COASTAL ECOLOGY – MANGROVE SEDIMENT CORES
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So welcome back to the mangrove community. Dr. Lodge gave us a great intro to the species that are found here in Tampa Bay and how they're adapted to survive in saltwater as one of the only trees we really know about that can still obtain freshwater in a saltwater community.

And now we're going to focus a little bit on the chemistry and the nutrient cycle and the advantages of the mangroves in the Tampa Bay system as an ecosystem. So mangroves, we mentioned the leaves fall from the trees, and then they become buried in the sediments on the bottom, or the benthic community.

And as those leaves break down, they provide a whole nutrients system of dissolved organic and inorganic chemicals that become food for something else. Primarily, the decomposers are bacteria that are living within the sediments themselves. So we're going to take some sediment core so you can see what it looks like underwater and in the sediment grains.

And I wanted to kind of mention, while we're at the surface of the water, how that chemistry part of it, how it begins. So there's a lot of gas exchange within the mangroves themselves. So these root systems that we were looking at, like the prop roots that are mentioned here. And this is really crunchy.

So while I'm standing on the bottom, my feet are actually sinking. So it's a rather soft bottom. And that's because mangroves really prefer a low energy system. So there's not a lot of big waves. There's not a lot of real fast water movement here, because they can stabilize with their root systems in a softer bottom.

So for red mangroves, they tend to be generally sometimes closer to the water itself and more submerged in the water. But these roots have to be able to wash in and out of the water. So there's gas exchange, oxygen and CO_2 exchange through these root systems.

And then the prop roots that Dr. Lodge mentioned, there's actually little pores. This is a vascular plant, so there's little pores called lenticels in all of the mangrove species. And this is actually where gas exchange occurs, whether it be oxygen, CO_2.

And I wanted to point out this root also that serves as a great habitat for things like barnacles. That's what we see attached here, lots of barnacles, hard structure. The mangroves provide that physical habitat. Other things that would encrust closer in on-- if we could zoom in-- you may see there's oysters that are attached to the prop roots. So it's a good habitat, but the roots serve physically to stabilize the sediments, provide habitat, and this gas exchange and the chemistry that happens within the water column and the sediments.

So what we're going to do is very quickly take a look at the bottom. And so I'm going to take a core here, because we're right in the red mangroves. This is very simple, just a PVC pipe. Then we're going to push it through. It's going to push it into the sediments, get an idea how soft this is.

And it will be a little crunchy, because there's both leaves and root material, shells, and a lot of muds and silts in the water on the bottom that form the bottom. And a lot of that softness is because of that decay and breakdown of the plant material, the leaves themselves. It creates a really soft mushy bottom, which if you were standing here with us, you would feel that our feet are sinking slightly in the water.

So I'm going to go ahead and try to pull this up, retrieve this core, and see what we have. So there we have a core from within the red mangroves here. And we see that it's not evenly stratified. We see a lot of water and different size grains within this core and a lot of difference in the coloration. And those are some of the things we look at. So there's a lot of organic and inorganic processes happening here.

So near the surface, where the water meets the sediment, that's where we would expect to find the highest oxygen concentration. And as we go deeper into the core, you see a lot more darker materials, dark grains. And that's actually the organic composition. So that's where things are being broken down. And that process requires oxygen. So as we go deeper into the sentiments, it becomes more anoxic.

So there's a lot less oxygen. And it releases a gas, hydrogen sulfide, which we can equate to if you've ever boiled an egg, and egg gets kind of that yucky smell. It's that kind of rotten egg smell. That's what the hydrogen sulfide gases that are released as part of the process of decomposition.

So up here, we can see a little piece of leaf material, plant material here, some little pieces of leaves, some shells. And all of these are eventually getting buried deeper and deeper in the sediments. And this is loaded with bacteria that actually break down that plant material so that it can be utilized and recycled and eventually used again by the plant. And so this is just one way to visually see what's happening within the sediments, which again, is the contribution of these mangroves and the breakdown of that plant material that serves as food and to support an entire food web called the detrital food web.

So we're going to go ahead and take the core a little further away from the mangrove, see if we can see some differences in the composition. This is why this is called push coring. I'm literally just pushing this clear PVC pipe into the water. Still a little bit of crunch, not nearly as rooty and as much vegetation as near the mangrove leaf litter.

So the first thing we notice with this core, you can definitely, if you were smelling, you might smell that. That is the release of the hydrogen sulfide gas. I just had a whiff of that, filled my nostrils. But you'll see that the composition, the coloration of the sediments, it's a lighter shade. There's not as much dark organic matter within the sediments.

You notice a lot more shell material. That would explain why it was a little crunchier collecting this, retrieving this core. You can see there's a marine worm tube actually at the top of this, so just to signify some of the worms. We can actually probably see those worms if we were to get a close up look at this core.

But we're going to take this, and we just see that-- so the contribution and contrast to being closer to the mangroves, that leaf/plant material, we had a lot more organic breakdown happening. And that's indicated through the coloration. If we were to take the chemistry of the water, we would get measurements that would confirm that for us, and the nutrients that are dissolved within the water column and in the sediments. So again, take home message. The oxygen's going to be much higher towards the sediment water interface. And oxygen levels will decrease as we move further down into the sediment column.

So now let's move a little further offshore and see what our final core looks like. So here we are in a seagrass bed. And we see again, the return of this very dark organic breakdown. And in this case, it would be the seagrass, not the mangroves that we're capturing in this core.

Near the surface, so as the plant material, the seagrass, gets buried we see a darker layering. The oxygen level is decreasing. And out here, quite a ways from the mangrove, we can see an increase in the shell material as part of the sediments. And this is a much sandier composition. So the grain size is a little larger as we move further away from the mangroves, closer to the channel.

So I hope that gives you a view of what it looks like underwater, both through the water column and right into the sediments themselves. And how important the role of sediments and the chemistry that's happening in the sands and muds is just as important as what's happening within the water column itself.