ACES Project Summary

Period Covered by the Report:	6/01/00 – 12/31/01
Date of Report:	4/01/02
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:	06/01/00-12/31/02

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 previously been examined. The current study was 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 study 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 study 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.

Progress Summary/Accomplishments:

<u>Research</u>

Data collected in our first year of sampling indicate that 7 of the 21 dominant aquatic plant species that we have identified in the waters surrounding Gravine are NIS. The most common NIS are *Alternathera philoxeroides* (alligator weed), *Eichhornia crassippes* (water hyacinth), and *Hydrilla verticillata* (Hydrilla). At least one of these three species occurs at all nine of our sampling sites, with some sites having greater than 50% coverage of NIS. The pattern for native species is more variable. *Zizaniopsis miliacea* (cut grass), *Potamogeton nodosus* (longleaf pondweed), *Najas guadalupensis* (bushy pondweed), and *Nuphar luteum* (spatterdock) are dominant species at specific sites, but there is no common pattern across sites. This parallels results from an earlier study at Gravine conducted by Nelson (1999) and is consistent with a broader survey of submerged aquatic vegetation in the Mobile Delta (Zolczynski and Shearer 1997). 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 (Table 1). 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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Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. *Bioscience* 48: 607-615.

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, has joined us as a graduate student. Her research focuses on the factors influencing the macroinvertebrate distributions. A second student, Stan Arabaczauskas, is using the research skills he gained in his job as an environmental consultant.

Publications/Presentations: na

Future Activities:

Based on the results of the first year of study, which, as described above, indicated that the presence of invasive plant species did not have a significant impact on macroinvertebrate assemblages, our focus has turned to the impact of these NIS on plant diversity. Data is currently being gathered in both lab and field studies on the physiological and growth parameters of dominant native and introduced aquatic plant species from the waters surrounding Gravine Island. In addition, data on important environmental parameters including light, nutrient availability, and temperature are being collected in an effort to better understand differences in the responses of native and NIS species.

Supplemental Keywords:

Non-indigenous species, bio-inventory, aquatic plants

Relevant Websites:

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

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Table 1: Percent distribution of macroinvertebrates families found on plant samples from a representative site in waters surrounding Gravine Island, data for July 2000 sampling period.

Plant scientific name	**Plant common name**	**Macroinvertebrate family name**	**Total # found**	**% of each sample**
Eichhornia crassipes	water hyacinth	Chironomidae	85	15.3
		Coenagrionidae	1	0.2
		Culicidae	2	0.4
		Dreissenidae	13	2.3
		Gammaridae	33	5.9
		Hyalellidae	10	1.8
		Lymnaeidae	403	72.4
		Naucoridae	1	0.2
		Neritinidae	2	0.4
		Physidae	4	0.7
		Potamanthidae	1	0.2
		Staphylinidae	2	0.4
Potamogeton nodosus	Longleaf pondweed	Chironomidae	40	31.5
		Coenagrionidae	2	1.6
		Dreissenidae	37	29.1
		Neritinidae	2	1.6
		Unidentified eggs	20	15.7
Mixed sample: *Eichhornia crassipes* and *Potamogeton nodosus*	water hyacinth and longleaf pondweed	Belostomatidae	1	0.4
		Chironomidae	40	14.3
		Coenagrionidae	12	4.3
		Dreissenidae	35	12.5
		Gammaridae	7	2.5
		Hyalellidae	9	3.2
		Leptoceridae	1	0.4
		Libellulidae	1	0.4
		Lymnaeidae	149	53.2
		Naucoridae	3	1.1
		Neritinidae	5	1.8
		Physidae	4	1.4
		Unidentified eggs	13	4.6