ANOSIM, PERMANOVA, SIMPER, Indicator Value

Pablo E. Gutiérrez-Fonseca

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```r
libraries <- c("vegan", "ggplot2", "dplyr")
lapply(libraries, require, character.only = TRUE)
```

```
## [[1]]
## [1] TRUE
##
## [[2]]
## [1] TRUE
##
## [[3]]
## [1] TRUE
```

Paso 1. LLamar de nuevo a las tablas.

```r
Moth_full  <- read.csv("data/fullmatrix.csv")
head(Moth_full)
```

```
##    TimeCode Year Site  Habitat    Month       Period Abundance Richness M1 M2
## 1  T1Apr17 2017   T1 Tabonuco   April  Pre-Hurricane        73       25  1  0
## 2  T1May17 2017   T1 Tabonuco     May  Pre-Hurricane        61       25  0  0
## 3  T1Jun17 2017   T1 Tabonuco    June  Pre-Hurricane        68       33  6  1
## 4  T1Jul17 2017   T1 Tabonuco    July  Pre-Hurricane        73       17  3  0
## 5  T1Aug17 2017   T1 Tabonuco  August  Pre-Hurricane        46       19  2  0
## 6  T1Oct17 2017   T1 Tabonuco October Post-Hurricane       124       15  0  0
##   M3 M5 M7 M8 M10 M13 M15 M17 M19 M25 M26 M29 M45 M48 M50 M52 M53 M54 M55 M66
## 1  0  0  2  0   0   1   0   1   0   0   1   0   0   1   0   0   1   0   7   0
## 2  0  0  4  0   0   1   2   0   0   0   1   1   0   1   0   2   0   0   1   0
## 3  2  0 21  1   1   0   0   0   2   1   2   0   1   2   1   1   3   1   2   0
## 4  0  0  5  0   0   1   0   1   0   0   9   0   0   0   0   1   0   0   0   1
## 5  2  0  6  0   0   0   0   0   1   0   3   0   0   0   1   0   1   0   0   0
## 6  0  0 78  0   0   0   0   0   0   0  14   0   0   0   0   1   0   0   0   0
##   M70 M74 M77 M79 M80 M81 M85 M86 M87 M88 M89 M94 M95 M96 M100 M104 M105 M106
## 1   0   0   0   0   0   0   0   0   2   0   0   0   0   1    0    0    0    0
## 2   0   0   0   0   0   0   1   1   3   0   0   1   0   0    0    0    0    0
## 3   0   0   0   1   0   0   0   1   2   0   0   3   1   1    1    0    0    1
## 4   0   0   2   0   0   0   0   1   0   0   0   0   0   0    0    0    0    0
## 5   0   0   0   0   0   0   0   0   0   0   0   1   0   0    0    0    0    0
## 6   0   0   0   4   0   0   0   0   4   0   0   0   0   0    0    0    0    0
##   M109 M110 A1 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A14 A15 A16 A17 A19 A21 A22 A24
## 1    0    0  1  4  0  0  1  0  0  0   1   1   0   0   1   0   0   0   0   0   1
```

```
## 2     0     0 0 0 0 0 0 0 0 0     0     1     0     0     1     0     0     2     1     0     0
## 3     0     0 0 0 0 0 0 0 0 0     0     0     0     0     0     0     0     0     0     0     0
## 4     0     0 0 0 0 0 0 0 0 0     0     1     0     0     0     0     0     1     1     0     0
## 5     0     0 0 0 0 0 0 0 0 0     0     1     0     0     0     0     1     1     0     0     0
## 6     0     0 0 0 0 0 0 0 0 0     0     0     0     0     0     0     1     2     5     3     0
##    A25 A27 A28 A29 A30 A31 A32 A33 A34 A36 A37 A38 A39 A40 A41 A42 A43 A44 A45
## 1   1   0   0   0   0   0   1   0   0   0   0   1   0   0   0   0   0   0   0
## 2   0   0   0   0   0   0   0   0   0   1   0   0   0   0   0   0   0   0   0
## 3   1   0   0   0   0   0   0   0   0   1   0   0   0   0   1   0   0   0   0
## 4   4   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## 5   4   0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0
## 6   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
##    A46 A47 A48 A49 A50 A51 A52 A53 A54 A55 A56 A58 A59 A60 A61 A65 A66 A67 A68
## 1   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## 2   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0
## 3   0   0   0   0   0   0   0   1   0   0   0   0   0   1   0   0   0   0   0
## 4   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## 5   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## 6   0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0   0
##    A69 A70 A71 A72 A73 A74 A75 A76 A77 A78 A79 A80 A81 A82 A83 A84 A86 A97 A99
## 1   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0   0   0   0   2
## 2   0   0   1   0   0   0   0   0   0   0   0   0   0   0   0   0   2   0   2
## 3   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1
## 4   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## 5   0   0   0   0   1   0   0   1   0   0   0   0   0   0   0   0   0   0   0
## 6   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
##    A101 A105 A111 A112 A115 A116 A117 A118 A119 A120 A121 A122 A123 A124 A125
## 1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 2    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 3    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 4    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 5    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 6    0    0    0    0    0    0    0    1    0    0    0    0    0    0    0
##    A126 A127 A128 A129 A130 A131 A132 A133 A134 A135 A136 A137 A138 A139 A140
## 1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 2    0    0    0    0    0    0    0    0    1    0    0    0    0    0    0
## 3    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 4    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 5    0    0    0    0    0    0    0    0    0    0    0    1    0    0    0
## 6    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
##    A141 A142 A143 A144 A145 A147 A148 A149 A150 A151 A152 A153 A154 A155 A157
## 1    0    0    0    0    0    0    0    0    0    0    0    0    0    0   36
## 2    0    0    0    0    0    0    0    0    0    0    0    1    0    0   27
## 3    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 4    0    0    0    0    0    0    0    1    0    0    0    0    1    0   38
## 5    0    0    0    0    0    1    0    0    0    0    0    1    0    0   16
## 6    1    0    0    0    0    0    0    0    0    0    0    0    0    0    3
##    A158 A159 A160 A161 A162 A163 A164 A165 A166 A167 A168 A169 A170 A171 A172
## 1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 2    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 3    0    0    0    0    0    0    0    0    1    0    0    0    0    0    0
## 4    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 5    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 6    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
##   A177 A178 A179 A182 A184 A185 A186 A188 A190 A191 A192 A193 A194 A196 A198
## 1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 2    0    0    0    0    1    0    0    0    0    0    0    0    0    0    0
## 3    0    0    0    0    0    0    0    0    0    0    0    0    1    0    0
## 4    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 5    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 6    0    0    0    0    0    0    0    5    0    0    0    0    0    0    0
##   A199 A200 A201 A202 A203 A205 A206 A207 A208 A209 A210 A211 A212 A213 A214
## 1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 2    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 3    0    0    0    0    0    0    0    0    0    0    1    0    0    0    0
## 4    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 5    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 6    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
##   A215 A216 A218 A219 A220 A222 A223 A225 A228 A230 A234 A235 A236 A237 A238
## 1    0    0    0    0    0    0    0    0    0    0    0    2    1    0    0
## 2    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 3    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 4    0    0    0    0    0    0    0    0    0    0    0    0    2    0    0
## 5    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
## 6    0    0    0    0    0    0    0    0    0    0    0    0    1    0    0
##   A239 A240 A241 A242 A243 A244 A245 A246 A247 A248 DAMAGED
## 1    0    0    0    0    0    0    0    0    0    0       9
## 2    0    0    0    0    0    0    0    0    0    0       2
## 3    0    0    0    0    0    0    0    0    0    0       1
## 4    0    0    0    0    0    0    0    0    0    0       6
## 5    0    0    0    0    0    0    0    0    0    0       2
## 6    0    0    0    0    0    0    0    0    0    0       4
```

```r
moth_sp <- select(Moth_full, M1:A248)
```

Paso 2. Vamos a comparar entre grupos. Son los grupos propuestos (e identificados en el nMDS) significativamente diferente? Vamos hacer un ANOSIM
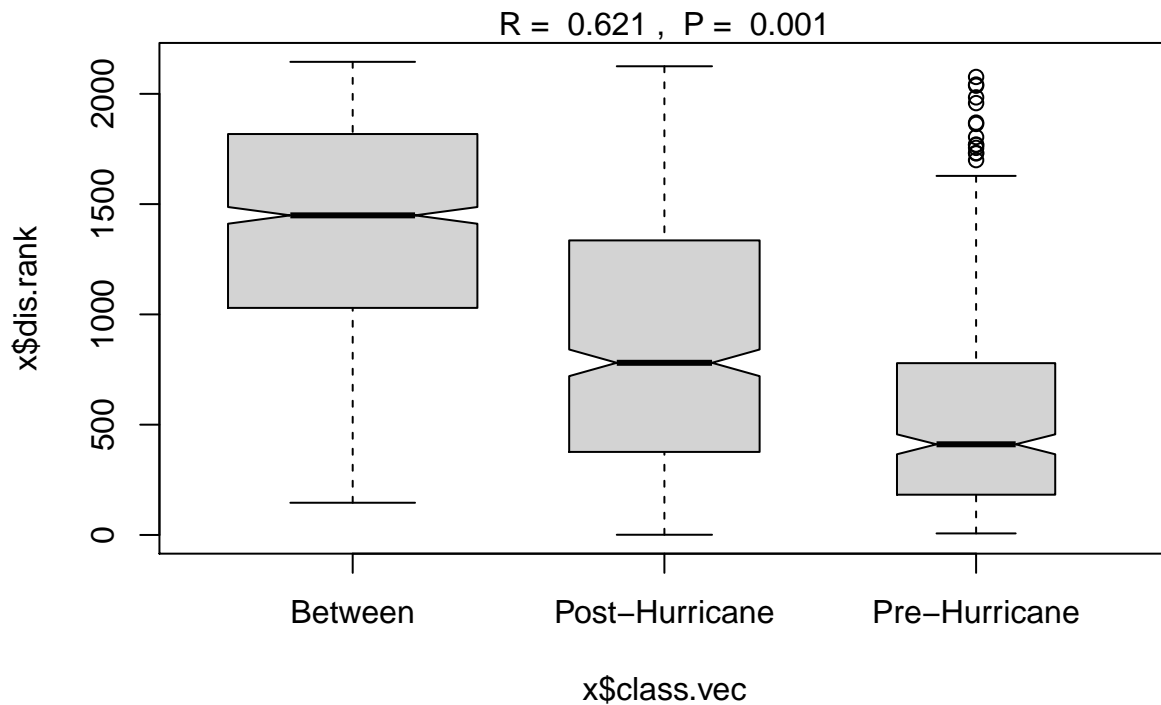
```r
################## ANOSIM ##################

moth.dist <- vegdist(moth_sp,method="bray")
moth.ano <- anosim(moth.dist, Moth_full$Period)
summary(moth.ano)
```

```
##
## Call:
## anosim(x = moth.dist, grouping = Moth_full$Period)
## Dissimilarity: bray
##
## ANOSIM statistic R: 0.6206
##       Significance: 0.001
##
## Permutation: free
## Number of permutations: 999
##
## Upper quantiles of permutations (null model):
##     90%    95%  97.5%     99%
```

```
## 0.0305 0.0434 0.0619 0.0772
##
## Dissimilarity ranks between and within classes:
##                  0%      25%     50%       75%    100%     N
## Between         146 1029.75 1449.0 1817.375 2145.0 1080
## Post-Hurricane    1  376.50  780.5 1334.875 2125.0  630
## Pre-Hurricane     7  182.50  411.0  779.000 2076.5  435
```

```
plot(moth.ano)
```


SIMPER

(sim <- with(Moth.frm, simper(moth, Hurricane))) summary(sim)

(sim <- with(Moth.frm, simper(moth, Habitat))) summary(sim)

Indicator Value

install.packages("labdsv") install.packages("indicspecies") library("indicspecies") library("labdsv")

library(vegan) library(MASS) library(labdsv) library(cluster) library(indicspecies)

ind_species<-multipatt(moth,Moth.frm$Hurricane,max.order=2, duleg=TRUE,func="IndVal.g",control=how(nperm=5000)
ind_species summary(ind_species)

other things to do

Berger-Parker dominance

graficos de canopy cover

https://rpubs.com/Roeland-KINDT/694021

install.packages("BiodiversityR") library(BiodiversityR)

speciespreH <- select(Moth.frm, M1:A248) Period <- select(Moth.frm, Period)

Accum.2 <- accumcomp(speciespreH, y=Period, factor='Period', method='exact', conditioned=FALSE, plotit=FALSE) Accum.2

accum.long1 <- accumcomp.long(Accum.2, ci=NA, label.freq=5) accum.long1

plotgg1 <- ggplot(data=accum.long1, aes(x = Sites, y = Richness, ymax = UPR, ymin = LWR)) + scale_x_continuous(expand=c(0, 1), sec.axis = dup_axis(labels=NULL, name=NULL)) + scale_y_continuous(sec.axis = dup_axis(labels=NULL, name=NULL)) + geom_line(aes(colour=Grouping), size=2) + geom_point(data=subset(accum.l labelit==TRUE), aes(colour=Grouping, shape=Grouping), size=5) + geom_ribbon(aes(colour=Grouping), alpha=0.2, show.legend=FALSE) + labs(x = "Month", y = "Species diversity", colour = "Period", shape = "Period")+ theme_classic()

plotgg1