# Kapolei Middle School Science Students Explore Plankton:
## Discover Intricate, Supportive Coral Reef with Scientists

Continuing a collaboration spanning six years and involving more than one thousand students, Kapolei middle school 7th grade students explored marine ecology with support of the Center for Microbial Oceanography Research and Education (C-MORE) and the Hawaii Institute of Marine Biology (HIMB).

While comparing western and windward Oahu coastal habitats, students followed scientists' and volunteers' instructions and discovered a surprising abundance of once invisible, unimaginable organisms, dancing with light in a "sea soup."

The scientists unveiled dependencies and affects radiating from both coral reef and land ecosystems. For example, Michelle Jungbluth, Ph.D candidate, explained patterns of copepod abundance in relationship to big rain runoff events. She and scientist Jim Foley from the C-MORE Outreach and Education office assisted students as they explored the marine environment.

Students discussed the logical links between the land's bay input and coral reef populations. They gained an appreciation for problem solving, realizing that to craft a workable solution, the details to the problem must be thoroughly understood.

How important are coral reefs? What harms and benefits a coral ecosystem?

M. Soriano and L. Tabion inspect the plankton "sea soup".

Offered here are two reports, one from Taryn Morikawa, the other from Kaleigh Toyama, exploring the answers to those questions through considering their marine ecology studies with C-MORE and HIMB.

Mahalo to all the wonderful researchers and educators at C-MORE and HIMB, and also to the wonderful students involved in the studies.

May we find more creative energy to keep our coral ecosystems healthy.

Scott LaChance
7th grade Life Science Teacher
Kapolei Middle School

Student reflections on the HIMB field trip

By Taryn Morikawa
KMS 7th Grade Life Science

On May 14th I went on the plankton research field trip to the Hawaii Institute of Marine Biology research station on Moku o Lo'e (Coconut Island) in Kane'ohe Bay with my teacher Mr. LaChance and my other science classmates.

We had to take a boat to Coconut Island and while we were on the boat, the scientists there had some of my classmates collect plankton with a plankton net that they had on board. This is also known as a net tow. A net tow is basically a sample of plankton that has been taken at one time. Other than the net tow, we also stopped the boat closer towards the island and the scientists on the boat from the Hawaii Institute of Marine Biology explained to us how to use the different tools they use to measure the ocean water.

I never knew that there were so many ways to measure water. For example, they measure the salinity (amount of salt dissolved), turbidity (cloudiness/ murkiness of the water), dissolved oxygen (amount of oxygen that a marine organism is able to use), pH (acidic level of water) and water temperature of the water. But the one measure type that stood out to me/caught my eye was turbidity.

The scientists on Coconut Island use a tool called secchi disc to measure turbidity. The secchi disc looks like a huge, thin plastic disc attached to a long piece of rope that has knots tied in it and each knot represents one meter. How it works is that you drop the disc in to the water and lower it until you can't see it anymore and when you can't see it, you look at what number knot you are on and that gives you the turbidity of the water. I actually had the chance to use the secchi disc and the turbidity data that I collected was that the turbidity of the water was three meters (on all three trials).

A possible cause for the change in turbidity is when we have huge rain storms and sediment runoff occurs. Sediment runoff is when all the mud and dirt run in to the water, which will result in the murkiness of the water to increase. The phytoplankton can use the nutrients from rain runoff, but when there is too much sediment runoff murkiness increases and serious problems can happen.

The turbidity of the water is very important because it has huge effects on the bay and coral reef. For example, the producers (the organisms that make and store their own food) of the marine ecosystem usually are closer to the bottom of the area of water, such as kelp, seagrass, algae, etc.

A coral reef has approximately 700 species of coral and if the turbidity of the water increases, the coral may have a chance of dying. If sediment runoff occurs, it makes the water murkier, but coral grows at the bottom of the area that it is in. Producers need sunlight in order to go through the process of photosynthesis (the making and storing of sugar and oxygen). Coral can't really hunt for food so what they have is a type of algae called zooxanthellae growing in the tissues of the coral polyps that makes them sugar to eat and oxygen to use.

But if the sunlight can't reach the algae, it can't produce for the coral and the coral will eventually die (since it's not getting the basic things they need).

Coral is the home of many kinds of small fish and many other consumers. When they don't have a home/shelter, they are more vulnerable to predators and their population will eventually decrease. This will result in the predator's population to decrease and their predator's population to decrease and so on. This could start a whole chain of declines in marine life. Possibly we could catch fewer fish... (since our coral reefs support 25% of all known marine species).

The population of the coral is not only threatened by sediment runoff but is threatened by this type of seaweed called Gorilla Ogo. Gorilla Ogo is a type of alien/invasive species that is a huge problem in Kane'ohe Bay. An invasive/alien species is a species that is not native or has not originated where it is.

Gorrila Ogo grows over the coral and uses the sunlight for photosynthesis. But this is a major problem because the Gorilla Ogo is taking all of the zooxanthellae's sunlight, so now the zooxanthellae can't produce for the coral and the coral dies. This can result in the loss of marine life. Gorilla Ogo is a serious problem in Kane'ohe Bay and it can eventually ruin the whole coral reef ecosystem.

Since Gorilla Ogo is such a huge problem, the scientists at the Hawaii Institute of Marine Biology have come up with a solution. What they do is, they go to the coral reefs and use this vacuum-like device, called the supersucker to suck up the Gorilla Ogo.

But even if one small speck of Gorilla Ogo is left behind, it reproduces like crazy and the whole problem begins again. So the scientists of Coconut Island leave behind a species of sea urchin that eats the Gorilla Ogo.

A problem that the scientists faced is that the sea urchins didn't grow/live in Kane'ohe Bay. So the scientists grow and care for their own sea urchins that they will later release in to the water to eat the Gorilla Ogo. David Cohen created the sea urchin farm and he raised about 150,000 sea urchins in the year of 2013. With the help of sea urchins, the Gorilla Ogo problem is starting to decrease. The sea urchins can fit in to tiny crevices in the coral to eat up all of the Gorilla Ogo. Since the Gorilla Ogo problem is decreasing, our coral reef ecosystems have a better chance of surviving.

After everything that I've learned at our trip to Coconut Island I do still have some questions I would like to discover. One question is, if the amount of sediment runoff increases, what marine organisms would also increase/benefit from sediment runoff?

Another question I have is, does the amount of phytoplankton in an area decrease or increase when the Gorilla Ogo population increases?

Will the sea urchins affect the population of phytoplankton?

If the water is completely clear, will it have a negative or positive impact on the marine ecosystem?

Finally, what is a highly dangerous turbidity level/measure?

Overall, I've learned a lot about coral reefs and marine ecosystems through this experience. For example, I didn't know how the turbidity of the water had such a huge impact on our marine life.

I also learned that one species being harmed may also harm other organisms. I used to think that coral reefs and oceans just had/support marine organisms, and I didn't take in to account all the problems coral reefs and oceans face. I honestly just thought it was just a place to swim, but it's actually like our land, just underwater. It has organisms that all support and depend on each other to keep a healthy ecosystem.

I also had so much fun using the tools that the scientists use to measure water. So if I had the chance to go there again I would definitely go because I had such a great time there and I would totally want to learn more about our marine ecosystems and how they affect our lives.

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Kayleigh Toyama
KMS 7th grade Life Science

I have recently gone on a plankton research field trip to Coconut Island. Before the field trip, I didn't know much about the ocean or coral, but I know a lot more now. On the field trip, I learned many interesting things, like how to test for different aspects of water, and the importance of coral reefs. I also got to see different invertebrates and types of zooplankton that lived in the water.

While on the boat ride to Coconut Island, we got to test for different aspects of the water. To measure the turbidity/cloudiness of the water, we used a secchi disc. We couldn't see it 6 meters down for each of 3 trials, so that was our measure of the turbidity.

To measure salinity/amount of salt dissolved, we used a refractometer. We measured an average of 36.33 parts of salt per thousand of water.

Next, we measured the pH of the water with a pH probe and pH strips. The water had an average pH of 7.05.

Lastly we used a dissolved oxygen probe to find the amount of dissolved oxygen (which is how much oxygen is available to organisms) in the water, and the temperature of the water. The water had about 6.52 mg/l of oxygen and an average temperature of 24.8 °C.

Coral reefs provide habitats for many different organisms like fish, many crustaceans, and algae. Algae are really important because they are food for many consumers and provide many marine animals with oxygen.

Coral reefs aren't only habitats; they also limit the amount of erosion the shoreline receives and supports Hawaii's economy with the tourists it attracts. Coral reefs also provide food for many people, and some coral reef species can be used in medicine. No matter how important coral reefs are, the reefs are being damaged from sediment runoff, marine debris, and invasive species.

Sediment runoff is bad because it smothers coral and cuts off the sunlight. Invasive species can damage a coral reef ecosystem because it can outcompete native species for resources or overgrow and smother the coral.

One invasive species is Gorilla Ogo, or *Gracillaria salicornia*. This species can outcompete native seaweeds and algae, and outgrow coral and smother it to death. It can also fill in crevices that other organisms use for habitats, which has a negative impact on those creatures as well. To combat this invasive species, biologists use an underwater vacuum cleaner called a Supersucker and some sea urchins. First, use the Supersucker to vacuum the algae off of the reef, and then introduce native sea urchins, hāwa'emaoli or *Tripneustes gratilla*, to prevent the algae from growing back.

But even though the Gorilla Ogo is damaging, it's also where a lot of invertebrates live. The seaweed is yellow in color at the top where there is more sunlight, and brown towards the bottom. I got to pick through some of the seaweed and found mollusks, cnidarians, annelids, arthropods. There were 30 file clams, which look like little shells, until they open up, then they have little tentacle-like strands coming from them. There were a few little jellyfish, which have tiny stinging parts called nematocysts. Then, there were 21 fireworms, which are hairy worm-like things that can sting you. The Gorilla Ogo may be damaging, but it has a lot of organisms living in it.

K. Blas, S. Paige, and J. Pakai sort and count organisms found on Gorilla Ogo.

Overall, I found the research field trip to Coconut Island very fun and educational. I learned a lot on the trip and had fun while doing it. I now know how important coral reefs are and what they do for not only marine animals, but humans as well. I really enjoyed the trip and hope that I will be able to go on more trips like that in the future.

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