Final Report Executive Summary
ACES Project Summary: Part 1 Web Summary Report

Period Covered by the Report:	12/31/01 – 12/31/03
Date of Report:	12/31/03
EPA Agreement Number:	R827072-02
Title:	Role of Invasive Species in Shaping Plant-Animal Interactions in the Mobile Delta
Investigators:	Dr. Anne Boettcher, Dr. Timothy Sherman, and Dr. John Valentine
Institution:	University of South Alabama and Dauphin Island Sea Lab
Research Category:	Small Grant for Exploratory Research
Project Period:	06/01/00-12/31/03

Objectives of the Research Project:

Introduction of non-indigenous species (NIS) is recognized as one of the leading causes of loss in biodiversity, second only to habitat loss (Walker and Steffen 1997, Wilcove *et al*. 1998). However, the identification of factors that lead to the establishment and persistence of these invaders has remained elusive (Lodge *et al*. 1998). The Mobile-Tensaw River Delta, an area rich in species diversity, has not escaped the advance of invasive species. Previous studies have shown that, in certain areas, non-indigenous aquatic plants can dominate in terms of both frequency and biomass (Nelson 1999). However, the impacts of these species on native plant assemblages and on plant-animal interactions in this system have not been examined previously. This study and a companion study entitled, "Influence of Invasive Plant Species in Determining Diversity of Aquatic Vegetation in the Mobile-Tensaw River Delta" were designed to evaluate the role of introduced plant species in shaping plant-animal interactions and plant-plant interactions in an effort to elucidate the environmental impacts that NIS may have on the Delta system. The studies focused on NIS currently present in the system, with study sites located in waters surrounding Gravine Island, Baldwin County, AL. The primary objectives of the studies were to:

1. Develop a bio-inventory of native and non-indigenous aquatic plant species in the waters surrounding Gravine Island.
2. Develop a bio-inventory of the most common macroinvertebrates found on and around dominant native and introduced aquatic plants in the waters surrounding Gravine Island.
3. Gather data on physiological and growth parameters of dominant native and introduced aquatic plants.
4. Create a SQL relational database of plant spatial and temporal distribution and abiotic parameters for the study sites.

Summary of Findings:

<u>Research</u>
Data for the aquatic plant and macroinvertebrate bio-inventories have been collected and are being logged into the recently-created SQL database. The database will allow for rapid analyses of plant and animal abundance, diversity, and distribution. Preliminary analyses of plant distribution and abundance reveal several patterns. As expected, plant abundance follows seasonal changes in temperature, with peak abundance occurring during the summer season, decreasing with decreasing temperatures. During the first year of sampling the most common

NIS were *Alternathera philoxeroides* (alligator weed), *Eichhornia crassippes* (water hyacinth), and *Hydrilla verticillata* (Hydrilla). Interestingly, during the second year and third summer of sampling, *H. verticillata* was the dominant NIS and *E. crassipes* was rarely detected. There were similar shifts in native species abundance. During the first year, *Zizaniopsis miliacea* (cut grass), *Potamogeton nodosus* (longleaf pondweed), and *Najas guadalupensis* (bushy pondweed) were dominant species at specific sites, but there was no common pattern across sites. However, during the second year and third summer, the dominant natives across sites were *Z. miliacea*, *N. guadalupensis*, and *Ceratophyllum demersum* (coontail).

Preliminary analyses of macroinvertebrate assemblages indicate that gammarid amphipods, small portunid crabs, bivalves in the family Dreissenidae, gastropods in the families Neritinidae, Lymnaeidae and Planorbidae, damselfly larvae in the family Coenagrionidae, caddisfly larvae in the family Polycentropodidae, and adult coleopteran beetles are common. The results suggest that both invasive and native plant species serve primarily and equally well as habitat for these macroinvertebrates. However, there are differences in the macroinvertebrate distributions among sites. Based on the presence of indicator organisms including members of the orders Ephemeroptera, Plecoptera, and Trichoptera (otherwise known as EPT) the differences in distribution are thought to be associated with differences in water chemistry.

Literature Cited

Lodge, D.M., R.A. Stein, K. M. Brown, A.P. Covich, C. Bronmark, J.E. Garvey, and S.P. Klosiewski. 1998. Predicting impact of freshwater exotic species on native biodiversity: challenges in spatial scaling. *Australian Journal of Ecology.* 23: 53-67.

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Walker, B. and Steffen, W. 1997. An overview of the implication of global change for natural and managed terrestrial ecosystems. *Conservation Ecology [online]*, 1, URL: http://www.consecol.org/vol1/iss2/art2

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Zolczynski, J. and R. Shearer. 1997. Mobile Delta submersed aquatic vegetation survey 1994. *Report to Department of Conservation and Natural Resources*, January 1997.

Education

Several undergraduates (Lonnie Driskell, Matthew Dawson, Darren Barrett, Anna Penton, Stanislaus Arbaczauskas, Heather Norman, Adrienne Berg, and Savvas Michaelades) have been supported by and/or have conducted directed research projects associated with this project. This has provided these students hands-on research experience in both the laboratory and the field. One of the undergraduates supported in the first year of funding, Anna Penton, joined us as a graduate student. Her research focuses on the factors influencing the macroinvertebrate distributions, however, she has assisted with all components of the research and is currently working with the database. A second student, Stan Arabaczauskas, is using the research skills he gained in his job as an environmental consultant. Two graduate students from the Department of Computer and Information Science help us to create the SQL database.

Publications/Presentations:

Penton, A., J. Valentine, J. McClintock, C. Amsler, T. Sherman, and A. Boettcher. 2002. Role of invasive species in shaping plant-animal interactions in the delta. Oral presentation,

ACES Scientific Advisory Committee Meeting. Dauphin Island Sea Lab, Dauphin Island, AL. May 2002.

Supplemental Keywords:

Estuary, ecology, ecological effects, indicators, habitat, surveys, south central

Relevant Websites:

http://aquatl.ifas.ufl.edu/
http://www.invasivespecies.gov/

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