sNMF analysis - S. botryophora

```
# Load library with sNMF function
library(LEA)
# Set input filenames
inputs <- c("bo6_10_ingroup", "bo6_30_ingroup", "bo6_50_ingroup", "bo6_70_ingroup", "bo6_90_ingroup")
```

```
# Read in sample names from vcf file
library(vcfR)
```

```
## Warning: package 'vcfR' was built under R version 3.6.3
```

```
##
##    *****       ***   vcfR   ***       *****
##    This is vcfR 1.10.0
##      browseVignettes('vcfR') # Documentation
##      citation('vcfR') # Citation
##    *****       *****      *****       *****
```

```
vcf <- read.vcfR(paste(inputs[1],".vcf",sep=""))
samples <- colnames(vcf@gt)[-1]
```

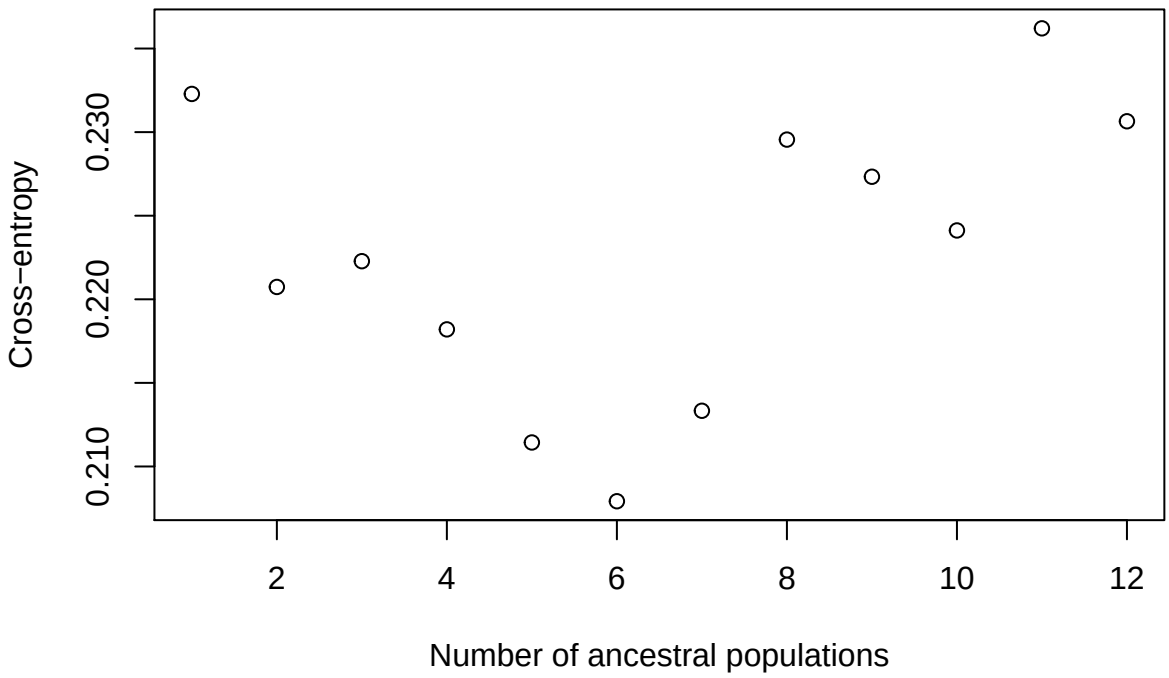
```
# Convert vcf file to .geno format for sNMF
for(i in 1:length(inputs)){
  vcf2geno(paste(inputs[i],".vcf",sep=""))
}
```

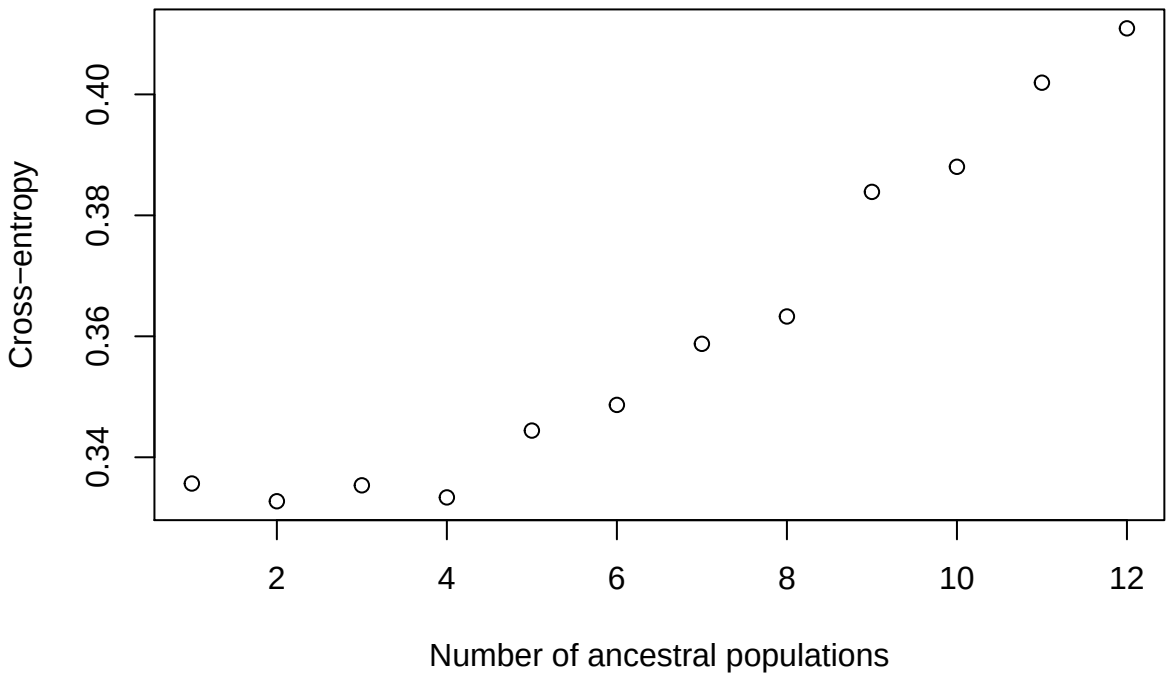
```
##
##  - number of detected individuals:   42
##  - number of detected loci:      882
##
## For SNP info, please check ./bo6_10_ingroup.vcfsnp.
##
## 13 line(s) were removed because these are not SNPs.
## Please, check ./bo6_10_ingroup.removed file, for more informations.
##
##
##  - number of detected individuals:   42
##  - number of detected loci:      5545
##
## For SNP info, please check ./bo6_30_ingroup.vcfsnp.
##
## 138 line(s) were removed because these are not SNPs.
## Please, check ./bo6_30_ingroup.removed file, for more informations.
##
##
```

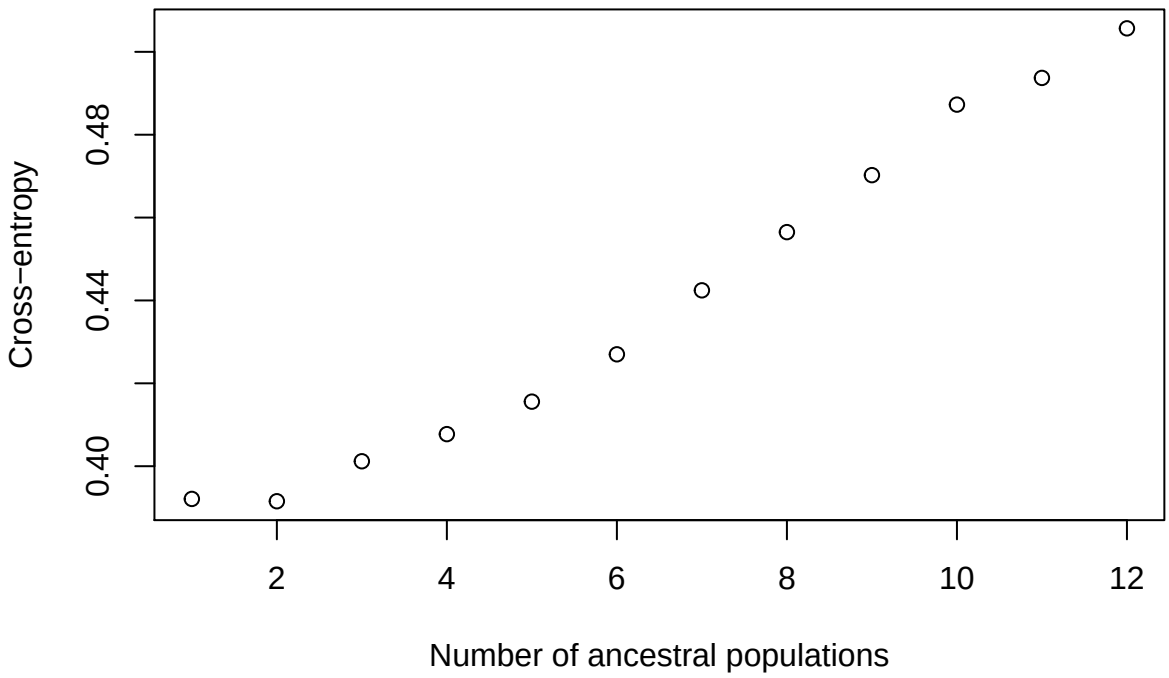
```
##  - number of detected individuals:   42
##  - number of detected loci:      17597
##
## For SNP info, please check ./bo6_50_ingroup.vcfsnp.
##
## 423 line(s) were removed because these are not SNPs.
## Please, check ./bo6_50_ingroup.removed file, for more informations.
##
##
##  - number of detected individuals:   42
##  - number of detected loci:      65236
##
## For SNP info, please check ./bo6_70_ingroup.vcfsnp.
##
## 1347 line(s) were removed because these are not SNPs.
## Please, check ./bo6_70_ingroup.removed file, for more informations.
##
##
##  - number of detected individuals:   42
##  - number of detected loci:      234664
##
## For SNP info, please check ./bo6_90_ingroup.vcfsnp.
##
## 4046 line(s) were removed because these are not SNPs.
## Please, check ./bo6_90_ingroup.removed file, for more informations.
```

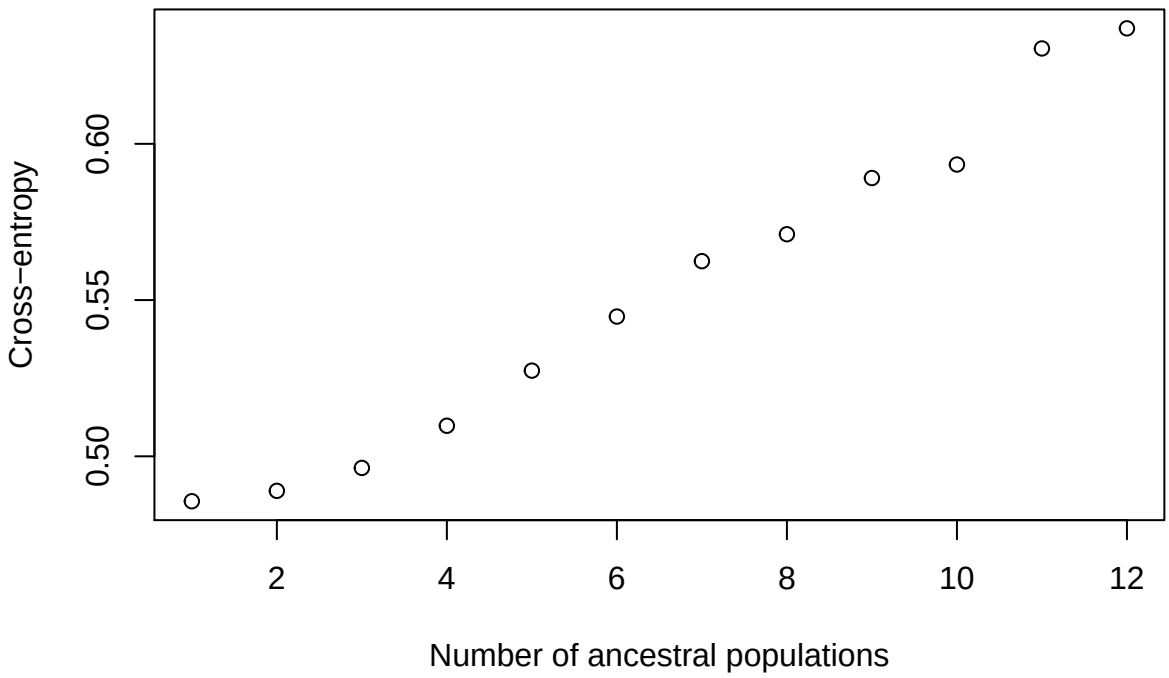
```
#Run sNMF with k from 1 to 1+number of populations
k <- c(1:12)

for(i in 1:length(inputs)){
  snmf(paste(inputs[i],".geno",sep=""), K = k, repetitions = 5, CPU=6,
              project = "new", entropy = TRUE, iterations = 2000, alpha = 1)

  snmf(paste(inputs[i],".geno",sep=""), K = k, repetitions = 5, CPU=6,
              project = "continue", entropy = TRUE, iterations = 2000, alpha = 10)

  snmf(paste(inputs[i],".geno",sep=""), K = k, repetitions = 5, CPU=6,
              project = "continue", entropy = TRUE, iterations = 2000, alpha = 100)
}
```

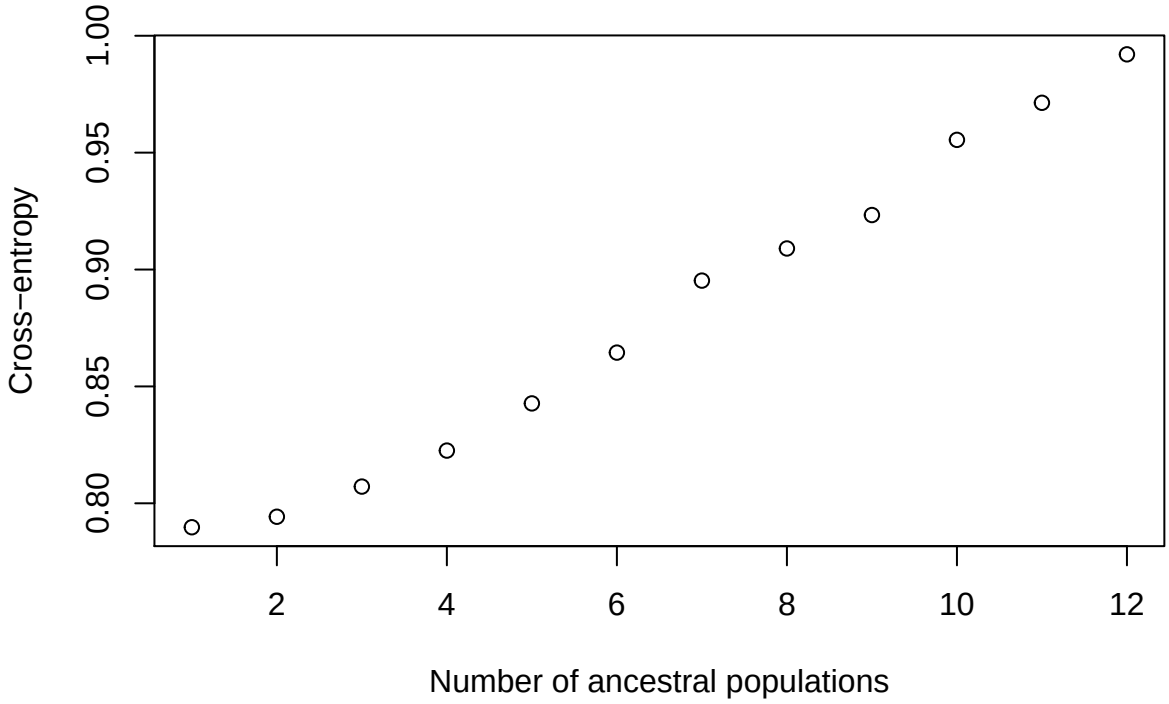
```
# Plot the cross entropy
for(i in 1:length(inputs)){
  snmf <- load.snmfProject(paste(inputs[i],".snmfProject",sep=""))
  plot(snmf)
  summary(snmf)
}
```


Cross−entropy
0.210
0.220
0.230
2
4
6
8
10
12
Number of ancestral populations

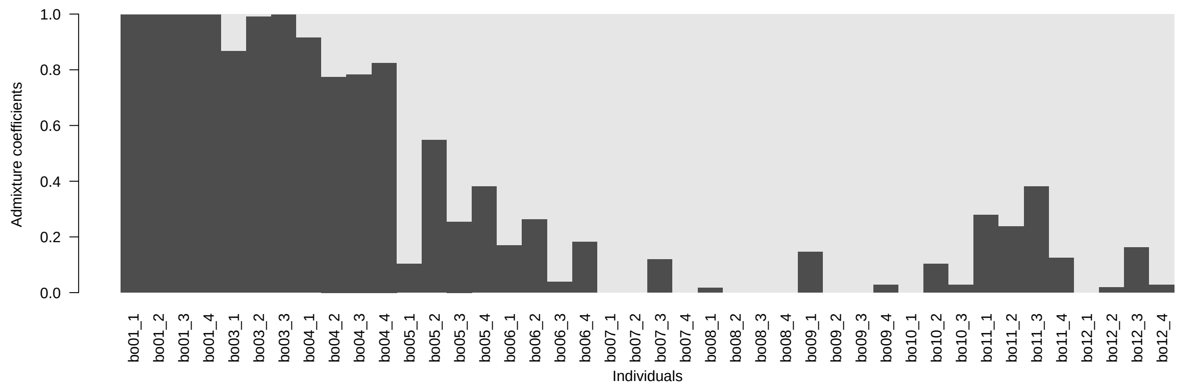

Cross−entropy
0.34
0.36
0.38
0.40
2
4
6
8
10
12
Number of ancestral populations

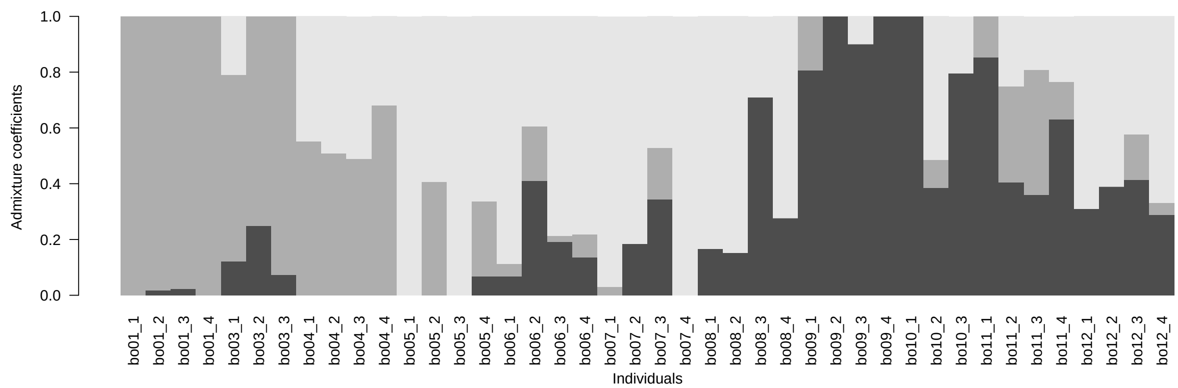

Cross−entropy
0.40
0.44
0.48
2
4
6
8
10
12
Number of ancestral populations

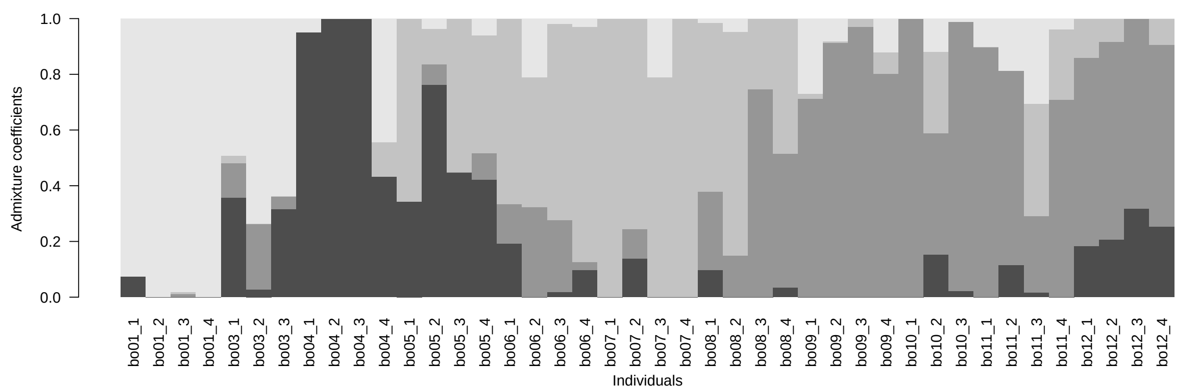

Cross−entropy
0.50
0.55
0.60
2
4
6
8
10
12
Number of ancestral populations

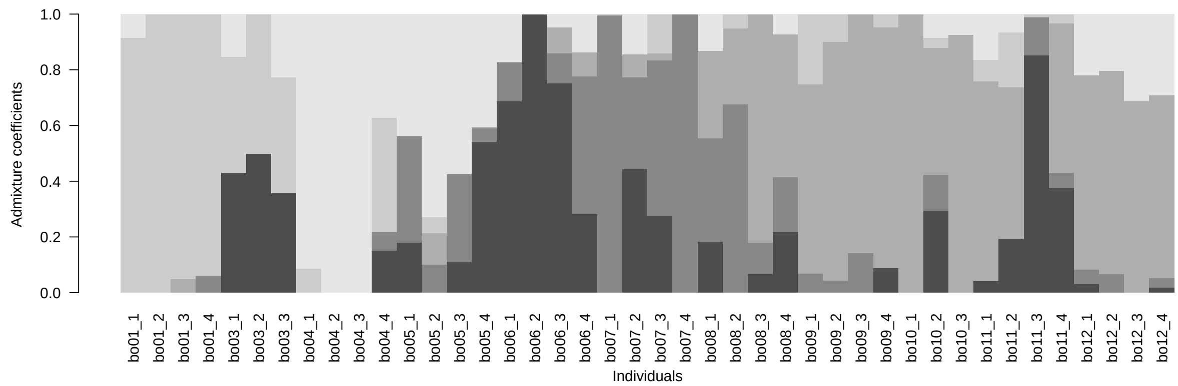


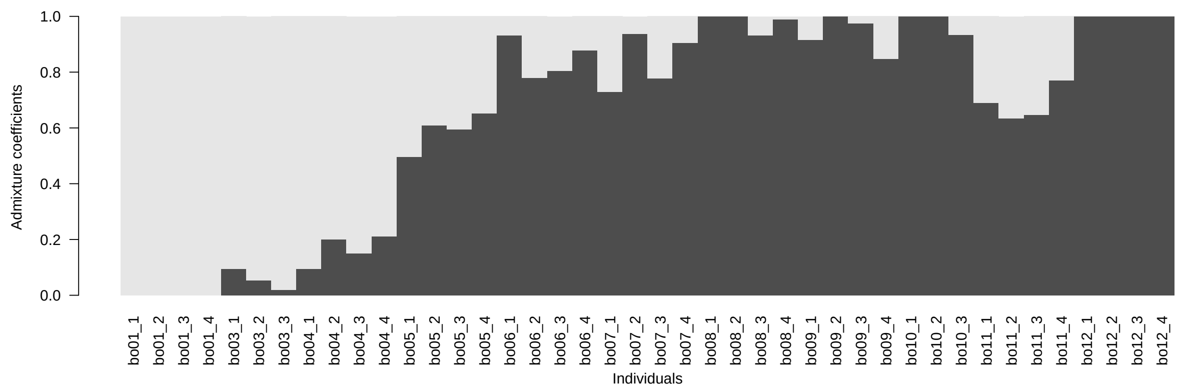

```
# Plot barplots
for(i in 1:length(inputs)){
  snmf <- load.snmfProject(paste(inputs[i],".snmfProject",sep=""))
  for(j in 2:5){
    ce <- cross.entropy(snmf, K = j)
    best <- which.min(ce)

    qmatrix = Q(snmf, K = j, run = best)

    barplot(t(qmatrix), border = NA, space = 0, xlab = "", ylab = "Admixture coefficients",
            names.arg=samples, las=2)
    mtext("Individuals", side=1, line=4)
  }
}
```


Admixture coefficients
1.0
0.8
0.6
0.4
0.2
0.0
bo01_1 bo01_2 bo01_3 bo01_4 bo03_1 bo03_2 bo03_3 bo04_1 bo04_2 bo04_3 bo04_4 bo05_1 bo05_2 bo05_3 bo05_4 bo06_1 bo06_2 bo06_3 bo06_4 bo07_1 bo07_2 bo07_3 bo07_4 bo08_1 bo08_2 bo08_3 bo08_4 bo09_1 bo09_2 bo09_3 bo09_4 bo10_1 bo10_2 bo10_3 bo11_1 bo11_2 bo11_3 bo11_4 bo12_1 bo12_2 bo12_3 bo12_4
Individuals


Admixture coefficients
1.0
0.8
0.6
0.4
0.2
0.0
bo01_1 bo01_2 bo01_3 bo01_4 bo03_1 bo03_2 bo03_3 bo04_1 bo04_2 bo04_3 bo04_4 bo05_1 bo05_2 bo05_3 bo05_4 bo06_1 bo06_2 bo06_3 bo06_4 bo07_1 bo07_2 bo07_3 bo07_4 bo08_1 bo08_2 bo08_3 bo08_4 bo09_1 bo09_2 bo09_3 bo09_4 bo10_1 bo10_2 bo10_3 bo11_1 bo11_2 bo11_3 bo11_4 bo12_1 bo12_2 bo12_3 bo12_4
Individuals


Admixture coefficients
1.0
0.8
0.6
0.4
0.2
0.0
bo01_1 bo01_2 bo01_3 bo01_4 bo03_1 bo03_2 bo03_3 bo04_1 bo04_2 bo04_3 bo04_4 bo05_1 bo05_2 bo05_3 bo05_4 bo06_1 bo06_2 bo06_3 bo06_4 bo07_1 bo07_2 bo07_3 bo07_4 bo08_1 bo08_2 bo08_3 bo08_4 bo09_1 bo09_2 bo09_3 bo09_4 bo10_1 bo10_2 bo10_3 bo11_1 bo11_2 bo11_3 bo11_4 bo12_1 bo12_2 bo12_3 bo12_4
Individuals


Admixture coefficients
1.0
0.8
0.6
0.4
0.2
0.0
bo01_1 bo01_2 bo01_3 bo01_4 bo03_1 bo03_2 bo03_3 bo04_1 bo04_2 bo04_3 bo04_4 bo05_1 bo05_2 bo05_3 bo05_4 bo06_1 bo06_2 bo06_3 bo06_4 bo07_1 bo07_2 bo07_3 bo07_4 bo08_1 bo08_2 bo08_3 bo08_4 bo09_1 bo09_2 bo09_3 bo09_4 bo10_1 bo10_2 bo10_3 bo11_1 bo11_2 bo11_3 bo11_4 bo12_1 bo12_2 bo12_3 bo12_4
Individuals


Admixture coefficients
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0.4
0.2
0.0
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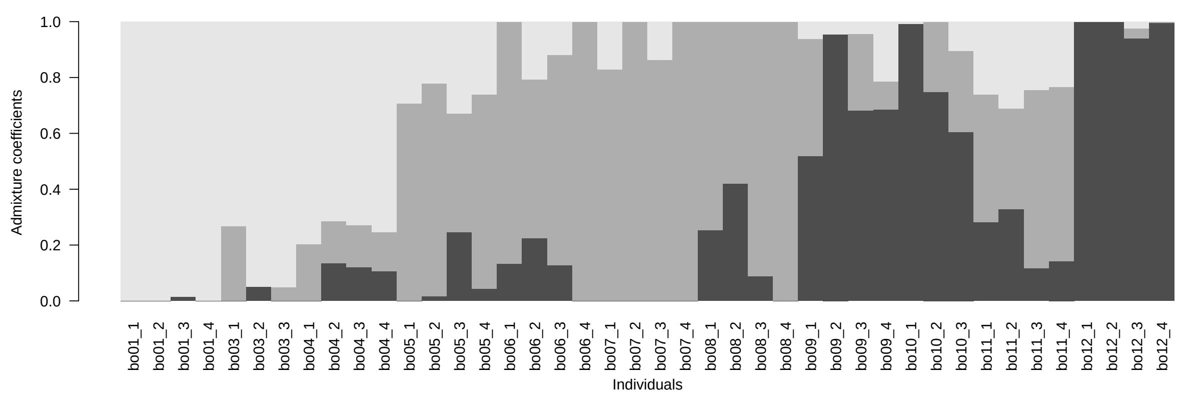
Individuals


Admixture coefficients
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0.6
0.4
0.2
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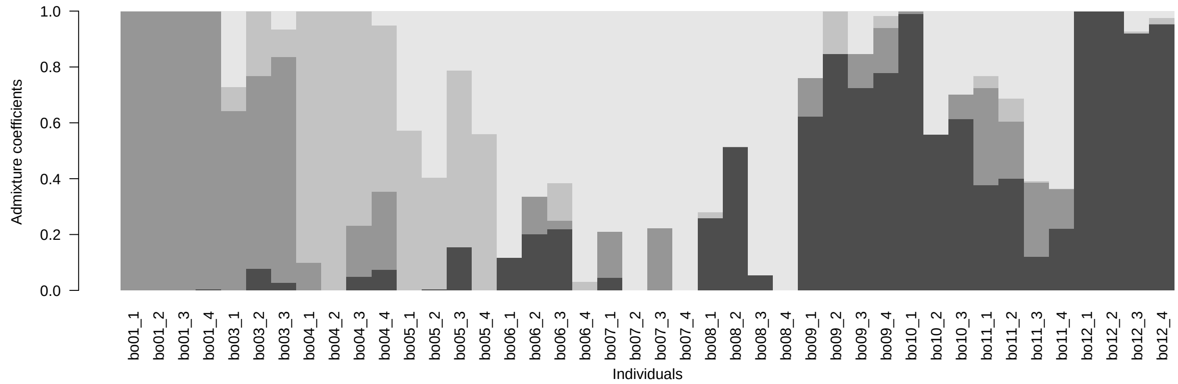
Individuals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0.8
0.6
0.4
0.2
0.0
Admixture coefficients
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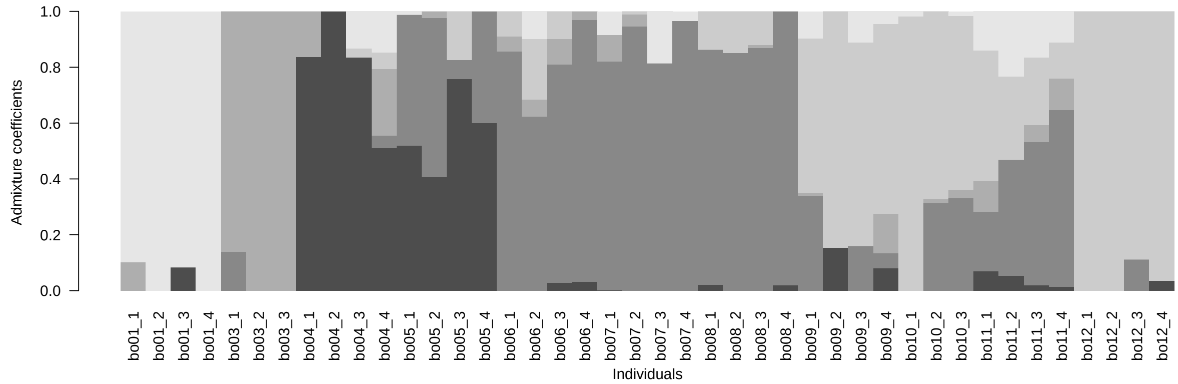
Individuals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0.8
0.6
0.4
0.2
0.0
Admixture coefficients
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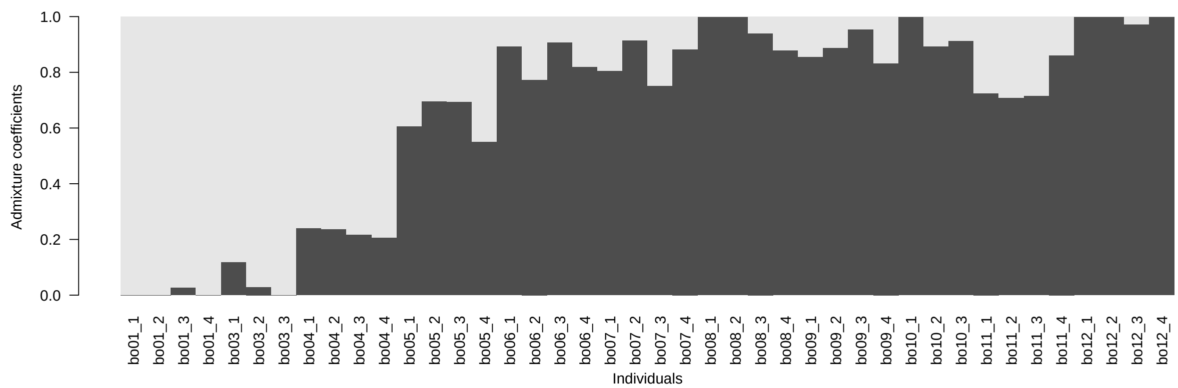
Individuals


1.0
0.8
0.6
0.4
0.2
0.0
Admixture coefficients
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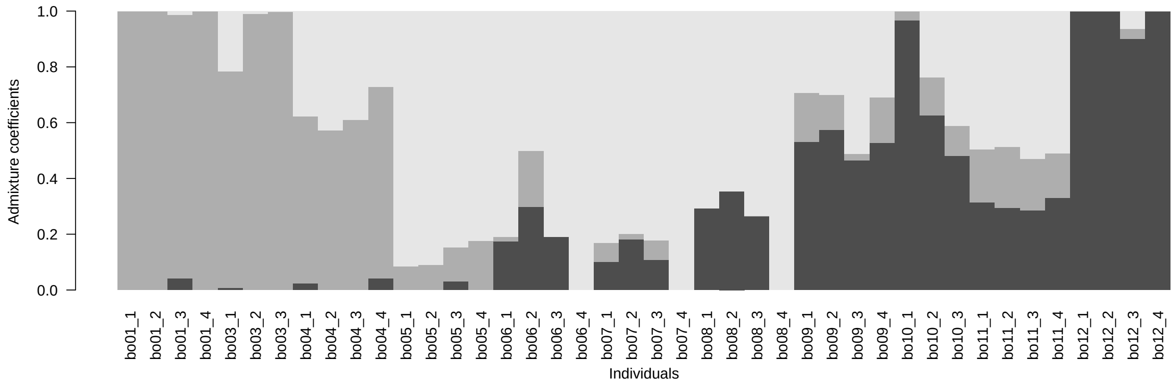
Individuals


Admixture coefficients
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0.4
0.2
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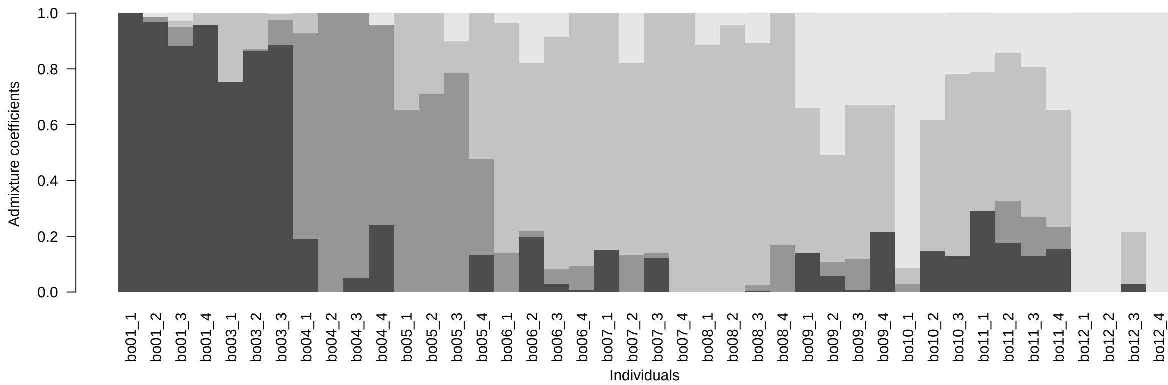
Individuals


Admixture coefficients
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0.8
0.6
0.4
0.2
0.0
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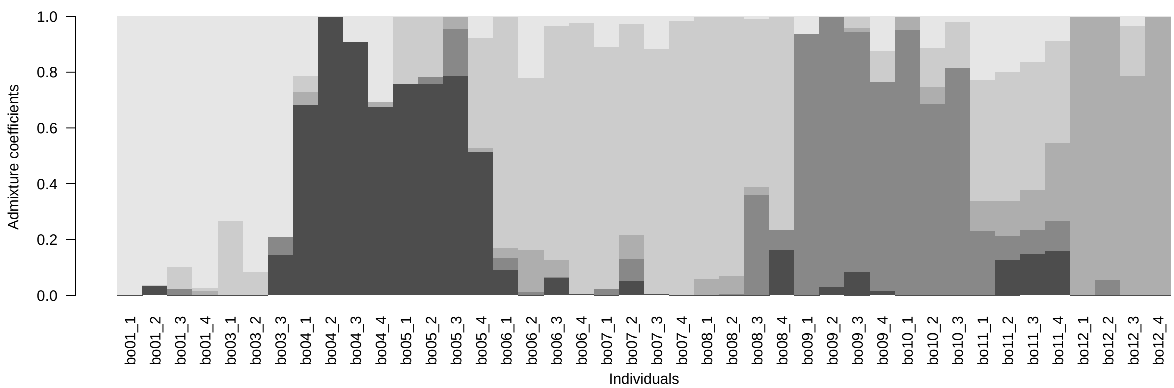
Individuals


Admixture coefficients
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0.8
0.6
0.4
0.2
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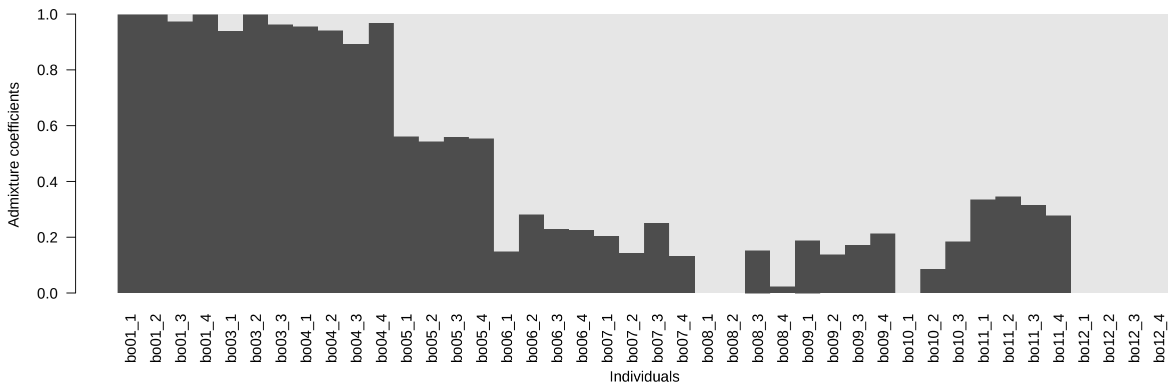
Individuals


Admixture coefficients
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0.8
0.6
0.4
0.2
0.0
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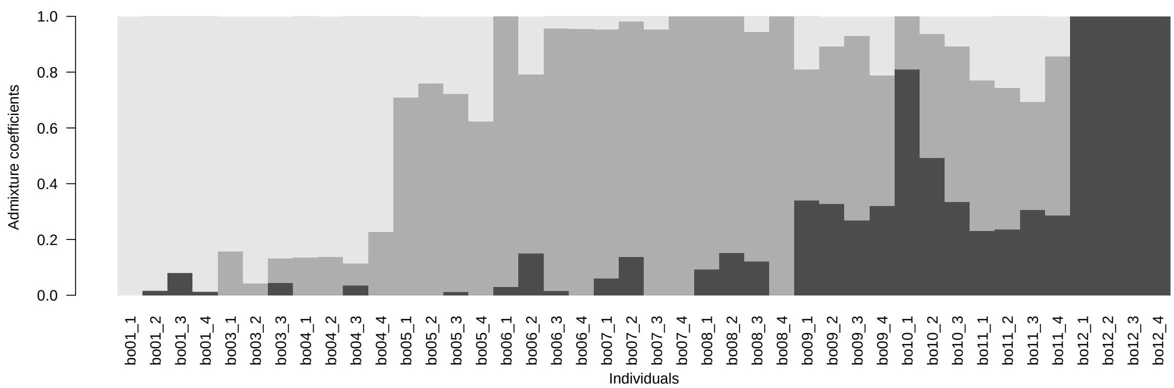
Admixture coefficients
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0.6
0.4
0.2
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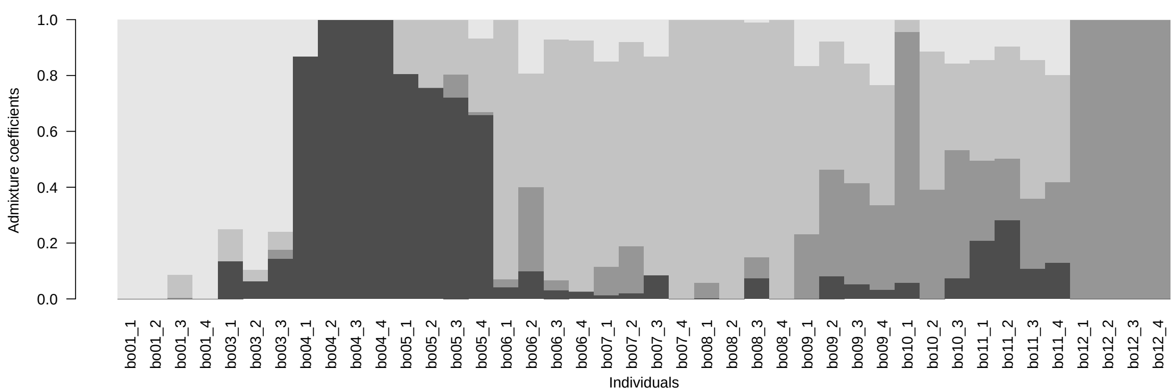
Individuals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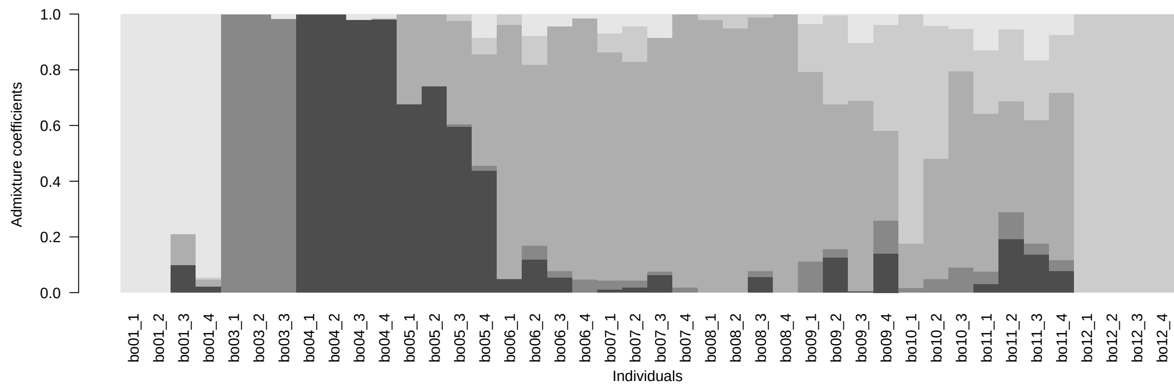
Individuals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0.6
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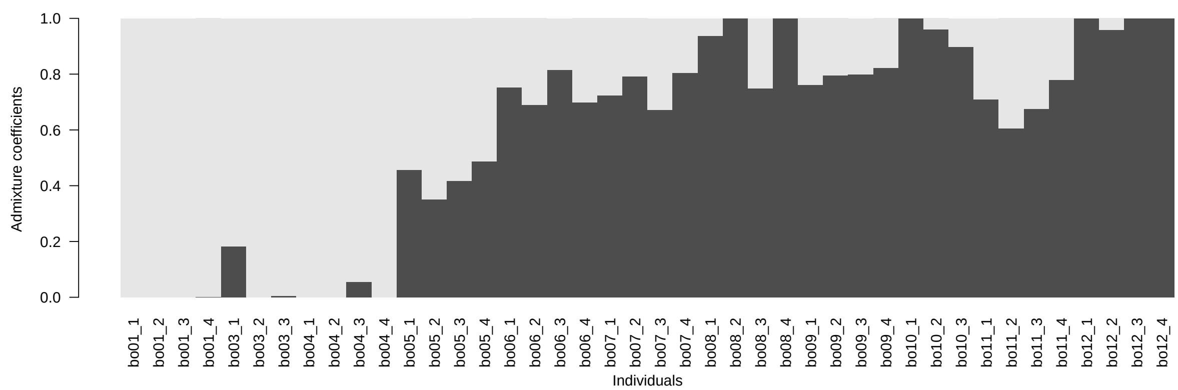
Individuals


Admixture coefficients
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0.6
0.4
0.2
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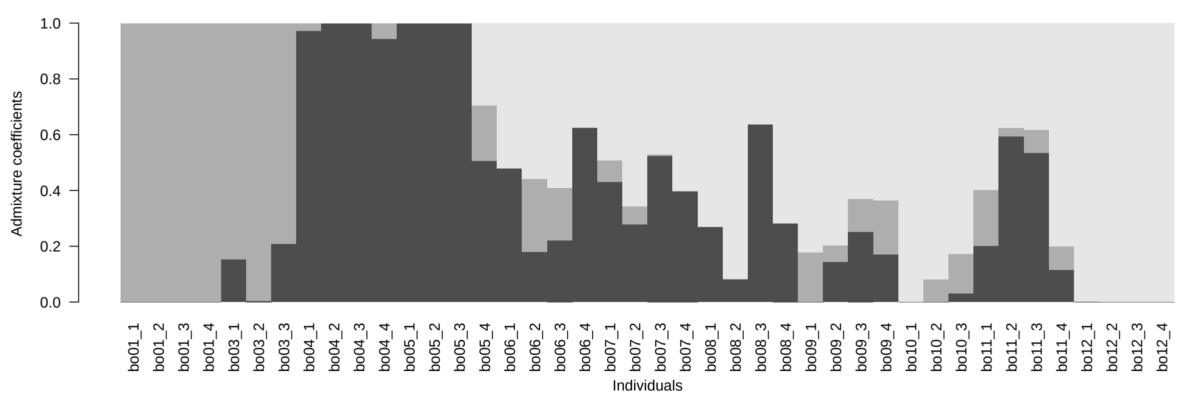
Individuals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0.6
0.4
0.2
0.0
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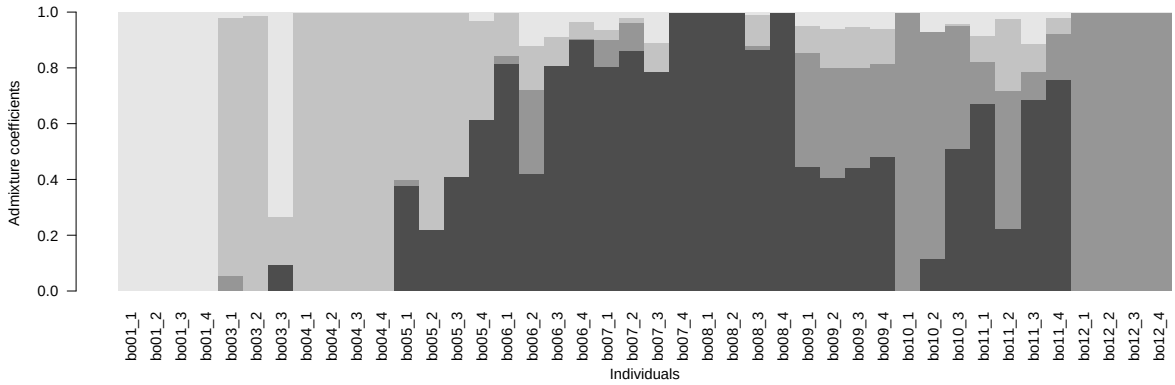
Individuals


Admixture coefficients
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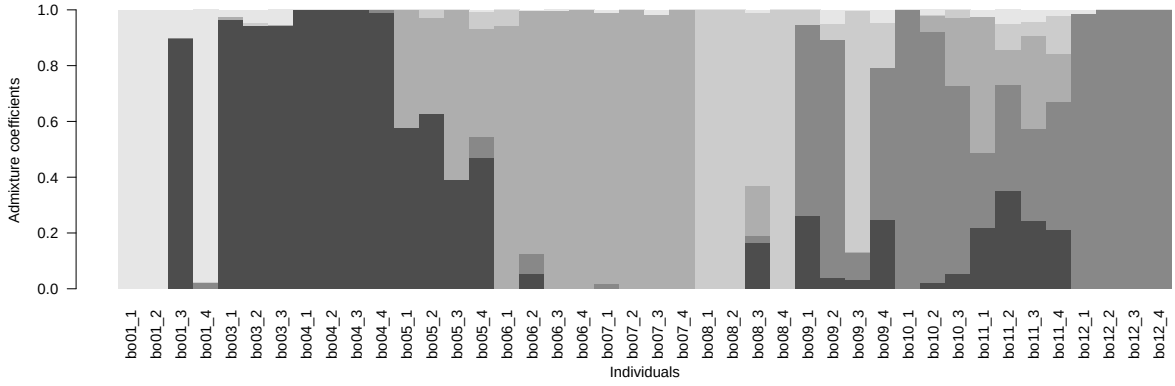
0.8
0.6
0.4
0.2
0.0
bo01_1 bo01_2 bo01_3 bo01_4 bo03_1 bo03_2 bo03_3 bo04_1 bo04_2 bo04_3 bo04_4 bo05_1 bo05_2 bo05_3 bo05_4 bo06_1 bo06_2 bo06_3 bo06_4 bo07_1 bo07_2 bo07_3 bo07_4 bo08_1 bo08_2 bo08_3 bo08_4 bo09_1 bo09_2 bo09_3 bo09_4 bo10_1 bo10_2 bo10_3 bo11_1 bo11_2 bo11_3 bo11_4 bo12_1 bo12_2 bo12_3 bo12_4
Individuals


Admixture coefficients
1.0
0.8
0.6
0.4
0.2
0.0
bo01_1 bo01_2 bo01_3 bo01_4 bo03_1 bo03_2 bo03_3 bo04_1 bo04_2 bo04_3 bo04_4 bo05_1 bo05_2 bo05_3 bo05_4 bo06_1 bo06_2 bo06_3 bo06_4 bo07_1 bo07_2 bo07_3 bo07_4 bo08_1 bo08_2 bo08_3 bo08_4 bo09_1 bo09_2 bo09_3 bo09_4 bo10_1 bo10_2 bo10_3 bo11_1 bo11_2 bo11_3 bo11_4 bo12_1 bo12_2 bo12_3 bo12_4
Individuals