

## **Annual Report Summary**

**Period Covered by the Report:** June 2001 to March 2002

**Date of Report:** 1 April 2001

**Title:** The influence of shallow water hydrodynamics on the importance of seagrass detritus in estuarine food webs

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**Institution:** University of South Alabama

**Research Category:** Small Grant for Exploratory Research (SGER)

**Project Period:** 1 June 2001 to 1 June 2002

### **Objective(s) of the Research Project:**

The objectives of this ongoing study are as follows:

- To identify and characterize the hydrodynamic conditions that control the export of *Thalassia testudinum* and *Halodule wrightii* detritus from source beds and their subsequent deposition in nearby unvegetated areas.
- To determine the persistence time of these small patches of accumulated *Thalassia testudinum* and *Halodule wrightii* under natural conditions.
- To estimate the amount of *Thalassia testudinum* and *Halodule wrightii* detrital export from source beds in Perdido Bay.
- To determine the degree to which the shallow water benthic community of Perdido Bay is controlled by small-scale accumulations of *Thalassia testudinum* and *Halodule wrightii*.

The size and persistence of accumulations of seagrass detritus, and the size of the detritus fragments within them, probably limits the number of species using seagrass detritus as shelter, and/or food. Thus, the flow regime should control the utilization of accumulations of seagrass detritus by controlling the transport, deposition and persistence of detrital patches. If true, then hydrodynamic processes, coupled with bottom topography, will likely control the productivity of the detrital patches and the flow of energy to higher order consumers in coastal waters. This study uses both laboratory studies and field experimentation to elucidate the role of hydrodynamics in controlling the flow of energy from seagrass detritus to higher order consumers in Perdido Bay. In the laboratory, predictive criteria are being developed to understand the role of hydrodynamic processes in controlling the spatial distribution of seagrass detritus accumulations in a shallow water seagrass-sand flat mosaic. In the field, the realism of these predictions, the degree to which benthic topography and hydrography interact to create and sustain accumulations, and the use of seagrass detritus by benthic organisms are being tested.

### **Progress Summary/Accomplishments:**

The first objective of this study listed above, "To identify and characterize the hydrodynamic conditions that control the export of *Thalassia testudinum* and *Halodule wrightii* detritus from source beds and subsequent deposition in nearby unvegetated areas" is nearing completion. We have completed the laboratory (flume) experiments and are currently developing the predictive criteria that will be used to understand the role of hydrodynamic processes in controlling the spatial distribution of seagrass detritus accumulations in a shallow water seagrass-sand flat mosaic. The data collected during these experiments is currently being analyzed, and we anticipate that this analysis will be completed within the next six weeks. The first series of field collections from within source beds and nearby small-scale detrital accumulations are also being processed. Upon the completion of the sample processing, these

field data will be compared with the flume results to determine the degree to which small scale hydrodynamics control the movement and distribution of seagrass detritus within the study area. This will also result in the development of predictive criteria which will allow coastal managers to better understand the impact of natural and anthropogenic changes in hydrodynamic conditions within and surrounding seagrass ecosystems.

The second objective of this study, “To determine the persistence time of these small patches of accumulated *Thalassia testudinum* and *Halodule wrightii* under natural conditions,” is also in progress. Preliminary results show that water depth and storm events can significantly shorten the persistence of most detrital accumulations but, under certain conditions patches can persist for several weeks. This indicates that patches at least occasionally persist long enough to be a source of food and/or shelter for organisms outside of living seagrass beds. Thus, these patches likely represent an important, and as yet unconsidered, direct link between seagrass beds and mud/sand flat habitats, and this linkage must be considered during the development and implementation of coastal management practices.

The third objective of this study, “To estimate the amount of *Thalassia testudinum* and *Halodule wrightii* detrital export from source beds in Perdido Bay,” is being met through field experiments which have been conducted approximately every six weeks since August 2001. In order to track seasonal changes in detrital seagrass export, these experiments will be continued until the end of August 2002. Due to intensity of the activities described above, samples collected during these experiments have been frozen for later processing. To date, it has only been possible to process some of the samples from the August 2001 and February 2002 experiments. However, a few things have become apparent during these experiments: 1) the sampling methods are effective, and appear to capture seasonal changes in detrital export, such as the winter seagrass die-off; 2) prevailing winds, even at low speeds, appear to have a large influence on the distribution of seagrass detritus within the study site; and 3) storm events appear to play an important role in seagrass detritus export and distribution.

The fourth objective of this study, “To determine the degree to which the shallow water benthic community of Perdido Bay is controlled by small-scale accumulations of *Thalassia testudinum* and *Halodule wrightii*”, will be completed within the next few months. A small initial set of samples was collected during 2001, and are currently being processed. Once processing is complete, a power analysis will be conducted to determine the appropriate sample size, and a final set of samples will be collected and processed. This data is expected to provide further support of the importance of detrital patches in coastal ecosystems.

#### **Publications/Presentations:**

No publications or presentations have yet arisen from this project. However, we anticipate the submission of the first manuscript, which will present the findings of the laboratory work, by August 2002. Preparation of this manuscript is currently in progress.

#### **Future Activities:**

This study was originally proposed to be conducted from April 2001 to April 2002. However, the project start-up was delayed as funds to conduct the study were not obligated until July 2001. As a result, data collection began in August 2001 and must continue through August 2002 in order to meet the study objectives.

To meet the first objective of this study, “To identify and characterize the hydrodynamic conditions that control the export of *Thalassia testudinum* and *Halodule wrightii* detritus from

source beds and subsequent deposition in nearby unvegetated areas,” several things must be finished. First, the data collected during the flume experiments is currently being analyzed, and we anticipate that this analysis will be completed soon. Second, the first series of field observations of ambient flow within source beds, and small-scale detrital accumulations is ongoing, and we anticipate completion by the end of this April. Finally, field data will be compared with the results from the flume studies to elucidate the role of hydrodynamics in controlling the movement and distribution of seagrass detritus within the study area. We also anticipate that a manuscript presenting our findings will be submitted for publication this fall.

To meet the second objective of this study, “To determine the persistence time of these small patches of accumulated *Thalassia testudinum* and *Halodule wrightii* under natural conditions,” a field experiment which is currently in progress must be finished. This experiment will end on 5 April 2002, and the data will be compiled by 8 April 2002.

To meet the third objective of this study, “To estimate the amount of *Thalassia testudinum* and *Halodule wrightii* detrital export from source beds in Perdido Bay,” field experiments which have been conducted approximately every six weeks since August 2001, will continue until the end of August 2002. Samples collected during experiments that have already been conducted have been frozen for processing as time permits. Since the sample processing is time-consuming, we anticipate that it will continue until December 2002.

To meet the fourth objective of this study, “To determine the degree to which the shallow water benthic community of Perdido Bay is controlled by small-scale accumulations of *Thalassia testudinum* and *Halodule wrightii*,” the final set of samples must be collected and processed. We anticipate that this objective will be completed by August 2002.

**Supplemental Keywords:** NA

**Relevant Web Sites:** NA

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### **Disclaimer**

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