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A Comparison of Plant Height Around the Invasive Australian Pine (Casuarina Equisetifolia) and Endemic Trees on San Salvador Island, Bahamas

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A comparison of plant height around the invasive Australian pine (*Casuarina equisetifolia*) and endemic trees on San Salvador Island, Bahamas.

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Introduction

- Australian pine (*Casuarina equisetifolia*) is an invasive deciduous tree species in many areas of the world and is capable of growing more than 100 ft tall (Figure 1).
- San Salvador Island, Bahamas has a large population of Australian pines that are considered to be invasive.
- The Australian pine has a rapid growth rate and commonly allows for beach erosion due to the shallow root system. Dense tree stands create shade and leaf litter that makes other plant growth difficult. It can grow in nutrient poor soil with ease using nitrogen-fixing microbial associations.
- Allelopathy or the release of compounds from the Australian pine that inhibits vegetation growth of other species can cause other growth to decline.
- We hypothesized that there would be a difference in species and mean height of plants that grew under the two tree types, pine and endemic.
- We predicted that the average height growth of plants under the Australian pine will be less than under endemic tree species on San Salvador island in the Bahamas.



Figure 1. A photograph of an Australian Pine (*Casuarina equisetifolia*) on San Salvador Island, Bahamas. Data collected March 2020 (Photo: Rachel Chandler).

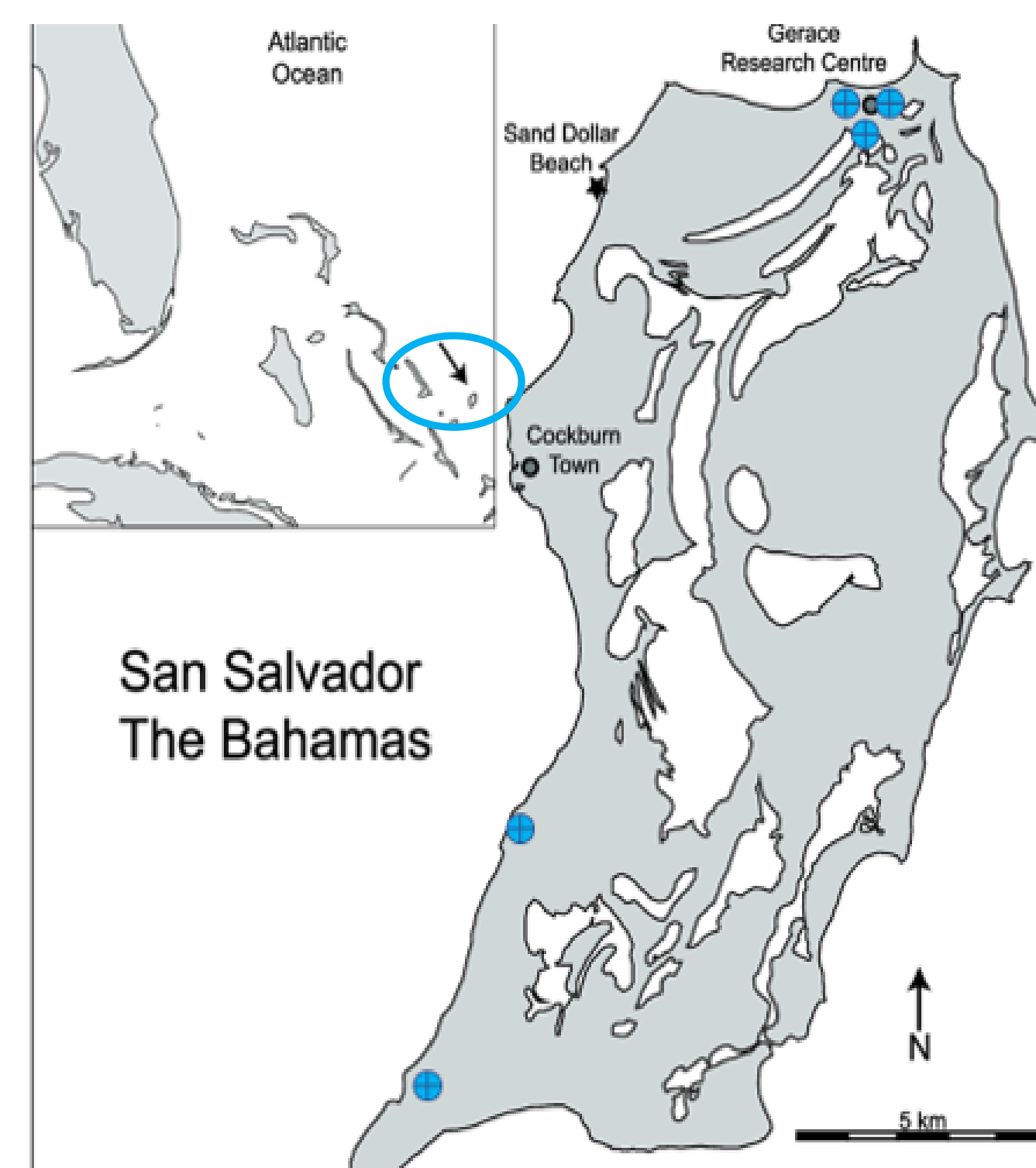


Figure 2. Location of San Salvador Islands relative to Florida (clear circle outlined in blue) and location of the five sample sites around San Salvador island (blue circles). Data collected March 2020 (Figure source: Anderson et al. 2016.)

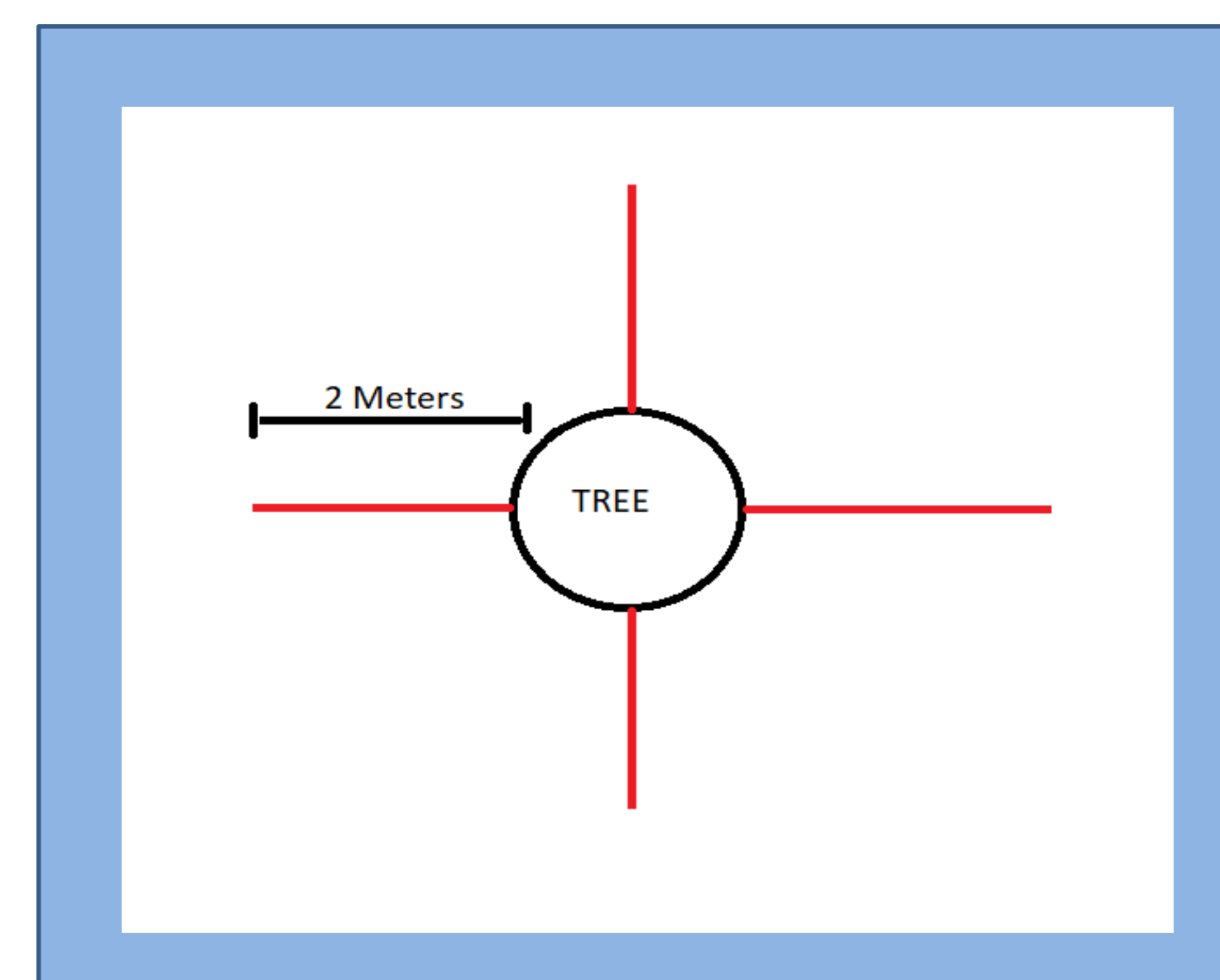


Figure 3. Transect diagram showing the four transects, San Salvador Island, Bahamas. (Figure credit: Rachel Chandler).

Methods

- Between 4 March and 7 March 2020, five random sites were identified and trees above three meters were measured if they were at least three meters away from other trees of the same species. Trees close to poisonous plants (such as poisonwood) were not included for the safety of the collecting researchers (Figure 2).
- Data was gathered by creating four, two meter transects for each tree type. Transects were 90 degrees from each other. Any plants that hung over the transect were included in the count. Species and height were recorded. For each paired set of trees (a pine and an native), three measured plants were chosen at random in cases where there were more than three plants of a species along the transect (Figure 3).
- We calculated mean height for each species between the control (endemic) and experimental (pine) groups and carried out a Student's t-test to determine if there were differences between the two groups.

Results and Discussion

- We found that there was not a significant difference in the mean height of plants grown under the Australian pines versus the endemic trees on San Salvador island as displayed in Table 1 ($t < 1.98$, $p = 0.87$, $df = 1$). Therefore, our hypothesis was not supported.
- The diversity of plant heights under endemic trees was more diverse than Australian pines. Endemic trees also had more small plants between .2 m and 1.0 m than Australian pine trees.
- The greater amount of shorter plant heights under endemic trees could be attributed to new germination being more prevalent under endemic species as opposed to Australian pine trees.
- While there was not a significant difference in mean height, the difference in diversity suggests that there is a negative impact of the Australian pine relative to native plant growth.
- Further research should be done on the effects of growth under forests of Australian pine as opposed to a single tree. The effects of erosion around Australian pine trees should also be studied.
- The inability to know how long the plants have been growing makes it hard to determine if growth was stunted or supported from factors of time or from factors due to proximity to trees studied. Plant height also does not provide a complete picture of growth or plant health. Therefore, a similar study carried out over a longer time period would clarify this issue.

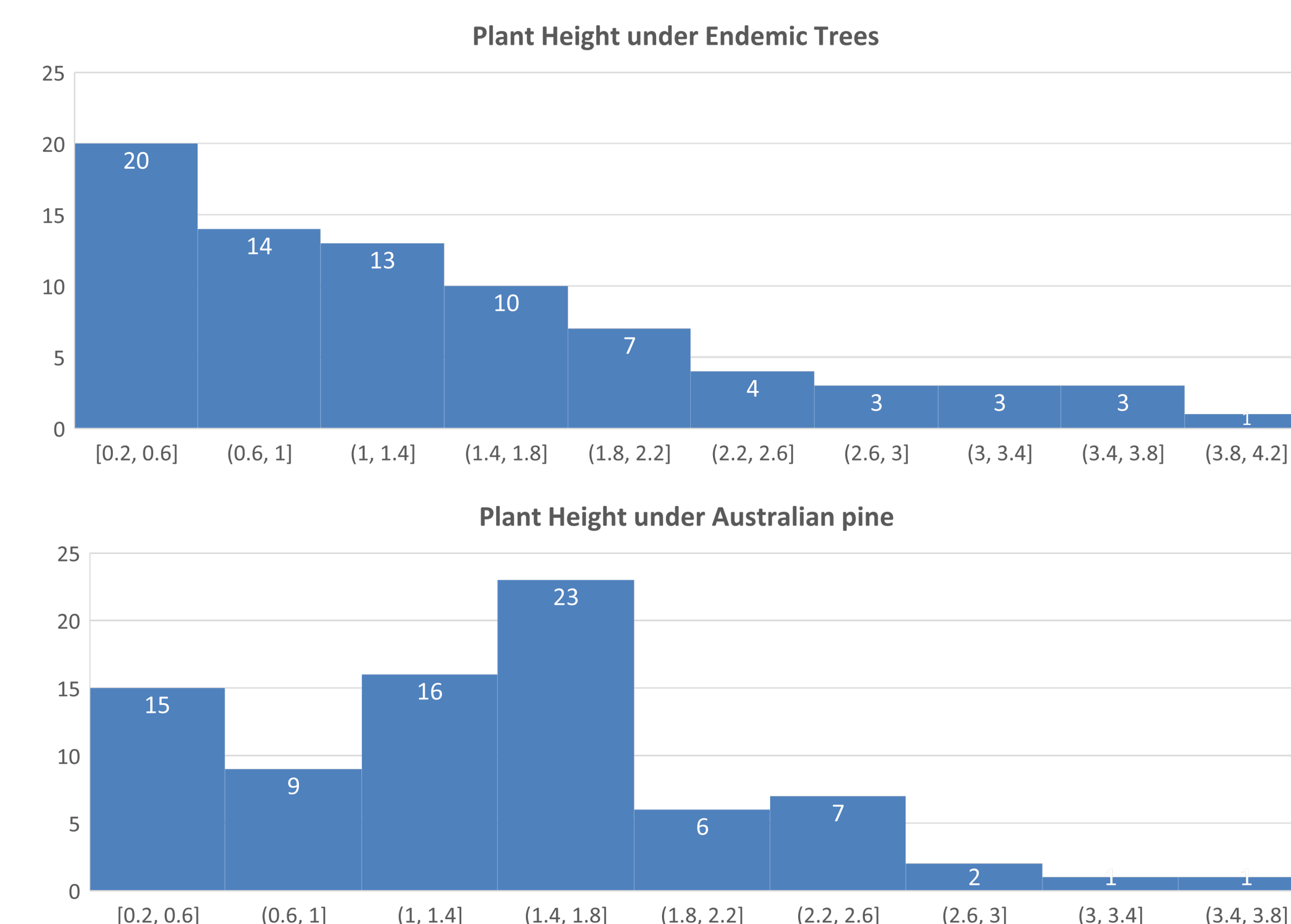


Figure 4. Plant heights found underneath endemic trees (top) and Australian pines (bottom). San Salvador Island, Bahamas. March 2020.

Table 1. Mean height underneath each tree type (Australian pine or endemic). San Salvador Island, Bahamas. March 2020.

	Australian Pine	Endemic Trees
Average height	1.33	1.49
Total number of plants counted	99	97
Total number of heights measured (m)	80	78
Standard Deviation	0.60	0.91
Number of Differing Species	19	17
T-Test Value (P value .05)	0.87	0.87

Literature Cited

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