EPA-Alabama Center for Estuarine Studies Annual Report

Period Covered by Report: July 1, 2001 - June 30, 2002
Date of Report: May 3, 2002
Title: Natural Biogeochemical Tags of Striped Mullet, *Mugil cephalus*, Estuarine Nursery Areas in the North Central Gulf of Mexico
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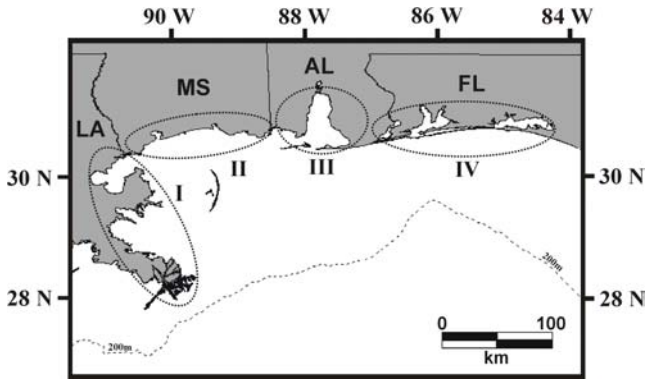
Research Category: EPA Science to Achieve Results: Small Grant for Exploratory Research
Project Period: July 1 2001 - December 31, 2002

Objectives of the Research Project:

The objective of this project is to develop natural tags of juvenile striped mullet, *Mugil cephalus*, (mullet) in the north central Gulf of Mexico (GOM) based on otolith elemental and isotopic signatures unique to their natal estuaries. We will collect juvenile mullet from estuaries locate in four areas of the north central GOM (Fig. 1) and develop natural tags of each area based on analysis of otolith chemical composition performed by high resolution-inductively coupled plasma-mass spectrometry (HR-ICP-MS) and isotope ratio-mass spectrometry (IR-MS). Previous studies have demonstrated drainage basins, hydrographic linkages, and water chemical composition are different among these four areas and similar within them. Therefore, we expect to find significant differences in the chemical signatures of juvenile mullet otoliths from different natal habitats in the north central GOM. In future studies, we will employ developed natural tags to estimate estuarine site fidelity of adult mullet, connectivity among north central GOM mullet populations, and estuarine-specific contribution to the offshore spawning stock in winter.

Figure 1. Estuarine systems to be sampled for juvenile mullet in spring 2001 and 2002.



Progress Summary/Accomplishments:

Juvenile mullet (n = 463) were collected in the north central GOM from late May through early July 2001 (Table 1). Preliminary analysis of otolith chemistry by HR-ICP-MS indicate concentrations of several elements are estimable at levels significantly higher than detection limits (e.g. B, Ba, Ca, K, Mg, Mn, Na, P, and Sr). Otolith concentrations of stable isotopes of Sr (^{86}Sr, ^{87}Sr, and ^{88}Sr) also appear to estimable with HR-ICP-MS.

Table 1. Sample sites and sample sizes of juvenile mullet collected in spring 2001.

Area	Sample Sites	Sample Sizes
I	10	159
II	8	116
III	6	77
IV	9	111

Publications/Presentations: none

Future Activities:

Currently, we are examining the otolith chemistry of juvenile mullet collected in spring 2001 with HR-ICP-MS. We also will begin examining otolith concentrations of stable isotopes of C, N, O, and S this spring/summer once the stable isotope laboratory at the University of Alabama Department of Geological Sciences comes online. Also in spring 2002, we will revisit estuarine sites sampled in 2001to collect juvenile mullet for interannual comparison of otolith elemental and isotopic chemistry.

Keywords: otolith, Mugil, HR-ICP-MS, IR-MS, estuarine, life-cycle analysis, ecology, north central Gulf of Mexico, SIC: 0912

Relevant Web Sites: none