ANOSIM, PERMANOVA, SIMPER, Indicator Value

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```
libraries <- c("vegan", "ggplot2", "dplyr", "indicspecies", "labdsv", "MASS",
               "labdsv", "cluster")
lapply(libraries, require, character.only = TRUE)
```

```
## [[1]]
## [1] TRUE
##
## [[2]]
## [1] TRUE
##
## [[3]]
## [1] TRUE
##
## [[4]]
## [1] TRUE
##
## [[5]]
## [1] TRUE
##
## [[6]]
## [1] TRUE
##
## [[7]]
## [1] TRUE
##
## [[8]]
## [1] TRUE
```

Paso 1. LLamar de nuevo a las tablas.

```
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    1    0    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    1    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
##   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
```

```
moth_sp <- dplyr::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

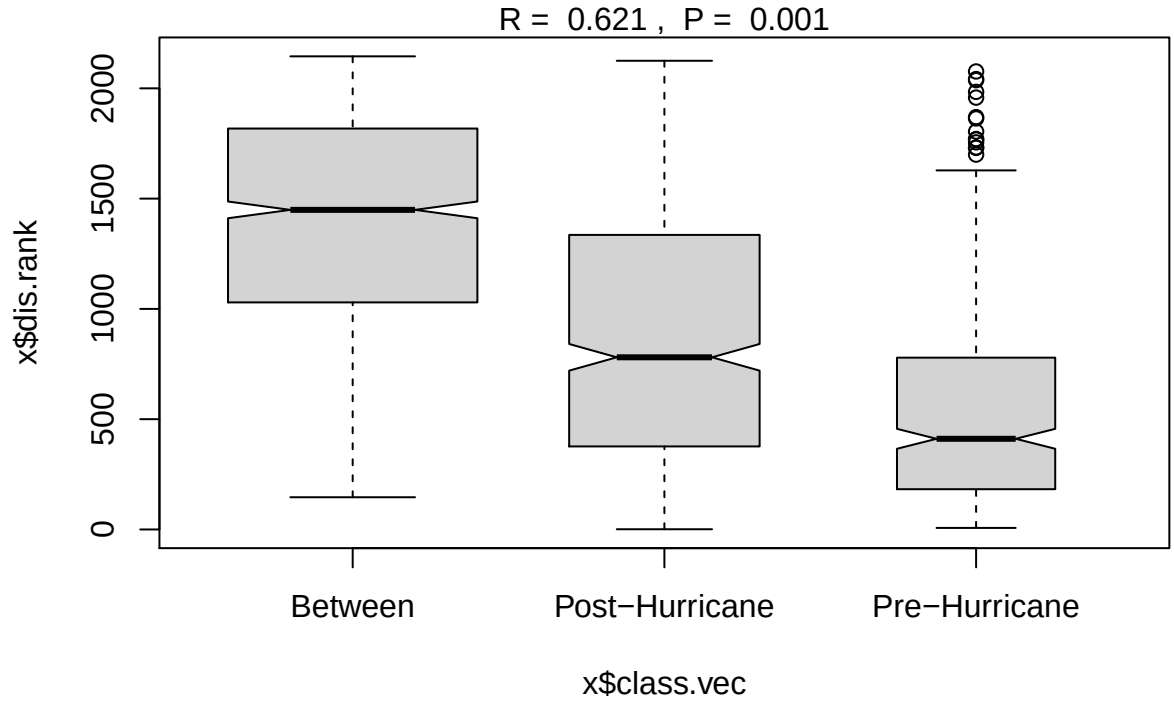
```
################## ANOSIM ###################

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%
## 0.0313 0.0470 0.0568 0.0785
##
## 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)
```



Paso 3. Vamos a ver quien cuales especies contribuyen a la disimilaridad entre esos grupos.

```
################ SIMPER ######################

moth_simper <- with(Moth_full, simper(moth_sp, Moth_full$Period), permutations = 999)
summary(moth_simper, ordered = TRUE,
    digits = max(3,getOption("digits") - 3))
```

```
##
## Contrast: Pre-Hurricane_Post-Hurricane
##
##        average        sd  ratio      ava      avb cumsum
## A157 1.639e-01 0.1071130 1.5302 32.46667  3.94444 0.2029
## M7   1.136e-01 0.1310294 0.8671 11.93333 22.72222 0.3436
## A141 9.986e-02 0.1120347 0.8913  0.03333 21.69444 0.4672
## M94  1.895e-02 0.0156875 1.2078  1.33333  3.72222 0.4907
## M26  1.595e-02 0.0163408 0.9760  1.43333  2.86111 0.5104
## M87  1.385e-02 0.0115333 1.2010  2.03333  2.47222 0.5276
## M55  1.273e-02 0.0221916 0.5738  2.03333  0.11111 0.5433
## M104 1.227e-02 0.0223592 0.5485  2.20000  0.44444 0.5585
## A21  1.108e-02 0.0095103 1.1654  0.80000  2.27778 0.5723
## A25  8.939e-03 0.0104711 0.8537  1.46667  0.33333 0.5833
## A188 8.810e-03 0.0103498 0.8512  0.03333  1.77778 0.5942
## A123 8.695e-03 0.0156544 0.5554  0.16667  1.83333 0.6050
## A22  8.532e-03 0.0097545 0.8747  0.10000  1.52778 0.6156
## A73  8.198e-03 0.0108273 0.7571  0.06667  1.66667 0.6257
## M52  7.996e-03 0.0164520 0.4860  1.30000  0.50000 0.6356
## A139 7.992e-03 0.0112553 0.7100  0.06667  1.41667 0.6455
## M1   7.338e-03 0.0106460 0.6893  1.16667  0.02778 0.6546
## A203 6.934e-03 0.0129661 0.5348  0.00000  0.91667 0.6632
## A58  6.736e-03 0.0087274 0.7718  1.16667  0.16667 0.6715
## A236 6.502e-03 0.0067682 0.9607  0.76667  0.86111 0.6796
## A19  6.492e-03 0.0080278 0.8087  0.63333  0.86111 0.6876
## A99  6.116e-03 0.0102138 0.5988  0.86667  0.00000 0.6952
## A86  6.102e-03 0.0099287 0.6145  0.86667  0.30556 0.7027
## M45  6.049e-03 0.0079997 0.7561  0.66667  0.61111 0.7102
## M3   5.948e-03 0.0069256 0.8589  0.80000  0.61111 0.7176
## A125 5.682e-03 0.0124889 0.4550  0.23333  0.91667 0.7246
## A163 5.482e-03 0.0066479 0.8247  0.23333  0.97222 0.7314
## A153 5.386e-03 0.0069346 0.7767  0.76667  0.44444 0.7381
## M79  5.170e-03 0.0060920 0.8486  0.40000  0.80556 0.7445
## A17  5.168e-03 0.0095796 0.5395  0.06667  0.83333 0.7509
## M48  5.134e-03 0.0077485 0.6626  0.73333  0.27778 0.7572
## M50  4.917e-03 0.0063888 0.7697  0.76667  0.19444 0.7633
## A79  4.728e-03 0.0079849 0.5921  0.73333  0.13889 0.7692
## A60  4.706e-03 0.0054927 0.8567  0.20000  0.77778 0.7750
## A40  4.681e-03 0.0061086 0.7663  0.06667  0.77778 0.7808
## M53  4.607e-03 0.0062412 0.7382  0.73333  0.05556 0.7865
## A200 4.409e-03 0.0055058 0.8008  0.23333  0.72222 0.7920
## M8   4.381e-03 0.0072714 0.6025  0.13333  0.88889 0.7974
## A3   4.325e-03 0.0064252 0.6732  0.23333  0.63889 0.8027
## M13  4.306e-03 0.0055121 0.7811  0.66667  0.00000 0.8081
## M66  4.010e-03 0.0057964 0.6918  0.50000  0.33333 0.8130
## M10  3.948e-03 0.0055742 0.7083  0.63333  0.08333 0.8179
```

```
## A192 3.759e-03 0.0057529 0.6533  0.00000  0.63889 0.8226
## M77  3.540e-03 0.0083397 0.4244  0.46667  0.11111 0.8270
## A41  3.524e-03 0.0057052 0.6178  0.43333  0.25000 0.8313
## A15  3.420e-03 0.0053573 0.6383  0.40000  0.33333 0.8355
## A150 3.143e-03 0.0063736 0.4931  0.00000  0.52778 0.8394
## A239 3.020e-03 0.0047332 0.6379  0.10000  0.52778 0.8432
## A32  2.787e-03 0.0047516 0.5865  0.23333  0.27778 0.8466
## A11  2.763e-03 0.0039073 0.7070  0.40000  0.19444 0.8500
## M80  2.745e-03 0.0056451 0.4863  0.40000  0.00000 0.8534
## A186 2.527e-03 0.0057717 0.4378  0.03333  0.44444 0.8566
## A36  2.424e-03 0.0037284 0.6501  0.36667  0.08333 0.8596
## A80  2.355e-03 0.0059924 0.3929  0.03333  0.58333 0.8625
## M19  2.336e-03 0.0042497 0.5497  0.40000  0.00000 0.8654
## A5   2.175e-03 0.0046809 0.4648  0.03333  0.30556 0.8681
## A216 1.945e-03 0.0041023 0.4742  0.03333  0.38889 0.8705
## M29  1.925e-03 0.0036106 0.5331  0.33333  0.00000 0.8729
## A134 1.821e-03 0.0033783 0.5389  0.33333  0.00000 0.8751
## M86  1.803e-03 0.0034797 0.5183  0.23333  0.05556 0.8774
## M96  1.749e-03 0.0039201 0.4461  0.13333  0.19444 0.8795
## A154 1.712e-03 0.0038382 0.4460  0.30000  0.00000 0.8816
## M85  1.650e-03 0.0038896 0.4243  0.23333  0.02778 0.8837
## A7   1.636e-03 0.0040174 0.4072  0.23333  0.00000 0.8857
## A6   1.626e-03 0.0034751 0.4679  0.20000  0.11111 0.8877
## A207 1.616e-03 0.0031801 0.5082  0.10000  0.19444 0.8897
## M106 1.593e-03 0.0041172 0.3870  0.26667  0.00000 0.8917
## A162 1.577e-03 0.0042160 0.3740  0.23333  0.05556 0.8936
## A168 1.523e-03 0.0030447 0.5004  0.23333  0.00000 0.8955
## M95  1.520e-03 0.0029500 0.5154  0.13333  0.16667 0.8974
## A51  1.492e-03 0.0028353 0.5262  0.06667  0.25000 0.8993
## M15  1.487e-03 0.0037777 0.3936  0.23333  0.00000 0.9011
## A33  1.439e-03 0.0028652 0.5021  0.23333  0.00000 0.9029
## A82  1.389e-03 0.0034971 0.3972  0.06667  0.22222 0.9046
## A185 1.372e-03 0.0033002 0.4157  0.13333  0.16667 0.9063
## A30  1.368e-03 0.0033083 0.4135  0.06667  0.25000 0.9080
## A178 1.345e-03 0.0034425 0.3907  0.26667  0.00000 0.9097
## A14  1.335e-03 0.0031203 0.4277  0.20000  0.05556 0.9113
## A138 1.319e-03 0.0036980 0.3567  0.00000  0.22222 0.9130
## A201 1.304e-03 0.0038866 0.3355  0.20000  0.00000 0.9146
## A167 1.284e-03 0.0031907 0.4025  0.16667  0.02778 0.9162
## A179 1.212e-03 0.0035034 0.3459  0.06667  0.13889 0.9177
## A83  1.205e-03 0.0033145 0.3636  0.00000  0.27778 0.9191
## A244 1.184e-03 0.0025924 0.4567  0.03333  0.22222 0.9206
## M105 1.183e-03 0.0049062 0.2411  0.03333  0.11111 0.9221
## A149 1.169e-03 0.0036708 0.3185  0.13333  0.02778 0.9235
## M70  1.143e-03 0.0028682 0.3986  0.13333  0.02778 0.9249
## A9   1.132e-03 0.0026436 0.4282  0.10000  0.11111 0.9263
## A208 1.088e-03 0.0025764 0.4223  0.13333  0.05556 0.9277
## A194 1.076e-03 0.0026228 0.4101  0.06667  0.11111 0.9290
## A38  1.061e-03 0.0023351 0.4542  0.16667  0.02778 0.9303
## A193 1.059e-03 0.0026641 0.3974  0.16667  0.05556 0.9316
## M81  1.053e-03 0.0028777 0.3661  0.13333  0.00000 0.9329
## A67  1.029e-03 0.0021588 0.4768  0.20000  0.00000 0.9342
## A76  1.027e-03 0.0031214 0.3291  0.16667  0.00000 0.9355
## M88  1.024e-03 0.0040235 0.2545  0.16667  0.00000 0.9368
```

```
## M17  1.015e-03 0.0024039 0.4224  0.16667  0.00000 0.9380
## A235 9.952e-04 0.0039701 0.2507  0.13333  0.00000 0.9393
## A209 9.825e-04 0.0023584 0.4166  0.16667  0.00000 0.9405
## A28  9.682e-04 0.0027311 0.3545  0.16667  0.00000 0.9417
## A71  9.483e-04 0.0024407 0.3885  0.13333  0.02778 0.9428
## M5   8.693e-04 0.0024407 0.3562  0.13333  0.00000 0.9439
## A196 8.515e-04 0.0022978 0.3706  0.06667  0.08333 0.9450
## A31  8.434e-04 0.0023308 0.3618  0.13333  0.00000 0.9460
## M89  8.099e-04 0.0022537 0.3594  0.13333  0.00000 0.9470
## A105 8.037e-04 0.0030572 0.2629  0.13333  0.00000 0.9480
## M2   8.030e-04 0.0023242 0.3455  0.10000  0.02778 0.9490
## A56  7.922e-04 0.0023043 0.3438  0.10000  0.02778 0.9500
## M25  7.876e-04 0.0021373 0.3685  0.03333  0.11111 0.9510
## A130 7.785e-04 0.0024274 0.3207  0.00000  0.11111 0.9519
## A118 7.712e-04 0.0018620 0.4142  0.03333  0.13889 0.9529
## A55  7.389e-04 0.0021778 0.3393  0.00000  0.11111 0.9538
## A116 7.323e-04 0.0028005 0.2615  0.00000  0.25000 0.9547
## A184 7.030e-04 0.0023297 0.3018  0.13333  0.00000 0.9556
## A1   6.842e-04 0.0022091 0.3097  0.10000  0.00000 0.9564
## A78  6.797e-04 0.0019966 0.3404  0.06667  0.05556 0.9573
## A164 6.659e-04 0.0022808 0.2919  0.03333  0.05556 0.9581
## M110 6.628e-04 0.0031251 0.2121  0.06667  0.02778 0.9589
## A8   6.502e-04 0.0028173 0.2308  0.10000  0.00000 0.9597
## A145 6.442e-04 0.0023479 0.2744  0.00000  0.22222 0.9605
## A119 6.378e-04 0.0019624 0.3250  0.06667  0.05556 0.9613
## A59  6.312e-04 0.0016588 0.3805  0.00000  0.16667 0.9621
## A159 6.308e-04 0.0020006 0.3153  0.10000  0.00000 0.9629
## M54  6.299e-04 0.0020775 0.3032  0.10000  0.00000 0.9636
## A39  6.295e-04 0.0018148 0.3468  0.10000  0.02778 0.9644
## A27  6.250e-04 0.0020559 0.3040  0.10000  0.00000 0.9652
## A66  6.111e-04 0.0019498 0.3134  0.10000  0.00000 0.9660
## A61  5.848e-04 0.0019283 0.3033  0.10000  0.00000 0.9667
## A81  5.775e-04 0.0018627 0.3100  0.00000  0.11111 0.9674
## A117 5.638e-04 0.0017029 0.3311  0.03333  0.08333 0.9681
## A136 5.564e-04 0.0022254 0.2500  0.06667  0.00000 0.9688
## A49  5.498e-04 0.0016363 0.3360  0.03333  0.08333 0.9695
## A44  5.074e-04 0.0020553 0.2469  0.10000  0.00000 0.9701
## A37  5.065e-04 0.0028852 0.1756  0.06667  0.00000 0.9707
## A29  4.944e-04 0.0019732 0.2506  0.06667  0.00000 0.9713
## A34  4.931e-04 0.0019845 0.2485  0.06667  0.00000 0.9719
## A111 4.812e-04 0.0016805 0.2863  0.03333  0.05556 0.9725
## A52  4.743e-04 0.0014812 0.3202  0.10000  0.00000 0.9731
## A43  4.699e-04 0.0014640 0.3210  0.10000  0.00000 0.9737
## A198 4.609e-04 0.0018706 0.2464  0.06667  0.00000 0.9743
## A206 4.461e-04 0.0015135 0.2947  0.00000  0.08333 0.9748
## A121 4.323e-04 0.0014510 0.2980  0.00000  0.11111 0.9754
## A171 4.311e-04 0.0018288 0.2357  0.00000  0.05556 0.9759
## M74  4.303e-04 0.0017508 0.2458  0.06667  0.00000 0.9764
## A84  4.167e-04 0.0014994 0.2779  0.00000  0.08333 0.9769
## A135 4.165e-04 0.0017358 0.2399  0.03333  0.02778 0.9775
## A72  3.895e-04 0.0016786 0.2320  0.00000  0.05556 0.9779
## A170 3.854e-04 0.0016170 0.2383  0.03333  0.02778 0.9784
## A133 3.835e-04 0.0011278 0.3401  0.00000  0.11111 0.9789
## A191 3.591e-04 0.0015734 0.2282  0.00000  0.05556 0.9793
```

```
## A45  3.506e-04 0.0019492 0.1799  0.06667  0.00000 0.9798
## A77  3.469e-04 0.0014642 0.2369  0.00000  0.05556 0.9802
## A218 3.312e-04 0.0013911 0.2381  0.00000  0.05556 0.9806
## A74  3.280e-04 0.0013935 0.2354  0.00000  0.05556 0.9810
## A222 3.258e-04 0.0013926 0.2340  0.00000  0.05556 0.9814
## A237 3.236e-04 0.0013489 0.2399  0.00000  0.08333 0.9818
## A54  2.972e-04 0.0011504 0.2583  0.06667  0.00000 0.9822
## A213 2.849e-04 0.0016405 0.1737  0.03333  0.00000 0.9825
## A4   2.795e-04 0.0016063 0.1740  0.03333  0.00000 0.9829
## A12  2.795e-04 0.0016063 0.1740  0.03333  0.00000 0.9832
## A16  2.795e-04 0.0016063 0.1740  0.03333  0.00000 0.9836
## A147 2.795e-04 0.0016063 0.1740  0.03333  0.00000 0.9839
## A211 2.743e-04 0.0015736 0.1743  0.03333  0.00000 0.9843
## A214 2.743e-04 0.0015736 0.1743  0.03333  0.00000 0.9846
## M109 2.669e-04 0.0015271 0.1748  0.03333  0.00000 0.9849
## A142 2.659e-04 0.0016364 0.1625  0.00000  0.02778 0.9853
## A240 2.659e-04 0.0016364 0.1625  0.00000  0.02778 0.9856
## A205 2.554e-04 0.0015675 0.1629  0.00000  0.02778 0.9859
## A131 2.354e-04 0.0013332 0.1766  0.03333  0.00000 0.9862
## M100 2.318e-04 0.0013113 0.1768  0.03333  0.00000 0.9865
## A53  2.318e-04 0.0013113 0.1768  0.03333  0.00000 0.9868
## A166 2.318e-04 0.0013113 0.1768  0.03333  0.00000 0.9871
## A225 2.305e-04 0.0014064 0.1639  0.00000  0.02778 0.9873
## A234 2.305e-04 0.0014064 0.1639  0.00000  0.02778 0.9876
## A169 2.265e-04 0.0013808 0.1641  0.00000  0.02778 0.9879
## A10  2.233e-04 0.0012598 0.1773  0.03333  0.00000 0.9882
## A24  2.233e-04 0.0012598 0.1773  0.03333  0.00000 0.9885
## A144 2.227e-04 0.0013562 0.1642  0.00000  0.02778 0.9887
## A230 2.208e-04 0.0013442 0.1643  0.00000  0.02778 0.9890
## A143 2.190e-04 0.0013325 0.1643  0.00000  0.02778 0.9893
## A152 2.190e-04 0.0013325 0.1643  0.00000  0.02778 0.9896
## A161 2.190e-04 0.0013325 0.1643  0.00000  0.02778 0.9898
## A115 2.162e-04 0.0009270 0.2332  0.00000  0.05556 0.9901
## A97  2.082e-04 0.0011686 0.1781  0.03333  0.00000 0.9904
## A132 2.082e-04 0.0011686 0.1781  0.03333  0.00000 0.9906
## A177 2.082e-04 0.0011686 0.1781  0.03333  0.00000 0.9909
## A50  2.027e-04 0.0011360 0.1784  0.03333  0.00000 0.9911
## A137 2.027e-04 0.0011360 0.1784  0.03333  0.00000 0.9914
## A210 2.027e-04 0.0011360 0.1784  0.03333  0.00000 0.9916
## A212 2.027e-04 0.0011360 0.1784  0.03333  0.00000 0.9919
## A47  1.948e-04 0.0011792 0.1652  0.00000  0.02778 0.9921
## A172 1.920e-04 0.0011615 0.1653  0.00000  0.02778 0.9924
## A190 1.902e-04 0.0007974 0.2386  0.00000  0.05556 0.9926
## A124 1.879e-04 0.0011360 0.1654  0.00000  0.02778 0.9928
## A122 1.868e-04 0.0010421 0.1793  0.03333  0.00000 0.9931
## A165 1.868e-04 0.0010421 0.1793  0.03333  0.00000 0.9933
## A202 1.868e-04 0.0010421 0.1793  0.03333  0.00000 0.9935
## A69  1.814e-04 0.0010102 0.1795  0.03333  0.00000 0.9937
## A70  1.814e-04 0.0010102 0.1795  0.03333  0.00000 0.9940
## A75  1.814e-04 0.0010102 0.1795  0.03333  0.00000 0.9942
## A158 1.783e-04 0.0009921 0.1797  0.03333  0.00000 0.9944
## A46  1.753e-04 0.0009746 0.1799  0.03333  0.00000 0.9946
## A155 1.753e-04 0.0009746 0.1799  0.03333  0.00000 0.9948
## A241 1.753e-04 0.0009746 0.1799  0.03333  0.00000 0.9951
```

```
## A220 1.722e-04 0.0010377 0.1659  0.00000  0.02778 0.9953
## A223 1.722e-04 0.0010377 0.1659  0.00000  0.02778 0.9955
## A68  1.711e-04 0.0010309 0.1660  0.00000  0.02778 0.9957
## A247 1.711e-04 0.0010309 0.1660  0.00000  0.02778 0.9959
## A48  1.660e-04 0.0009207 0.1803  0.03333  0.00000 0.9961
## A65  1.660e-04 0.0009207 0.1803  0.03333  0.00000 0.9963
## A120 1.590e-04 0.0009556 0.1664  0.00000  0.02778 0.9965
## A228 1.590e-04 0.0009556 0.1664  0.00000  0.02778 0.9967
## A243 1.590e-04 0.0009556 0.1664  0.00000  0.02778 0.9969
## A140 1.570e-04 0.0008683 0.1808  0.03333  0.00000 0.9971
## A199 1.570e-04 0.0008683 0.1808  0.03333  0.00000 0.9973
## A246 1.570e-04 0.0008683 0.1808  0.03333  0.00000 0.9975
## A219 1.453e-04 0.0008713 0.1667  0.00000  0.02778 0.9977
## A160 1.441e-04 0.0007947 0.1814  0.03333  0.00000 0.9979
## A245 1.400e-04 0.0008391 0.1669  0.00000  0.02778 0.9980
## A127 1.338e-04 0.0008011 0.1671  0.00000  0.02778 0.9982
## A128 1.338e-04 0.0008011 0.1671  0.00000  0.02778 0.9984
## A238 1.338e-04 0.0008011 0.1671  0.00000  0.02778 0.9985
## A148 1.325e-04 0.0007931 0.1671  0.00000  0.02778 0.9987
## A151 1.312e-04 0.0007853 0.1671  0.00000  0.02778 0.9989
## A248 1.312e-04 0.0007853 0.1671  0.00000  0.02778 0.9990
## A42  1.311e-04 0.0007206 0.1820  0.03333  0.00000 0.9992
## A101 1.311e-04 0.0007206 0.1820  0.03333  0.00000 0.9993
## A182 1.311e-04 0.0007206 0.1820  0.03333  0.00000 0.9995
## A112 9.076e-05 0.0005401 0.1680  0.00000  0.02778 0.9996
## A242 8.234e-05 0.0004896 0.1682  0.00000  0.02778 0.9997
## A126 7.661e-05 0.0004553 0.1683  0.00000  0.02778 0.9998
## A129 7.661e-05 0.0004553 0.1683  0.00000  0.02778 0.9999
## A215 7.661e-05 0.0004553 0.1683  0.00000  0.02778 1.0000
## Permutation: free
## Number of permutations: 0
```

Paso 4. Vamos a determinar las especies que son indecadoras de cada periodo.

max.order = 1 (which is equal to duleg=TRUE) -> singletons #Unicas en un sitio max.order = 2 -> singletons and pairs # Unicas y comparitdas max.order = 3 -> singletons, pairs and triplets

```
################ Indicator Value ###############


ind_species<-multipatt(moth_sp, Moth_full$Period, max.order=1,
                   func="IndVal",control=how(nperm=999))
summary(ind_species)
```

```
##
##  Multilevel pattern analysis
##  ---------------------------
##
##  Association function: IndVal
##  Significance level (alpha): 0.05
##
##  Total number of species: 233
##  Selected number of species: 62
##  Number of species associated to 1 group: 62
```

```
##
##  List of species associated to each combination:
##
##  Group Post-Hurricane  #sps.  26
##       stat p.value
## A141 0.942   0.001 ***
## M7   0.834   0.032 *
## M94  0.814   0.001 ***
## A188 0.793   0.001 ***
## A22  0.761   0.001 ***
## A21  0.747   0.005 **
## A60  0.709   0.002 **
## A203 0.707   0.001 ***
## A73  0.696   0.001 ***
## A139 0.694   0.001 ***
## A17  0.685   0.001 ***
## A40  0.683   0.001 ***
## A163 0.645   0.004 **
## A192 0.601   0.001 ***
## A123 0.579   0.009 **
## A200 0.573   0.037 *
## A150 0.553   0.003 **
## A239 0.537   0.010 **
## A3   0.526   0.031 *
## M8   0.497   0.034 *
## A186 0.457   0.026 *
## A5   0.451   0.027 *
## A80  0.431   0.038 *
## A216 0.426   0.038 *
## A59  0.373   0.047 *
## A83  0.373   0.049 *
##
##  Group Pre-Hurricane  #sps.  36
##       stat p.value
## A157 0.903   0.001 ***
## A25  0.742   0.001 ***
## M55  0.729   0.001 ***
## M13  0.707   0.001 ***
## M1   0.697   0.001 ***
## A58  0.675   0.001 ***
## A99  0.658   0.001 ***
## M10  0.635   0.001 ***
## M104 0.634   0.011 *
## M53  0.630   0.001 ***
## M50  0.619   0.006 **
## A86  0.593   0.023 *
## M19  0.548   0.003 **
## A79  0.547   0.012 *
## M29  0.516   0.002 **
## A134 0.516   0.001 ***
## A36  0.512   0.027 *
## M80  0.483   0.003 **
## A33  0.483   0.006 **
## A168 0.483   0.004 **
```

```
## A7   0.447   0.007 **
## A67  0.447   0.009 **
## A154 0.447   0.005 **
## M85  0.418   0.037 *
## M15  0.408   0.020 *
## M17  0.408   0.020 *
## M106 0.408   0.011 *
## A178 0.408   0.018 *
## A209 0.408   0.017 *
## M5   0.365   0.045 *
## M81  0.365   0.044 *
## M89  0.365   0.048 *
## A28  0.365   0.039 *
## A31  0.365   0.046 *
## A76  0.365   0.050 *
## A201 0.365   0.039 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```