Effects of temperature on metabolism and muscle function of Narragansett Bay fish species

Anabela Maia (Rhode Island College)

Project Location:
Rhode Island College

Project Description:
The effects of climate change are particularly strong in estuarine habitats where animals are already exposed to a variety of stressors, including other anthropogenic pressures and changes in salinity. Summer temperatures in Narragansett Bay have seen a steady increase in the last decades, with even more pronounced temperature increases over winter months. Most fish are not able to regulate their body temperature and their metabolism is likely to be strongly affected by temperature fluctuations. In general, higher temperatures accelerate biological processes and can lead to faster growth, however they can also induce stress and leave less energy available for maintenance, immune response and reproduction. Temperature optima vary widely between different species and increases in temperature are likely to change the fish composition of Narragansett Bay. We are already seeing changes in population dynamics of black sea bass and scup, which have been increasing in abundance. Species like silver hake and little skate have been identified as more likely to be negatively impacted, while the effects of warming temperatures in spiny and smooth dogfish populations are complex. We aim to understand how the metabolic demands of these six species change under different temperatures by measuring basal and standard metabolic rates, that is the oxygen consumed during both rest and normal swimming activity. Swimming in fishes is a costly activity and is powered by body undulations and fin musculature. We will also look at muscle contraction through electromyography to determine changes in muscle recruitment that are likely affecting overall metabolism. We expect to see that species that are able to change muscle recruitment in a way that minimizes energy requirements at higher temperatures are more likely to outcompete species that have muscle function optimized for lower temperatures. We hope to predict which species are more likely to be negatively, positively or neutrally impacted based on their energy budgets and muscle function.

*This project involves **primarily lab or computer work***

Required/preferred skills for student applicant:
Preferred skills: knowledge of fish husbandry; some physiology background (e.g. animal or human physiology course)

Student transportation needed for project?
No