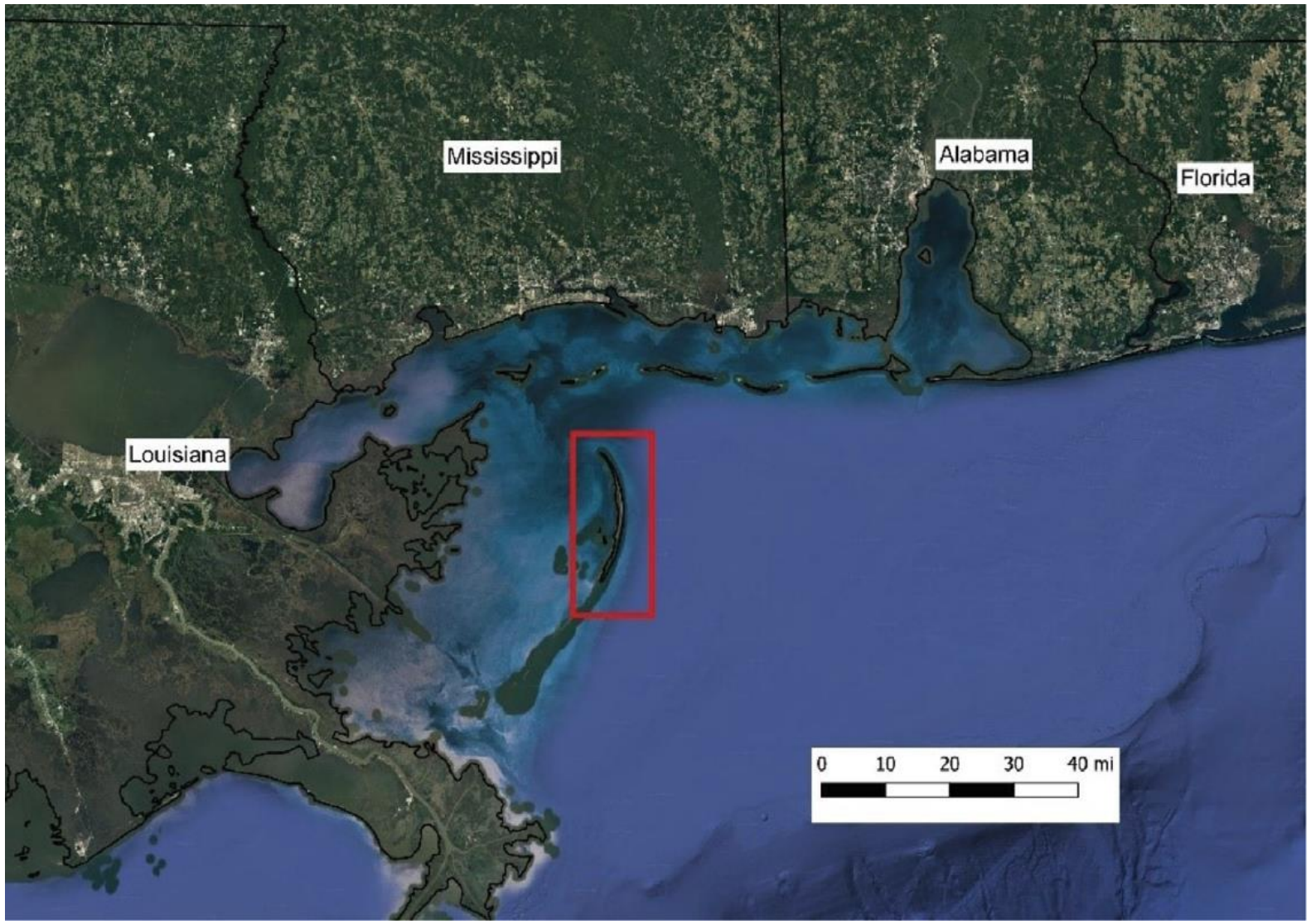
The role of seagrass at the Chandeleur Islands, LA as critical habitat for nearshore animals

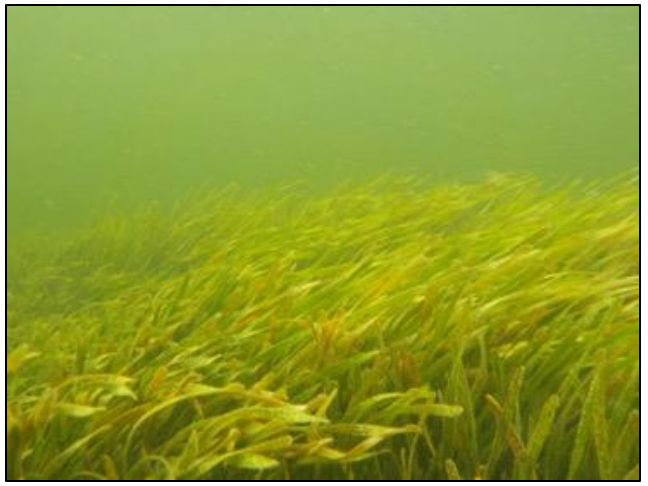
Kelly M. Darnell

The University of Southern Mississippi

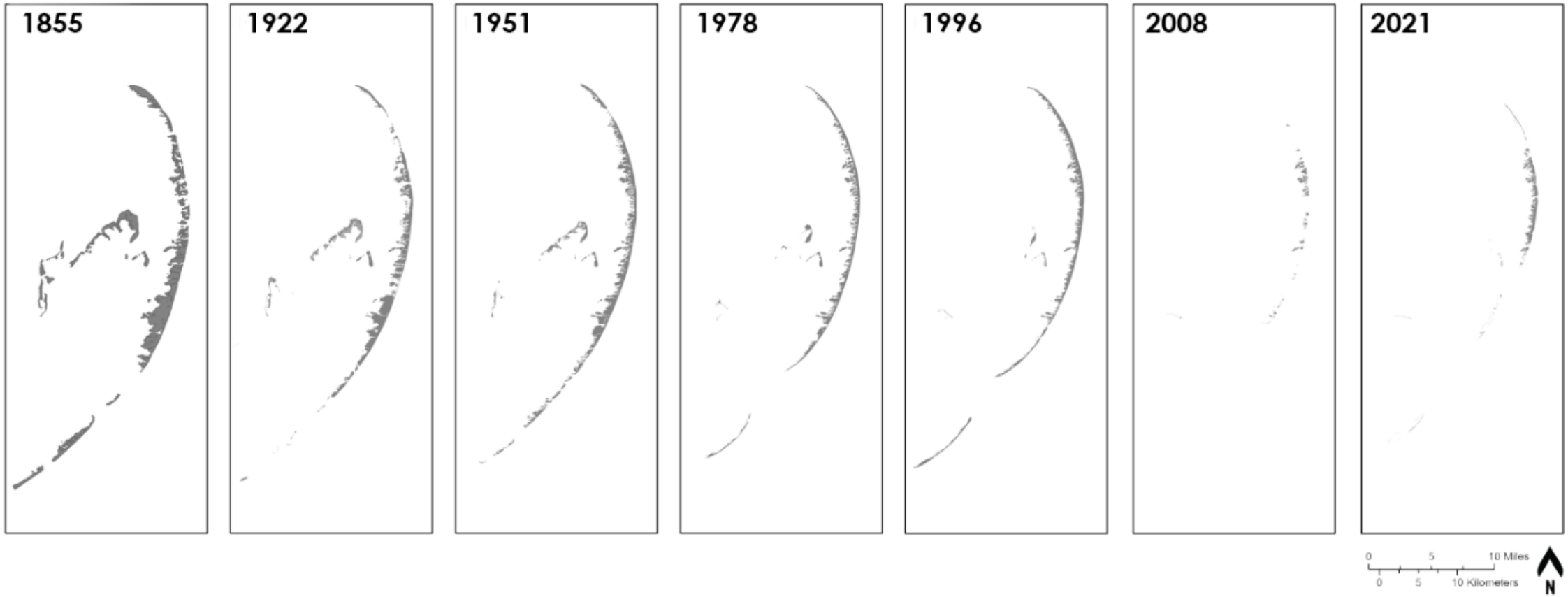
THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Chandeleur Islands, LA

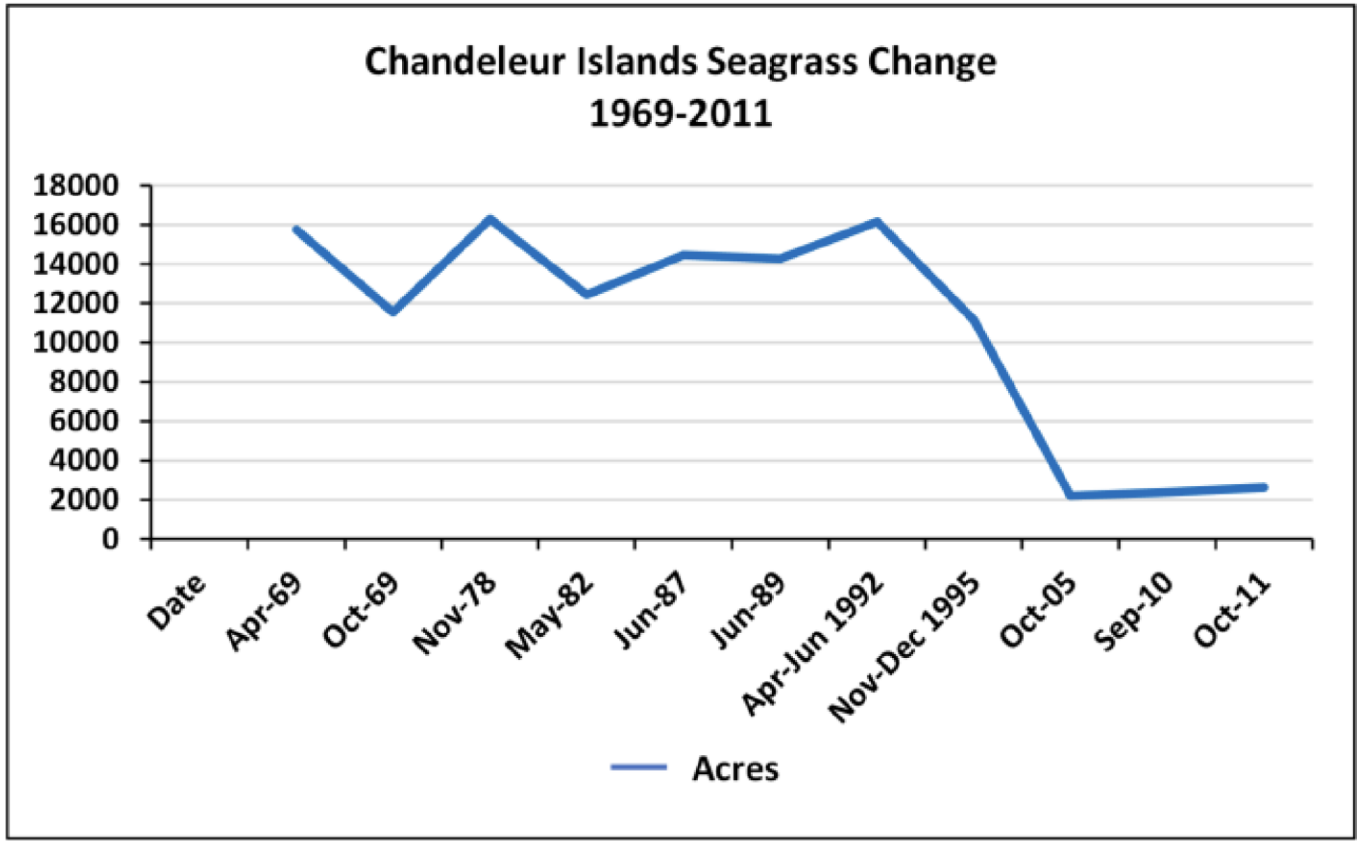




Northern Chandeleur Islands Shoreline Change 1855-2021



The Water Institute



Handley et al. 2020

Chandeleur Islands Restoration Project

Restoration Plan

CPRA is currently in the engineering and design phase of the Chandeleur Island Restoration Project, which will restore 13 miles of the barrier island chain. Once complete, the restoration will increase the overall, long-term resiliency and sustainability of these landmasses.

Included in the 2023 Coastal Master Plan and the Louisiana Wildlife Action Plan, the Chandeleur Islands Restoration Project will provide significant protection to several coastal communities through a whole ecosystem restoration approach.

Project goals include:

- Restore and conserve **bird** nesting and foraging habitat.
- Enhance **sea turtle** hatchling productivity while restoring and conserving nesting beach habitat.
- Restore and enhance **submerged aquatic vegetation** (seagrasses).
- Create, restore, and **enhance barrier islands.**

For more information: https://coastal.la.gov/chandeleur-island-restoration-project/ and **sessions #89 and #99**

Seagrass-supported productivity: historical and anecdotal data

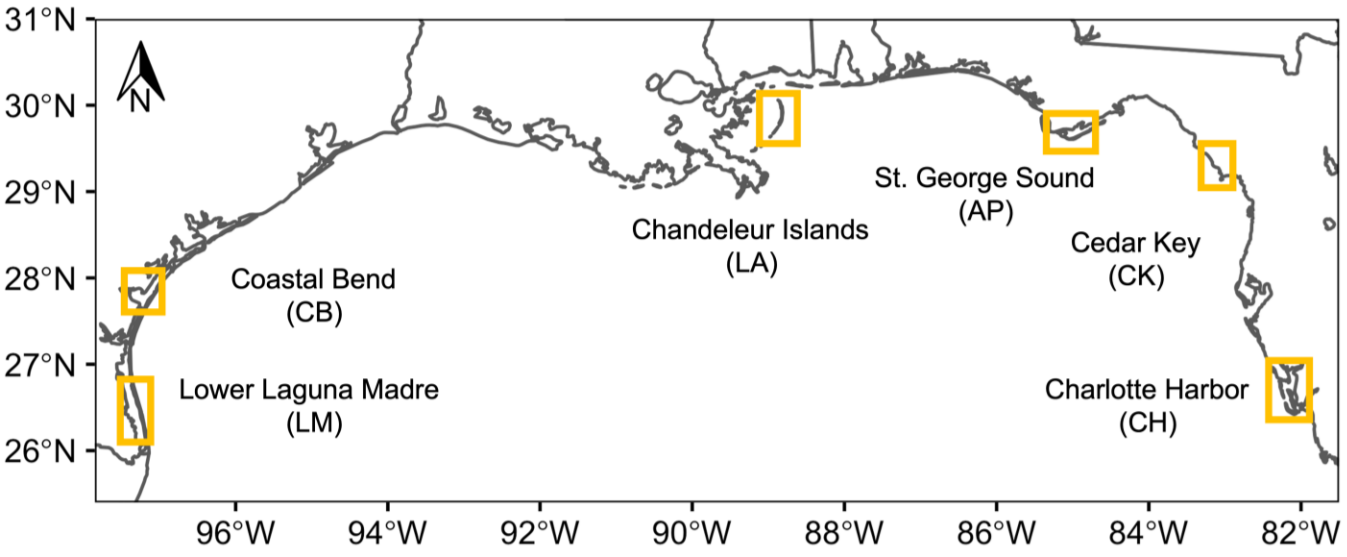
Chandeleurfishing.com

Literature review of seagrass habitat use at the Chandeleur Islands	
Survey and Reconnaissance of Sea Turtles in the Northern Gulf of Mexico	Ogren 1989
Winter biomass and nutrient values of three seagrass species as potential foods for redheads (Aythya americana Eyton) in Chandeleur Sound, Louisiana.	Michot and Chadwick 1994
Carrying capacity of seagrass beds predicted for redheads wintering in Chandeleur Sound	Michot 1997
Manatee Occurrence in the Northern Gulf of Mexico, West of Florida	Fertl et al 2005
Thesis presentation: Seagrass-associated fish and macroinvertebrate assemblages of the Chandeleur Islands, LA: habitat affinity, diel variation and responses to natural disturbance	Blanke 2006
Diurnal time-activity budgets of redheads (Aythya americana) wintering in seagrass beds and coastal ponds in Louisiana and Texas	Michot et al 2006
Food Habits of Redheads (Athya Americana) Wintering in Seagrass Beds of Coastal Louisiana and Texas, USA	Michot et al 2008
Response of barrier island fish assemblages to impacts from multiple hurricanes: assessing resilience of Chandeleur Island fish assemblages to Hurricanes Ivan (2004) and Katrina (2005)	Ellinwood 2008
Prey selection by young lemon sharks at Chandeleur Island nursery habitats with a comparison to three other co-occurring shark species	Davis 2010
Occurrence and genetic diversity of lemon sharks (Negaprion brevirostris) at a nursery ground at the Chandeleur Islands, Louisiana.	McKenzie 2013
Determinants of the nursery role of seagrass meadows in the sub-tropical Gulf of Mexico: inshore-offshore connectivity for snapper and grouper	Fodrie et al 2020

Investigating habitat use of turtlegrass

Objective: Quantify juvenile and adult nekton habitat use of turtlegrass, measured as abundance, biodiversity, age-class use, community structure, and biomass

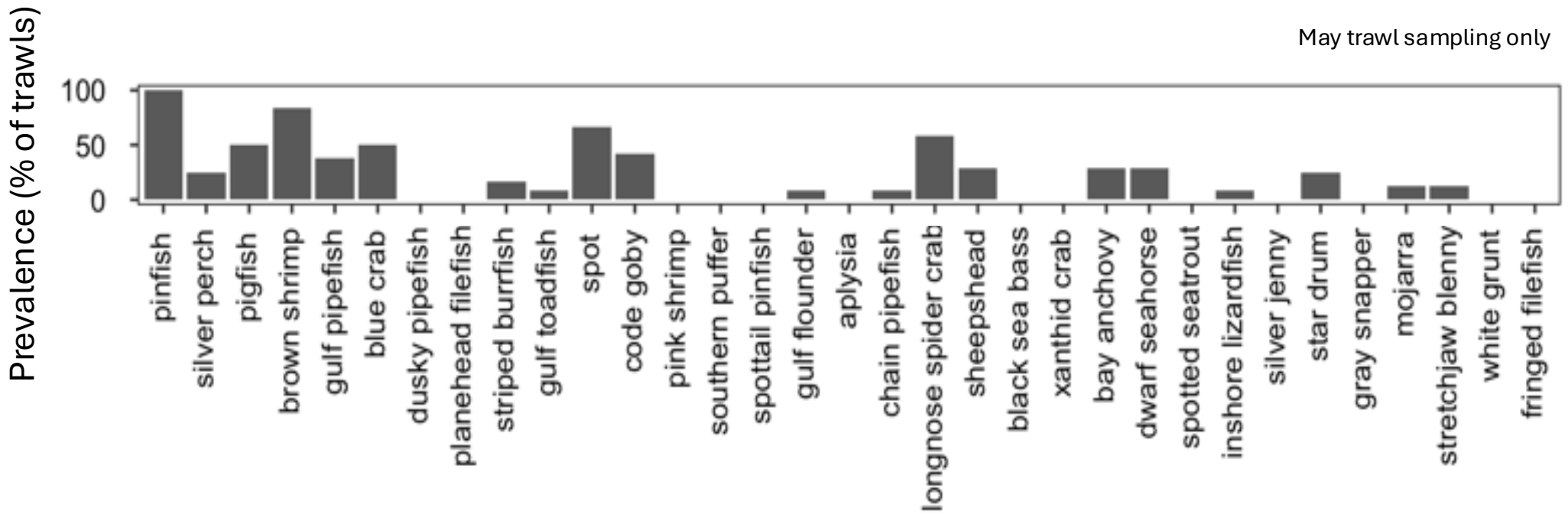
Methods: Trawl, benthic sled, and seagrass surveys in May, Aug, Nov 2018



RESTORE SCIENCE PROGRAM

Award #NA17NOS4510093

Chandeleur Islands seagrass supports a diverse community

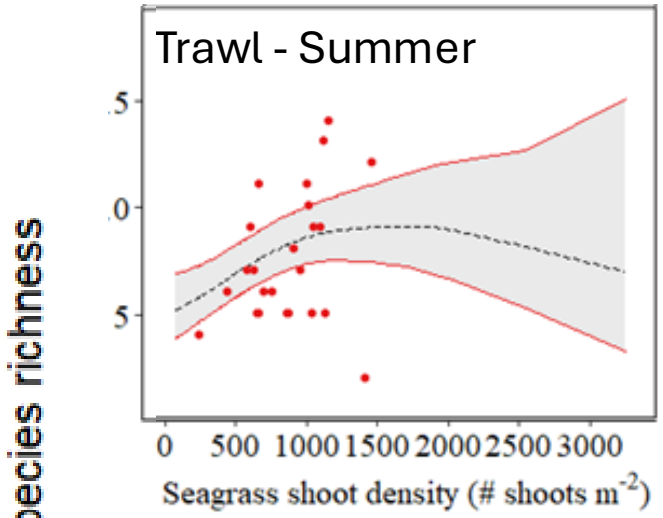


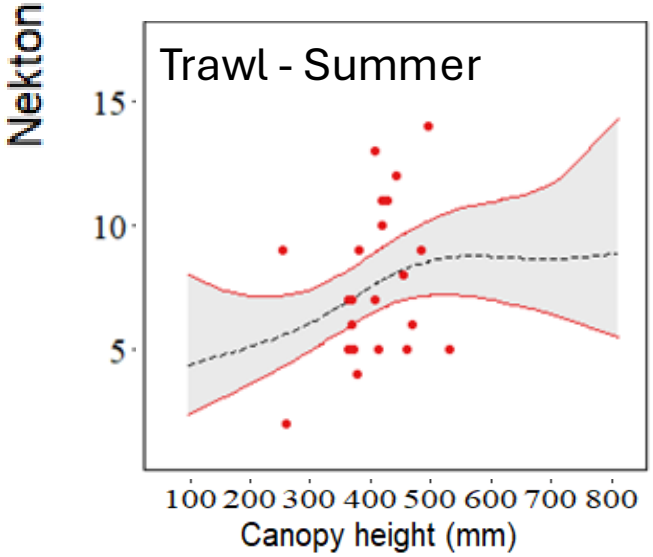
Fishbase.org

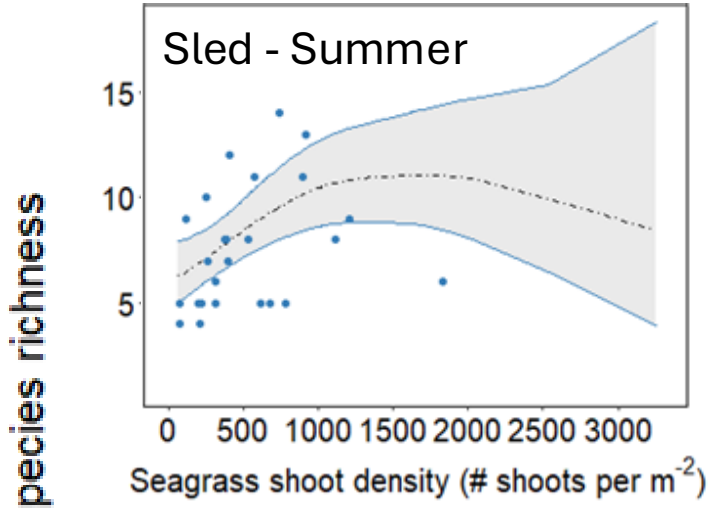
High density of small and juvenile nekton

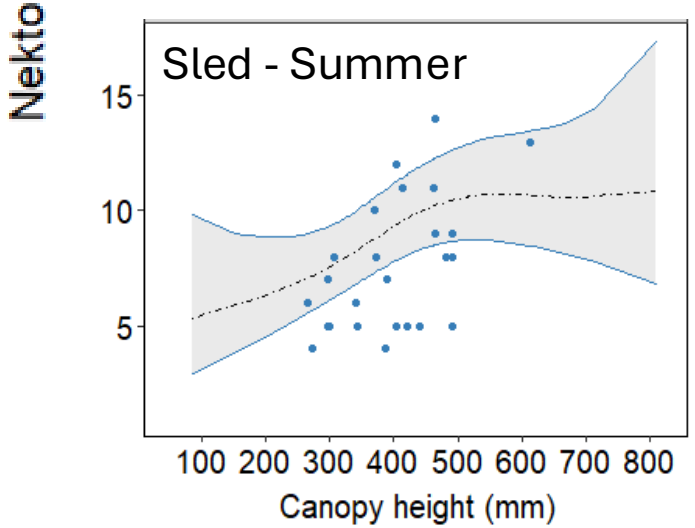
	Season	Stations	Nekton density (# m^{-2} ± SD)	Nekton biomass (g WW m^{-2} ± SD)
Trawl	May	24	0.93 ± 0.71	3.49 ± 3.47
	August	21	0.29 ± 0.23	3.04 ± 2.13
Sled	May	22	48.99 ± 43.6	7.96 ± 5.51
	August	22	125.73 ± 112.11	6.33 ± 4.25

Species Richness



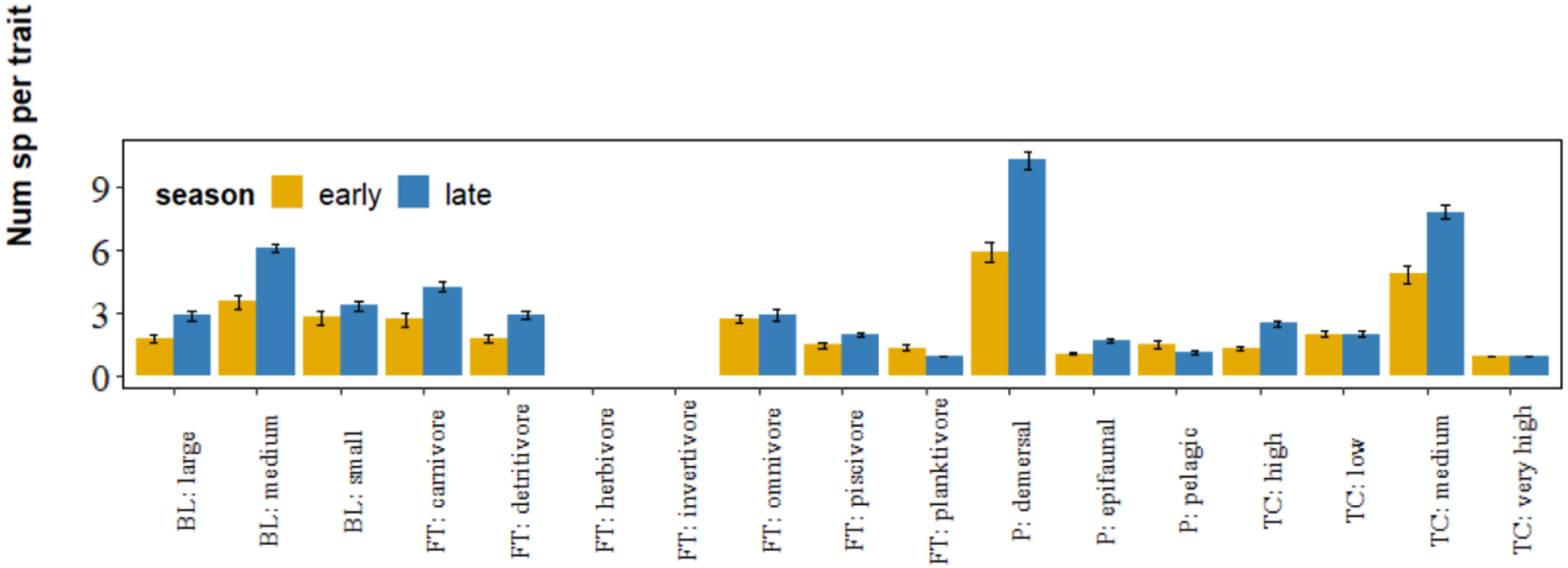






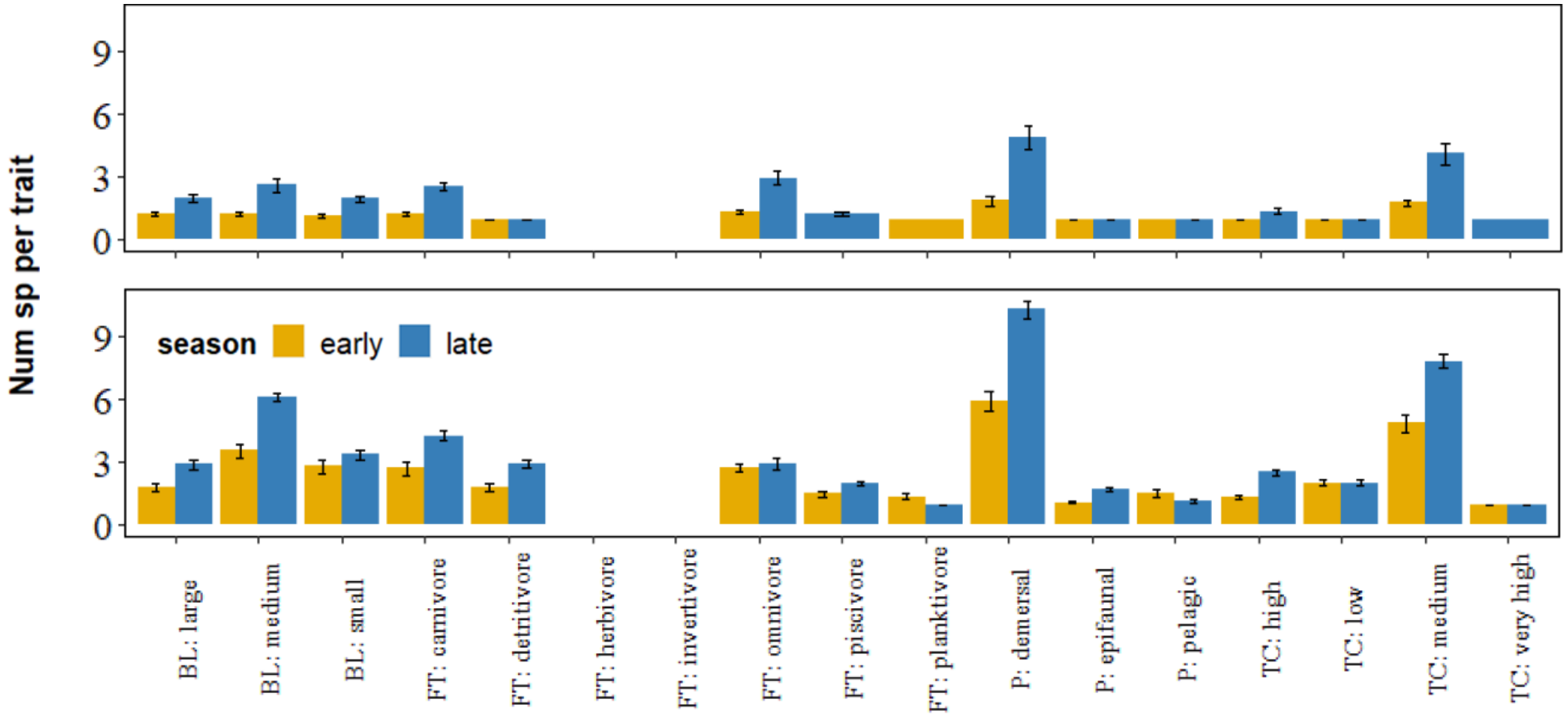
GAM analyses

Functional Redundancy



- Total number of species expressing a given trait
- Species that are taxonomically or genetically functionally equivalent may function in different roles under changing environmental conditions allowing nekton assemblages to better cope with environmental change.

Functional Redundancy



Laguna Madre, TX

- Total number of species expressing a given trait
- Species that are taxonomically or genetically functionally equivalent may function in different roles under changing environmental conditions allowing nekton assemblages to better cope with environmental change.
- **Chandeleur Islands nekton assemblages may be better able to respond to large-scale environmental disturbances compared to assemblages in other areas such as Laguna Madre, TX**

frontiers | Frontiers in Environmental Science

Changes in the morphology of widgeon grass (*Ruppia maritima*) with the onset of reproduction and impacts on fish assemblages at the Chandeleur Islands, LA

Matthew A. Byrnes, Kelly M. Darnell* and M. Zachary Darnell

School of Ocean Science and Engineering, The University of Southern Mississippi, Ocean Springs, MS, United States

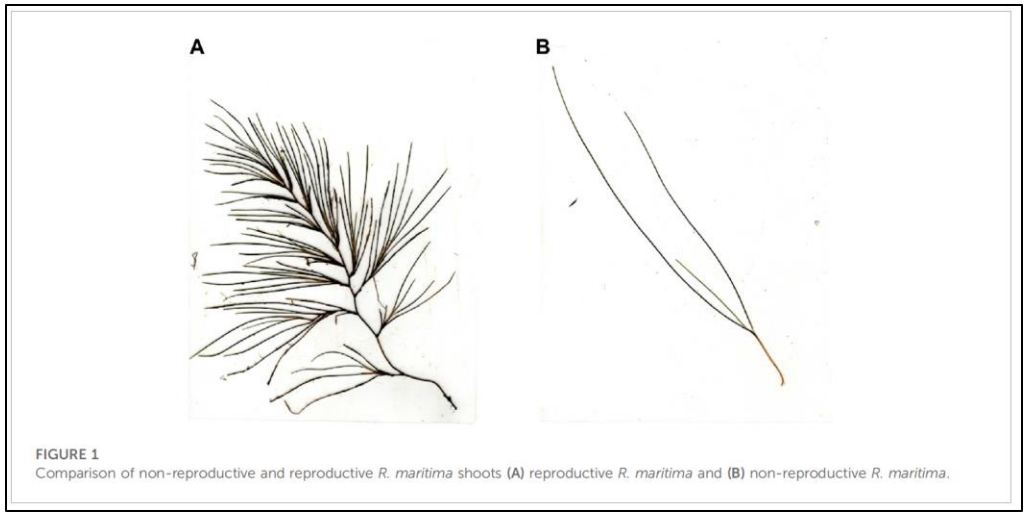


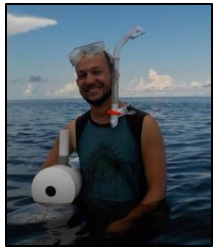
FIGURE 1
Comparison of non-reproductive and reproductive *R. maritima* shoots **(A)** reproductive *R. maritima* and **(B)** non-reproductive *R. maritima*.

Common name	Scientific name	Count	Standard length (mm)	Total length (mm)	Individual wet weight (g)
Darter Goby	*Ctenogobius boleosoma*	107	24.05 ± 0.66	30.81 ± 0.76	0.29 ± 0.02
Blackcheek Tonguefish	*Symphurus plagiusa*	33	32.21 ± 1.5	34.03 ± 1	0.38 ± 0.03
Gulf Pipefish	*Syngnathus scovelli*	23	62.3 ± 4.4	64.96 ± 4.59	0.25 ± 0.05
Rough Silverside	*Membras martinica*	20	46.7 ± 0.93	57.5 ± 1.21	1.43 ± 0.1
Code Goby	*Gobiosoma robustum*	11	23.45 ± 1.48	28.64 ± 1.81	0.33 ± 0.05
Pinfish	*Lagodon rhomboides*	7	72.29 ± 8.59	90.71 ± 11.49	14.3 ± 3.35
Chain Pipefish	*Syngnathus louisianae*	6	70 ± 7.45	73 ± 7.93	0.30 ± 0.11
Scaled Sardine	*Harengula jaguana*	5	47.4 ± 1.17	59.6 ± 1.29	2.26 ± 0.19
Speckled Seatrout	*Cynoscion nebulosus*	4	38.75 ± 4.64	47.75 ± 6.02	1.14 ± 0.33
Atlantic Threadfin	*Opisthonema oglinum*	2	46.5 ± 3.5	56 ± 4	1.79 ± 0.31
Dwarf Seahorse	*Hippocampus zosterae*	2	NA	18.5 ± 0.5	0.03 ± 0.02
Bay Anchovy	*Anchoa mitchilli*	1	30	37	0.27
Freckled Blenny	*Hypsoblennius ionthas*	1	25	28	0.12
Gulf Killifish	*Fundulus grandis*	1	19	24	0.14
Silver Perch	*Bairdiella chrysoura*	1	70	86	7.29

Using a co-production approach to inform project design, long-term monitoring, and adaptive management for restoration of the Chandeleur Islands to benefit seagrass

Scott Alford
Caylin Ashcraft
Ben Belgrad
Matt Byrnes
Kelly Correia
Zack Darnell
Pavel Dimens
Brad Furman
Penny Hall
Christian Hayes
Robin Jung
Adam Kemberling
Zac Lane
Jessica Lunt
Eme Marshall
Charlie Martin
Ashley McDonald
Deborah McNeal
Manuel Merello
Donna O'Dell
Helen Olmi
Apryle Panyi
Leanne Poussard
Whitney Scheffel
Candice Sheehan
Lee Smee
Sammie Smith
Mike Wheeler

Thank you!



RESTORE SCIENCE PROGRAM

This presentation is a result of research funded by the National Oceanic and Atmospheric Administration's RESTORE Science Program under awards NA17NOS4510093, NA21NOS4510177, and NA23NOS4510304 and to The University of Southern Mississippi

Kelly.Darnell@usm.edu

Lab Website:
www.darnellseagrassecologylab.com

COASTAL ECOLOGY AND SEAGRASS BIOLOGY
THE UNIVERSITY OF SOUTHERN MISSISSIPPI

THE UNIVERSITY OF SOUTHERN MISSISSIPPI