Spring 2021 Virtual Student Seminar

Abstract Booklet

Hosted by:
Graduate Student Symposium Committee 2021

Jill Thompson-Grim
Ph.D. Student, Marine Resource Assessment

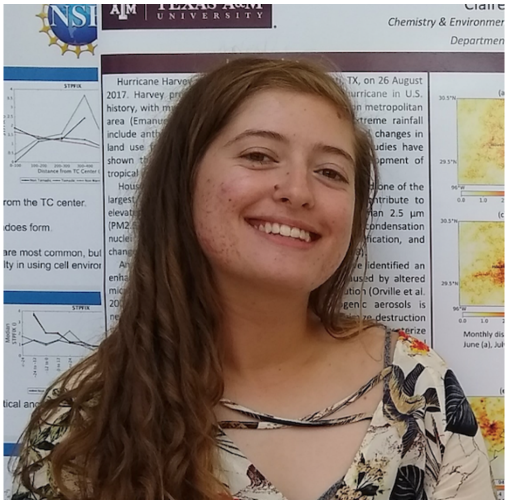
Advisor: Steve Murawski, Ph.D.

Assessing the Distribution of Fishes Across Relief Anomalies at the South Texas Banks

Thompson-Grim, Jill[1], Streich, Matthew[2], Stunz, Greg[3]

Abstract:

The South Texas Banks are unique natural reefs in the northwestern Gulf of Mexico formed through geological backstepping in response to rapid, punctuated sea-level rise events. As a result, the banks are topographically complex and characterized by biotopes (i.e., crest, edge, terrace, and base) and slope. The geospatial analysis was coupled with fisheries-independent data from remotely operated vehicle (ROV) and echosounder surveys collected between July 2018 and October 2019 to assess the impact of topographic complexity on fish community structure and density of federally managed species such as: Red Snapper (*Lutjanus campechanus),* Greater Amberjack (*Seriola dumerili*), Vermilion Snapper (*Rhomboplites aurorubens*), and Gray Snapper (*Lutjanus griseus*). Results indicated fish community structure was statistically similar across biotopes but was different between high and low turbidity regimes. These data also suggested that nepheloid-driven community structure may benefit species adapted to highly nepheloid-influenced environments. I found significant differences in fish density that could be explained by biotope, slope, and the interaction between the topographic variables. These data show that mean fish density is greatest at the crest when the slope ranges from 5° to 20°. This study highlights the importance of understanding the relationship between fish assemblages and topographic complexity to better estimate and manage reef fishes populations.



Claire Onak
Masters student, Chemical Oceanography
Advisor: Tim Conway, Ph.D.

Environmental impacts of copper mining in Michigan's Upper Peninsula

Onak, Claire[1], Wright, Derek[2]

Abstract:

Michigan's Keweenaw Peninsula, home to the world's largest deposits of native copper, was mined extensively in the late 1800s, at one point producing more than 95% of the country's copper. Milling and smelting processes extracted the valuable mineral from the remaining rock material. They were performed along the shorelines of lakes in the Keweenaw, including Torch Lake, for over 100 years. 200 million tons of waste rock were deposited into the lake, accounting for nearly 20% of the lake's volume. In addition, leaching chemicals, explosive residues, and mining byproducts were deposited into the lake. High concentrations of copper and other metals and fish abnormalities prompted investigations into the mining industry's impacts. Torch Lake was added to the National Priorities List (NPL) and other sites considered the most highly contaminated that undergo long-term remedial action. Since 1992, cleanup efforts have been conducted around Torch Lake, including the construction of a soil and vegetative cover, the removal of contaminated material, and natural attenuation. This presentation reveals the concentrations of several metals in Torch Lake's surface water, including Ni, Cu, As, Cd, Pb, and Ba, which were measured to gauge their potential toxicity to aquatic organisms and humans. These results were also used to assess the efficacy of cleanup efforts over time.

Alexander Timpe
Ph.D. student, Biological Oceanography
Advisor: Brad Seibel. Ph.D.

Small amounts of oxygen measurement error can drastically affect key metabolic parameters

Timpe, Alexander W.[1], Seibel, Brad A.[2]

Abstract:

Two key metabolic parameters that are important components in physiological range distribution models are the oxygen supply capacity (α) and critical oxygen partial pressure for standard metabolic rate ($P_{\text{crit-SMR}}$). $P_{\text{crit-SMR}}$ is the lowest oxygen level that completely satisfies an organism's basic metabolic needs, such as tissue maintenance, in a resting, fasted state (SMR). α is a species- and temperature-specific empirical parameter that describes how efficiently an organism can extract oxygen from its environment and is used to calculate $P_{\text{crit-SMR}}$ ($P_{\text{crit-SMR}}$ = SMR/α). However, small amounts of oxygen measurement error in the respirometry data used to determine these parameters can dramatically inflate the estimate α and consequently reduce $P_{\text{crit-SMR}}$. If unaddressed, animals may appear to be much more tolerant of low oxygen and accommodating of the temperature changes associated with climate change than they are. Here, I present results from several invertebrate zooplankton and teleost fish species that illustrate this problem and how it can be remedied.

Kiersten Monahan
Ph.D. student, Geological Oceanography
Advisor: Brad Rosenheim, Ph.D.

Improving our quantitative and mechanistic understanding of organic carbon preservation in the Guianas Mudbanks

Kiersten Monahan[1], Brad E. Rosenheim[2]

Abstract:

The Amazon River supplies an extensive sedimentary dispersal system that stretches ~1600 km along the Guianas coast. This energetic regime, subject to frequent physical reworking and reoxidation, has long been considered an organic matter incinerator. Previous studies have shown that only ~30% of terrestrial organic carbon (OC) introduced by the Amazon River is preserved in shelf sediments despite its supposedly recalcitrant nature. However, these estimates have relied on bulk measurements and simple two end-member mixing models, which inadequately represent complex OC mixtures. Here we employ ramped pyrolysis coupled with stable carbon isotope and radiocarbon analyses to provide a more detailed assessment of the broad range of OC reactivity, source, and age in sediments. We expect to show that terrestrial OC burial efficiency offshore the Amazon River has been underestimated by 50-100% with this approach. We also hope to explore the mechanisms responsible for the preservation, especially the role of reactive iron oxides in selectively stabilizing or protecting OC from degradation. Through reevaluating the fate of terrestrial OC in the Guianas Mudbanks, this study will provide new insights into carbon cycling in the coastal ocean and potentially change the way we factor major river systems into the global carbon budget.

Beatre Combs-Hintze
Ph.D. Student, Marine Resource Assessment
Advisor: Cameron Ainsworth, Ph.D.

Using Ecosystem Modeling to Assess Changes in Seagrass Meadow Ecosystem Under Various Harmful Algal Bloom Scenarios

Combs-Hintze, Beatre

Abstract:

The Gulf of Mexico (GoM) supports a large and biodiverse marine ecosystem that humans rely on for survival. Spanning subtropical and tropical water, much of the intertidal and coastal ecosystems of the Gulf depend on seagrass meadows. Seagrass is a keystone of coastal biology, providing critical nutrients and habitats to fisheries and many physical benefits like carbon capture and sediment stabilization. These meadows are especially sensitive to nutrient pollution, leading to toxic algal blooms like the red tide or seafloor shading. Here I propose methods that will further develop the existing Atlantis-GoM Ecosystem model to reflect seagrass communities and habitat. The ultimate goal of this will be to use end-to-end ecosystem modeling to understand the ecosystem effects of seagrass coverage under different scenarios of both toxic and non-toxic harmful algal blooms. Using ecosystem modeling, we can assess the direct and indirect impacts of seagrass coverage. These may include changes in prey availability and quality and changes in predation risk. The model will be updated with recently improved distributions for reliant seagrass macrograzers, in which statistical models predicted species distributions based on environmental variables. A similar method will be used to refine seagrass distribution and define community structure. Ultimately this work will help managers understand the true cost of ecosystem services provided by seagrass meadows – to weigh the benefit of restoration efforts in light of algal blooms.

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