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Department of Marine Sciences
Presents a Seminar by

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Atoms to Ecosystems: Molecular isotope approaches to studying of food web architecture in an age of global change

Food web architecture plays a pivotal role in the structure, function, and resilience of ecosystems. As climate continues to rapidly change and more complex human-environment interactions emerge, it has become even more important to understand how these relationships shape ecological processes. My approach centers on the development and application of novel compound-specific stable isotope analysis tools to transform how we study the sources and cycling of organic matter in marine systems. In this talk, I will explore two case studies that look at how climate change influences ecosystem structure and function through the lens of food web architecture. In the first case study, we show that over the last 1000 years, the North Pacific Subtropical Gyre has undergone significant multi-century scale shifts in plankton community composition between prokaryotic and eukaryotic dominated systems linked to large scale climate phenomena. The most recent regime has seen a significant increase in N₂-fixation that is unprecedented in the last millennium. These shifts have major implications for regional food web structure, biogeochemical cycling, and the efficacy of the biological pump to sequester carbon. In the second case study, we explore century scale penguin trophic dynamics in the Southern Ocean. We show evidence for a major krill surplus in the early to mid-20th century linked to overharvesting marine mammals followed by a decline in krill availability in recent decades as a function of climate-induced reductions in krill coupled with increased competition. We show that species-specific responses to these changes support ecological niche theory that specialists will be more sensitive to these environmental changes than their generalist counterparts. These studies illustrate the power of taking a molecular-level approach to food web ecology to provide an ecosystem-scale view of past and present ecosystem responses to environmental change.

Host: Craig Tobias

Time & Date: 11:00 am, Friday, March 13, 2020

Place: Marine Sciences Building, Seminar Room 103

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