Data and code from an analysis of twenty years of winter minimum temperature data near Port Fourchon, LA from 2002 to 2022

Website: https://www.bco-dmo.org/dataset/941490
Version: 1
Version Date: 2024-10-28

Project

» CAREER: Integrating Seascapes and Energy Flow: learning and teaching about energy, biodiversity, and ecosystem function on the frontlines of climate change (Louisiana E-scapes)

Contributors	Affiliation	Role
Nelson, James	University of Georgia (UGA)	Principal Investigator
Leavitt, Herbert	University of Georgia (UGA)	Student
Thomas, Alexander	University of Georgia (UGA)	Student
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

This dataset analyzes twenty years of winter minimum temperature data from the Louisiana Coast Wide Reference Monitoring Systems database using 11 stations of data closest to the sampling locations for the primary project. We downloaded monthly averaged data from 2002 to 2022 from each site and used these values to calculate our minimum temperature data.

Table of Contents

Coverage

Location: near Port Fourchon, Louisiana, USA

Methods & Sampling

Location description: All data for this analysis were collected near Port Fourchon, Louisiana, USA (29.10 °N, 90.19 °W). The marshes around the port are microtidal, with a mean tidal range of ~0.37 m. The site sits at the precise edge of black mangrove expansion into saltmarsh habitats and although some land loss in the areas has occurred, mangroves in the area have been expanding since the 1990s (Osland et al., 2013).

Methods & Sampling:
    The expansion of mangroves, and many other range expanding species, is catalyzed by increasing winter temperatures (Osland et al., 2013). To verify that the winter temperatures are increasing in Port Fourchon we used data from the Coastal Protection and Restoration Authority (CPRA) of Louisiana from the Coastwide Reference and Monitoring System (CRMS)-Wetlands Monitoring Data. We retrieved water temperature data from 2005 to 2022 for the CRMS sites closest to the species sampling locations. In total, we pulled data from 11 stations located in Barataria and Terrebonne Bay marshes (Retrieved from Coastal Information Management System (CIMS) database, 2023; Steyer, 2010). We used a regression analysis on the mean minimum temperature for the winter months (November-February) to determine the trend in temperature from 2005 until 2022.

Data Processing Description

The data was processed using python code.

Parameters

Parameters for this dataset have not yet been identified

Project Information

CAREER: Integrating Seascapes and Energy Flow: learning and teaching about energy, biodiversity, and ecosystem function on the frontlines of climate change (Louisiana E-scapes)

Website: http://www.nelsonecolab.net/career

Coverage: Saltmarsh ecosystem near Port Fourchon, LA

NSF Award Abstract:
Coastal marshes provide a suite of vital functions that support natural and human communities. Humans frequently take for granted and exploit these ecosystem services without fully understanding the ecological feedbacks, linkages, and interdependencies of these processes to the wider ecosystem. As demands on coastal ecosystem services have risen, marshes have experienced substantial loss due to direct and indirect impacts from human activity. The rapidly changing coastal ecosystems of Louisiana provide a natural experiment for understanding how coastal change alters ecosystem function. This project is developing new metrics and tools to assess food web variability and test hypotheses on biodiversity and ecosystem function in coastal Louisiana. The research is determining how changing habitat configuration alters the distribution of energy across the seascape in a multitrophic system. This work is engaging students from the University of Louisiana Lafayette and Dillard University in placed-based learning by immersing them in the research and local restoration efforts to address land loss and preserve critical ecosystem services. Students are developing a deeper understanding of the complex issues facing coastal regions through formal course work, directed field work, and outreach. Students are interacting with stakeholders and managers who are currently battling coastal change. Their directed research projects are documenting changes in coastal habitat and coupling this knowledge with the consequences to ecosystems and the people who depend on them. By participating in the project students are emerging with knowledge and training that is making them into informed citizens and capable stewards of the future of our coastal ecosystems, while also preparing them for careers in STEM. The project is supporting two graduate students and a post-doc.

The transformation and movement of energy through a food web are key links between biodiversity and ecosystem function. A major hurdle to testing biodiversity ecosystem function theory is a limited ability to assess food web variability in space and time. This research is quantifying changing seascape structure, species diversity, and food web structure to better understand the relationship between biodiversity and energy flow through ecosystems. The project uses cutting edge tools and metrics to test hypotheses on how the distribution, abundance, and diversity of key species are altered by ecosystem change and how this affects function. The hypotheses driving the research are: 1) habitat is a more important indirect driver of trophic structure than a direct change to primary trophic pathways; and 2) horizontal and vertical diversity increases with habitat resource index. Stable isotope analysis is characterizing energy flow through the food web. Changes in horizontal and vertical diversity in a multitrophic system are being quantified using aerial surveys and field sampling. To assess the spatial and temporal change in food web resources, the project is combining results from stable isotope analysis and drone-based remote sensing technology to generate consumer specific energetic seascape maps (E-scapes) and trophic niche metrics. In combination these new metrics are providing insight into species' responses to changing food web function across the seascape and through time.

Funding