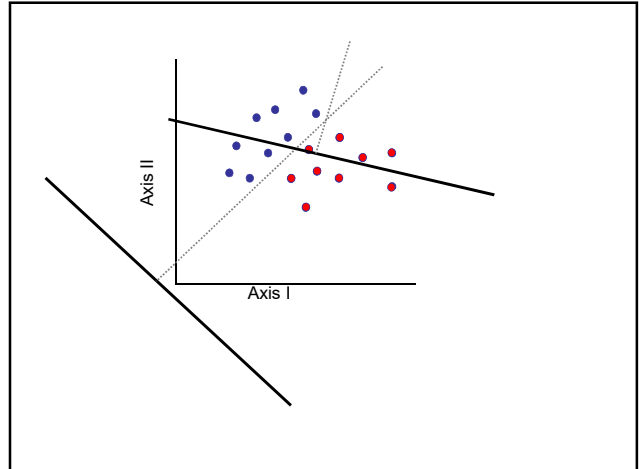


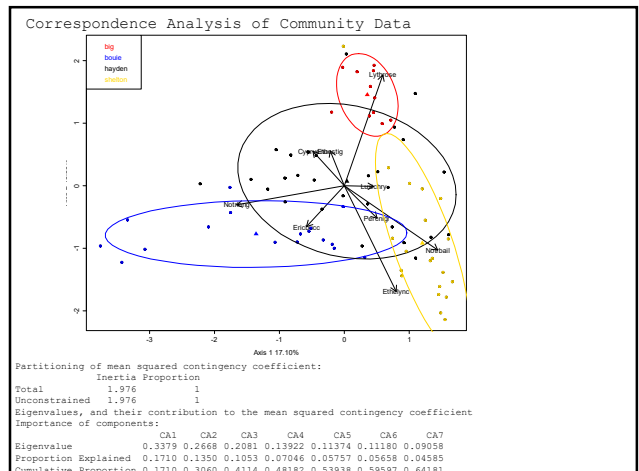
Discriminant Function

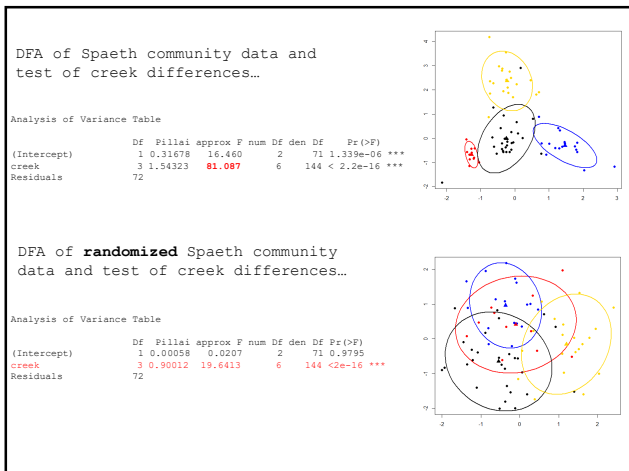
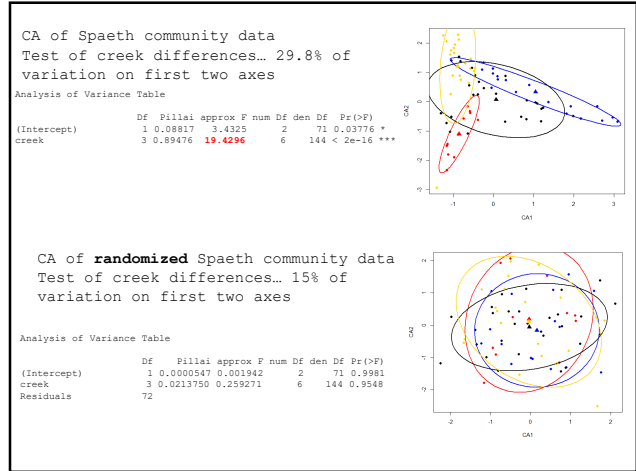
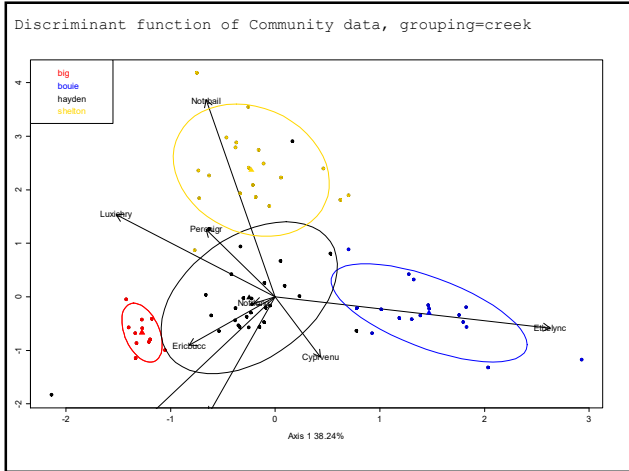
- General class of analyses that build a model to predict a single continuous or categorical dependent variable from a set of predictor variables.
- Analysis looks for linear combinations of the data that effectively define or predict the groups.
- There are a variety of methods, but dfa often uses ordination for reducing the dimensionality of the predictor variables.



Discriminant Function

- The result is a predictive model (discriminant function) that can be used to:
 - Emphasize differences among groups
 - Build a predictive model of group membership
- **Tests of classification accuracy** – use half of the data to build a model, test classification accuracy with the second half
- Function `discrimin.coa` (ade4 package)
 - Provide a matrix of predictor variables and one classification variable
 - Uses CA for data summary then uses classification to form **canonical variables**





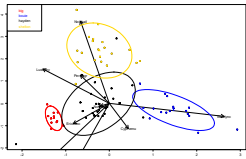
Discriminant Function

- Common use – “Can group membership be determined from variables alone?”
 - Divide data into “training” and “testing”
 - Perform discriminant function with “training” data
 - Function lda
 - `discrim<- lda(spaeth_train,grouping=spaeth_factors$creek)`
- Use “testing” data to see if you can predict creek
 - Function predict.lda
 - `predict.lda(discrim,spaeth_test)`
 - Returns predicted class (creek in this case) for each sample in the testing data.
 - Classification accuracy

Discriminant Function – predicted and actual group

Training dataset (37 samples picked randomly):

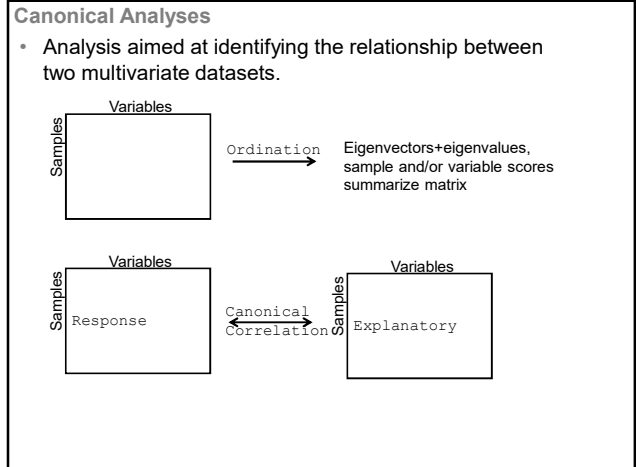
	big	bouie	hayden	shelton
big	4	0	0	0
bouie	0	8	0	0
hayden	0	0	16	0
shelton	0	0	0	9



Testing dataset (other 39 samples):

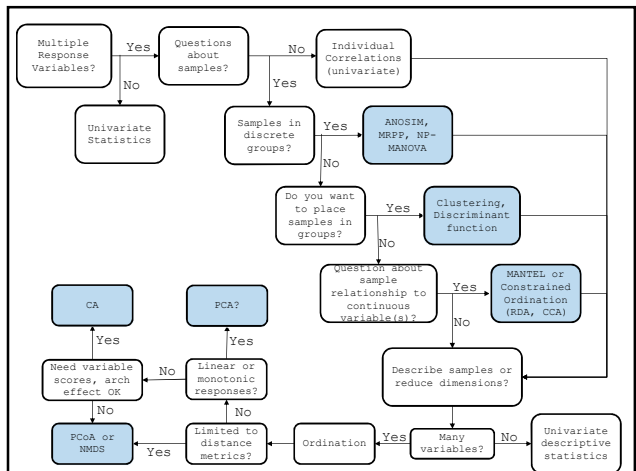
	big	bouie	hayden	shelton
big	3	1	1	0
bouie	1	6	4	4
hayden	3	2	3	2
shelton	0	0	4	5

17 Correct, 22 incorrect
 44% accurate, null = 25%
 Most accurate for Big (3/5) and Shelton (5/9)
 Least accurate for Bouie (6/15) and Hayden (3/10)



Canonical Analyses

- Constrained Ordinations (next week)
 - Redundancy Analysis (RDA)
- Canonical Correspondence Analysis
- Canonical Correlation** – measure of association between two sets of variables (function `cancor`).
- Discriminant Function and Canonical Variates (shape analyses)



**General Recommendations for Ordination:
A dichotomous key**

1. **Direct Gradient Analysis**.....2

2. Few species.....4

4. **Monotonic responses to gradients (low beta)**.....

4. Nonmonotonic responses to gradients (high beta).....
.....Generalized linear models

2. Many species.....5

5. **Monotonic responses**.....**BDA***

5. Nonmonotonic responses.....6

6. concerned about **arch effect**.....**DCCA**

6. not concerned about **arch effect**.....**DCA**

1. **Indirect Gradient Analysis**.....3

3. Only distance values are available.....7

7. **Monotonic responses**.....**BMDS**

7. Nonmonotonic responses.....**NMDS**

3. Raw data available.....8

8. **Monotonic responses**.....

9. Variables noncommensurate.....**CA** = corr. matrix

9. Variables commensurate.....**CA** = cov. matrix

8. Nonmonotonic responses.....10

10. Feel OK about prespecifying number of dimensions,
not worried about local optima, not interested in
species scores.....**BMDS**

10. Not as above, but willing to accept either **arch**
effect or **detrrending/rescaling**.....11


11. Don't like **arch**, **detrrending** OK.....**CCA**

11. **Arch** OK, or only interested in axis 1.....**CA**

The above is just meant as a menu point for discussion. Check the boxes set to complete to order the decision about which method to use in a dichotomous key. Suggestions for revisions are welcome!

Remember, the **Direct** and **Indirect** have pointed out that Correspondence Analysis (and by implication, its derivatives DCA, CCA and DCCA) has two "flavors": a unimodal form and a linear form. This implies that if
MCA/CCA is that the latter is better for species composition, and not for overall trends in abundance of all species combined.

This page was created and is maintained by [Michael Palmer](#).

 [To the ordination web page](#)