Results

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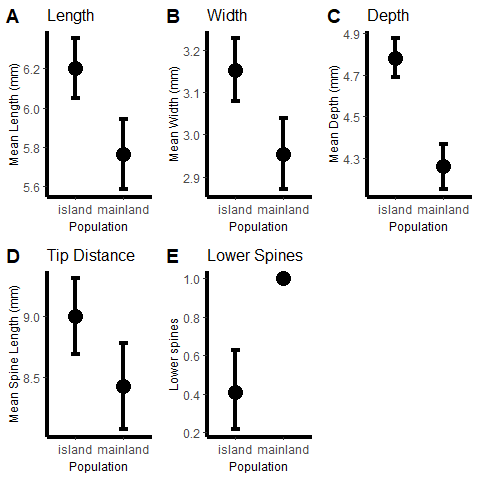
# Results

# Univariate analysis: trait ~ group + year

## Model 1: Mainland/Island

### Mericarp

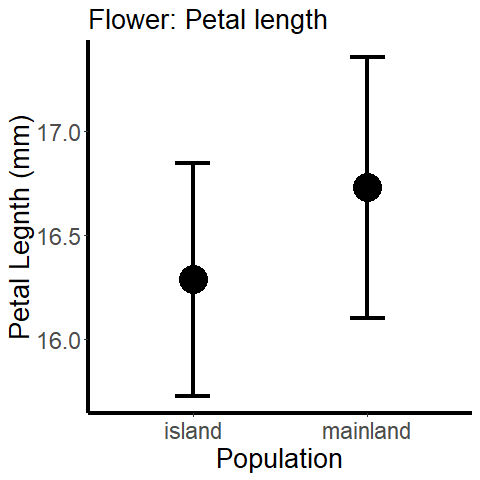
We found that mericarps in island populations are larger but less spiny than mericarps in mainland populations. Mericarps on islands are 7% longer, 5% wider, 12% deeper than mainland populations ( = 14.10, p = <0.001; = 12.43, p = <0.001; = 52.33, p = <0.001). Their upper spines are 6% more separated between them on island populations than on mainland ( = 5.85, p = 0.015). However, lower spines are more common on mainland populations than on island populations ( = 76.74, p = 0.001). The effect of year was significant on all traits ( = 8.61, p = <0.001; = 8.16, p = <0.001; = 19.54, p = <0.001; = 0.091, p = <0.001).



Estimated means of mericarp traits between island and mainland populations.

### Flower

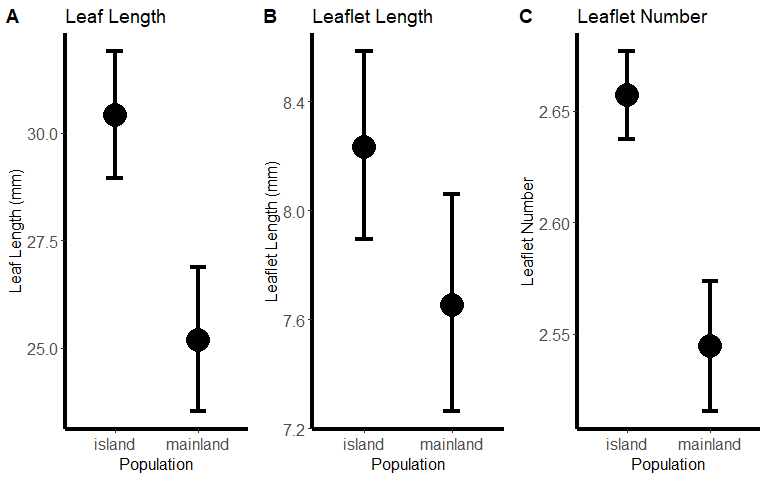
We found no significant differences between mainland and island populations on petal length (p = 0.299). However, there was a significant result for year ( = 15.89, p = <0.001) between mainland and island populations.



Estimated means of petal length between island and mainland populations.

### Leaf

We found that leaves in island populations are longer, and have more leaflets than leaves in mainland populations. Leaves on islands are 20% longer, their leaflets are 7.5% larger and they have approximately 11% more leaflets than mainland populations ( = 21.86, p = <0.001; = 4.86, p = 0.027; = 39.61, p = <0.001). The effects of year were also significant for all three traits. ( = 6.50 p = <0.001; = 4.86, p = <0.001).

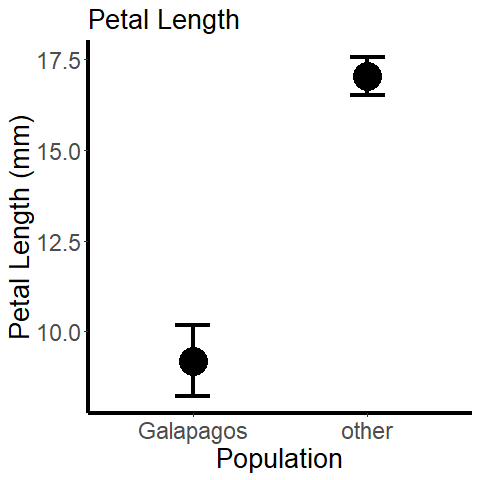


Estimated means of leaf traits between island and mainland populations.

## Model 2: Galapagos/Other Islands

### Flower

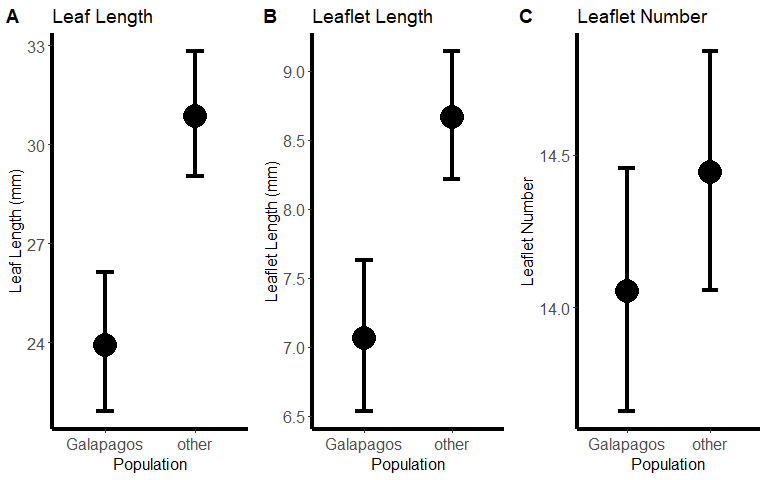
We found that *Tribulus* flowers in the Galapagos are smaller than flowers of populations from other islands. Petal length of *Tribulus* on the Galapagos is 46% shorter than petals from other islands ( = 156.39, p = <0.001). The effect of year has also significant between the two groups ( = 10.13, p = 0.0014)



Estimated means of petal length between the Galapagos and other islands populations.

### Leaf

We found that leaf length of population from the Galapagos are smaller than populations from other islands. Leaves are 22% shorter and leaflets are 18.5% shorter compared to other island populations ( = 20.39, p = <0.001; = 17.20, p = <0.001). However there were not significant differences for the number of leaflets between Galapagos and other island populations (p = 0.17). The effect of year was not significant for both leaf and leaflet length (p = 0.44, p = 0.347).

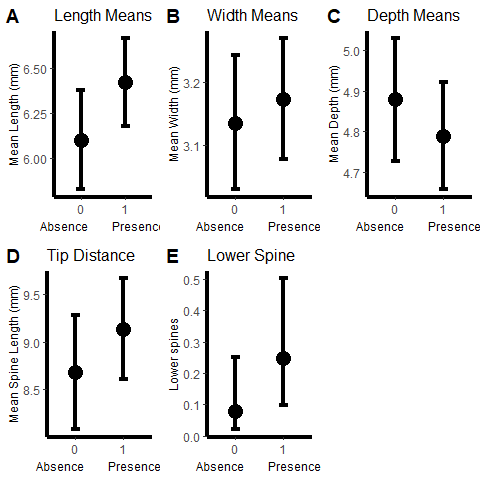


Estimated means of leaf traits between the Galapagos and other island populations.

## Model 3: Finch Beak

### Mericarp

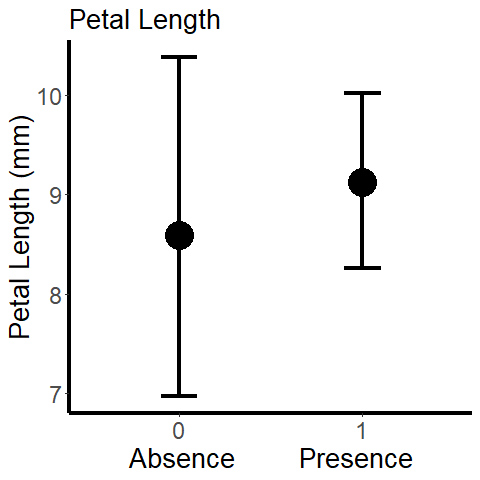
The presence of large beak finch species, *Geospiza magnirrostris* and *Geospiza cornirostris* was significantly associated with the presence of lower spines ( = 125.47, p = <0.001). However, mericarp length, width, depth and spine tip distance were not significant (p = 0.08, p = 0.58, p = 0.37, p = 0.25). The effect of year was significant for lower spines ( = 17.414, p = <0.001) but not significant for the other traits (p = 0.69; p = 0.32; p = 0.11; p = 0.94).



Estimated means of mericarp traits between finch beak communities. 1 = Presence of large finch species, *Geospiza magnirrostris* and *Geospiza cornirostris*. 0 = Absence of large finch species.

### Flower

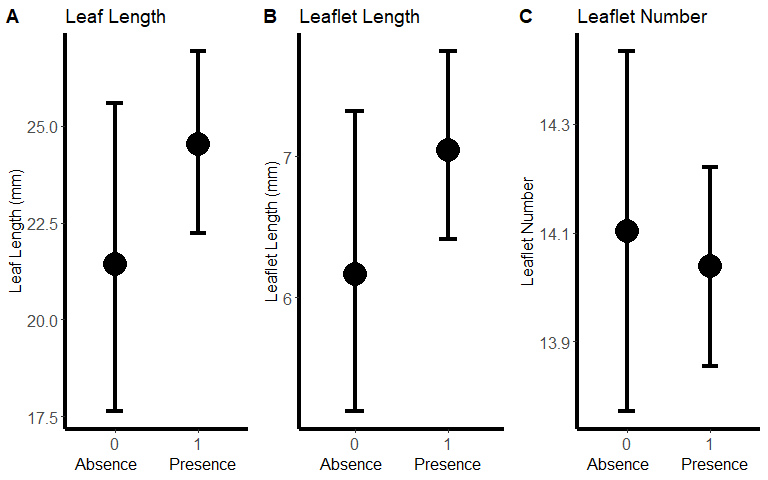
There was no statistically significant difference for petal length and year between islands with large beak finches present and absent (p = 0.55; p = 0.009)



Estimated means of petal length between finch beak communities. 1 = Presence of large finch species, *Geospiza magnirrostris* and *Geospiza cornirostris*. 0 = Absence of large finch species.

### Leaf

There is not statistically significant difference between islands with large finch beak species present and absent for all three leaf traits, leaf length, leaflet length and leaf number (p = 0.17; p = p = 0.15; p = 0.73). However there was a significant effect of year for leaf length and leaflet number ( = 12.85, p = <0.001; = 11.98, p = <0.001). The effect of year for leaflet length was barely significant ( = 3.7091, p = <0.0542).



Estimated means of leaf traits between finch beak communities. 1 = Presence of large finch species, *Geospiza magnirrostris* and *Geospiza cornirostris*. 0 = Absence of large finch species.

# Univariate ANOVA table summary

Model

Dataset

Trait

Chisq

P

Model 1: Mainland/Island

Mericarp

Length

14.1013891

0.0001732

Year Length

8.6192264

0.0033263

Width

12.4375510

0.0004208

Year Width

8.1604112

0.0042815

Depth

52.3335494

0.0000000

Year Depth

19.5424240

0.0000098

Tip Distance

6.0898498

0.0135961

Year Tip Distance

0.0276011

0.8680502

Lower Spines

76.7444476

0.0000000

Model 1: Mainland/Island

Flower

Petal Length

1.0773450

0.2992922

Year Petal Length

15.8994511

0.0000668

Model 1: Mainland/Island

Leaf

Leaf Length

21.8618750

0.0000029

Year Leaf Length

6.5024760

0.0107724

Leaflet Length

4.8651444

0.0274045

Year Leaflet Length

8.6928194

0.0031947

Leaf Number

39.6192434

0.0000000

Model 2: Galapagos/Other Islands

Flower

Petal Length

156.3980600

0.0000000

Year Petal Length

10.1334553

0.0014560

Model 2: Galapagos/Other Islands

Leaf

Leaf Length

20.3974384

0.0000063

Year Leaf Length

0.5726341

0.4492141

Leaflet Length

17.2063072

0.0000335

Year Leaflet Length

0.8816053

0.3477624

Leaf Number

1.8644732

0.1721094

Model 3: Finch Beak Presence/Absence

Mericarp

Length

3.0175412

0.0823683

Year Length

0.1566561

0.6922540

Width

0.2771715

0.5985612

Year Width

0.9632845

0.3263607

Depth

0.7951283

0.3725539

Year Depth

2.4684788

0.1161503

Tip Distance

1.3132890

0.2518000

Year Tip Distance

0.0048628

0.9444054

Lower Spines

2.4871950

0.1147761

Model 3: Finch Beak Presence/Absence

Flower

Petal Length

0.3459436

0.5564184

Year Petal Length

6.7203092

0.0095321

Model 3: Finch Beak: Presence/Absence

Leaf

Leaf Length

1.8787000

0.1704800

Year Leaf Length

12.8564770

0.0003363

Leaflet Length

2.0279931

0.1544244

Year Leaflet Length

3.7091102

0.0541162

Leaf Number

0.1126053

0.7371973

Year Leaf Number

11.9862382

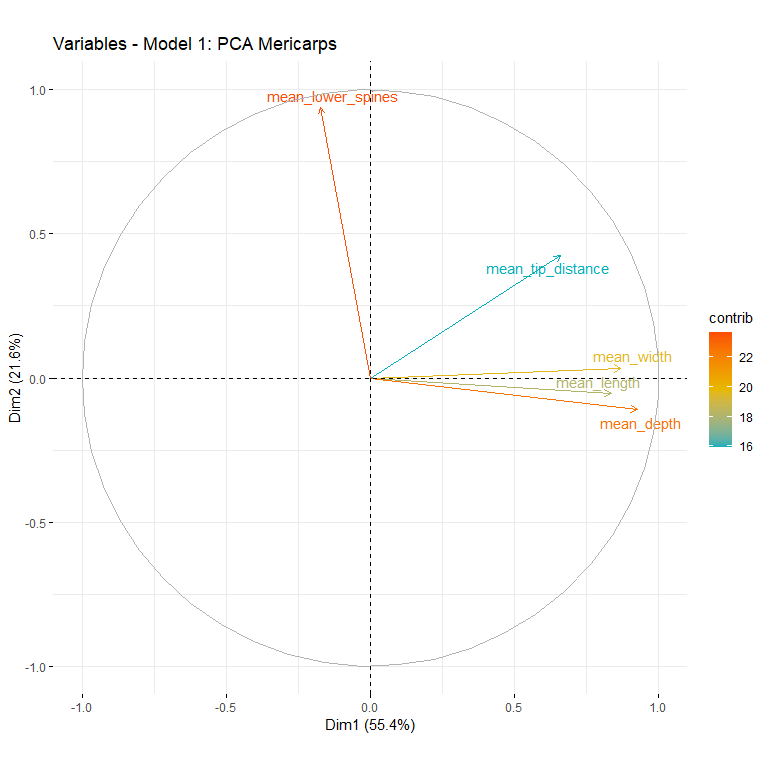
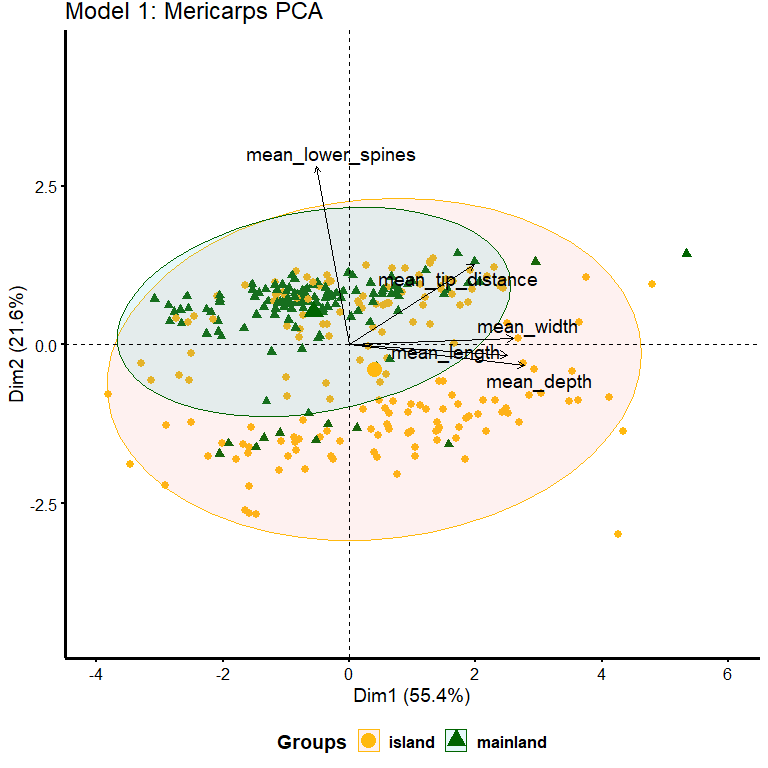
0.0005359

# Multivariate analysis: trait ~ group + condition(year)

## Model 1: Mainland/Island

### Mericarp

We observed that mericarps from islands and mainlands populations differed in size and number of spines. Mericarps on islands are larger than mericarps on the mainland with depth being the variable that contributes more to the variation of mericarp size. For spines, the presence of lower spines was more related to mainland populations than to island populations and was the variable that contribute to most of the variation between the two groups.

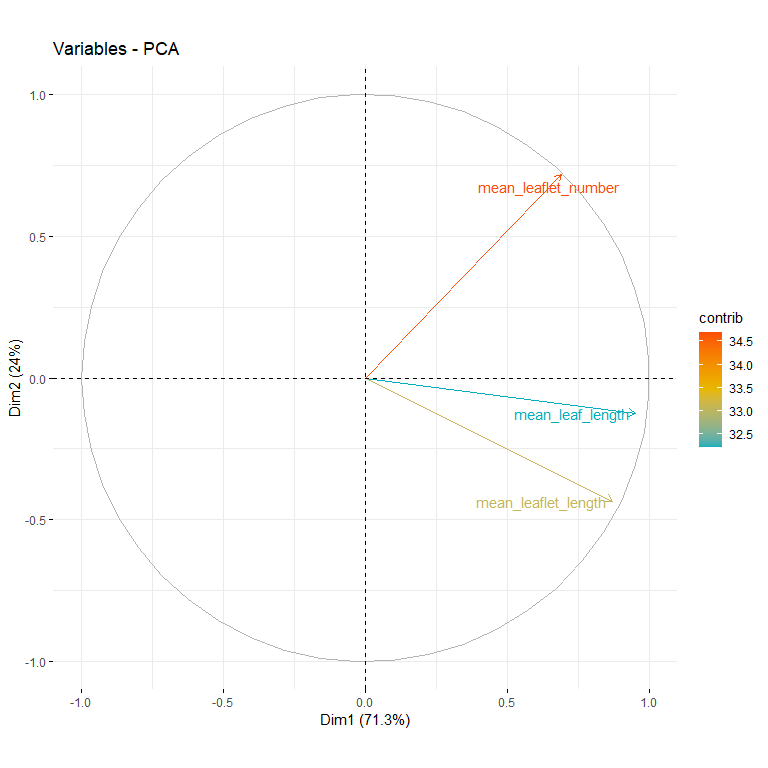
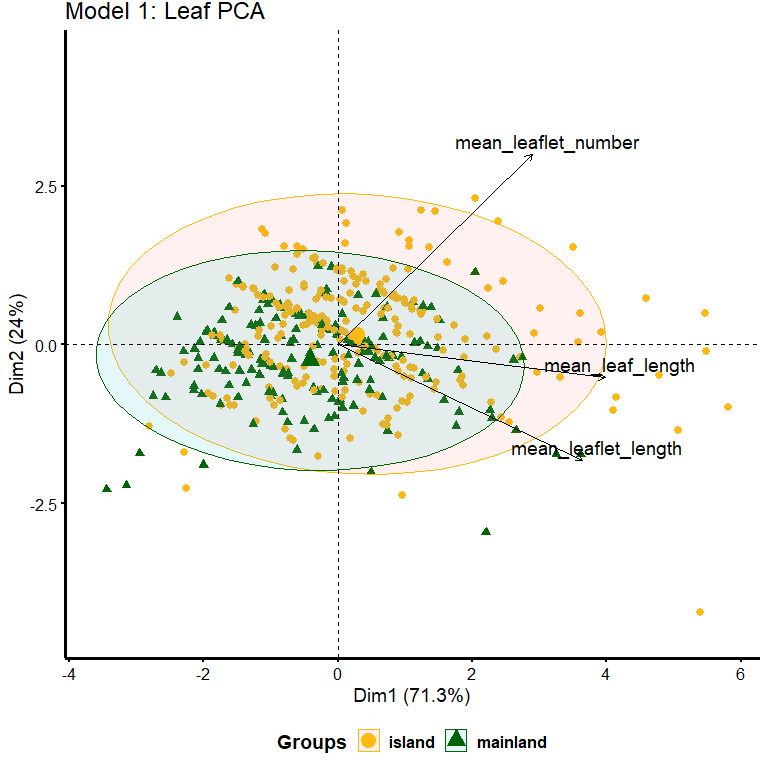


Permutation test for rda under reduced model Terms added sequentially (first to last) Permutation: free Number of permutations: 999

Model: rda(formula = scale(mericarp\_traits) ~ mainland\_island + Condition(year\_collected), data = mericarp) Df Variance F Pr(>F)  
mainland\_island 1 0.2607 255.79 0.001 \*\*\* Residual 4626 4.7145  
— Signif. codes: 0 ‘***’ 0.001 ’****’ 0.01 ’*’ 0.05 ‘.’ 0.1 ’ ’ 1

### Leaf

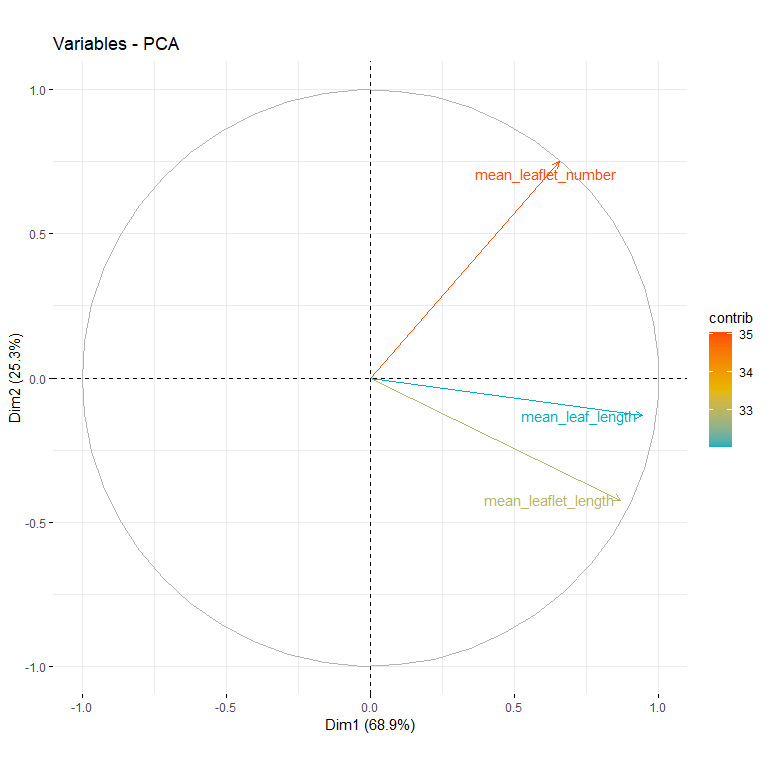
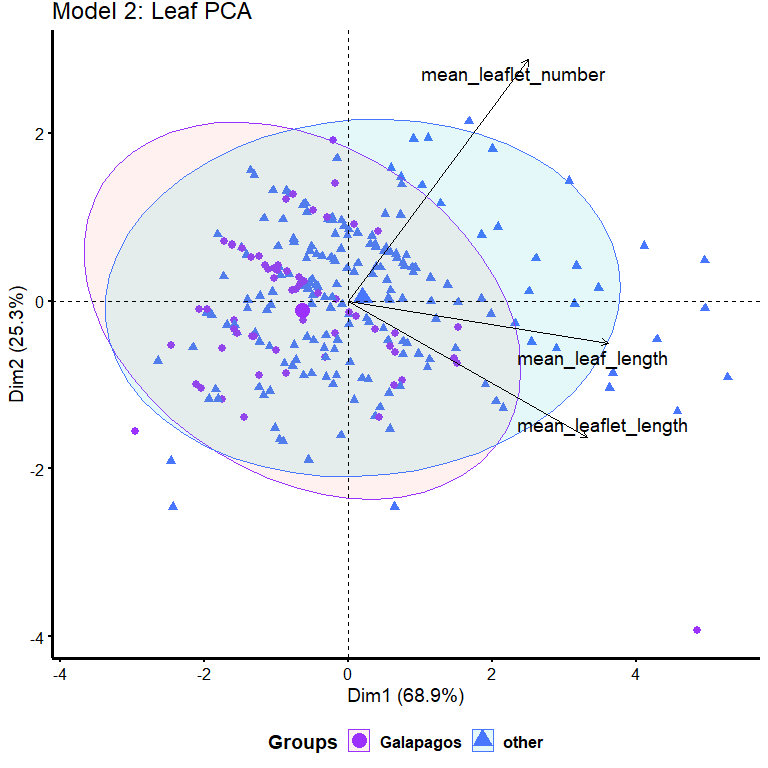
Leaves are larger on islands than in the mainland. This size difference also contributes to the number of leaflets present, with island populations habving more. This trait is the main difference between the two groups.



## Model 2: Galapagos/Other

### Leaf

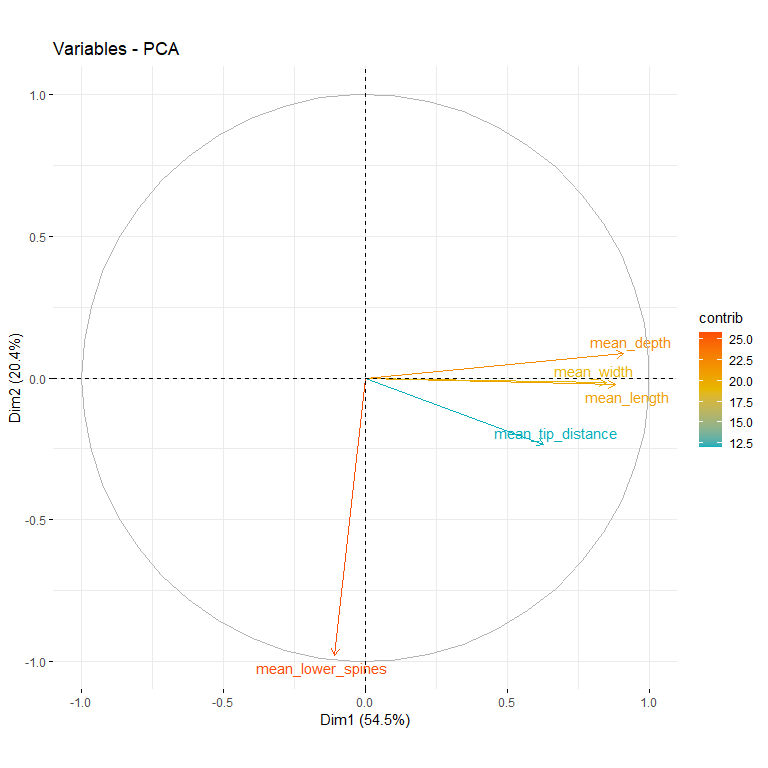
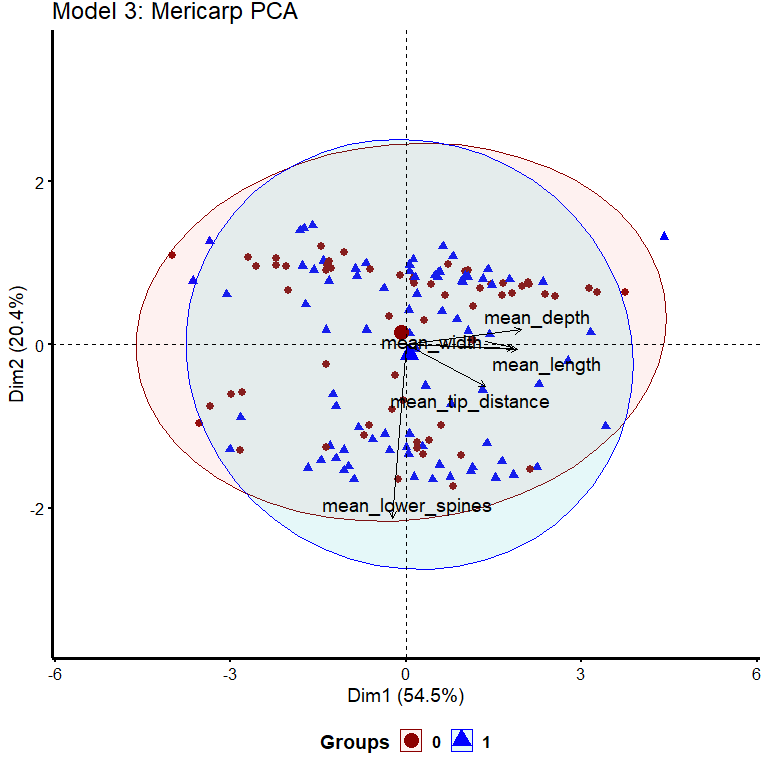
Leaves from the Galapagos Islands are smaller than other island populations. *Tribulus* leaves in the Galapagos are smaller and have less leaflets than other Islands.



## Model 3: Finch Beak

### Mericarp

The presence of lower spines is by far the trait that contributes most to the differences between groups. This means that the presence of lower spines are associated with large beak finches. Mericarp size contributes 54% of the variation but is not particularly associated with any group.



### Leaf

Leaf size and leaflet number is not particularly associated with any group of finches.

