



36th Annual Graduate Student Symposium

*University of South Florida, College of Marine Science
January 11, 2019*

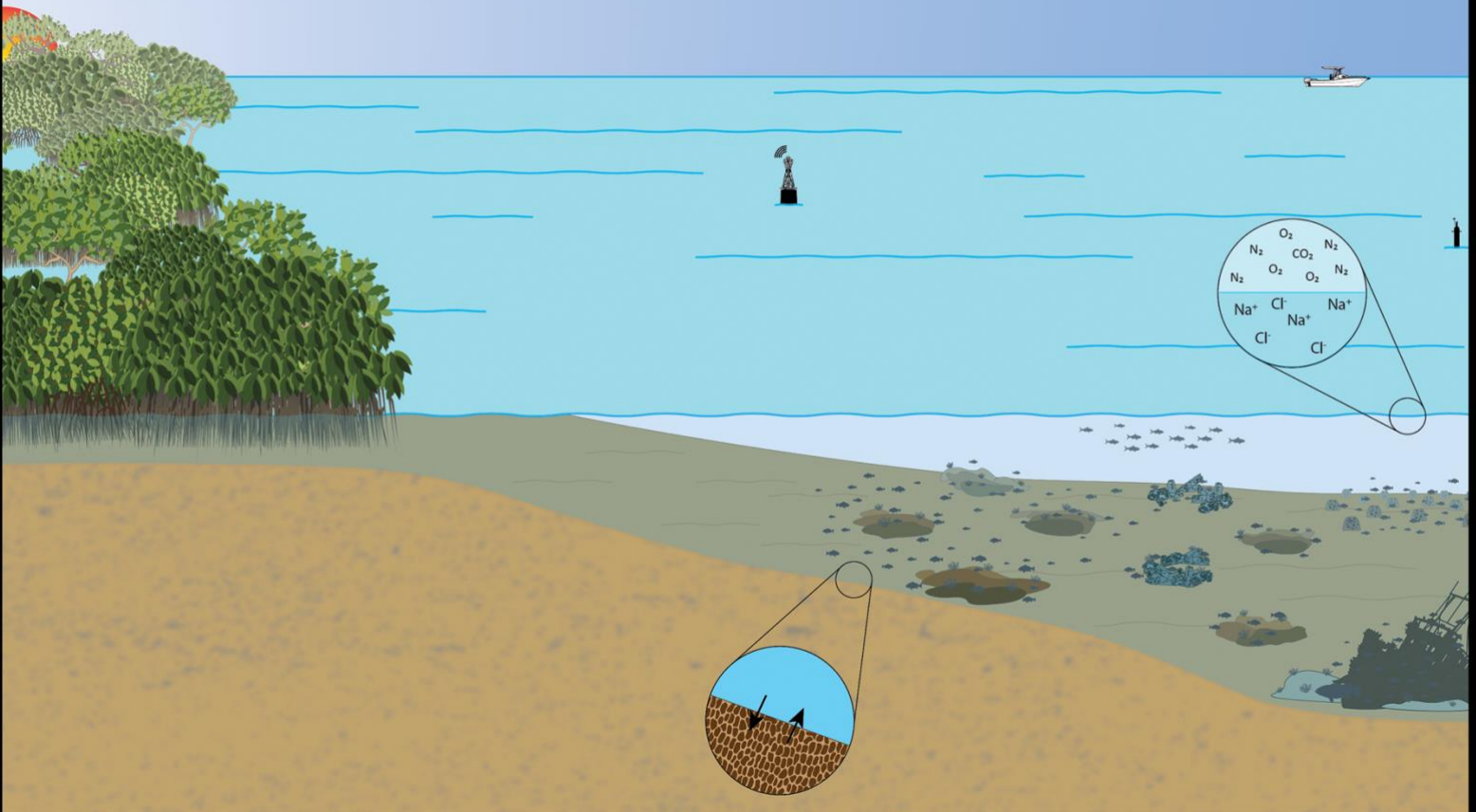


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GRADUATE STUDENT SYMPOSIUM SCHEDULE

Plenary Speaker

9:30 am Jennifer Flannery Corals as Climate Recorders

Oral Presentations – Proposed Research

10:15 am Jonathan Peake Metacommunities in 4D: Spatiotemporal Dynamics of Coastal Marine Metacommunities in the Western Atlantic

10:30 am Garrett Miller Acute and Chronic Disturbance Effects on Estuarine Communities

Oral Presentations – Current Research Including Results

10:45 am Julie Vecchio Can the Isotopes in Fish Eye-Lens Cores be Used to Identify Spawning Locations?

Break 11:00 am

11:15 am Jeremy Browning DNA Barcoding Fish Eggs Collected from Discrete Depths Offshore of Tampa Bay, Florida: Preliminary Results

11:30 am Natalia López Exploring Viral Diversity in Submerged Aquatic Vegetation in Florida's Springs

11:45 am Imogen Browne Antarctica in hot water: ice sheet growth during the warm Miocene Climate Optimum

Lunch 12:00-1:30 pm

1:30 pm Viviane Nguyen Investigation of Retention Versus Connectivity of Fish Eggs in the Northern Gulf of Mexico

1:45 pm Kara Vadman Holocene variations in modified Circumpolar Deep Water near the Totten Glacier, East Antarctica

2:00 pm Natalie Sawaya Optimization of the polony technique for quantification of ssDNA gokushoviruses in the Red Sea

2:15 pm Carey Schafer Are Mangroves Less Effective Carbon Sinks than Previously Thought?

Raffle 2:30-2:45 pm

Poster Presentations 2:45 – 4:15 pm

- | | |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Brent Summers | Investigating the isotopic signature and release of iron sourced from sediments to the UK South Atlantic GEOTRACES GA10 Section |
| Kyle Amergian | Florida's Springs Coast as an Area of Refuge for Foraminifera During Increased Ocean Acidification |
| Cara Estes | Can we Monitor pH Over Coral Reefs Using Only Remote Sensing? |
| Catherine Prunella | Plio-Pleistocene ocean temperature and Antarctic ice sheet variability at the Ross Sea shelf break: foraminiferal stable isotope records from IODP Site U1523 |
| Alyssa Andres | How Low Can Predators Go? Hypoxia Tolerance of Coastal Shark Species of Varying Lifestyle |

Judging Ends 4:15 pm

TGIF in MSL Lounge 4:15 pm

Awards and Raffle in MSL Lounge 4:45 pm

Metacommunities in 4D: Spatiotemporal Dynamics of Coastal Marine Metacommunities in the Western Atlantic

Jonathan Peake

Recent efforts in community ecology have sought to reconcile the local and regional processes influencing the structure of organismal communities. This has led to the development of the metacommunity concept, which treats a group of interacting communities, or metacommunity, as a “community of communities,” similarly to a community of organisms. Interactions among communities within a regional metacommunity mirror the interactions observed among species within a local community. The local biotic and abiotic factors that influence how species are organized within a community also influence the structure of the metacommunity on a regional scale.

Applications of metacommunity theory, which have been largely focused on terrestrial and freshwater systems, differ widely in the researcher-defined spatial extent of the metacommunity, and typically ignore the temporal dynamics of species distributions across communities. My research will identify metacommunity structure among coastal fish communities in the tropical and subtropical Western Atlantic on a variety of spatial and temporal scales to test the scope and stability of metacommunities over a broad geographic range. By identifying the structure and spatiotemporal dynamics of marine metacommunities, we can better understand the major processes that influence the distribution and abundance of marine species. This can lead to more accurate modeling of fisheries processes, and improved management of fisheries species in the future.

Degree		PhD
Field		Marine Resource Assessment
Advisor		Dr. Chris Stallings

Acute and Chronic Disturbance Effects in Estuarine Communities

Garrett Miller, Chris Stallings

Estuarine communities are subject to numerous disturbances on various timescales. Here, we propose to examine the effects of climate change and red tide on these communities. We will utilize fisheries independent monitoring (FIM) data from the Florida Fish and Wildlife Conservation Commission (FWC), an approximately twenty-year data set. From this, we plan to identify whether estuarine communities in the northern regions of the West Florida Shelf are becoming more tropical. Specifically, if the structure of the communities in the northern regions has begun to take on components of the community structures in the south. In complement to this, we intend to elucidate any spatial distribution changes in the communities as a response to red tide. This research will be centered primarily on the 2005 red tide and focus on the estuaries of Apalachicola Bay, Cedar Key, Tampa Bay, and Charlotte Harbor.

Degree	MS
Field	Marine Resource Assessment
Advisor	Dr. Chris Stallings

Can the Isotopes in Fish Eye-Lens Cores be Used to Identify Spawning Locations?

Julie Vecchio, Ernst Peebles

While adult and juvenile reef fish habitats on the West Florida Shelf (WFS) have been well studied, spawning and larval locations remain poorly understood. The isotopic values ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) of the inner-most fish eye-lens layer (core) reflect the trophic level and location of the fish during the earliest weeks of life. Here we use the locations, areas, and overlaps of standard ellipses within $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ bivariate isotope space to infer spawning and larval location patterns on the WFS of four reef-fish species. We found that the means of both $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ were unique for each species. The Red Grouper larval standard ellipse area was smallest (2.76‰) and mean $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values were lowest (-19.22 ± 0.17 and 6.75 ± 0.11 , respectively). In contrast, Black Seabass ellipse area was largest (5.58‰) and mean $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values were highest (-18.54 ± 0.2 and 8.20 ± 0.2 respectively). Standard ellipse overlap ranged from 5% between Black Seabass and Red Grouper to 50% between Black Seabass and Red Snapper. Together, these data suggest differences in larval origins for different reef-fish species on the WFS. In the future, this technique may be combined with data from other analyses, such as fish egg DNA barcoding, to better understand spawning and larval habitat requirements for a wide variety of reef-fish species.

Degree	PhD
Field	Marine Resource Assessment
Advisor	Dr. Ernst Peebles

DNA Barcoding Fish Eggs Collected from Discrete Depths Offshore of Tampa Bay, Florida: Preliminary Results

Jeremy Browning

Broadcast spawning in marine fishes can occur at a variety of depths, which should be considered for effective survey design and when modeling egg dispersal. The objectives of this study were to characterize fish egg abundances through the water column, to explore the potential for depth stratification of different egg taxa, and to establish a baseline for depth ranges that can be used in future egg surveys. On two cruises during spring 2018, a gasoline-powered water pump fitted with an inline digital flowmeter and flexible hose was used to collect egg samples from different depths within the water column. On the vessel's deck, the pumped water was filtered through a 333 μm mesh, conical plankton net, and the material retained on the mesh was collected within a plastic cod-end jar. Forty-eight samples containing a total of 4,990 eggs were collected. A subsample of at least fifty eggs (or all eggs if <50) from each depth will undergo genetic analysis via DNA barcoding (approximately 2,000 eggs), which is ongoing. To date, 538 eggs representing 22 taxa from 12 families have been successfully sequenced to at least genus level. Notable egg identifications include: *Orthopristis chrysoptera* (Pigfish), *Haemulon aurolineatum* (Tomtate), *H. plumierri* (White grunt), *Lachnolaimus maximus* (Hogfish), *Menticirrhus saxatilis* (Northern kingfish), *Centropristis spp.* (sea bass), and *Archosargus probatocephalus* (Sheepshead). After all samples have been barcoded, a multivariate analysis will determine whether fish-egg community composition differs with depth.

Degree	PhD
Field	Marine Resource Assessment
Advisor	Dr. Ernst Peebles

Exploring Viral Diversity in Submerged Aquatic Vegetation in Florida's Springs

Natalia López, Karyna Rosario, Noémi Van Bogaert, Mason Kerr, Haris Paliogiannis, and Mya Breitbart

Little is known about viral diversity, prevalence and evolution in aquatic plants. Aquatic plants fulfill essential ecosystem functions such as facilitating nutrient uptake and cycling and increasing habitats for fishes and invertebrates. However, populations of aquatic plants in Florida's freshwater springs are currently in decline due to both environmental and anthropogenic stressors. We strive to identify viruses associated with submerged aquatic vegetation (SAV) in Florida's springs, using Sequence Independent Single Primer Amplification (SISPA) and sequencing. Up to 8 species of SAV per site were collected in July 2017 from four different springs in Florida (Ichetucknee, Rainbow, Manatee and Blue Springs). Sequences with similarities to known viruses were identified in Ichetucknee, Manatee, Blue Springs, with most sequences similar to terrestrial-plant-infecting RNA viruses of the families Alphaflexiviridae and Potyviridae. Additionally, sequences similar to unclassified Picornavirales that infect red algae and diatoms, as well as ssDNA viruses associated with aquatic invertebrates, were also identified. Current efforts focus on completing the genomes of these novel viruses, as well as determining their host range and biogeography. Future work will examine the transmission dynamics of these viruses and determine their effects on the ecology of SAV, providing information of value for the conservation of aquatic plants in these ecosystems.

Degree		PhD
Field		Biological Oceanography
Advisor		Dr. Mya Breitbart

Antarctica in hot water: ice sheet growth during the warm Miocene Climate Optimum

Imogen Browne, Amelia Shevenell, Rob McKay, Laura De Santis, Denise Kulhanek, and the Expedition 374 Scientists

Sustained warmth during the Miocene Climate Optimum (MCO; ~17-14.5 Ma) gave way to global cooling and Antarctic ice sheet growth across the middle Miocene Climate Transition (MMCT; ~14 Ma), manifested in the deep-sea geochemical record as one of the largest climate transitions of the Cenozoic. Ice-proximal marine sediment cores from the inner shelf of the Ross Sea indicate dynamic advance and retreat of grounded ice sheets during the MCO and MMCT within a narrow range of atmospheric CO₂ (300-500 ppmv), similar to present and what is expected for the end of the 21st century. This implies either increased sensitivity of Antarctic ice sheets to changes in global carbon cycling, or that other mechanisms such as poleward heat and moisture transport were instrumental in driving ice sheet variability. To understand the influence of ocean temperature on MCO ice sheet dynamics, we reconstructed upper ocean temperatures using marine mudstones recovered on the outer shelf of the Ross Sea at International Ocean Discovery Program (IODP) Site U1521. We compare paleotemperature analyses to lithological changes and infer shelf-wide advance of grounded ice sheets during the MCO, occurring at least 0.5 million years before the MMCT. Our results support previous findings that suggest that the Ross Sea sector was warm and wet during the MCO, implying that poleward heat and moisture transport was required for ice sheet growth.

Degree		PhD
Field		Geological Oceanography
Advisor		Dr. Amelia Shevenell

Investigation of Retention Versus Connectivity of Fish Eggs in the Northern Gulf of Mexico

Viviane Nguyen, Ernst Peebles

In recent years, it has become more common to combine several disciplines in oceanographic research. Here we combine physical oceanographic models with traditional fisheries stock assessment techniques to investigate the geographical distribution of fish spawning sites and eggs. The location and time of spawning, the reproductive capability (i.e., fecundity) of female fishes, and the geographic fate of spawned, planktonic eggs is fundamental to managing fisheries resources. It has been demonstrated that fish fecundity can be highly variable over space and time, greatly influencing fish population dynamics. The present research is focused on determining the number of eggs that a reef-associated species, Vermilion Snapper, releases in one spawning event (i.e., batch fecundity). There was a mean of 101,293 eggs per batch for Vermilion Snapper, on the northern West Florida Shelf. The goal is also to use ocean circulation models to perform hindcasting and forecasting of fish-egg locations to determine whether eggs remain in the waters where they were spawned or are widely dispersed by ocean circulation. Combining these types of data outputs will allow a comparison of these processes between pelagic and reef-associated fishes.

Degree	MS
Field	Marine Resource Assessment
Advisor	Dr. Ernst Peebles

Holocene Variations in Modified Circumpolar Deep Water Near the Totten Glacier, East Antarctica

Kara Vadman, Amelia Shevenell, Amy Leventer, Imogen Browne, Sean Gulick, Bruce Huber, Brad Rosenheim

The Totten Glacier-Moscow University Ice Shelf (TG-MUIS) system, at the outlet of the Aurora Subglacial Basin, drains one eighth of the East Antarctic Ice Sheet (EAIS) and is losing mass. Recent oceanographic observations indicate that warm modified Circumpolar Deepwater (mCDW) is accessing TG-MUIS grounding lines, suggesting that the Aurora Basin catchment is susceptible to ocean thermal forcing, with implications for ice mass loss and sea level rise. To understand past ocean-ice interactions, we reconstruct oceanographic change from a 13 meter-long laminated diatom mud and ooze sequence collected from the continental shelf, seaward of the TG-MUIS, that records oceanic conditions from the last deglaciation (~15,000 yr BP) through the present. A detailed chronology was developed from biogenic carbonate and Ramped PyrOx-based AMS ^{14}C dates. Our multi-proxy reconstruction uses foraminifer and diatom assemblages, foraminifer stable isotopes, and foraminifer (Mg/Ca) and organic (TEX₈₆) paleothermometry. Results indicate warm ocean conditions during the deglaciation and middle Holocene, and a recent increase in mCDW influence at the outlet of the Aurora Subglacial Basin. We suggest that ocean thermal forcing of regional ice extent is related to wind strength, which influences the position/strength of the Antarctic Coastal Current and Antarctic Slope Current.

Degree		PhD
Field		Geological Oceanography
Advisor		Dr. Amelia Shevenell

Optimization of the Polony Technique for Quantification of ssDNA gokushoviruses in the Red Sea

Natalie A. Sawaya, Nava Baran, Michael Carlson, Debbie Lindell, Mya Breitbart

Gokushovirinae, a subfamily of the Microviridae family, are single-stranded DNA (ssDNA) phages that are ubiquitous in marine environments, but little is known about their diversity and abundance. This knowledge gap is partly due to the methodological limitations associated with studying ssDNA phages. The polony method is a solid phase PCR that immobilizes the template DNA in an acrylamide gel, then hybridizes the PCR products with a fluorescent probe to determine the abundance of targeted viral groups. The polony approach allows us to quantify the abundance of a diverse group of gokushoviruses instead of targeting a specific subgroup. The gokushovirus major capsid protein was amplified and sequenced from water samples collected from 9 depths (0 m, 20 m, 40 m, 60 m, 80 m, 100 m, 140 m, 200 m, and 400 m) in the Gulf of Aqaba in the Red Sea in September 2015, during a period of water column stratification. A high diversity of gokushoviruses were identified in these samples, with multiple viral types present at each depth and some clades only recovered in deep waters. Based on the sequences recovered, a probe was designed for the quantification of the gokushoviruses using the polony method. The polony method has been successfully implemented to quantify gokushovirus positive controls and is currently being optimized. Application of these methods to marine samples from the Red Sea will provide the first estimates of gokushovirus abundances in the oceans.

Degree		PhD
Field		Biological Oceanography
Advisor		Dr. Mya Breitbart

Are Mangroves Less Effective Carbon Sinks than Previously Thought?

Carey Schafer, Brad Rosenheim, Joseph Smoak, Ryan Moyer, and Amanda Chappel

Over the last decade, coastal marine ecosystems have gained considerable attention for their ability to sequester large amounts of carbon dioxide from the atmosphere. These “blue carbon” sinks include mangrove forests, which cover only 0.5% of coastal land area across the globe, yet account for ~15% of total carbon sequestration along coasts. However, the mechanisms controlling soil organic carbon (SOC) dynamics in these ecosystems have only recently been investigated. A combination of ^{210}Pb and ^{14}C chronologies allows for insight into SOC cycling. Whereas ^{210}Pb dating allows for the determination of sediment accumulation rates, tracking the penetration of “bomb radiocarbon” gives insight into carbon cycling within the soil. Sediment cores from Ten Thousand Islands, Florida show the penetration of bomb radiocarbon into deeper sediment strata and ^{14}C ages all with post-modern values ($F_m > 1$). These findings indicate mangroves are moving young carbon from the atmosphere into older sediment strata. However, Ramped Pyrolysis results indicate this young carbon may not be stable on long timescales, calling into question the effectiveness of the mangrove carbon sink. If these results represent mangroves worldwide, the carbon sink associated with these ecosystems may be much less effective than previously thought.

Degree	MS
Field	Geological Oceanography
Advisor	Dr. Brad Rosenheim

Investigating the Isotopic Signature and Release of Iron Sourced from Sediments to the UK South Atlantic GEOTRACES GA10 Section

Brent Summers, Will Homoky, Rachel Mills, Seth John, Tim Conway

Iron (Fe) is an essential nutrient in the oceans, where it is needed for nitrogen fixation and photosynthesis by marine microorganisms. In order to better understand the role Fe plays as a micronutrient, we require a detailed understanding of the oceanic sources of Fe. Fe isotope ratios ($\delta^{56}\text{Fe}$) may provide insight into this because different sources (sediments, atmospheric dust and hydrothermal venting) may have distinct $\delta^{56}\text{Fe}$ signatures. Reductive release of Fe from sediments has isotopically light values of -1.8 to -3.5‰ being measured both within porewaters and in the water column near sediments. Furthermore, GEOTRACES transects show that such sources may be traced and quantified in the oceans. Here, we present new water column dissolved $\delta^{56}\text{Fe}$ data from several shallow stations on the South American margin, collected from the UK 40°S GEOTRACES GA10 cruise. At these stations, dissolved Fe concentrations are high (0.6 – 3 nmol/kg), likely due to Fe release from shelf and slope sediments. We use these data, together with sediment porewater dissolved $\delta^{56}\text{Fe}$ profiles, to place constraints on the isotopic signature of Fe released from sediments in this region. Our GA10 section dataset has water column Fe concentration anomalies (0.8-2 nmol/kg) that are coincident with light $\delta^{56}\text{Fe}$ signatures (down to -0.6‰) as far east as 40°W, such that long range transport of sedimentary Fe in this region of the South Atlantic might be invoked as an explanation for these data.

Degree	PhD
Field	Chemical Oceanography
Advisor	Dr. Tim Conway

Florida's Springs Coast as an Area of Refuge for Foraminifera During Increased Ocean Acidification

Kyle Amergian, Sean Beckwith, Pamela Hallock

Florida's Springs Coast is a unique system of salt marshes spanning the length of three counties. Many springs discharge directly into coastal waters or into rivers that collectively discharge millions of liters of fresh water into coastal waters every day. As a consequence of the limestone lithology of this region, the chemical properties of the spring water include high alkalinity and high calcium concentrations. Benthic foraminifera occur abundantly on the shallow shelf off the Springs Coast. Common taxa include porcelaneous milioline species, including species that host algal symbionts. Based on the prevalence of the benthic foraminifer *Archaias angulatus* in the seagrass beds along this shelf, a previous study proposed that the Springs Coast provides favorable conditions for "subtropical" calcifying organisms such as *A. angulatus*, despite existing literature indicating that salinities and winter temperatures are below the tolerance of this species. The objective of this study is to determine the distribution of total foraminiferal assemblages as they relate to the unique environmental settings and microhabitats off Florida's Springs Coast. I hope to identify a gradient of changing assemblages determined by environmental influences. The underlying motivation for this research is to determine if, during a time of increasing ocean acidification, the Springs Coast may provide suitable water chemistry and physical habitat to provide a refuge for such calcifying organisms.

Degree		MS
Field		Biological Oceanography
Advisor		Dr. Pamela Hallock Muller

Can we Monitor pH Over Coral Reefs Using Only Remote Sensing?

Cara Estes, Frank Muller-Karger

Remote sensing is an important and practical technique used to monitor the ocean on a broad scale. The ocean is changing due to human activities and natural processes and it is important to characterize the changes in marine ecosystems and biodiversity. Of interest is understanding how shallow tropical coral reef communities are reacting to such changes. This part of the study will be trying to accurately monitor the flux of CO₂ at the surface of coral reefs to see if there is any link between the flux and biodiversity.

Degree		PhD
Field		Biological Oceanography
Advisor		Dr. Frank Muller-Karger

Plio-Pleistocene ocean temperature and Antarctic ice sheet variability at the Ross Sea shelf break: foraminiferal stable isotope records from IODP Site U1523

Catherine Prunella, Amelia Shevenell, Robert McKay, Laura De Santis, Denise Kulhanek, and the Expedition 374 Scientists

Warm Southern Ocean waters are implicated in the recent retreat of marine terminating outlet glaciers in West Antarctica. To understand Antarctica's response to ongoing warming, paleoceanographic records of past ocean-ice interactions are required. Evidence from deep-sea sediments record orbitally-paced fluctuations in ice extent during the Plio-Pleistocene, but the contribution of Antarctica's ice sheets to these variations is still unclear because deep-sea oxygen isotope records also incorporate signals of Northern Hemisphere ice volume and global cooling. To address the response of Antarctica's ice sheets to changing ocean temperatures during the Plio-Pleistocene, International Ocean Discovery Program (IODP) Expedition 374 recovered sediments from the Ross Sea outer-shelf at Site U1523. Site U1523 sediments include foraminifer-bearing/rich sands and muds, which enable development of benthic and planktic foraminifer paleotemperature records. We present planktic (*N. pachyderma*) and benthic foraminifer (*Uvigerina spp.*) stable oxygen ($\delta^{18}\text{O}$) and carbon ($\delta^{13}\text{C}$) isotope records. We assess the utility of foraminifer-based paleothermometry in this Southern Ocean setting, and document Plio-Pleistocene ocean temperature and ice volume changes. Stable isotope records, in conjunction with Mg/Ca paleothermometry and lithofacies analyses, will enable assessment of the impact of ocean temperatures on past Antarctic ice sheet dynamics.

Degree		MS
Field		Geological Oceanography
Advisor		Dr. Amelia Shevenell

How Low Can Predators Go? Hypoxia Tolerance of Coastal Shark Species of Varying Lifestyle

Alyssa Andres, Brad A Seibel, Emily Slesinger, Grace Saba, Vincent Saba, Jack Morris

Environmental oxygen availability, relative to requirements, is an important determinant of habitat suitability for marine organisms and provides a measure of effective metabolic scope for all life functions beyond basic maintenance. As the balance between metabolic oxygen demand and environmental supply changes with climate, energetic trade-offs occur to facilitate survival, or alternative habitat is sought to alleviate metabolic constraints. As the global incidence of low oxygen, "hypoxic zones" increases each year, it is crucial to understand how marine organisms respond to hypoxia. Coastal shark species of varying lifestyle such as blacktip sharks (*Carcharhinus limbatus*), and spiny dogfish sharks (*Squalus acanthias*) may be vulnerable to hypoxia due to oxygen-intensive behaviors, such as high-speed swimming, migration, etc. Hypoxia, in conjunction with temperature-induced increases in oxygen demand, may limit performance and viable habitat of coastal shark species. To accurately forecast shark niches, and habitat selection in the face of these climate shifts, we must first determine species-specific tolerances to hypoxia. Hypoxia tolerance was measured using Pcrit, defined as the critical oxygen partial pressure at which oxygen demand equals supply. Using respirometry, we determined Pcrit for *C. limbatus* and *S. acanthias*, and examined how Pcrit varies with temperature. Results from this study provide a physiological basis for predicting viable habitat for these species.

Degree		PhD
Field		Biological Oceanography
Advisor		Dr. Brad Seibel

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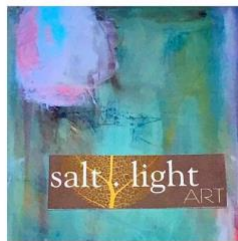
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