

Final Report Executive Summary

Period Covered by the Report: October 2001-September 2003

Date of Report: September, 2004

Title: Evaluating trophic processes as indicators of anthropogenic eutrophication in coastal ecosystems: an exploratory analyses

Investigators: Just Cebrian (DISL)

Institution: Dauphin Island Sea Lab

Research Category: SGER

Project Period: 10/2001-09/2002 (non-cost extension granted till 09/2003)

Objective(s) of the Research Project: The proposal aims at investigating how the metabolism of coastal lagoons changes across a gradient in anthropogenic eutrophication. Metabolical balances are a key property of coastal lagoons because they determine how much primary production is transferred to higher trophic levels, the extent of trophic connectivity to adjacent systems (offshore fisheries), and whether the lagoons act as carbon and/or nutrient sinks or sources. Therefore, this project will increase our understanding of how the pervasive, world-wide problem of anthropogenic eutrophication may alter the ecological services offered by subtropical coastal lagoons, which are ubiquitous systems in our coasts. These goals are different from the initial goals sought with this proposal, and they represent the evolution of our ideas, reality-checks and a final refinement of the methodology used.

Summary of findings: The findings of this proposal are now being written up as one scientific manuscript and they represent one chapter of the Ph.D. dissertation by Jason P. Stutes, who is scheduled to defend in Summer 2005. The findings can be summarized as:

As human utilization of our coasts increases, detrimental effects such as loss of seagrasses can be seen in the surrounding ecosystems. Though many have examined primary production, biomass

and other indicators of ecosystem health, few have examined how human-induced seagrass loss may affect the metabolism of coastal communities by examining community level production and respiration over long temporal scales. To contribute to this question, we have compared community metabolism (using oxygen evolution in in-situ incubations) between three coastal lagoons that differ greatly in the extent of anthropogenic eutrophication and shoalgrass (*Halodule wrightii*): a pristine lagoon, with 70% of bottom covered by shoalgrass, a moderately impacted lagoon, with 10% of bottom covered by shoalgrass, and a highly impacted lagoon, with no shoalgrass present. Our results demonstrate that, regardless of the coastal lagoon considered, gross community production tends to be higher for shoalgrass beds than for bare sediment (i.e., mostly populated by benthic microalgae), but for net community production (i.e., the difference between community gross primary production and respiration) differences between community types become smaller and eventually nonexistent as eutrophication increases. Hence, the results indicate that shoalgrass loss and replacement by microphytobenthic communities in coastal lagoons due to increasing eutrophication may depress the magnitude of primary production (i.e., total incorporation of CO₂ into producer biomass) in the lagoon, but not the excess of production over respiration (net community production) and thus the quantity of carbon susceptible to burial or export.

Publications/presentations:

Publications:

Stutes, J. P., J. Cebrian, A. L. Stutes, A. Hunter and A. A. Corcoran. 2004. Changes in benthic community metabolism of coastal lagoons across a gradient in shoalgrass abundance. In preparation (to be submitted in Spring 2005)

Presentations:

Oral Presentations:

Stutes, J. P. and J. Cebrian. Effects of epiphyte grazing on the productivity of epiphytes and seagrass host. 16th Biennial Conference of the Estuarine Research Federation, November 2001, St. Pete (Florida).

Stutes, J. P. and J. Cebrian. The effects of grazing on seagrass epiphytes across a latitudinal gradient. 4th Annual Graduate Student Symposium, January 2002, Ocean Springs, Mississippi.

Stutes, J. P. , A. L. Stutes, A. Hunter, A. Corcoran and J. Cebrian. Comparing community production dynamics between seagrass dominated benthos and bare sediment in a pristine and impacted coastal lagoons in NW Florida. 33rd Annual Marine Benthic Ecology Meeting. Mobile, Alabama. March 25-28, 2004.

Posters:

Stutes, J. P., S. Sari and J. Cebrian. The effects of grazing on seagrass epiphytes in the Baltic Sea: a comparison across latitudinal and nutrient gradients. 31st Annual Marine Benthic Ecology Meeting, March 2002, Orlando (Florida).

Stutes, J. P., A. L. Stutes, A. Hunter, A. Corcoran and J. Cebrian. Examining the response of coastal ecosystems to human impacts: Comparing community production dynamics between seagrass dominated benthos and bare sediment in a pristine and impacted site in NW Florida. 17th Biennial Conference of the Estuarine Research Federation, Seattle, Washington. September 14-18, 2003.

Supplemental keywords:

benthic microalgae, shoalgrass (*Halodule wrightii*), metabolism, gross primary production, respiration, eutrophication, seagrass loss

Relevant web sites:

<http://ecosystemslab.disl.org>

<http://www.disl.org>