

COP Annual Progress Report

Project Title:

SFERPM 2000: Past and Present Trophic Studies of Florida Bay.

Grantee:

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Award Period:

From September 16, 2000 to September 15, 2002.

Period Covered by this Report:

From May, 2001 to May, 2002.

Summary of Progress:

1. Work Accomplishments:

- a. Summary of progress and results obtained to date, and relationship to goals of the grant.

Multiple stable isotope analyses of biota collected from the interior of the bay during previous years of funding (1997-1999) illustrate a strong dependence on benthic production such as seagrasses, seagrass detritus, benthic algae and sedimentary organic matter. Specimens collected from stations moving toward the Gulf/Western region of the bay express increasing dependence on water-column production (see Figure 1, attached).

Preservation experiments were concluded in 2000-2001. These experiments were conducted by fixing (5% buffered formalin) and preserving (etoh) fish, and then evaluating the $\delta^{13}\text{C}$ of bone and $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ of muscle tissue at several time points over a 12-month period. Results are presented in Figures 2 and 3 (attached). For muscle tissue $\delta^{13}\text{C}$, all time points were significantly different from t_0 (control), and magnitude and direction of preservation were similar for both formalin and formalin+etoh. Offset was approx. 1 ‰ depletion for all specimens, total shift occurred relatively soon after preservation, and effect does not appear to increase over time, i.e. contrary to long-held assumptions about the confounding influence of formalin and ethanol on the $\delta^{13}\text{C}$ of muscle tissue, the effect of the preservative is discrete and predictable. Results for $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ were more variable, but time points were not statistically different from t_0 (control).

The Florida Museum of Natural History donated samples of fish collected from Florida Bay and Biscayne Bay from 1956-1966, and muscle tissue from these specimens was analyzed for $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$. Although museum specimens from the Gulf/Western region expressed more variability than current specimens, the basic trend and character of the Bay is relatively unchanged. Differences could be related to increased influence of water from Shark River Slough (eg, terrestrial, mangrove)

and more seagrass (*Thalassia testudinum*) coverage in this region in the 1950's to 1970's (Hall et al., 1999; Lorenz et al., 1999). Table 1 presents species-specific results by region.

- b. Summary of work to be performed during the next year of support, if changed from the original proposal and indication of any current problems or favorable or unusual developments.

During the remainder of the project we will focus on publication of results and obtaining additional museum specimens for analysis. Two manuscripts are in the final stages of preparation for submission:

Chasar, L.S., J.P. Chanton, C. Koenig and F. Coleman. 2002. A stable isotope approach to establishing the trophic status of historical fish specimens. In prep., for submission to Marine Ecology Progress Series.

Chasar, L.S., J.P. Chanton, C. Koenig and F. Coleman. 2002. Evaluating the possible impact of environmental disturbance on the trophic structure of Florida Bay: multiple stable isotope analyses of seagrasses, invertebrates and fishes. In prep., for submission to Estuaries.

One more manuscript will be prepared describing the results of the museum work. Additional historical specimens should be available from both FMRI and FMNH. Both collections have undergone facility moves over the last few years, resulting in restricted access to specimens identified in their databases as appropriate for our study (e.g., specimens not unpacked, not logged in, in some cases lost). We will revisit the collections over the summer, and will also be contacting other institutions about the possibility of access to additional collections. We will likely request a no cost time extension to complete this project.

2. Applications

- a. Publications, presentations, workshops:

A poster entitled "Past and Present Trophic Structure of Florida Bay" was presented at the last Florida Bay Meeting, and two publications have been prepared and will be submitted shortly (see above).

- b. Applications to management or research:

n/a

- c. Data or information products:

As described above, two publications and a poster presentation.

- d. Partnerships established :

n/a

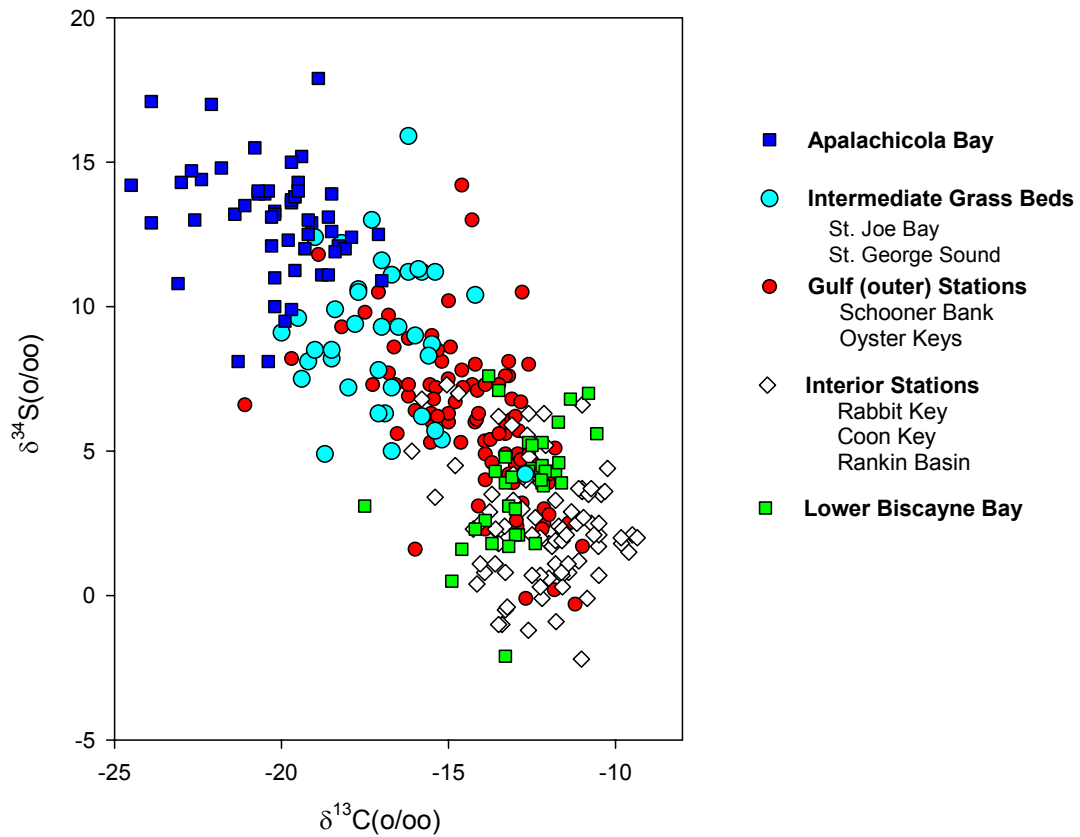


Figure 1. Summary comparison of consumer tissue $\delta^{13}\text{C}$ vs $\delta^{34}\text{S}$ for several Florida coastal ecosystems. Data illustrate the gradient in stable isotope values as trophic dependence increases from seagrass beds ($\delta^{13}\text{C}$ -enriched, $\delta^{34}\text{S}$ -depleted) to the water-column ($\delta^{13}\text{C}$ -depleted, $\delta^{34}\text{S}$ -enriched) (Chanton and Lewis 2002).

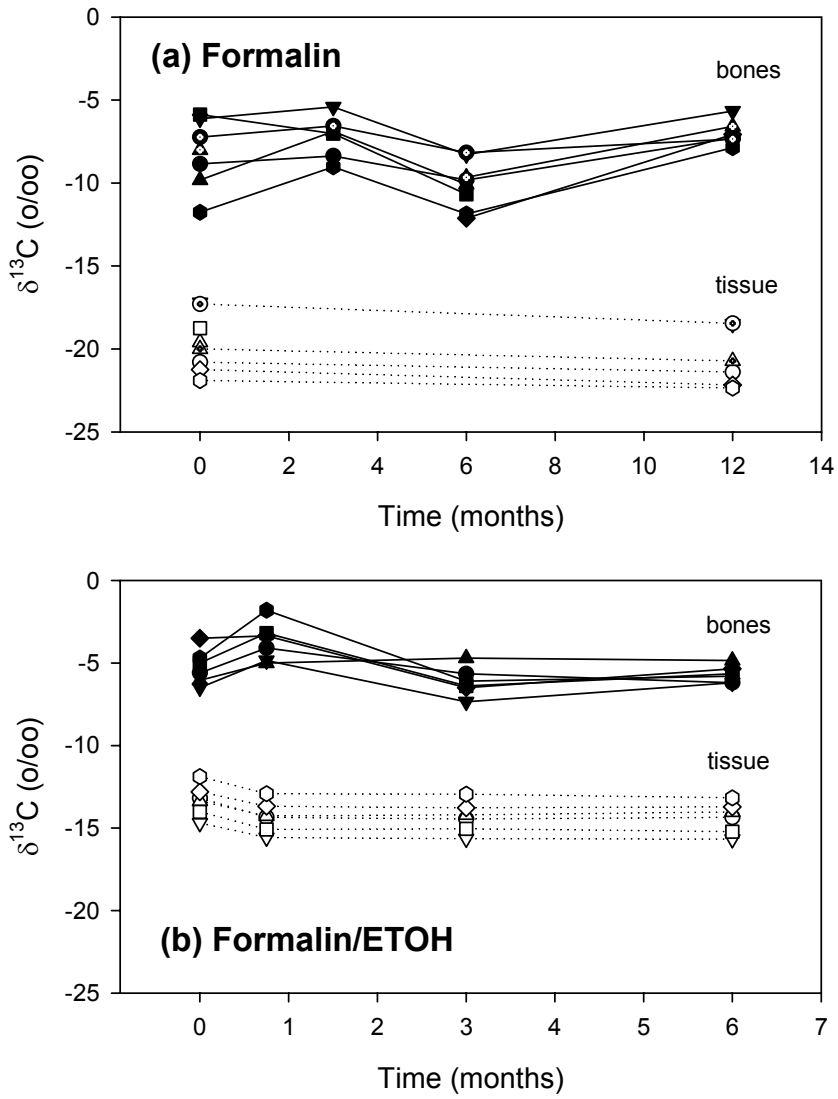


Figure 2. Time-series preservation experiments with both fish bone and tissue: (a) specimens preserved in formalin only; (b) specimens fixed briefly in formalin and then preserved in ethanol.

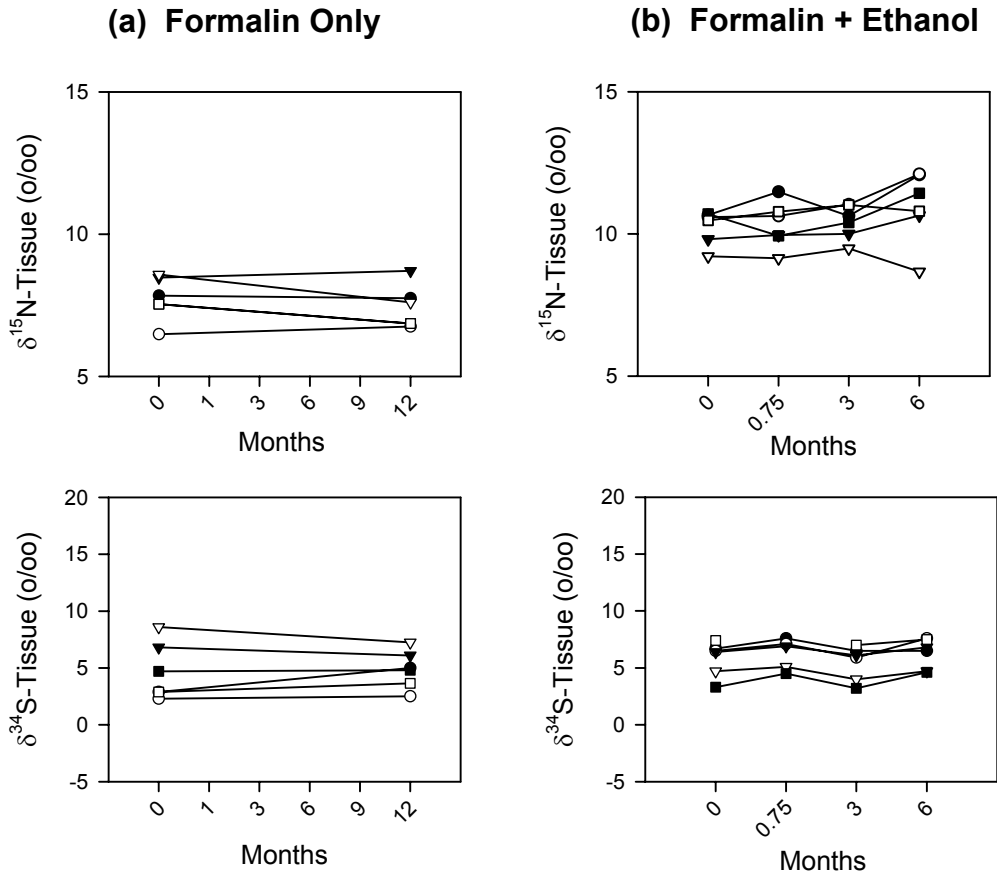
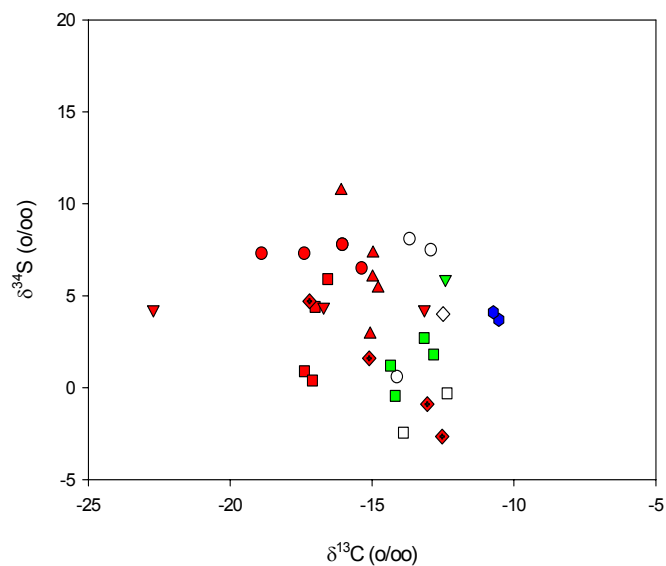


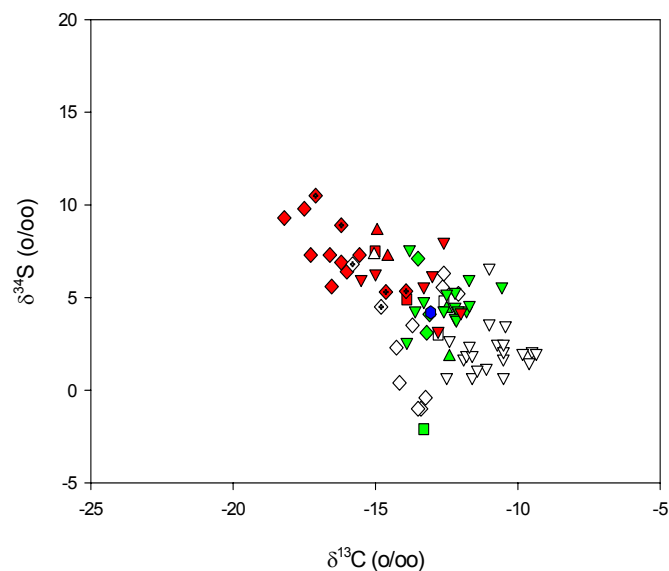
Figure 3. The effects of (a) formalin and (b) formalin fixation/ETOH preservation on the $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ of fish tissue (sp. *Mugil cephalus*).

Preserved Specimens - Florida Museum of Natural History
1956-1963



- | | |
|---|--|
| <i>Lagodon rhomboides</i>
◇ Joe Kemp | <i>Haemulon plumieri</i>
▲ E. Cape Sable, Sandy key |
| <i>Eucinostomus gula</i>
■ Sandy Key
□ Joe Kemp
■ Biscayne Bay | <i>Orthopristis chrysoptera</i>
◆ Sandy Key |
| <i>Bairdiella chrysoura</i>
● Sandy Key, Conchie Channel
○ Joe Kemp Key | <i>Lutjanus griseus</i>
▼ Sandy Key
▼ Biscayne Bay |
| | <i>Strongylura timucu</i>
● Plantation Key - Bay side |

Field Specimens - Florida Bay and Biscayne Bay
1997-1999



- | | |
|--|--|
| <i>Lagodon rhomboides</i>
◆ Schooner Bank, Oyster Key
◇ Rabbit Key, Coon Key, Rankin
◆ Biscayne bay | <i>Orthopristis chrysoptera</i>
◆ Schooner Bank, Oyster Key
◇ Rabbit Key, Coon Key, Rankin |
| <i>Eucinostomus gula</i>
■ Schooner Bank, Oyster Key
□ Rabbit Key, Coon Key, Rankin
■ Biscayne Bay | <i>Lutjanus griseus</i>
▼ Schooner Bank, Oyster Key
▼ Rabbit Key, Coon Key, Rankin
▼ Biscayne Bay |
| <i>Haemulon Plumieri</i>
▲ Schooner Bank, Oyster Key
△ Rabbit Key, Coon Key, Rankin
▲ Biscayne Bay | <i>Strongylura timucu</i>
● Plantation Key - Bay side |

Figure 4. Comparison of (a) preserved and (b) current fish specimens from Florida Bay. $\delta^{13}\text{C}$ for museum specimens is adjusted for preservation effects (+ 1 o/oo); all museum specimens were in ethanol, and collection dates ranged from 1956 to 1963.

Table 1. Comparison of carbon, nitrogen and sulfur stable isotope signatures by species and region for Museum vs. Current fish specimens.

Species		Museum		Current	
		(1956-1963)	s.d.	(1997-1999)	s.d.
<i>Eucinostomus gula</i>					
Gulf/Western	$\delta^{13}\text{C}$	-17	0.3	-14.4	0.8
	$\delta^{15}\text{N}$	12.5	0.4	12.3	0.1
	$\delta^{34}\text{S}$	2.9	2.7	6.2	1.8
Interior	$\delta^{13}\text{C}$	-13.1	1.1	-12.5	0.3
	$\delta^{15}\text{N}$	12	0.7	9.3	1.1
	$\delta^{34}\text{S}$	-1.4	1.5	3.9	1.2
Biscayne	$\delta^{13}\text{C}$	-13.6	0.7	-13.3	
	$\delta^{15}\text{N}$	12.7	0.7	10.5	
	$\delta^{34}\text{S}$	1.3	1.3	-2.1	
<i>Haemulon plumieri</i>					
Gulf/Western	$\delta^{13}\text{C}$	-15.2	0.6	-14.8	0.1
	$\delta^{15}\text{N}$	13	0.4	10.8	1.1
	$\delta^{34}\text{S}$	6.5	2.4	7.9	1
<i>Lagodon rhomboides</i>					
Interior	$\delta^{13}\text{C}$	-12.5		-13.3	0.6
	$\delta^{15}\text{N}$	11.9		8.9	0.7
	$\delta^{34}\text{S}$	4		1.5	1.7
<i>Lutjanus griseus</i>					
Gulf/Western	$\delta^{13}\text{C}$	-14.9	2.4	-13.4	1.2
	$\delta^{15}\text{N}$	12.8	0.1	10.1	1
	$\delta^{34}\text{S}$	4.3	0.1	5.6	1.5
Biscayne	$\delta^{13}\text{C}$	-12.4		-12.6	0.9
	$\delta^{15}\text{N}$	15.2		12.6	1
	$\delta^{34}\text{S}$	5.9		4.7	1.1
<i>Orthopristis chrysoptera</i>					
Gulf/Western	$\delta^{13}\text{C}$	-14.5	2.1	-15	2
	$\delta^{15}\text{N}$	12.1	1.3	10.5	0.5
	$\delta^{34}\text{S}$	0.7	3.2	7.5	2.2