

Studies of aquatic community structure and dynamics in the seasonally variable wetlands of southern Florida

The USGS Florida Caribbean Science Center's Restoration Ecology Branch staff at the Everglades National Park conducts integrated studies of the ecology of South Florida's wetland fauna in partnership with local agencies and universities. Understanding the wetland communities and their responses to the environment is critical to the scientific management and restoration of these imperiled systems.



Experimental cages in the Everglades

To reverse the trend in declining and changing biotic communities, a scientifically based restoration plan for the greater Everglades ecosystem is being developed. The restoration will restructure the physical and operational aspects of the Central & South Florida Project. Despite the attention focused on the Everglades, the structure and functioning of many components of the wetlands remain unclear. Through investigations at the species and community levels that are both site-specific and landscape-wide, this project attempts to understand short- and long-term responses of Everglades aquatic communities to natural and anthropogenic environmental changes. The mix of descriptive and experimental studies is designed to fill the data gaps that

limit restoration and management prospects.

Freshwater fishes and macro-invertebrates have been accepted as indicators of environmental change by the multi-agency groups responsible for guiding and measuring restoration success. The rationale is that small marsh animals are easy to sample with standard protocols, and their short-life spans and rapid turnover rates make them responsive to short- and long-term environmental changes. We use a process of empirical data collection and hypothesis-testing under field and laboratory conditions, and intermediate level "mesocosm" studies. Those data are used to build ecological simulation models of the community.

Results from the fish-community monitoring program have clearly demonstrated that a well-designed and consistently funded program can not only track the status and responses of the

community to anthropogenic and natural disturbances, but also can provide biological and ecological data to understand community dynamics. The system restoration will proceed using an adaptive-management strategy; therefore, aquatic-animal communities will continue to be monitored across the region to evaluate model output and help guide the restoration.

Studies conducted on Everglades wetland ecology advance the understanding of the ecological structure and function of this large, freshwater marsh system, but also have wider implications for comparison with other tropical and sub-tropical wetlands worldwide. Such systems have received little descriptive or experimental study, despite providing vital regional and local functions for water supply, wildlife and fishery habitat, etc. In view of the human activities that threaten to degrade many freshwater wetlands, it is critical to understand their ecological function and how that might be restored after damage has occurred. Lessons learned from this project in the Everglades may provide information, sampling guidelines, and models for other wetland systems.



Female Eastern Mosquitofish

Ongoing Research and Collaborations

Everglades Aquatic Ecology Studies

William F. Loftus., USGS BRD.

The scope of investigations requires the collaboration of many individuals with diverse expertise: Oron L. Bass, Walter Meshaka, and Sue Perry - Everglades National Park; Donald DeAngelis, USGS-BRD - University of Miami; Anne-Marie Eklund, NMFS - Southeast Fisheries Center; Mindy Nelson, University of Miami; Janet Reid, U. S. National Museum; and Joel C. Trexler, Florida International University.

Investigations focus on long-term community dynamics, responses to hydrology, and habitat relationships of fishes and invertebrates.

Life History, Ecology, and Interactions of Everglades Crayfishes in Response to Hydrological Restoration.

Noble Hendrix, Jr., and David Armstrong, University of Washington-Seattle; William F. Loftus, USGS BRD.

This study addresses the ecology and interactions of the Everglades crayfish (*Procambarus alleni*) and slough crayfish (*P. fallax*).

The Asian Swamp Eel: A Recent Invader in the Southeastern United States.

Leo G. Nico, James D. Williams, William F. Loftus, USGS BRD; and Joel C. Trexler, Florida International University.

We are investigating distribution, life-history, and ecology of a recently established, introduced fish.

Mercury Transfer Through an Everglades Aquatic Food Web.

William F. Loftus, USGS BRD; Joel C. Trexler and Ronald D. Jones, Florida International University.

This study focuses on mercury bioaccumulation in invertebrates and fishes related to trophic position and wetland conditions.

Experimental Studies of Predator and Prey Interactions.

Joel C. Trexler, Florida International University; William F. Loftus, USGS BRD; and Sue Perry, Everglades Na-

tional Park.

Mesocosm tanks are used to study biotic interactions that structure communities.

Population Structure and Spatial Delineation of Consumer Communities in the Everglades National Park.

Joel C. Trexler and Karen Kandl, Florida International University; William F. Loftus, USGS BRD.

Genetics and physical marking are used to estimate structure and dispersal in animal communities.

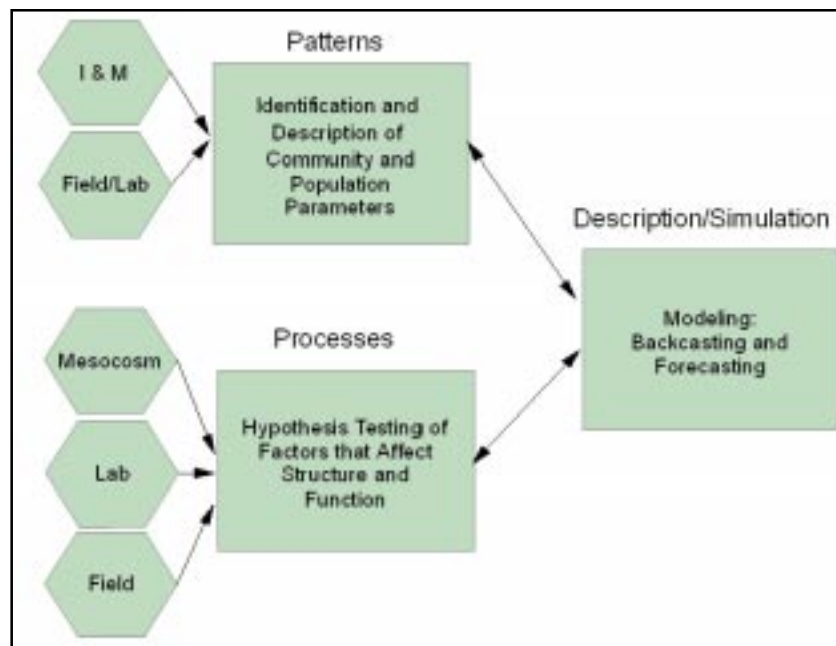
*Current Status of the Key Silverside, *Menidia conchorum*, in the Florida Keys.*

David O. Conover, State University of New York at Stony Brook; and William F. Loftus, USGS BRD.

This is a preliminary investigation of the current geographic distribution and status of *Menidia conchorum* in southern Florida, which has not been surveyed during the last 25 years. Hurricane Georges affected the entirety of its range, making a rapid survey important. A plan will be developed to evaluate and assess management options that will help maintain and enhance the key silverside population.

Acknowledgments

Funding for this research was provided in part by Department of Interior's South Florida Ecosystem Restoration Program's Critical Ecosystem Studies Initiative (Administered by Everglades Natl. Park), by the Florida Dept. of Environmental Protection and, in part, with base funds from USGS/BRD's Florida Caribbean Science Center.



Aquatic Ecology Program design