LPA

IB Biology/Chemistry Group 4 Project

For our Group IV experience, we take advantage of an educational partnership with Harbor Branch Oceanographic Institute and our proximity to the Indian River Lagoon, a diverse estuary on the east coast of Florida. Students from Biology HL and Chemistry SL work in cooperative groups during the field work.

An overview lecture on the IRL is given to the entire group by a consultant from HBOI. At the end of the lecture, the students brainstorm what aspects of this ecosystem could be investigated and decide what would be the appropriate order in which to carry out these activities.

In the field, scientists from HBOI guide the students through the data gathering to measure various biological and physical parameters at three locations on the estuary.

Back in the classroom, the groups compile their group's data to be shared with all students. In this way each student will have the entire set of data. For Biology, each student chooses an independent variable to write a lab report. I require that all Biology HL students use biodiversity as their dependent variable, connecting our Group IB field work with Option C.

Proposed research topic:

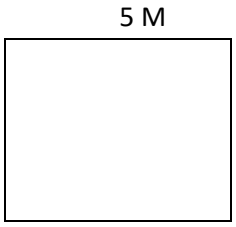
How do species richness and diversity as well as water quality and sediment differ with respect to seagrass community in the Indian River Lagoon? Past studies have indicated a difference in diversity of fauna with respect to the type and the structure of bottom habitat (Virnstein et al, 1983; Virnstein and Howard, 1987). The structure of seagrass (height, width, shape) is species specific, which could result in different bottom habitats with respect to seagrass species. To test this hypothesis, three study sites are chosen. Site1 includes seagrass communities along the south property of HBOI. Site 2 includes sea grass communities along the north property of HBOI. Site 3 includes seagrass communities just south of the Ft.Pierce Inlet on the river side of the barrier island at Jaycee Park.

Ultimately, we want to determine a difference in fauna between distinct species of seagrass communities, but we recognize that not all seagrass beds are homogeneous so the species composition and density of seagrass in each community is documented and considered during this study.

Several types of sampling are undertaken to address the issue of species richness and abundance as well as water quality and sediment. The study sites will first be marked. Water quality measurements will then be taken and the weather conditions noted. Next, organisms will be collected with seine nets. Once organisms from each of 3 seines are identified on the beach and turbidity of the site decreased, seagrass coverage will be measured. Percent cover and species composition of seagrass will be determined using quadrats. Core samples will then taken to investigate sediment composition. The sampling will take place over a three-day period, collecting the seagrass data, water quality, animal species diversity and animal species abundance at each site. All observations will be recorded in your log book.

Marking the Sampling Area:

Find a seagrass bed. Measure four 5 meters sides using a transect tape. Mark each of the points with a wooden stake or piece of PVC pipe. The pipes with floats attached should be placed at the deeper points. Determine the location of three testing points within your area and mark them A, B, and C. We decided to test near shore (A), halfway to your sampling area (B) and within the sampling area(C). Draw a map of your area. Show the location relative to on-shore landmarks. Indicate the location of the A, B, and C testing points.



Physical Parameters:

Students should measure and record the water depth at the testing points, wind speed, and air temperature. Also estimate wave height and wave length. Note weather conditions such as cloud cover and sun or rain. Repeat these measurements/observations each time water samples are taken.

Water Sampling:

Once you have marked off the study area, take water samples (in 200 ml containers) at the A, B, and C. One bottle for each sample should be used. Be sure to label the bottle properly. Fill the container under the surface of the water, about half way down the water column. Replace the cap before bringing the container to the surface. Once you have taken the water samples, carry

them carefully back to the shore without agitating the sample. Measure the temperature and Dissolved Oxygen. The other qualities (salinity, pH, nitrates, and phosphates and other factors that you might have decided to include in your study) can be measured as well. Water samples will be tested at three times throughout the day.

Seining:

Once you have collected your water samples, you can seine for organisms. Walking outside of your study area, carry the seine net to the back of the area. Unroll the net and place the leadweighted line on the river bottom. Remember when you are pulling the net; the lead line should always be in front of the top of the net. In other words, hold the net at a 45^0 angle, tilted away from the direction that you are walking.

Start at one side of the study area and sweep the net across, pulling as swiftly as possible to avoid organisms swimming out. The lead line must stay on the bottom. (If the net is less than 5 meters long, when you reach the other side of the study area, you will have to pivot around and sweep back to the side you started on. When you reach the perimeter, raise the net in unison up over the water and bring it to the beach where you can sort out the sample. Hold the net flat, parallel to the water to prevent any animals from escaping.

Once you pull in the net, immediately place all organisms collected into a bucket of water. To identify them, remove them from this bucket one at a time using a dip net. Immediately after identification, place them in a second bucket of water.

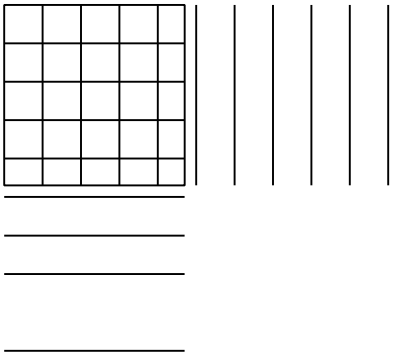
Record genus/species and common names and the number of each type in your log book. Refer to your field guide if you do not recognize a species. If all else fails, ask an instructor. Weigh the macroalgae that was found in the seine using the hanging scale provided. Identify all organisms before you conduct the next seine. Gently release the animals back into the water as far away from your study area as possible.

Wait at least 5 minutes between seines. Repeat the process of seining two more times for three data collections.

Water Sampling:

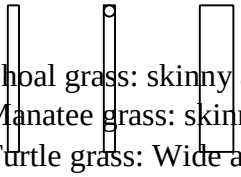
Seagrass:

After water samples have been taken, and seining is complete, determine the percent cover and species composition of the seagrass at your site. You can do this by placing the 1 m^2 quadrat in one corner of the area. Count the number of squares of the quadrat that are filled with sea grass (or drift algae if present). Determine the type of seagrass or algae as well as which ones are most dominant. Flip the quadrat and continue to measure until you have covered the entire study area.



$1m^2$ quadrat (1 sq=1%)

1 2 3



3 Main Seagrass Species

1) Shoal grass: skinny and flat
2) Manatee grass: skinny and round
3) Turtle grass: Wide and flat

Core Sampling:

Take sediment samples at the A, B, and C locations. The core "depth" should be standardized to 15 cm. This means that you will compare the first 15 cm of material.

- Push sediment core tube into the sediment, twisting it in as far as possible. Place the lid on the top and slowly pull out the tube. Bring this back to shore. Measure the sample from the surface to 15 cm down into the sediment. Note any stratification of layers (see any clear color changes in sediment layers). Draw the sample in your log book, marking layers, measurements, and other observations. Retrieve the sample by slowly taking off the lid(s) and push the sediment out from the opposite direction. Make sure you lay the sample on its side or in a diagonal direction when you do this so the integrity of the core is maintained.
- Use the sieves to separate the sediment material by particle size. Record the % of each sized particle.

Water Sampling:

Data Analysis:

On site, you share data with your group so that everyone has a complete set of data.
When we return to class, your group will be responsible to prepare a summary of your data to be shared.
As an individual, you will choose some aspect of the data as your independent variable to write your report. Your dependent variable will be the biodiversity of the fauna as measured by Simpson's Diversity Index. We will discuss in class how to organize and analyze the data. Instructions for writing a final report will be provided.