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Lab 2

1. I identified about three different species using morphological characteristics. Species 1 contains samples (24,25,7,12). Species 2 (1,2,4,6,7,8,9,10,11,17,20,21). Species 3(3,5,13,14,15,16,18,19,22,23).
2. The morphological features I used were the general shape of the shell. Specifically, how it spirals and the shape of the whorls on the exterior of the shell. Beyond that, I used stratigraphic position to group like species. Lastly, I used shell dimensions, taking into consideration sexual dimorphism.
3. It is hard to say whether or not ontogenetic change can be seen as I can’t determine if there are any juveniles present in the sample.
4. Sexual dimorphism is a factor and was evaluated by looking at the side profile of each species. The males have wider shells than the females.

**Part 2**

1. names(plethodon) function gives [1] "land" "links" "species" "site" "outline"
2. Each object is a list.
3. > dim(plethodon[[1]])

>[1] 12 2 40

**Part 2.1**



1. First I made a new list of integers from the landmark data Land <- hummingbirds[["land"]]
2. Then I used the procrustes fuction on Land, ProcrustusHum <- gpagen(Land) Call:

gpagen(A = hummingbirds[["land"]])

Generalized Procrustes Analysis

with Partial Procrustes Superimposition

25 fixed landmarks

0 semilandmarks (sliders)

2-dimensional landmarks

2 GPA iterations to converge

Consensus (mean) Configuration

X Y

[1,] -0.23070658 -0.004019945

[2,] -0.23166828 -0.007872797

[3,] -0.13382098 0.009674268

[4,] -0.10762567 0.011136305

[5,] 0.26083316 0.015204714

[6,] 0.24301063 0.014771238

[7,] 0.27241822 0.022915273

[8,] 0.26430590 -0.029750895

[9,] 0.28811752 -0.006634614

[10,] 0.34824633 -0.024553255

[11,] -0.21062229 0.004416187

[12,] -0.18177979 0.011634535

[13,] -0.15154339 0.015655990

[14,] 0.06298980 0.024762656

[15,] 0.15601429 0.025397121

[16,] -0.21004620 -0.004104279

[17,] -0.18029996 -0.001923553

[18,] -0.15104120 -0.001215210

[19,] 0.06135931 -0.001525065

[20,] 0.15517959 -0.005228372

[21,] -0.21030744 -0.010858309

[22,] -0.17970193 -0.013894294

[23,] -0.14958777 -0.015212206

[24,] 0.06106577 -0.011552568

[25,] 0.15521098 -0.017222926

>

1. finally ran a PCA > plotTangentSpace(ProcrustusHum[["coords"]],warpgrids=FALSE,verbos =FALSE 
2. There one species of hummingbirds.

**Part 3**

1. Fangs longer than six inches.
2. Sulfurous odor.
3. Adorable eyelashes.
4. C, D, and E, have a sulfurous odor.
5. D does not have a laser death ray.
6. Adorable eyelashes are a synapomorphy.
7. Species A is a monophyletic group, B and C are a paraphyletic group and D and E a monophyletic group.
8. No, because it would be paraphyletic
9. a) Species A,B, C are Paraphyletic.

b) Species C,D, E are Monophyletic.

c) Species C,D are Polyphyletic.

d) Species A,B are Paraphyletic

e) Species A,D, E are Monophyletic

**Part 4**

1. Assuming Species D and E, species D is an example of peramorphosis and species E an example of paedomorphosis.
2. Gryphaea gigantea (E)
3. Paedomorphosis