Central Biodiversity study March 2021

What is the current state and biodiversity of undeveloped 900 square metre plots of land in the Grand Cayman central Mangroves (March 2021)?

Introduction:

In the IA project, mangroves are the topic and I will be discussing what they are and how there are up to 80 different types of mangroves globally, how important they are to our ecosystem, how they are able to retain carbon within their carbon rich soil, what are the threats to the mangroves and what we can do to help bring back the mangroves. Mangroves are salt tolerant trees and
shrubs that grow in the intertidal regions of the tropical and subtropical coastlines. They grow in places where freshwater mixes with seawater and where sediment is composed of accumulated mud (Mangroves,n.d.). There are 80 different types of mangroves but the most common species are black mangroves also known as *Avicennia gerinans* (Mangroves Are Trees,n.d.).

Mangroves are very important to our ecosystem; they are able to help stabilize ecosystems and prevent erosion. They provide natural infrastructure and protect nearby populated areas by preventing erosions and absorbing storm surge impacts during extreme weather events such as hurricanes (Mangroves,n.d.).The mangrove sturdy root system helps form a natural barrier against violent storms, surges and floods. River and land sediment is trapped by the roots, which can protect coastline areas and slow erosion. This filtering process also prevents harmful sediment reaching coral reefs and seagrass meadows. The complex root system filters nitrates, phosphates and other pollutants from the water improving water quality. Mangroves are able to absorb massive amounts of carbon dioxide emissions and other greenhouse gases from the atmosphere, they trap and store them in their carbon-rich flooded soils from millennia (Mangroves Are Trees,n.d.). They also provide habitats and refuge to a wide range of species such as birds, fish, invertebrates, mammals, and plants. Mangrove shorelines and tree roots are often important spawning and nursery territory for juvenile marine species including shrimp, carb, and many fish species such as redfish, snook and tarpons. And many depend on Mangroves for certain life cycles i.e grouper and shrimp. Mangroves provide protection for communities at risk from the sea-level rises and severe weather caused by climate change. Their coastal forest helps fight against global warming by removing carbon dioxide from the atmosphere most of which is stored within the plant. The mangrove tree roots, branches and leaves are covered by soil which is submerged under tidal water slowing and breaking the materials and boosting carbon storage. Coastal mangroves outperform most other forests in their capacity to store carbon (Chapman,). Due to how many species and the surrounding ecosystems are dependent on mangroves, they are preserved. Another reason why mangroves may be preserved is to provide future generations with the same opportunities that current generations have. For example, if the number of mangrove forests continue to decrease in coastal regions, sand erosion could occur which can result in less protection for current developments from wave action as well as impact future developments in the surrounding areas.

Mangrove's biggest threat is the rapidly expanding shrimp aquaculture industry. Hundreds and thousands of acres of lush wetlands have been cleared to make room for artificial ponds that are densely stocked with shrimp.

Tourism is a booming industry and an important source of income in many developing nations. Unfortunately irresponsible tourism can destroy the mangroves that people are coming to see (Mangroves Trees,n.d.). As they hike, drive, or paddle into one of the mangrove areas they bring with them garbage, sewage, noise, fumes, lights, and other disturbance that can damage the mangroves and the surrounding ecosystem. Tourism can be sustainable when there are small groups and people leaving the habitat the way they found it. Tourism can also be sustainable when ecotourism is encouraged (i.e. education to the tourist about the importance of mangroves).

Many thousands of acres of mangrove forest have been destroyed to make way for rice paddies, rubber trees, palm oil plantations, and other forms of development. When farmers use fertilizers and chemicals and run-off containing these pollutants makes its way into the water supply. This can cause eutrophication, which can result in anoxic waters (unlivable for most organisms) as well as mangroves can only tolerate a certain amount of industrial and agricultural pollution without dying (Waters,n.d.). Coastal development takes many forms like ports and docks, hotels, golf courses, marinas, and convention halls. Everyone loves being near the sea and that's the problem, pollutants that accompany development can damage individual trees or whole tracts of mangroves (Waters,n.d.). With buildings come people, traffic, garbage, and noise which takes its toll on the plants and animals that inhabit rich coastal ecosystems. However,when mangroves are cleared, valuable habitats are lost, threatening the survival of many species. Mangrove forests are also a potential source of undiscovered biological materials that could benefit mankind, such as antibacterial compounds and pest-resistant genes, which are also when coastal areas are cleared. Protecting natural ecosystems like mangroves forest not only helps preserve biodiversity, it also helps preserve a vital resource for local communities (Chapman, 2018). Chopping down mangroves for charcoal and timber is an important cottage industry for many coastal communities. Mangrove wood is used for building material, fencing, and fuel. In places where fishing has declined below subsistence levels, many people have turned to charcoal production for their livelihood, which furthers the cycle of habitat loss and fishery decline. Mangroves might appear or be coastal cousins of inland forest but these rich ecosystems support the planet and people in a unique way, by providing breeding ground for fish to carbon storage, to protect against flooding. Despite their importance, mangrove forests are under threat. Over a third of their species have disappeared, and in regions such as the Americas, they are being cleared at a faster rate than tropical rainforests. Most of the clearance is to reclaim land for agriculture, industrial development and infrastructure projects. In addition to climate change and pollution, there are also local threats. Including overharvesting of wood for fuel and construction, dams and irrigation that reduce the flow of water reaching the forests, and overfishing causing disruption to food chains and fish communities. We have destroyed coastal ecosystems that help sustain life and livelihoods. Many people that live around mangroves depend on them for their livelihoods. Mangroves are a reliable source of wood for

construction and fuel. In some areas the wood has been harvested commercially for pulp, wood chip anc charcoal, raising concerns about sustainability (Wood, 2019). Plants extracts are collected by locals for their medical quilitie and the leaves of mangrove trees are often used for animal fodder.

Preserving mangroves can be done in many ways as well as some threats can turn into an advantage.sustainable tourism offers a stimulus to preserve existing mangroves areas with the potential to generate income for local inhabitants. When located near coral reefs and sandy beaches the forest provides a rich environment for activities like sport fishing and kayaking. It is important to maintain a balance between visitor numbers and protecting the forest delicate ecosystem. If the sustainable levels helf , ecotourism could provide the perfect motivation for protecting mangroves, instead of clearing them for mass tourism developments (Chapman, 2018). Mangroves can also be preserved through marine protected areas, or through conservation projects, like the Mangrove Action Project in which they attempt to improve mangrove forest populations through replanting mangroves as well as educating communities about the importance of mangroves. In conclusion, conservation projects as well as education on mangroves can be the next step in preserving mangroves, however mangrove forest populations are still declining at a severe rate therefore there should be more efforts in conserving mangroves. This could be through having conservation projects based in locations where mangroves may be at threat or through having harsher restrictions on marine protected areas like mangroves to avoid damage to the mangroves.

Processing data:

The process of how we collected the date is we first established a base camp with all the supplies. Once an area was found we established a quadrant within the mangroves that was 30m x 30m. A quadrat is a frame usually square used in ecology and geography to isolate a standard unit of area for study of the distribution of an item over a large area. We then subdivided the large quadrant into 25 squares (each was 6mx6m). We then looked at our surroundings looking at how many birds we could see and what kind of birds that were in quadrants. Once we tallied up all the birds we counted all the different types of mangroves that were in the quadrats and found out which type was more common around that area. We then looked at the water around the mangroves and wanted to know what the peat depth is. For each qudrat we calculated how much O2 was dissolving from the mangroves. In each quadrant we looked at how tall the mangroves are. Lastly, we looked at how many animals we could find that were in the quadrants. In conclusion we found up to 6 different types of birds around the area. We found out that there are 56.9% red mangroves, 21.6% white mangroves, 16.7% buttonwood mangroves, and 4.9% black mangroves. The peat depth around the mangroves are between 11.9 feet and 13 feet. We found out that about 0.57% dissolved oxygen goes up into the atmosphere. The average heights of the mangroves for each quadrant was 33.1. Lastly, we tallied up how many different types of animals were in each quadrant there were multiply small black ants, multiply large red ants, 25 leucauge spider, multiply flesh flies, multiply small moths, numerous lace bugs, numerous small flies, 1 mangrove buckeye butterfly and 3 termites. The data shown only shows what the mangroves state was at that point in time. In conclusion the data shown doesn’t support and doesn’t provide data that confirms an environmental issue. For

future data collection I would do it a little bit differently to get the most accurate results. Firstly, getting a longer peat depth measurer because last time it wasn't long enough to get the actual measurement. Secondly, using a GPS to mark out more accurate squares in the quadrats so everything is the same size. Thirdly, estimating the different population numbers of plants and animals so we can calculate a biodiversity index. Lastly, collecting insect samples and plant samples so we can properly identify them. The data shows what a mangrove looks like when around central mangroves. So in the future when collecting data we can look back and compare the 2 sets of data and see if anything has changed overtime.

Animals that live in central Mangroves


Small Black ant - https://www.pestkil.com/services/ants-treatment-in-cayman-islands


large Red ant - https://www.rentokil.com/ph/ants/species/


Leucauge Spider - https://en.wikipedia.org/wiki/Leucauge


Flesh Flies - https://www.pctonline.com/article/management-control-of-flesh-flies/


Small Moths - https://www.ortho.com/en-us/library/bugs/how-control-prevent-moths

Lace Bug - https://www.gardentech.com/insects/lace-bugs

small flies - https://toughbugsolutions.com/pest-identification/small-flies/

Mangrove Buckeye Butterfly - https://www.inaturalist.org/guide_taxa/358096

Moths - https://en.wikipedia.org/wiki/Moth

Anole - https://www.thesprucepets.com/green-anoles-pets-1236900

Termites - https://careers.trianglepest.com


Ants - https://www.zonehomesolutions.com/ants-in-georgia/

Bird that live in central mangroves


Yellow Warbler- https://landsinlove.com/american-yellow-warbler-in-costa-rica/


Northern Flicker- https://www.wikiwand.com/en/Northern_flicker

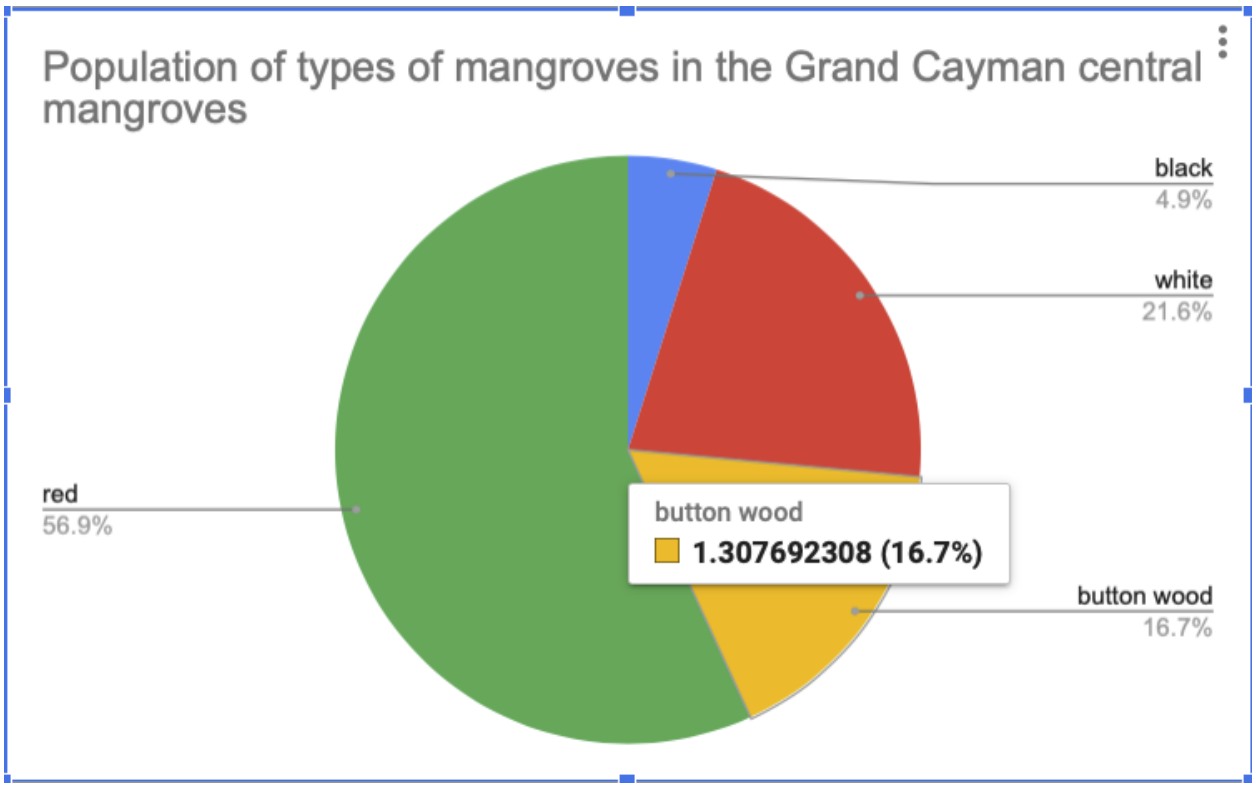

Lasanger Flycatche - https://identify.whatbird.com/obj/348/_/Willow_Flycatcher.aspx

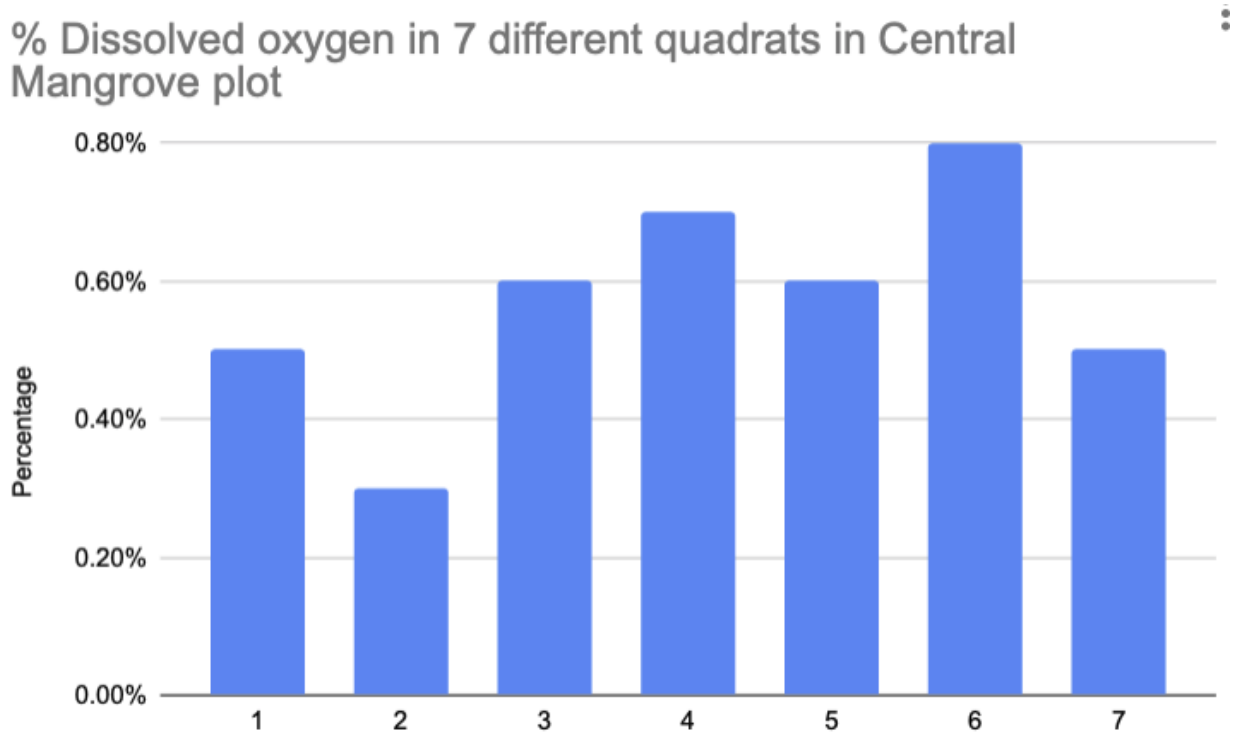

Anhinga - https://www.allaboutbirds.org/guide/Anhinga/id

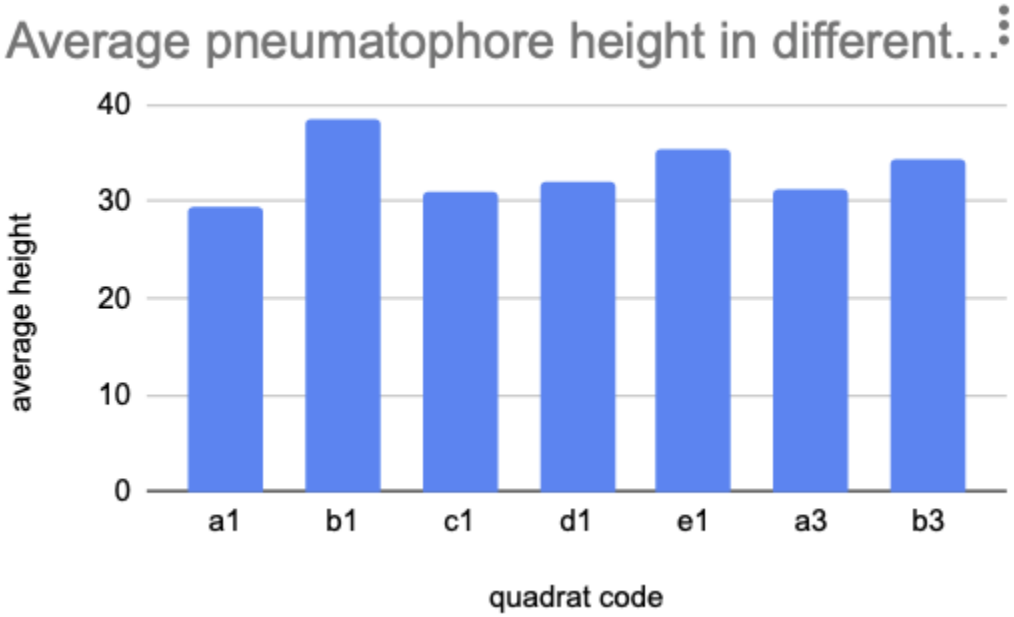

Tri Coloured Heron - https://www.allaboutbirds.org/guide/Tricolored_Heron/id


Ching Ching - https://camanimals.com/birds/

Appendices







Application

The data collected can help us in the future with an environmental impact assessment by looking back at the data and seeing if there are any differences between the two sets of data. It can also help us monitor the health of the mangrove system and help us come up with conservation strategies. Though the 900 square meter plot of mangrove represented the biodiversity that exists in a central mangrove it

was an inland plot which is subject to a lot of drying and wetting cycles with the seasons. Whereas the coastal areas will always be flooded so there will be different communities present also there whole aquatic ecosystem underwater that would have to be investigated. For future investigation it will be important to do a study in a coastal mangrove area. Unfortunately the only way to get coastal mangrove areas is by boat.

Bibliography

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