Spiny lobsters inside and outside of marine protected areas

Marine Protected Areas (MPA) are specific areas in the marine or estuarine environment where human activity is restricted for a conservation purpose, such as preserving marine life and habitat. California has a network of MPAs along the coast and their effectiveness and overall performance are continuously evaluated to determine their success in meeting the goals of protecting the state's marine resources. One species of interest in California is the California spiny lobster (*Panulirus interruptus*), a highly sought-after recreationally and commercially important species.

A pilot study comparing lobsters inside and outside of a long standing MPA on Catalina Island showed that outside the MPA, lobsters were greater in number and had a higher ratio of reproductively active females than the lobsters inside the MPA, even though the lobsters inside the MPA were protected. The difference may have occurred because the lobsters outside the MPA had access to intertidal beds of mussels (*Mytillus californianus*), which composed 75% of their diet. The lobsters inside the MPA likely did not access the mussel beds due to distance and seafloor topography. While the spiny lobsters are generally thought of as a subtidal species, this pilot study was among the first to demonstrate the importance of intertidal habitat in their population structure and reproduction capacity.

This project will expand on the pilot study to determine the seasonal diet variation of the spiny lobsters associated with the migration from subtidal to intertidal during their reproductive season. We will use Geographic Information System (GIS) and remote sensing imagery to assess how geology and habitat affect lobster foraging behavior with the goal of informing future MPA design and placement. Additionally, we will use stable isotope analysis to assess the diet preferences of spiny lobsters to further determine the role of intertidal species in the reproductive success of spiny lobsters throughout the Southern California Bight.

As an undergraduate student assistant for this project, you will get to assist with:

- Preparing dried samples of California spiny lobster tissue for stable isotope analysis
    - Grinding samples
    - Weighing samples
- Using GIS to analyze images
- Field work at Catalina Island over winter break if your schedule allows (**please note: this is strictly optional and is not required**)

Things you will learn/be exposed to:

- Ecological theory
- Laboratory procedures
- Stable Isotope Analysis (SIA) principles
- Image Analysis
    - Geographic Information System (GIS)
    - Drone and remote sensing image products
    - Georeferencing images
- Statistical analyses (in R including using Bayesian mixing models)

You will need to be willing and able to:

- Work with small samples of dried California spiny lobster tissue
- Work on a computer for extended periods
- Reliably get yourself to the Monterey Bay Aquarium Research Institution (MBARI) in Moss Landing.

Looking for someone who is:

- Hard working
- Attentive to detail
- Patient