



MarineLab

Marine Resources Development Foundation

Marine Science education in the Florida Keys

MarineLab Programs Utilizing Research Tools/Techniques

While all of our lessons are data driven and incorporate up to date science content, many of our programs incorporate opportunities for students to get hands on experience with research tools and/or techniques.

Half Day Programs:

Advanced Seagrass Ecology: Seagrass Surveys

The seagrass ecology program is a part of MarineLab's core curriculum. The seagrass survey program was created to give students experience with in-water data collection. Students will learn about the importance of the seagrass habitat, how to identify seagrass and algae species, and what animals they can be looking for during the seagrass survey. Seagrass survey protocols and techniques will be discussed in the classroom before students practice on land. Once confident, we will go to the survey site where students will have time to conduct survey and enjoy a seagrass snorkel. Student data will be analyzed and discussed before being entered into MarineLab's database. Experimental design and the importance of baseline data will be reviewed.

Grade Level: 9th and Above

Timing: 3 hours (1 hour in classroom, 30 minutes on land practice, 1.5 hours on/in water)

Coral Reef Ecology II: A closer look

This program was created for students that have already participated in MarineLab's coral reef ecology program; the concepts build on the ideas introduced during our core coral reef ecology program. Through incorporating recent coral reef research, the program includes a more complex approach to observing the coral reef habitat. After a classroom discussion, students have the opportunity to snorkel two different coral reef sites with a checklist of specific organisms, behaviors, symbioses and environmental impacts to look for. MarineLab staff will be in the water and on the boat to lifeguard, point out marine life, and discuss observations.

Grade Level: 9th and above (all students in the group must have already participated in our Coral Reef Eco or Advanced Coral Reef Eco program during current trip or on a previous trip)

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Timing: Class is 1 hour. Field trip is 3 hours (field trip can be shortened, if necessary)

Advanced Coral Reef Ecology: Coral Bleaching and Disease Monitoring

The coral reef ecology program is a part of MarineLab's core curriculum. Corals are the key component to the Florida Keys' marine ecosystem. Students discuss coral reef ecology with a MarineLab instructor before boarding the boats to snorkel the coral reefs off of Key Largo. While in the classroom, protocols for observing coral bleaching and disease will be reviewed and practiced. While always dependent on conditions, we generally snorkel two sites. MarineLab staff will be in the water and on the boat to lifeguard, point out marine life, and discuss observations. Students will discuss data once on the boat and data will be entered into an online database used by scientists at Mote Marine Lab.

Grade Level: 9th Grade and Above

Timing: Class is one hour and field trip is 3 hours (field trip can be shortened)

Advanced Fish ID: Parrotfish Feeding Surveys

The fish identification program is a part of MarineLab's core curriculum. This advanced version gives students the opportunity to participate in data collection as part of a greater research study. As with our basic Fish ID program, students will learn the best field marks to use to identify a fish, behavioral characteristics of fish families, and how to identify fish species that we commonly see on Key Largo's reefs. For this particular program, students will also be taught the proper protocols for data collection for the study they will be participating in and the reasoning behind the study. The students are then taken out to a reef to put what they learned into practice! During the snorkel, each pair of students will spend 6 minutes recording parrotfish feeding data. All data is submitted to Dr. Deron Burkepille and entered into MarineLab's database.

Grade Level: 9th Grade and Above

Timing: Class is 1 hour, field trip is 3 hours (field trip can be shortened, if necessary)

Advanced Fish ID: REEF Fish Survey Program

The fish identification program is a part of MarineLab's core curriculum. This advanced version gives students the opportunity to participate in citizen science. As with our basic Fish ID program, students will learn the best field marks to use to identify a fish, behavioral characteristics of fish families, and how to identify fish species that we commonly see on Key Largo's reefs. For this particular program, students

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will learn the “roving diver” technique employed by REEF survey volunteers. Once in the water, the students will be equipped with underwater slates and REEF fish survey sheets in order to record all fish they can identify and count. Students can take his/her data sheet home, register at reef.org and enter his/her data.

Grade Level: 7th grade or above

Timing: Class is 1 hour. Field trip is 3 hours (can be shortened, if necessary). Optional quiz (see “Extensions” below) is additional time.

Advanced Mangrove Ecology: Sediment Analysis Lab

The mangrove ecology is a component of our core program and allows the staff to truly use the outdoors as a classroom. Mangroves provide an important habitat and play a vital role in the ecological functioning of other associated habitats in the keys. Students will learn about mangrove ecology during a discussion on the boat on the way to the mangrove snorkel site. Boat will stop at various locations so instructors can point out any animals to identify (birds!), examples of mangrove adaptations, the identifying characteristics of the three species of mangroves and unique habitats created by the mangroves. During one stop, students will collect and analyze a sediment core from two different mangrove zones. Once at the site, students will join a MarineLab instructor to snorkel amongst the mangrove roots. The instructor will collect a sample of representative animals that he/she will bring back to the boat for observation and discussion.

Grade Level: 9th Grade and Above

Algae Investigation

Students board the boats to a mangrove island in Florida Bay. Macroalgae as a microhabitat is introduced before students are asked to snorkel and record some observations about the macroalgae and its community that they find fascinating or cause them to wonder. They use these wonders to design testable questions and conduct short investigations. They will work with their buddy to make sense of their results before sharing and reflecting on potential investigation improvements with the boat group.

Grade Level: 5th – 12th (slight variations depending on grade level)

Timing: This is a 3 hour long field trip but timing with this program is very flexible. If there is not time for a boat trip, we can do this in Largo Sound, the body of water adjacent to our campus. The program is most effective when conducted after students have participated in our Mangrove Ecology Program.

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Florida Bay Survey Program

The Florida Bay survey program is a citizen science based field trip that builds on the snorkeling expertise gained during the seagrass/mangrove ecology core programs. This is a 3 hour program where students will collect water quality data and work in buddy pairs to conduct underwater surveys. Students will record the abundance of seagrass, macroalgae and Florida Bay animals they learned to identify during the seagrass/mangrove ecology programs. Once back on the boat, data is discussed. All data is entered into MarineLab's long term database. **All students must have already participated in our seagrass and mangrove ecology core programs.**

Grade Level: All

Timing: 2 – 3 hours ** we can shorten this program to 2 hours if you are interested in incorporating another lab/discussion **

Marine Debris Program

Marine debris is one of the most widespread pollution problems facing the world's oceans and waterways. This is a half day program that encompasses a classroom discussion, mangrove cleanup and data analysis. In the classroom, marine debris is defined and impacts and solutions to the issue are discussed. Students participate in a cleanup and return to MarineLab to collect and analyze data. All data will be submitted to Mote Marine Lab and entered into MarineLab's in house database.

** There are *options*:**

- 1- Take a boat to the mangroves, climb onto mangrove island to pick up trash amongst the roots – we recommend avoiding this option during hottest summer months but perfect for winter months
- 2- Take a boat to a mangrove site to snorkel and pick up trash under water – we recommend this option for the hottest summer months
- 3- Do a land based cleanup near MarineLabs campus – we recommend this options if you are looking to avoid the additional cost of a boat trip

Grade Level: 7th grade and above

Timing: 3 hours (flexible)

Nest Key Field Trip

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Students will board boats to go to Next Key, a mangrove island in Florida Bay, within the Everglades. True backcountry waters! Once at the island, we will discuss mangrove island growth and development. Students will walk a short trail from the edge to the middle of the island to observe island zonation and the shift from mangroves to salt tolerant trees. Afterwards, a seining activity in the waters adjacent to the island will provide students a hands on look at some of the unique organisms we have in our backcountry waters.

** Due to heat, insects, etc., we recommend avoiding this trip during the hottest summer months **

Grade Level: All

Timing: 3 hours

Reef Restoration with Citizen Science

Students spend an hour in the classroom discussing the need for reef restoration and various restoration efforts in the Florida Keys. During the field trip, snorkelers will observe one of Coral Restoration Foundation's coral nurseries and then snorkel a restoration site. The citizen science reef restoration program provides students the opportunity to directly participate in local reef restoration efforts. Before leaving the dock, MarineLab instructor will teach the students how to identify outplanted coral and record the necessary data. Students will be taken to one of the Coral Restoration Foundation's coral nurseries for the first site. The students will then collect data on corals that have been outplanted by the Coral Restoration Foundation at a second site. Once back at the dock, data will be submitted via CRF's app.

Grade Level: 7th and above

Timing: 2-4 hours. Class discussion is 1 hour. Field trip is generally 3 hours but can be compressed to 2 hours. The discussion is not a required component of this program. It is suggested 7th and 8th grade students don't participate in the discussion and solely do the field trip portion.

Rodriguez Key Field Trip with Diversity Indexing

The transitional ecotone habitats within the Florida Keys often harbor diverse communities. The field trip will begin at the dock with a brief discussion on ecotones, the specific algal shoal habitat the group will be snorkeling, and examples of some of the organisms they can expect to see in the water. *Neogoniolithon strictum* ("Gonio") is a branching crustose coralline algae that creates a microhabitat for a diverse array of invertebrates. Students will snorkel the unique Gonio ecotone habitat and participate

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in a lab on the boat to observe, identify and discuss the invertebrate community that lives within the Gonio. Students will then use the tools and knowledge gained during Diversity Indexing Lab to compute the Simpson's diversity index for the area; the number found will be compared to the index they calculated for Largo Sound and data will be discussed. Dependent on time and weather, students will be taken to a second snorkel site (North side of the island at the plane wreck or a patch reef.)

Grade Level: High School or Above (**Must have participated in our Diversity Indexing Lab**)

Two Hour Programs:

Diversity Indexing Lab

The lab begins with a discussion relating biodiversity to ecosystem health and stability. Students work in pairs to count and identify every invertebrate he/she can find on a live rock freshly collected from Largo Sound. Each pair calculates a diversity index for their rock. Discussion continues regarding application to true scientific studies and the need for increased sample size. Students use raw data from all rocks in the lab to calculate an "overall" diversity index and numbers are compared and discussed. The lab concludes with a discussion regarding the validity of the study overall. What are the "pros" and cons of utilizing a mathematical measurement of biodiversity? What is the study lacking?

Grade Level: High School or Above

Timing: 2 hours

Phytoplankton Monitoring Lab (HAB Lab)

Phytoplankton play a vital role in the marine ecosystem; changes in diversity and abundance can affect the entire food chain, including humans. The hands on portion of the lab will be preceded by a powerpoint presentation where students will learn about plankton, the importance of phytoplankton in the marine ecosystem, sources and impacts of HABs and how to identify phytoplankton. Students will then participate in data collection for NOAA's Phytoplankton Monitoring Network by filtering and analyzing water samples collected from water adjacent to Key Largo. Each group of students will have a compound microscopes with screens to utilize for analysis.

Grade Level: High School and Above

Timing: 2 hours

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One Hour Programs:

Water Quality Lab/Advanced Water Quality Lab

Abiotic water parameters determine the health and the community of any fresh or salt water system. Primary water quality parameters will be discussed as well as the best tools and methods to measure each parameter. Students will have hands on opportunity to use all of the tools in preparation for water quality field collection and analysis. Students will collect water quality data during scheduled snorkel trips at a minimum of two sites.

Grade Level: 7th and above

Timing: 1 hour

Microplastics Lab

While not necessarily visible, microplastics are a global marine debris issue with documented impacts on animals from plankton to whales. Continued research and public education is necessary to create the best solution to this oceanwide problem. Students will have the opportunity to not only learn about the impacts of microplastics but they will see the problem firsthand. Samples collected from a snorkel site will be analyzed. Students will have the opportunity to be a part of the solution by submitting their data to SeaGrant's Florida Microplastics Awareness Project.

Grade Level: 7th and above

Timing: 1 hour

***Cassiopeia* Culturing Lab**

This inquiry-based lab provides students an opportunity to visualize life stages of the *Cassiopeia* jellyfish. The activity begins with students observing medusa jellyfish along with embryos that have been extracted. Large and small group discussions will focus on the challenges of aquaculture and the *Cassiopeia* life cycle before students work in pairs to design an experiment. Experiments are meant to test preferred settlement cues, an important component to understand when utilizing aquaculture with invertebrates. Experimental vials are labeled and monitored by students throughout the week. Students look for developing planula and polyps in their vials through the following days. Results are discussed during "summary" class.

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Grade Level: 8th Grade and Above

Timing: This is a one hour long lab. Students monitor data throughout their stay. Results discussed during “Summary”.

*** Embryos take up to 3 days to develop into polyps; this lab has best results when conducted on the first evening students arrive ***

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