HSI1000 Ecological Connectivity Field Trip

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Sites Visited: Labrador Nature Park & Labrador Nature Reserve
Datetime of Visit: 26 Feb 2024, 0800H

1. Overview

From 8-11am on 26 February 2024, our group visited Labrador Nature Reserve and Labrador Nature Park to compare the wildlife and vegetation between these 2 sites.

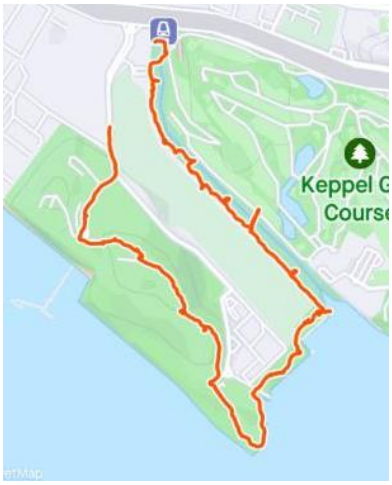


Figure 1: GPS map of route taken using Strava mobile application

Figure 2: Dragon's Teeth Gate at Labrador Nature Park

Figure 3: Labrador Gunner's Tribute at Labrador Nature Reserve

2. Observations

Tree Heights

Methodology

To estimate tree heights at both sites, we used a tangent method (Larjavaara & Muller-Landau, 2013) as illustrated in Figure 4. Before the trip, eye height, h, and arm span length to estimate length, x, was measured. An inclinometer mobile application was used to determine the angle from the person's eye to the top of the tree, θ. The height, y, can then be estimated by the equation $x \cdot \tan\theta$, and the estimated tree height obtained with $y + h$.

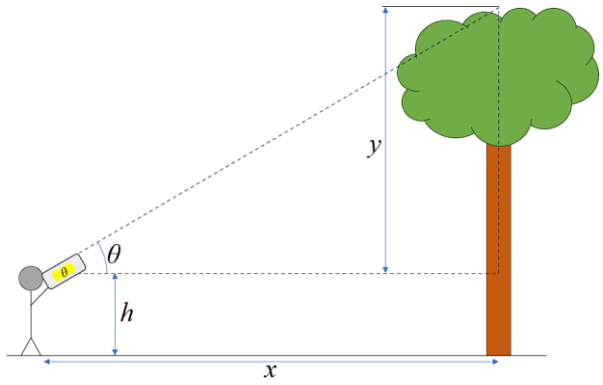


Figure 4: Illustration of tangent method to estimate tree height

Trees were chosen at regular intervals along the route at both sites. For ease of calculation, we chose trees that were at ground level. Although it is acknowledged that this reduces the choice of samples we could choose, it also reduces the uncertainty of measurements as the angle only has to be measured once.

Pre-Measured Data

Eye Height 1.6m
Arm Span 1.7m

3 readings were taken for the angle θ to reduce the uncertainty of measurements

Labrador Nature Park Tree Height

x (m)	θ_1 (deg)	θ_2 (deg)	θ_3 (deg)	Average θ (deg)	y (m)	Est Tree Height (m)
8	42.0	43.2	46.9	44.0	7.7	9.3
11	39.2	42.0	38.9	40.0	9.2	10.9
7	40.2	38.4	41.3	40.0	5.9	7.5
10	45.2	38.2	43.7	42.4	9.1	10.7
9	45.0	39.2	38.3	40.8	7.8	9.4
				Average Tree Height		**9.6**

Figure 5: Height Estimation of Trees in Labrador Nature Park

Labrador Nature Reserve Tree Height

x (m)	θ_1 (deg)	θ_2 (deg)	θ_3 (deg)	Average θ (deg)	y (m)	Est Tree Height (m)
15	58.3	60.1	54.0	57.5	23.5	25.1
12	55.0	54.2	58.2	55.8	17.7	19.3
10	59.3	62.3	64.2	61.9	18.8	20.4
12	56.3	49.9	53.2	53.1	16.0	17.6
13	59.4	57.2	57.7	58.1	20.9	22.5
				Average Tree Height		**21.0**

Figure 6: Height Estimation of Trees in Labrador Nature Reserve

As seen from Figure 5 and 6, the average height of trees in Labrador Nature Reserve (21.0m) is significantly higher than that of the Labrador Nature Park (9.6m).

Tree Density

At 3 different 10m segments along the trail (at the start, middle and end), the number of trees along a 10m segment was counted to approximate the tree density along the line. This 10m was approximated using the arm span measured before the trip also used to measure distance x in tree height estimation.

Site	Trees Counted in 10m			Average Density of Trees
Labrador Nature Park	5	8	3	0.53 trees/metre
Labrador Nature Reserve	9	10	7	0.87 trees/metre

Figure 7: Approximate tree density by straight-line count

The average density of trees in Labrador Nature Reserve was observed to be significantly higher than that in Labrador Nature Park.

Plant Diversity

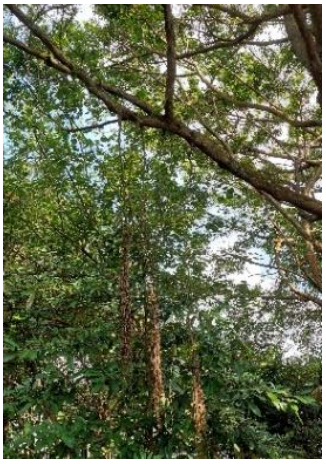
We identified various plants species at each site using a plant identification tool (Pl@ntNet, 2024). The following sections shows the various plant species identified.

Labrador Nature Park

Native Plant Species

			
Calophyllum inophyllum	Barringtonia asiatica	Podocarpus polystachyus	Scaevola taccada

Exotic Plant Species

		
Barringtonia acutangula	Costus woodsoni	Hibiscus rosa-sinensis
		
Coccoloba uvifera	Nerium oleander	Ficus benjamina

Labrador Nature Reserve

Native Plant Species

 Rhodomyrtus tomentosa	 Oncosperma tigillarium	 Caryota mitis
 Nypa fruticans	 Ardisia elliptica	 Rhizophora apiculate

Exotic Plant Species

 Costus woodsoni	 Licuala grandis	 Ochna Kirkii	 Dieffenbachia amoena

Other Signs of Animal Life

 Mynah (Acridotheres tristis) looking for food	 Plantain Squirrel (Callosciurus notatus) running around trees	 Monitor Lizard (Varanus varius) near the roadside not moving
 Red Junglefowl (Gallus Gallus) crowing	 Golden web spider (Nephila Pilipes) with insects caught in its web	 Asian Koel (Eudynamys scolopaceus) cawing as a mating call

3. Final Thoughts

Labrador Nature Reserve appears to a "better" forest than Labrador Nature Park due to its higher tree density, higher average tree height, and higher proportion of native plant species which are indicative of a more naturally-formed forest. This supports the expectation that naturally-formed forests such as the nature reserve are "better" forests than a nature park. This is likely due to the nature reserve being a primary forest which has had a longer time to grow as compared to the man-made secondary forest in the nature park. The heightened competition for sunlight in the dense canopy of the nature reserve may have also promoted the vertical growth of trees in order to absorb more sunlight, forming a taller canopy overall as well. Despite some common species in the two sites, such as the *costus woodsonii*, Labrador Nature Park's largely man-made landscape has caused the existence of a higher proportion of exotic plants which were likely added to improve the aesthetics of the park. In addition, the plant species observed in the nature reserve were characteristic of tropical rainforests with a larger number of native plant species, supporting the conclusion that the Labrador Nature Reserve is a "better" forest.

One limitation are the methods used to obtain tree density and plant diversity. This study was limited to plants along man-made footpaths whilst trees deep into the vegetation could not be measured. Measurements were also taken using an approximation method in which the uncertainty of measurements may increase as trees grow taller. Although, the distinction between the two sites was large enough to be significant at nearly double the approximated height, future measurements can be taken using more precise tools such a hypsometer.

4. References

Larjavaara, M., & Muller-Landau, H. C. (24 May, 2013). Measuring tree height: a quantitative comparison of two common field methods in a moist tropical forest. *Methods in Ecology and Evolution*. doi:10.1111/2041-210X.12071

Pl@ntNet. (2024). *Identify, explore and share your observations of wild plants*. Retrieved from Pl@ntNet: https://identify.plantnet.org/