Aims and Hypotheses	18
<b>2. FIELD DATA</b>	
INTRODUCTION	20
METHODS	
<i>Sampling protocols</i>	23
<i>Data Exploration and Analyses</i>	27
RESULTS	
1. <i>Species Composition</i>	30
2. <i>Multivariate Analyses</i>	32
3. <i>Linear Regressions on Biomass</i>	36
4. <i>Biomass across Sites and Seasons</i>	37
5. <i>Seasonal Patterns</i>	41
6. <i>Percent Cover and Biomass of Drift Algae</i>	47
7. <i>Seasonal and Inter-annual Comparisons</i>	49

DISCUSSION	
<i>Drift Algae</i>	51
<i>Rhizophytic Algae</i>	53
<i>Seagrass Epiphytes</i>	54
<i>Algae as Indicators</i>	56

### 3. LIGHT AND TEMPERATURE

INTRODUCTION	
Light	59
Temperature	62
METHODS	
Light	
1. <i>Light Regime</i>	65
2. <i>Light Responses</i>	66
Temperature	
1. <i>Temperature Regime</i>	67
2. <i>Temperature Responses</i>	68
Multi-factorial Experiments: Light x Temperature Interactions	
1. <i>Experimental Facilities</i>	69
2. <i>Experimental Methods</i>	70
3. <i>Growth</i>	71
4. <i>Photosynthesis</i>	73
5. <i>Statistics</i>	74
RESULTS	
1. <i>Light Regime</i>	74
2. <i>Light Responses</i>	78
3. <i>Temperature Regime</i>	80
4. <i>Temperature Responses</i>	82
5. <i>Light x Temperature Interactions</i>	82
DISCUSSION	
Light	
<i>P-I Curves</i>	88
<i>Photosynthesis and Growth</i>	90
<i>Light and Temperature Interactions</i>	91
Temperature	93
SUMMARY	95

<b>4. SALINITY</b>	
INTRODUCTION	
Canal Impacts	96
Algal Salinity Responses	98
METHODS	
Salinity Regime	101
Salinity Responses	
1. <i>Static Salinity Experiments</i>	102
2. <i>Static Salinity Experiments - Spatial Population Responses</i>	104
3. <i>Dynamic Salinity Experiments</i>	105
RESULTS	
Salinity Regime	105
Salinity Responses	
1. <i>Static Salinity Experiments</i>	110
<i>Photosynthesis</i>	110
<i>Growth</i>	113
<i>Health</i>	117
2. <i>Static Salinity Experiments - Spatial Population Responses</i>	121
3. <i>Dynamic Salinity Experiments</i>	125
DISCUSSION	
Canal Impacts	127
Algal Salinity Responses	
<i>Salinity Tolerance Inferred from Distribution Patterns</i>	130
<i>Salinity Tolerance Measured under Laboratory Conditions</i>	131
<i>Spatial and Temporal Differences in Salinity Tolerance</i>	133
<i>Salinity Tolerance Under Pulsed vs. Static Salinity Stress</i>	135
SUMMARY	135
<b>5. NUTRIENTS</b>	
INTRODUCTION	
Eutrophication	137
<i>Nitrogen</i>	138
<i>Phosphorus</i>	139
Nutrient Physiology	
<i>Nutrient Uptake</i>	139
<i>Nutrient Kinetics</i>	141

Nutrient Limitation	143
Aims	145
METHODS	
Nutrient Regime	
1. <i>Temporal nutrient dynamics</i>	146
2. <i>Spatial nutrient dynamics</i>	147
3. <i>N:P elemental ratios in algae</i>	148
Nutrient Responses	
1. <i>Nutrient Addition Experiment</i>	149
2. <i>Limiting Nutrient Experiments</i>	151
Statistics	152
RESULTS	
Nutrient Regime	
1. <i>Temporal nutrient dynamics</i>	153
2. <i>Spatial nutrient dynamics</i>	157
3. <i>Tissue nutrient contents</i>	158
Nutrient Responses	
1. <i>Nutrient Addition Experiments</i>	
1.1 <i>Photosynthesis</i>	160
1.2 <i>Growth</i>	163
1.3 <i>Tissue Nutrients</i>	167
1.4 <i>Nutrient x Salinity Response-surfaces</i>	171
2. <i>Limiting Nutrient Experiments</i>	
2.1 <i>Nutrient Uptake</i>	174
2.2 <i>Photosynthesis</i>	178
2.3 <i>Growth</i>	182
2.4 <i>Tissue Nutrients</i>	187
<i>Summary of Nutrient Responses</i>	192
DISCUSSION	
Nutrient Regime	192
Algal Responses to Elevated Nutrients	195
<i>The Interaction of Elevated Nutrients and other Abiotic Variables</i>	197
<i>Limiting Nutrients</i>	197
<i>Benthic pelagic coupling and algal mats</i>	199
SUMMARY	201
APPENDIX: <i>Spatial Interpolation and Inverse Distance Weighting</i>	202

## 6. FLOW

### INTRODUCTION

<i>Flow and Morphology</i>	212
<i>Flow and Boundary Layers</i>	214
<i>Flow and Spatial Distribution</i>	215

### METHODS

Hydrodynamic Regime	217
Drift Algal Responses	218
<i>Experiment 1: Biomass and Composition of Drift</i>	219
<i>Experiment 2: Drift Transport and Persistence</i>	220
<i>Experiment 3: Drift Transport Rates</i>	222
<i>Experiment 4: Tidal Flow Velocities and Persistence Time</i>	223

### RESULTS

Hydrodynamic Regime	
<i>Flow</i>	225
<i>Bathymetry</i>	225
<i>Sediments</i>	229
Drift Algal Responses	
<i>Experiment 1: Biomass and Composition of Drift</i>	229
<i>Experiment 2: Drift Transport and Persistence</i>	
2.1 <i>Flow</i>	233
2.2 <i>Transport</i>	235
2.3 <i>Persistence</i>	235
<i>Experiment 3: Drift Transport Rates</i>	238
<i>Experiment 4: Tidal Flow Velocities and Persistence Time</i>	
4.1 <i>Flow</i>	240
4.2 <i>Persistence</i>	244

### DISCUSSION

<i>Sources of Drift</i>	249
<i>Transport of Drift</i>	252
<i>Spatial and Temporal Patterns</i>	253
<i>Synopsis of Patterns in Biscayne Bay</i>	255

<b>7. MODEL SYNTHESIS</b>	
INTRODUCTION	257
<i>Seagrass Systems</i>	258
<i>Aims</i>	260
METHODS	
1. <i>Conceptual Model and Mathematical Formulation</i>	261
2. <i>Parameterization</i>	266
RESULTS	
3. <i>Calibration</i>	273
4. <i>Validation</i>	276
5. <i>Sensitivity analysis</i>	281
DISCUSSION	
<i>Algal Simulation Models</i>	289
<i>Aggregation</i>	291
<i>Model Limitations and Suggested Refinements</i>	292
<i>Importance of System History</i>	296
SUMMARY	297
APPENDIX: <i>Tables of Parameter Values</i>	299
<b>8. SUMMARY AND CONCLUSIONS</b>	308
REFERENCES	320
APPENDICES	
APPENDIX 1: <i>Stella code</i>	360
APPENDIX 2: <i>Illustrations of algae</i>	365

Vita

# INDEX OF FIGURES

1.1 South Florida region showing interconnectivity of the Everglades	5
1.2 Generic conceptual model of processes influencing algal biomass	18
2.1 Location of study sites in Biscayne Bay, Florida	24
2.2 Sampling designs employed during the three phases of community analysis	25
2.3 Principle Components Analysis on total algal biomass per quadrat	34
2.4 Canonical Variates Analysis with 95% confidence ellipses	34
2.5 Mean annual biomass in grams dry weight·m <sup>-2</sup> and AFDW·m <sup>-2</sup>	38
2.6 Spatio-temporal distribution of common genera of macroalgae	42
2.7 Mean biomass of the three functional groups for each regime	43
2.8 Three month moving average of biomass	44
2.9 Three-month moving average of percent cover of drift algae	45
2.10 Regressions of drift biomass to percent cover	48
3.1 Theoretical P-I curves for two different algae	61
3.2 Diagram of four microcosms in an aquarium water bath	71
3.3 Average daily irradiance for Biscayne Bay	75
3.4 Light attenuation with depth	77
3.5 P-I curves for the three functional groups of algae	79
3.6 Water temperatures in Biscayne Bay	81
3.7 Temperature response curves for three common algae in Biscayne Bay	83
3.8 Seasonal light levels and temperatures during multi-factorial experiments	85
3.9 Mean daily growth and photosynthesis	86
4.1 Mean monthly salinities in the three regimes studied	107
4.2 Hourly salinity fluctuations at two canal and two oceanic sites	108
4.3 Mid-monthly snapshots of spatio-temporal distribution of salinities	109
4.4 Photosynthetic response to a range of salinities from 5 to 45 psu	111
4.5 Mean daily growth of the three functional groups of algae	114
4.6 Percentage of plants within each health category	118
4.7 Results of Correspondence Analyses for health	120
4.8 Mean growth and photosynthetic response of drift algae	122

4.9A Salinities measured in dynamic salinity-pulse experiments	126
4.9B Mean daily growth of the drift alga <i>Laurencia</i>	126
5.1 Graphical representation of a theoretical algal nutrient uptake model	142
5.2 Locations of DERM stations and three reefs	147
5.3 Water-column nutrient concentrations for monthly DERM samples	154
5.4 Mean water-column nutrient concentrations	155
5.5 Mean tissue contents (% dry weight) and N:P ratios	159
5.6 Mean photosynthesis of three functional groups of algae	161
5.7 Mean daily growth of three functional groups of algae	164
5.8 Mean of tissue contents and N:P ratios	168
5.9 Seasonal response-surfaces of mean daily growth	172
5.10 Difference between predicted and observed mean daily growth	173
5.11 Cumulative uptake of water-column P and N by drift algae	175
5.12 Cumulative uptake of water-column P and N by rhizophytic algae	176
5.13 Mean photosynthesis of two functional groups of algae	180
5.14 Mean daily growth of two functional groups of algae	184
5.15 Mean tissue nutrient contents (in % dry wt) and N:P ratios	188
5.16 Land use in the Biscayne Bay watershed	194
5.A1 Spatial interpolation using Inverse Distance Weighting	203
5.A2 Spatial interpolation of mean monthly water-column phosphates	206
5.A3 Spatial interpolation of mean monthly water-column inorganic N	207
5.A4 Spatial interpolation of mean monthly water-column nitrates	208
5.A5 Spatial interpolation of mean monthly water-column ammonia	209
5.A6 The variation around the mean monthly water-column phosphates	210
5.A7 The variation around the mean monthly water-column inorganic N	211
6.1 Schematic of the two experiments at the Bear Cut study site	219
6.2 Design of a flume used to measure transport speeds	222
6.3 Median incoming and outgoing tidal flows over 24 hrs	226
6.4 Biscayne Bay bathymetry, with depths in centimeters	227
6.5 Mean sediment depths (cm) in Biscayne Bay	228
6.6 Mean biomass of drift algae transported by tidal currents	231
6.7 Tidal flow velocities measured at the Bear Cut study site	234
6.8 Mean dissolution of carpenters chalk blocks over 24 hours	235
6.9 Results from Experiment Two	237

6.10 Mean drift transport rates under increasing flow velocities	239
6.11 Mean tidal flows and maximum flows at study sites	241
6.12 Mean dissolution of carpenters chalk blocks over 48 hours	243
6.13 Frequency of drift algae covering fixed quadrats	245
6.14 Diagram of two state model of drift dynamics	246
6.15 Transition probabilities at six sites in Biscayne Bay	247
6.16 Schematic showing source-sink relationships for drifting macroalgae	251
7.1 Conceptual model for the three functional groups simulated	263
7.2 Response functions of three functional groups of algae	272
7.3 Plots of simulated vs. observed biomass at two sites	274
7.4 Observed vs. Predicted plots of model output for the three locations	278
7.5 Relative change (percent) in environmental response-functions	288
8.1 Summary of important abiotic factors influencing the spatial distribution	317
A2.1 Common representatives of the rhizophytic algae	366
A2.2 Some representatives of the drift algae	367
A2.3 Some representative of seagrass epiphytes	368

## INDEX OF TABLES

2.1 Species composition of algal samples	31
2.2 Results of Principle Components Analysis	33
2.3 MANOVA on the PCA-reduced species set	33
2.4 Linear regressions of wet:dry and dry:ash-free dry weights	37
2.5a Two-way Sheirer-Ray-Hare tests on biomass	39
2.5b Tukey's post-hoc comparisons of significant results	39
2.6 ANCOVA on the three regression equations	48
2.7 Results of separate Wilcoxon rank-sum tests	50
3.1 Locations of sites from three sampling programs	68
3.2 Two-way ANOVA of noon-time light levels	76
3.3 $P_{\max}$ and $I_k$ values for winter and summer for P-I curves	78
3.4 Non-parametric Kruskal-Wallis tests on mean daily light levels	84
3.5 Non-parametric Kruskal-Wallis tests on growth rates	87
3.6 Non-parametric Kruskal-Wallis tests on photosynthesis	87
4.1 Abiotic conditions in the static salinity experiments	105
4.2a Two-way Sheirer-Ray-Hare tests on photosynthesis	112
4.2b Tukey's post-hoc comparisons of significant results	113
4.3a Two-way Sheirer-Ray-Hare tests on growth	115
4.3b Tukey's post-hoc comparisons of significant results	116
4.4 Health index for rhizophytic algae	117
4.5 Categorical tests of final health	119
4.6a Two-way ANOVAs on photosynthesis by location and salinity	123
4.6b Two-way ANOVA on growth by location and salinity	124
4.6c Categorical test on final health in <i>Penicillus</i>	124
4.7 Two-way ANOVA on growth by pulse duration and salinity	127
5.1a Two-way ANOVAs on water-column nutrient concentrations	156
5.1b Tukey's post-hoc comparisons, on the significant interaction effects	157
5.2 Results of t-tests on nutrient content and N:P ratios	160
5.3a Two-way ANOVAs on photosynthesis	162

5.3b Tukey's post-hoc comparisons of significant results	163
5.4a Two-way ANOVAs on growth	165
5.4b Tukey's post-hoc comparisons of significant results	166
5.5 Separate one-way ANOVAs on tissue nutrient content	169
5.6a Mean uptake ( $\mu\text{M day}^{-1}$ ) of water-column N and P	177
5.6b Two-way ANOVAs on 3-day mean uptake rate by nutrient added	178
5.7a Two-way Sheirer-Ray-Hare tests on photosynthesis	181
5.7b Tukey's post-hoc comparisons for significant results	182
5.8a Two-way Sheirer-Ray-Hare tests on growth	185
5.8b Tukey's post-hoc comparisons for significant results	186
5.9a Separate two-way ANOVAs on tissue nutrient contents	189
5.9b Tukey's post-hoc comparisons for significant results	190
6.1 Generic composition of drift algae coming through Bear Cut	231
6.2 Two-way ANOVAs of algal biomass by month and tide	232
6.3 Biomass of drift algae calculated coming through Bear Cut	232
6.4 One-way ANOVA of flows by pylon	235
6.5 Repeated measures ANOVA on persistence of drift biomass	238
6.6 Characteristics of seagrass habitats over which the flume was used	239
6.7 Sheirer-Ray-Hare test on drift transport rates	240
6.8 Non-parametric Kruskal-Wallis tests on mean flows by site	242
6.9 t-test results on in vs. outgoing flow velocities	242
6.10 Two-way ANOVA of chalk block dissolution by site and season	243
6.11 Mean monthly transition probabilities for a two phase model	246
7.1 Parameter values for environmental forcing functions	267
7.2 Summary validation statistics and linear regression statistics	280
7.3 For the oceanic model, % change in four statistics	283
7.4 For the canal model, % change in four statistics	284
7.A1 Range of water column nutrient concentrations	299
7.A2 Maximum and average biomass values of the three functional groups	300
7.A3 Range or maximum, and average growth rates	302
7.A4 Light saturation values from P-I curves	304
7.A5 Temperature ranges and optima	305
7.A6 Salinity ranges and optima	306
7.A7 Monod saturation coefficients	307