



Sargassum

- Coastal or pelagic seaweed species
- Constitutes most of the structure in open ocean
 - Essential Fish Habitat
 - Protected in US waters
- Rapid increase of Sargassum in Atlantic in recent years
- In 2018, 20,000,000 tons of Sargassum found in the Caribbean and Central Atlantic
- Caused by increased Carbon levels and nutrient discharge

Objective: create a catalog in which we can characterize the biodiversity of life within Sargassum.

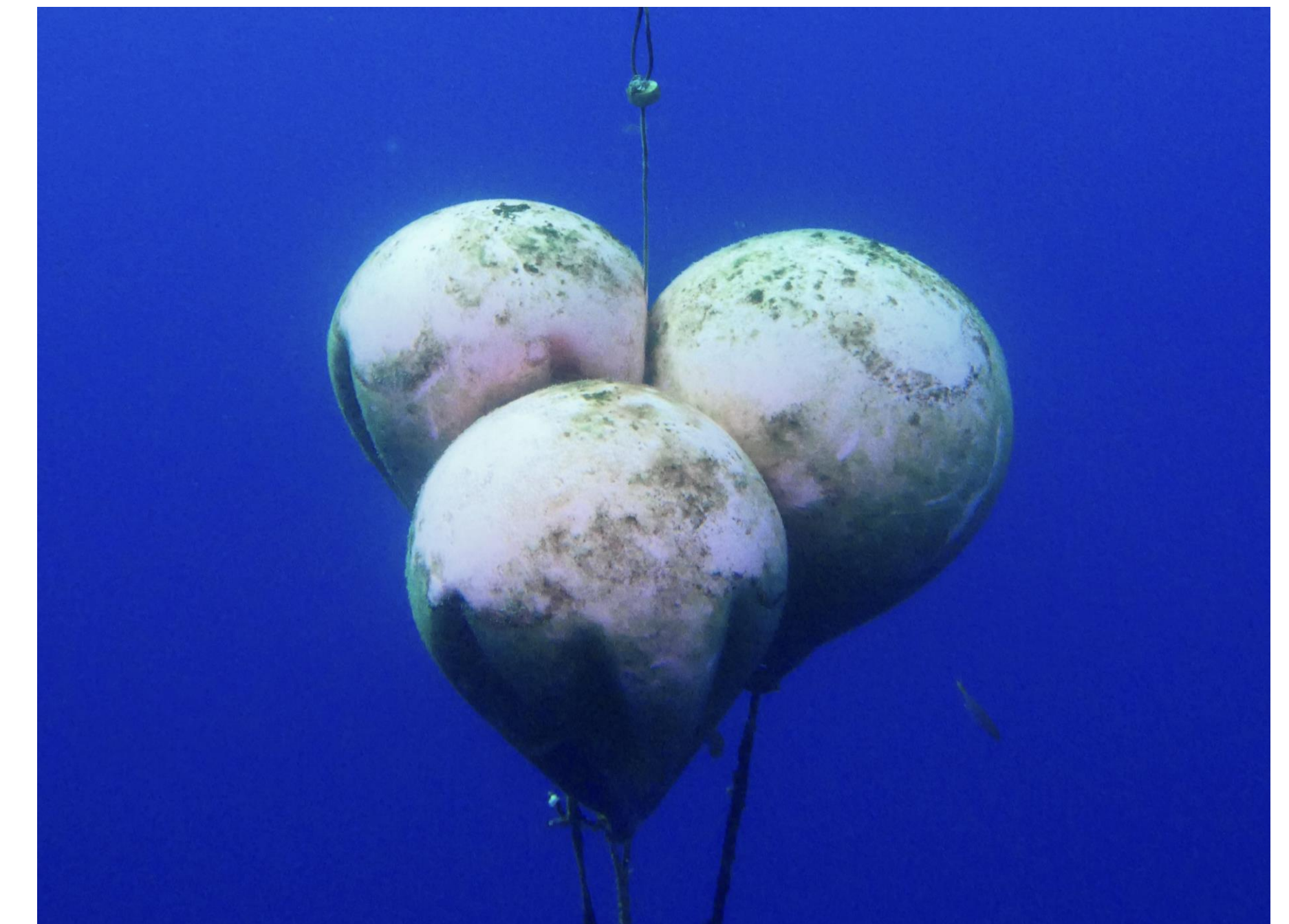
Pelagic Ecosystem

- The largest ecosystem in the world
- Volume of 330,000,000 cubic miles
- There is little structure therefore fish will gather around floating habitats

The main goal of our projects is to learn how organisms interact with the structure found in the pelagic ecosystem, whether it be natural or manmade.

Fish Aggregation Devices (FADS)

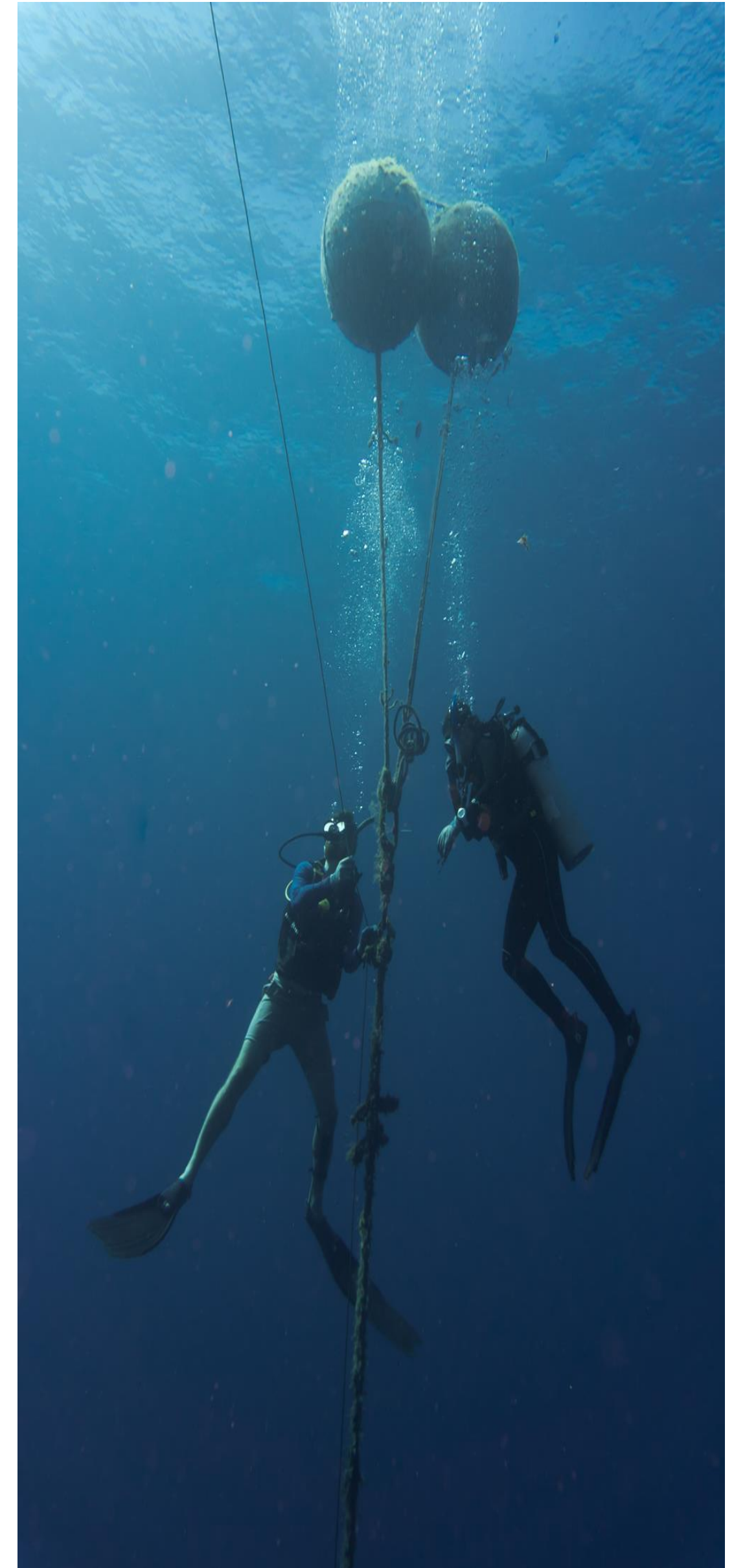
- FADs are floating buoys that can be anchored to the ocean floor or float on the surface
- Used to attract fish for easier capture
 - 60% of the world's tuna is caught at the FADs
- Fishing at the FADs leads to bycatch which is the unwanted catching of different species
- Fisheries use large seine nets to capture entire schools of fish



Objective: study the fine scale movement of fish around a FAD

Methods

- Two methods for collecting Sargassum:
 - Sargassum trawl (a large net that is dragged behind a boat through the water)
 - Quadrat dip nets (square nets used to scoop up sargassum by snorkelers)
- Our control is sampling biodiversity in the open water
- After collected, the sargassum is placed into buckets and taken back to CEI (Cape Eleuthera Institute)
- The sargassum is sorted through and organisms are found throughout the seaweed. Once an organism is found, it is placed in a petri dish filled with water and data is recorded on it. The organism is weighed, measured, and photographed. The abundance of each species found is also recorded
- This data is being used to create a catalog of all the species that are found in Sargassum



Methods

- Transmitters placed on fish send information to the receivers
- Receivers are placed in a vertical array at 10m, 100m, and 200m on the FAD anchor line
- Calibration tests by drifting a transmitter by the FAD at different depths
- Implanted two tags in Barracuda that served as test subjects for the effectiveness of the system
- Tags emit sound pings that communicate with the receiver to track their fine scale movement
- Receivers mark the time of the pings to calculate the distance between the FAD and the tag
- Transmitters: placed on the fish to send information to the receivers
- Multiple receivers allows us to pinpoint the depth of the tag and its distance from the FAD using trilateration
- Receivers: placed in a vertical array at 10m, 100m, and 200m on the FAD anchor line to gather information

Preliminary Results

Sargassum sp.

Sea snail (Mollusca)

Sargassum Nudibranch (Mollusca)

Sea snail (Mollusca)

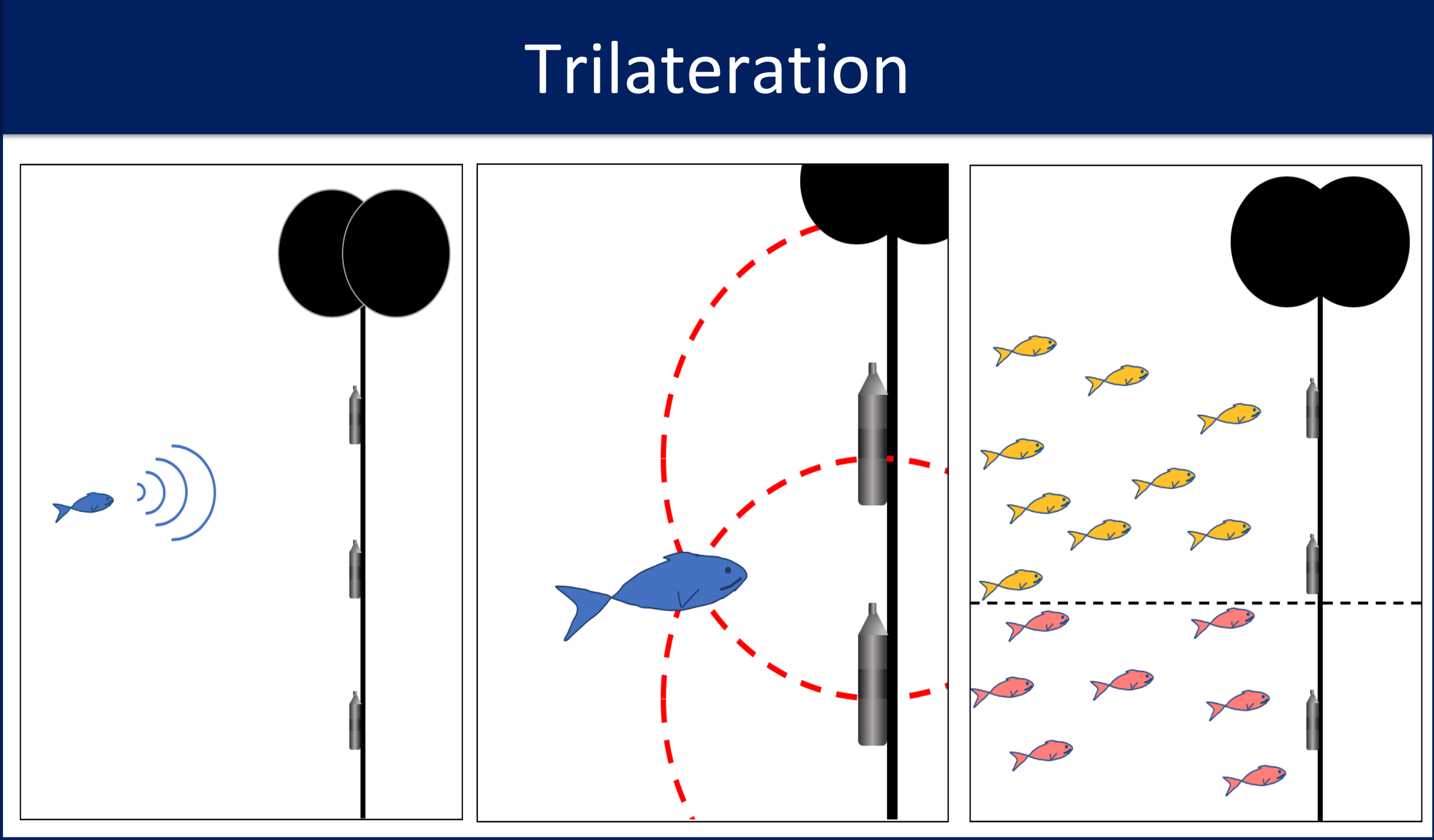
Sea spider (Arthropoda)

Pipefish (Chordata)

- Organisms collected from two quadrat dipnets
- Collected: two species of *Sargassum* and multiple species of epiphytic algae
- 122 individual organisms
- Organisms belonged to 4 different animal phyla: Arthropoda, Cnidaria, Mollusca, and Chordata

Acoustic Telemetry

- Acoustic telemetry: remotely tracking an object (i.e. fish) using sound pings
- Project goal: develop a system where we can study the movement of fish around a FAD using transmitters and receivers
- Typically used to track fish in shallow water habitats
- First vertical array implemented in the open ocean
- Project goal: develop a new system to study the fine scale movement of fish around a FAD



Discussion

The organisms collected from the *Sargassum* contribute to the ongoing catalog that characterizes the life living in *Sargassum* in order to observe the extent of biodiversity within the natural structure. The significance of this catalog is understanding what organisms are utilizing the *Sargassum* habitat. The protocol not only creates the catalog, it serves as a tool to help track the abundance of *Sargassum* as it proliferates across the Atlantic ocean. This is relevant because people are unaware of what *Sargassum* is, and how it is affecting the pelagic ecosystem.

Future Studies

By developing new technology and methodology in the form of our acoustic array and sargassum catalog we are looking towards better understanding the pelagic ecosystem. FADS have become an essential part of modern fisheries, but there is still so little known about how these FADS are impacting the greater pelagic environment. Despite being so vast, pelagic ecosystem is a limited resource, and the biggest impact of our research lies in the potential that this data holds for creating more sustainable fisheries through bycatch management.

Sargassum:

- Use the protocol to observe the contents of microplastics in the *Sargassum* and see how they are affecting the biodiversity within the *Sargassum*
- Critical step because microplastics are increasing in abundance while their impact on the ocean and biodiversity is not researched enough

FADS:

- Tag commercially relevant fish + sharks
- Next steps: implement the vertical array method elsewhere
- Aid fisheries in reducing their bycatch by determining where to position their nets to catch only targeted species
- Gain partnerships between scientists and fisheries

Discussion

Now that the method has been successful, we can now study the different movement patterns of species around the FADs. This information can then aid fisheries in reducing their bycatch by determining where to position their nets to only catch targeted species. This method could also provide partnerships between scientists and fisheries because it saves resources for both parties because the anchor lines are deployed on the existing FADs. With observation and studies we can understand more about the pelagic ecosystem, which will help us know how to conserve and protect this ecosystem.

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