DATE: September 7, 2004

TO: Pamela B. Whitlock, Director, Office of Research Administration

FROM: Michael Durako, Principal Investigator, UNCW/CMSR

RE: Final Progress Report -- UNCW #5-50113

Reporting Period: April 1, 2003 - March 31, 2004

Project Title: Florida Bay Fish-Habitat Assessment Program (FHAP)

Enclosed is a DVD-R of FHAP data, publications and reports which comprise the Final Progress Report for the FHAP Project extension.

Upon review and approval, please forward to:

Dr. Michael B. Robblee
USGS Project Officer
U. S. Geological Survey
Florida Caribbean Science Center
7920 N.W. 71st Street
Gainesville, FL 32653
(305)348-1269

Thank you for your continuing assistance!

cc 1 memo/1 report: Steve Mastro,UNCW/CMSR Grants Office

Florida Bay Fish Habitat Assessment Program
FY 03/04 Final Progress Report
(April 1, 2003- March 31, 2004)
UNCW 5-50113

Report Submitted by:
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Field Activity

1. Conducted Fall 2003 sampling during October 9-20, 2003. Braun-Blanquet and physical data were collected.

2. Submersible Diving-PAM settings were calibrated and tested in preparation for Spring FHAP 2004 sampling.

Laboratory Activity

1. Braun-Blanquet data from Fall 2003 sampling were entered into spreadsheets (see DVD).

2. Spring 2003 Braun-blanquet data for *Thalassia* and *Halodule* were averaged, krigged, and mapped using Surfer 8 software (see DVD 2003\Spring\jpeg maps). Change maps comparing distribution and abundance in Spring 2003 compared with Spring 1995 were also generated using the grid math option in Surfer (see DVD 2003\Spring\jpeg maps).

3. Total relative abundances for *Thalassia testudinum* and *Halodule wrightii* were calculated for Spring 2003 sample data (see DVD Synthesis\spreadsheets) and compared with previous years. Both *Thalassia* and *Halodule* abundances exhibited little change between 2002 and 2003; abundances for both species were still lower than for the peak years of 1998-2000.

4. Physical data from Spring 2003 and Fall 2003 sampling were entered into spreadsheets (see DVD 2003\Spring\Physical and 2003\Fall\Physical).

5. Physical and Braun-Blanquet data for the Springs 1995, 1997, 1999, 2001, 2002 and 2003 entered into ArcGIS for comparative and spatial analysis of macroalgae and seagrasses (see attached ppt page).

6. Dr. Marnie Campbell completed entering the epiphyte dry weight data from the Spring 2003 sampling, statistically analyzed the data and began to write up the results for publication (see DVD 2003\Spring\epiphyes).

Research Output and Products

Publications

1. Fourqurean, JW, Boyer, JN, Durako, MJ, Hefty, LN, Peterson, BJ. 2003. Forecasting responses of seagrass distributions to changing water quality using monitoring data. Ecological Applications. 13(2): 474-489.

2. Hackney, J. W. and M. J. Durako. 2004. Size-frequency patterns in morphometric characteristics of the seagrass *Thalassia testudinum* reflect environmental variability. Ecological Indicators 4: 55-71.

3. Hackney, J. W. and M. J. Durako. In Press. Landscape-scale variability in structural indicators of ecological condition in the seagrass *Thalassia testudinum*. Steve Bortone (ed.) Estuarine Indicators, CRC Press, Boca Raton, FL

4. Hackney, J. W. and M. J. Durako. In revision. Morphometric and allometric relationships in the seagrass *Thalassia testudinum* in a subtropical lagoon, Florida Bay, USA. Aquatic Botany.

Oral Presentations

1. Landscape-scale approaches to the assessment of seagrasses in a perturbed subtropical ecosystem. Durako, M.J., Hall, M.O., Merello, M. 17th International Conference of the Estuarine Research Federation, Sept. 14-18, 2003, Seattle, WA. (See attached abstract)

2. Changes in the Distribution of macroalgae in Florida Bay from 1995-2002. Landry J.B. and M. J. Durako. S.E. Phycological Colloquy, Oct. 24-26, 2003, Duke Marine Lab.

3. Florida Bay seagrass seed and seedling responses to salinity variation. Kahn, A.E. and M. J. Durako. S.E. Phycological Colloquy, Oct. 24-26, 2003, Duke Marine Lab.

4. A hierarchical statistical approach to the evaluation of seagrasss ecoindicators. Hackney, J. W. and M. J. Durako. Estuarine Indicators Workshop, Oct. 29-31, 2003, Sanibel, FL. (see attached abstract)

LANDSCAPE-SCALE APPROACHES TO THE ASSESSMENT OF SEAGRASSES IN A PERTURBED SUBTROPICAL ECOSYSTEM

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Following the die-off of seagrasses and subsequent ecological perturbations, there has been increasing concern regarding changes in seagrass distribution and abundance in Florida Bay. This concern has recently become more focused, in the context of proposed changes to hydrodynamic conditions within the Bay, associated with the Comprehensive Everglades Restoration Program (CERP). The Fish Habitat Assessment Program (FHAP) was initiated to assess spatial and temporal variability in seagrass and macroalgal communities within the Bay and to assess the effects of water management alterations on these communities. FHAP is based on an unbiased, hierarchical (shoot-to-landscape) sampling approach, combining shoot-specific morphometric and physiological characteristics with area-based abundance estimates. Using a rapid visual abundance-assessment technique in combination with PAM-fluorometry, presence, abundance, and condition are determined at a large number of sites. Spatial patterns, and changes in patterns, are estimated using the geostatistical gridding method of kriging. Volume-slicing and grid-subtraction have allowed tracking of spatially-explicit patterns of seagrass change, since 1995. In this presentation, we will focus on how FHAP data have demonstrated that abundance and condition are affected by both environmental factors and stochastic events.

SPS-26
Oral
Durako, M. J.

A hierarchical statistical approach to the evaluation of seagrass ecoindicators

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Seagrasses are a dominant component of many shallow, low-energy coastlines. Because they are benthic, frequently long-lived, and require relatively good optical water quality to persist, seagrasses are frequently used as ecoindicators by coastal managers. Recent seagrass die-offs have led to increased efforts to develop specific metrics of seagrass condition in order to assess their health and the health of their associated ecosystems. The seagrass *Thalassia testudinum* is the dominant biological component of Florida Bay, a perturbed subtropical estuary that is currently undergoing extensive management as part of the Comprehensive Everglades Restoration Program (CERP). The distribution, abundance, and condition of *Thalassia* is being used as an indicator of the ecological health of Florida Bay. As part of the Florida Bay Fish Habitat Assessment Program (FHAP), a suite of morphometric and biomass characteristics of *Thalassia* were evaluated for their potential as ecoindicators, using a hierarchical statistical approach. First, temporal and spatial patterns of variability were compared at two spatial scales (basin and bay) and between two sample years (1998 and 1999) using ANOVA, Mann-Whitney Rank Sum tests or t-tests. Only mean leaf number shoot^{-1} exhibited a significant inter-annual difference at the larger bay scale. Several morphometric parameters exhibited significant variability among basins and consistently grouped together in Duncan's Multiple Range tests. Principal component analysis indicated similar basin groupings, thus, data from the ten sampled basins were pooled into four ecological zones. Differences among the four zones were assessed with a second series of one-way ANOVAs of the zone-pooled data. Zones were then grouped into similar subsets using Duncan's Multiple Range tests for each variable to confirm or refute the independent assortment of the zones suggested by the PCA results. The statistically-defined *Thalassia* structural zones exhibited high spatial coincidence with previously defined physical, chemical, biological and geological regions in Florida Bay. Thus, spatial heterogeneity in biomass and morphometric characteristics of *T. testudinum* reflects the existence of ecologically distinct regions in Florida Bay. The results also demonstrate that the morphology of *T. testudinum* is under significant control from the physical, geological and chemical environment of Florida Bay.