Poster Session 1

MGH 206, Easel 172

11:00 AM to 1:00 PM

Stasis and Change in the Intertidal: A Comparison of Community Structure Over 45 Years

Cormac Lane Toler Scott, Junior, Pre-Sciences
Mary Gates Scholar
Chloe Hannah May, Senior, Environmental Science & Resource Management
Mary Gates Scholar
Jamie Andersen Maron Fields, Recent Graduate,
Mary Gates Scholar
Mentor: Hilary Hayford, Biology
Mentor: Robin Elahi, Hopkins Marine Station, Stanford University

As climate change progresses, increasing temperature is expected to have community and population-level consequences. The temperature-size rule predicts shifts in both community and population structure to favor smaller bodied organisms over larger bodied organisms as temperatures increases. We investigated this hypothesis in the context of rocky intertidal invertebrate communities on San Juan Island, and examined changes in community and population structure over the past 45 years. We replicated historical ecology studies on the abundance of six intertidal species; three of which body size data was also collected. These species included grazing and predatory molluscs (*Katharina tunicata*, *Nucella lamellosa*), anemones (*Anthopleura elegantissima*), and crabs (*Hemigrapsus nudus*, *Pugettia gracilis*, *Pagurus sp*). Additional abundance data was collected on smaller molluscs (limpets, littorine snails). Predicted decreases in body size were not apparent in populations of *K. tunicata*., *N. lamellosa*, and *A. elegantissima*. However, when comparing abundances, shifts in community structure towards smaller-bodied organisms were apparent. We observed an increased abundance of smaller-bodied gastropods and crustaceans (limpets and *Pagurus sp*), but a decrease in *K. tunicata* abundance, one of the largest grazers in this system. This research highlights the potential for a variety of community and population responses including both stability and variability in the face of climate change.

Session 1E

Animal Behavior, Ecology, and Evolution

Session Moderator: Luke Tornabene, School of Aquatic and Fishery Sciences and the Burke Museum of Natural History and Culture

MGH 231

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Niche Partitioning and Intertidal Habitat Use among Coexisting Gull Species on San Juan Island, Washington

Fiona C Boardman, Senior, Biology (Ecology, Evolution & Conservation)
Mentor: William Breck Tyler, Friday Harbor Labs

Gull species in the genus *Larus* differ in breeding range, habitat use, size, and feeding behavior. During their post-breeding season, however, many species of gulls gather and temporarily occupy the same sites and habitats. Although there is evidence of niche partitioning by gulls in northeastern North America and northwestern Europe, the mechanisms by which gulls coexist in the San Juan Islands of Washington state are poorly studied. To investigate gull coexistence on San Juan Island, WA, we studied the intertidal feeding ecology of Mew Gulls (*Larus canus*), California Gulls (*L. californicus*) and Glaucous-winged Gulls (*L. glaucescens*). Patterns in abundance, behavior, substratum-use, and large prey type (identifiable through spotting scope) were investigated through observational methods at Jackson Beach. Pairwise chi-square tests revealed significant differences in large prey type and substratum use between California and Mew gulls and between California and Glaucous-winged gulls. Patterns in frequency of large prey captured illustrate differences in prey selection among species, with Mew gulls capturing primarily worms, California gulls capturing primarily fish, and Glaucous-winged gulls demonstrating generalist foraging behavior. These findings suggest that during foraging, the gull species use shared habitat differently by specializing in different large prey types. This supports previous evidence of niche partitioning among gulls, and suggests that niche partitioning reduces competition among gull species in the San Juan Islands.

SESSION 1E

ANIMAL BEHAVIOR, ECOLOGY, AND EVOLUTION

Session Moderator: Luke Tornabene, School of Aquatic and Fishery Sciences and the Burke Museum of Natural History and Culture

MGH 231

12:30 PM to 2:15 PM

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The Evolution of Bone Density in Deep-Sea Snailfishes

Abbey Dias, Junior, Biology, Whitman College
Mentor: Mackenzie Gerringer, Friday Harbor Labs

Maintenance of neutral buoyancy is a challenge to all fishes. In shallow water, this is typically achieved through the use of a swim bladder, though a more favorable mechanism for deep-sea species is through a reduction in skeletal structure. Extreme environmental conditions—low temperature, high pressure, lack of light, limited food availability, and varying oxygen concentrations—exert evolutionary pressures on organisms that inhabit the deep sea. The family Liparidae (snailfishes) span the largest depth range of any marine fishes. Hadal snailfishes, the deepest-living fishes, reside as deep as ˜8,200 meters. With the elimination of swim bladders, a reduction in skeletal structure has become the mechanism by which this family achieves the buoyancy needed to hunt in the water column. We used micro-computed tomography (micro-CT) scanning to study bone density across the full bathymetric range of the Liparidae with representatives across the family tree. Of these specimens, five bones were measured for density: the lower jaw, for purposes of feeding mechanics; the third vertebrae, as a control; the first left pelvic pterygiophore for studying the suction disk; the hypural plate, to study swimming and movement trends, and the sagittal otoliths. Phylogenetic analyses revealed a decrease in bone density with increasing depth. The degree of change in density with depth differed among the structures measured, implying evolutionary effects on the function and performance of bone structures in the deep sea.

SESSION 2D

BIOLOGICAL RESPONSES TO ENVIRONMENTAL FACTORS

Session Moderator: Frieda B. Taub, Aquatic & Fishery Science

MGH 234

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Characterization of Benthic Habitat in the San Juan Archipelago and Divergence in Settling Mechanics for Shell Hash

Elisa Nicole Aitoro, Senior, Oceanography
Mary Gates Scholar
Mentor: Matthew Baker, Aquatic & Fishery Sciences

Pacific sand lance (*Ammodytes personatus*) are an important forage fish in the Salish Sea that spend large portions of their time buried in sediment. Five important *A. personatus* habitats, including San Juan Channel (SJC), Sucia Island (SI), North Peapod Island (NPI), Salmon Bank (SBnk), and Iceberg Point (IP), have been documented by students in the Pelagic Ecosystem Function apprenticeship at Friday Harbor Labs since 2010. Continued sampling efforts have led to extension of an important time series at these sand wave fields throughout the San Juan Archipelago, as well as three new sites. New sites include Hein Bank (HB), North Waldron Island (NWI), and Puffin Island (PI). Both HB and NWI had *A. personatus* present, while PI did not. A synthesis of data from previous years showed sediment type at Sucia Island and North Peapod Island are most similar to each other, while San Juan Channel and Salmon Bank both have a large variation in sediment type. Shell hash is a prominent portion of many *A. personatus* habitats. Previous studies of these wave fields have treated shell hash as analogous to typical geologic sediments, however this study aimed to examine the divergence of shell hash physical dynamics from what is generally expected. The irregular shape of these biologically-derived sediments leads to a relationship between diameter and minimum settling velocity that is the opposite of what is expected for geologically-derived sediment particles. Of the shell hash tested (n=70), the maximum velocity was relatively consistent, and differences in settling velocity between diameters was seen in minimum velocities. These results have implications for understanding net transport throughout the system where different sediment types are present, understanding how sorting and packing of shell hash impact the habitat quality for *A. personatus*, and how differing amounts of these materials may distinguish these important benthic habitats.