

# Introduction

- Brighamia rockii* is a species of flowering plant that is endemic to Hawaii. It once inhabited Maui and Lana'i but now is only found on Moloka'i. *B. rockii* is critically endangered, with **only 11** mature individuals alive in the wild.
- This limited breeding population has led to inbreeding depression. When inbreeding occurs, the species loses genetic diversity and its chances of survival decrease.
- Brighamia rockii* requires human intervention. Breeding programs are being developed to help restore the species' genetic diversity and wild population.

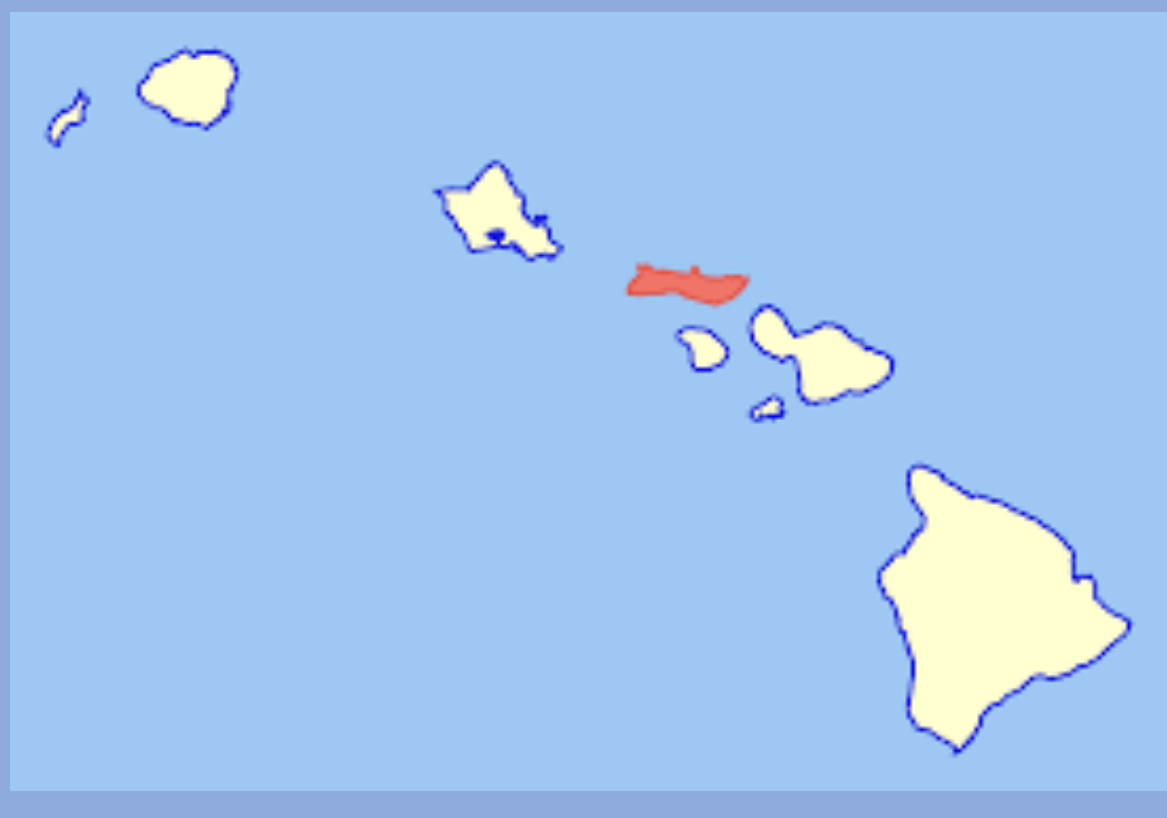


Figure 1. Map of last wild *B. rockii* on the island of Moloka'i.

# Objective

Compare the relatedness of *Brighamia rockii* between collections; to create a successful breeding program for the species.

# Methods and Materials

Samples were collected from various locations (wild, collections, etc.)



DNA was extracted using a modified CTAB protocol



DNA was amplified using a standard PCR protocol where 30 microsatellites were amplified



The amplified microsatellites were sequenced using the Beckman Coulter CEQ-8000 electrophoretic sequencing



Data was scored for allele size and analyzed for diversity and fitness measurements using GenAlEx



The individuals were each compared to predict the best pairs to avoid inbreeding and the collections were compared to identify the amount of diversity within them



# CHICAGO BOTANIC GARDEN Restoring *Brighamia rockii*

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# Results

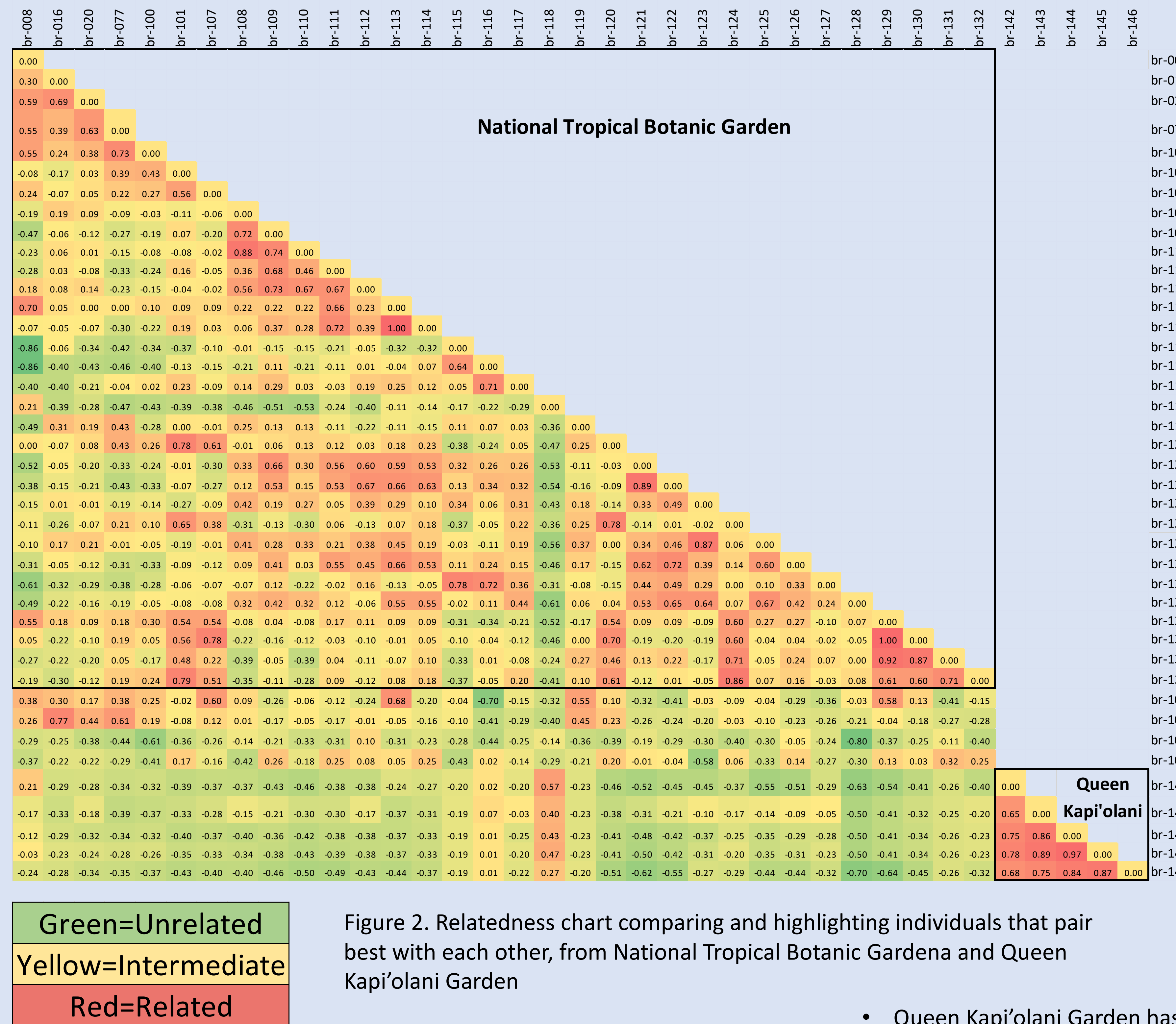


Figure 2. Relatedness chart comparing and highlighting individuals that pair best with each other, from National Tropical Botanic Garden and Queen Kapi'olani Garden

Table 1. Comparison of collections based on the percent of variation, calculated based on average allele frequency across all loci. Expected Heterozygosity based on how likely an individual pulled at random would be heterozygous

	He	%Total variation
<b>Herbarium</b>	0.530	62%
<b>Maui Nui Botanical Garden</b>	0.500	45%
<b>Moloka-collected for Hawaii meeting</b>	0.180	25%
<b>National Tropical Botanical Garden</b>	0.550	68%
<b>Other</b>	0.460	41%
<b>Queen Kapi'olani Garden</b>	0.180	28%

- Queen Kapi'olani Garden has a small number of individuals and is very inbred
- National Tropical Botanic Garden is more genetically diverse than Queen Kapi'olani Garden but has more individuals
- Best pairings are found when National Tropical Botanic Garden and Queen Kapi'olani Garden are matched
- National Tropical Botanic Garden has the highest He rate
- Herbarium has the greatest total variation but these specimens are no longer viable

# Literature Cited

*Brighamia rockii* (āluā). (n.d.). Retrieved August 15, 2022, from <https://www.iucnredlist.org/species/44081/83789301>  
*Native Plants Hawaii - Viewing Plant : Brighamia rockii*. (n.d.). Retrieved August 15, 2022, from [http://nativeplants.hawaii.edu/plant/view/Brighamia\\_rockii/](http://nativeplants.hawaii.edu/plant/view/Brighamia_rockii/)  
*Pua'ala (Brighamia rockii) | U.S. Fish & Wildlife Service*. (n.d.). Retrieved August 15, 2022, from <https://www.fws.gov/species/puaala-brighamia-rockii>

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# Discussion

- Brighamia rockii* is already inbred, with low diversity
- In order to avoid the collapse of the species there needs to be careful arrangements of pairings in order to optimize genetic diversity
- The data showed that the best pairings occurred outside the given collection
- A well-organized exchange is needed to avoid wasting any of the specimen
- It must be taken into consideration that some of the individuals on the chart are from herbaria and therefore that diversity is already lost



Figure 3. *Brighamia rockii* at NTBG Kahanu Garden nursery, photographed by Mike Opgenorth

# Conclusion

- There is only so much that can be done to restore this critically endangered species, without genetic information
- From the given genetic data there is a possibility to avoid more inbreeding and create a healthier population

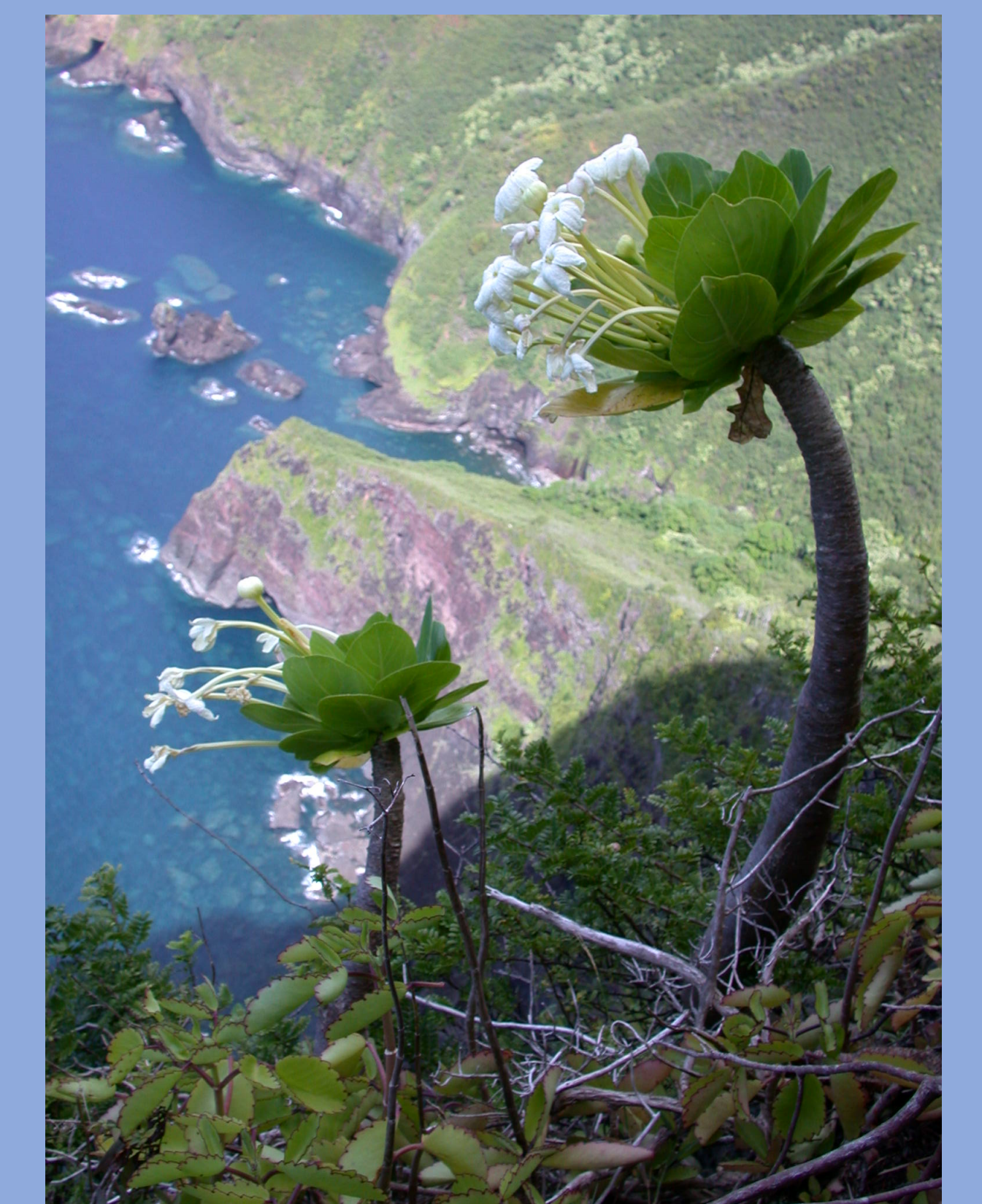


Figure 4. *Brighamia rockii* in the wild, photographed by Kenneth R. Wood, 2005