TP 2 estimation des effectifs en populations fermées

On charge le package `RMark` qui appelle le logiciel Mark depuis `R`. On charge aussi le package `secr` qui permet d'implémenter le test de `closure`.

```
library(RMark)
library(secr)
```

Exercice 1 : souris sylvestre

Lecture et formatage des données

On commence par lire les données qui se trouvent dans le répertoire dat/

```
mouse <- convert.inp("dat/deer-mouse-nogroup.inp",
                     group.df = NULL,
                     covariates = NULL)
```

On regarde les 10 premières lignes du fichier.

```
head(mouse)
```

```
##       ch freq
## 1 111111    1
## 2 100111    1
## 3 110011    1
## 4 110111    1
## 5 111111    1
## 6 110111    1
```

Les 10 dernières lignes.

```
tail(mouse)
```

```
##        ch freq
## 33 000010    1
## 34 000010    1
## 35 000010    1
## 36 000001    1
## 37 000001    1
## 38 000001    1
```

On fait les tests de fermeture. Pour cela, il nous faut d'abord convertir les données au format requis pour utiliser le package secr qui fait ces tests. Le formatage consiste à mettre un espace entre les colonnes de capture.

```
mouse_secr <- unRMarkInput(mouse)
```

On peut utiliser la fonction summary de R pour obtenir un résumé des données.

```
summary(mouse_secr)
```

```
## Object class       capthist
##
## Counts by occasion
##             1  2  3  4  5  6 Total
## n          15 20 16 19 25 25   120
## u          15  8  6  3  3  3    38
## f           9  6  7  6  6  4    38
## M(t+1)     15 23 29 32 35 38    38
## losses      0  0  0  0  0  0     0
## detections 15 20 16 19 25 25   120
```

Test de l'hypothèse de fermeture

On fait enfin les tests. Par défaut, seul le test d'Otis est fait. En rajoutant l'option "SB = TRUE", on fait aussi le test de Stanley et Burnham.

```
closure.test(mouse_secr, SB = TRUE)
```

```
## $Otis
##  statistic         p
##  0.7649179 0.7778398
##
## $Xc
##  statistic df         p
##     11.668  7 0.1120193
##
## $NRvsJS
##  statistic df          p
##    9.31129  3 0.02542603
##
## $NMvsJS
##   statistic df         p
##  0.04895105  1 0.8248987
##
## $MtvsNR
##  statistic df        p
##   2.356705  4 0.670465
##
## $MtvsNM
##  statistic df          p
##   11.61904  6 0.07102745
##
## $compNRvsJS
##   Occasion  Chisquare df           p
## 1        2 7.44579710  1 0.006358475
```

```
## 2        3 0.04505929  1 0.831895047
## 3        4 1.82043344  1 0.177261692
## 4        5         NA NA          NA
##
## $compNMvsJS
##   Occasion  Chisquare df         p
## 1        2         NA NA        NA
## 2        3         NA NA        NA
## 3        4         NA NA        NA
## 4        5 0.04895105  1 0.8248987
```

Une première série de modèles

Pour utiliser RMark, on passe par 3 étapes : la préparation des données, la définition des modèles et l'ajustement à proprement parler.

On commence par préparer les données.

```
mouse.proc <- process.data(mouse,
                           begin.time = 1,
                           model = "FullHet")
mouse.ddl <- make.design.data(mouse.proc)
```

On définit les modèles que l'on souhaite ajuster grâce à une fonction R qui fait 3 choses : spéficication des effets, création d'une liste des modèles à ajuster et préparation pour envoi à Mark. Par défaut, Mark considère un effet comportement et distingue une probabilité de capture c et une autre de recapture p. On utilise "share = TRUE" pour fusionner ces deux paramètres en une seule probabilité de capture.

```
run.mouse <- function() {

## On specifie les effets

  # M0 : p constant dans le temps
  p.dot <- list(formula =  ~ 1, share = TRUE)
  # Mb : p (recapture) different de c (premiere capture) et constants dans le temps
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  # Mt : p varie selon la session (dans le temps)
  p.time <- list(formula =  ~ time, share = TRUE)
  # Mh : p est heterogene entre individu
  p.h <- list(formula = ~ mixture, share = TRUE)
  # Mtb
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  # Mbh
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  # Mth
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  # Mtbh
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))
```

```
## On construit la liste des modeles
  mouse.model.list <- create.model.list("FullHet")

## On prépare le tout pour envoi a Mark
  mouse.results <- mark.wrapper(mouse.model.list,
                                data = mouse.proc,
                                ddl = mouse.ddl)

## On retourne les resultats
  return(mouse.results)
}
```

On fait tourner tous les modèles d'un coup.

```
mouse.results <- run.mouse()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=1)
## -2lnL:  109.5069
## AICc :  115.614  (unadjusted=111.52455)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept) -5.388063e-04 0.000000e+00 -5.388063e-04 -5.388063e-04
## p:(Intercept)   1.053607e-01 9.701209e-06  1.053416e-01  1.053797e-01
## f0:(Intercept) -1.660926e+01 0.000000e+00 -1.660926e+01 -1.660926e+01
##
##
## Real Parameter pi
##
##
## mixture:1 0.4998653
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6
## mixture:1 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
## mixture:2 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
##
##
## Real Parameter c
##
##                    2         3         4         5         6
## mixture:1 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
## mixture:2 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
##
##
## Real Parameter f0
##
```

```
##             1
##  6.119111e-08
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=3)
## -2lnL:  97.98748
## AICc :  106.1668  (unadjusted=104.09462)
##
## Beta
##                     estimate           se           lcl          ucl
## pi:(Intercept)  1.374697e-06 2508.2830000 -4916.2348000 4916.2348000
## p:(Intercept)  -6.525621e-01    0.3230651    -1.2857698   -0.0193544
## c:(Intercept)   4.554755e-01    0.1772735     0.1080195    0.8029316
## f0:(Intercept)  1.040117e+00    1.0904401    -1.0971458    3.1773795
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000003
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6
## mixture:1 0.3424124 0.3424124 0.3424124 0.3424124 0.3424124 0.3424124
## mixture:2 0.3424124 0.3424124 0.3424124 0.3424124 0.3424124 0.3424124
##
##
## Real Parameter c
##
##                   2         3         4         5         6
## mixture:1 0.6119403 0.6119403 0.6119403 0.6119403 0.6119403
## mixture:2 0.6119403 0.6119403 0.6119403 0.6119403 0.6119403
##
##
## Real Parameter f0
##
##         1
##  2.829548
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=1)
## -2lnL:  1
## AICc :  NA  (unadjusted=Not a Number                )
##
## Beta
##                estimate se lcl ucl
## pi:(Intercept)      Inf  0 Inf Inf
## p:(Intercept)       Inf  0 Inf Inf
```

```
## p:mixture2          Inf  0 Inf Inf
## f0:(Intercept)      Inf  0 Inf Inf
##
##
## Real Parameter pi
##
##
## mixture:1 5.562685e-309
##
##
## Real Parameter p
##
##                         1             2             3             4             5
## mixture:1 5.562685e-309 5.562685e-309 5.562685e-309 5.562685e-309 5.562685e-309
## mixture:2 5.562685e-309 5.562685e-309 5.562685e-309 5.562685e-309 5.562685e-309
##                         6
## mixture:1 5.562685e-309
## mixture:2 5.562685e-309
##
##
## Real Parameter c
##
##                         2             3             4             5             6
## mixture:1 5.562685e-309 5.562685e-309 5.562685e-309 5.562685e-309 5.562685e-309
## mixture:2 5.562685e-309 5.562685e-309 5.562685e-309 5.562685e-309 5.562685e-309
##
##
## Real Parameter f0
##
##   1
##  NA
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6  (unadjusted=5)
## -2lnL:  85.72969
## AICc :  98.10978  (unadjusted=95.999961)
##
## Beta
##                   estimate           se           lcl           ucl
## pi:(Intercept)  1.2784182    0.4930485  3.120431e-01     2.2447933
## p:(Intercept)  -1.5107137    0.7093404 -2.901021e+00    -0.1204064
## p:mixture2     22.7368730 9533.8165000 -1.866354e+04 18709.0180000
## c:(Intercept)  -0.1529383    0.2659579 -6.742159e-01     0.3683392
## c:mixture2      1.7873849    0.4787059  8.491213e-01     2.7256485
## f0:(Intercept)  2.4209137    1.1756229  1.166927e-01     4.7251347
##
##
## Real Parameter pi
##
##
## mixture:1 0.7821804
##
```

```
##
## Real Parameter p
##
##                   1        2        3        4        5        6
## mixture:1 0.180833 0.180833 0.180833 0.180833 0.180833 0.180833
## mixture:2 1.000000 1.000000 1.000000 1.000000 1.000000 1.000000
##
##
## Real Parameter c
##
##                    2         3         4         5         6
## mixture:1 0.4618398 0.4618398 0.4618398 0.4618398 0.4618398
## mixture:2 0.8367779 0.8367779 0.8367779 0.8367779 0.8367779
##
##
## Real Parameter f0
##
##         1
##  11.25614
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  9
## -2lnL:  80.75912
## AICc :  99.58481
##
## Beta
##                   estimate        se        lcl        ucl
## pi:(Intercept) -0.3007795 0.5739914 -1.4258026  0.8242436
## p:(Intercept)   0.6308273 0.5695651 -0.4855204  1.7471749
## p:time2         0.6813489 0.5269159 -0.3514062  1.7141041
## p:time3         0.1400700 0.5295158 -0.8977811  1.1779211
## p:time4         0.5482069 0.5267873 -0.4842963  1.5807101
## p:time5         1.3410905 0.5353027  0.2918972  2.3902837
## p:time6         1.3410905 0.5353027  0.2918972  2.3902838
## p:mixture2     -2.2472083 0.3887934 -3.0092434 -1.4851732
## f0:(Intercept)  0.8024623 1.2065518 -1.5623792  3.1673038
##
##
## Real Parameter pi
##
##
## mixture:1 0.4253669
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6
## mixture:1 0.6526770 0.7878771 0.6837150 0.7647741 0.8778169 0.8778169
## mixture:2 0.1657046 0.2819049 0.1859853 0.2557505 0.4316087 0.4316087
##
##
## Real Parameter c
```

```
##
##                   2         3         4         5         6
## mixture:1 0.7878771 0.6837150 0.7647741 0.8778169 0.8778169
## mixture:2 0.2819049 0.1859853 0.2557505 0.4316087 0.4316087
##
##
## Real Parameter f0
##
##         1
##  2.231028
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  15  (unadjusted=12)
## -2lnL:  68.98024
## AICc :  101.2444  (unadjusted=94.431404)
##
## Beta
##                     estimate           se           lcl           ucl
## pi:(Intercept)   0.5724537 3.633262e-01 -1.396658e-01     1.2845731
## p:(Intercept)   -2.8773298 1.278727e+00 -5.383635e+00    -0.3710248
## p:mixture2      22.0545330 4.371339e+03 -8.545770e+03  8589.8790000
## p:time2          2.2487184 1.351595e+00 -4.004081e-01     4.8978450
## p:time3          2.4718662 1.383084e+00 -2.389776e-01     5.1827100
## p:time4          2.1841808 1.461213e+00 -6.797961e-01     5.0481576
## p:time5          2.8773259 1.517171e+00 -9.633010e-02     5.8509818
## p:time6         29.1945490 1.789938e+04 -3.505360e+04 35111.9850000
## c:(Intercept)   -0.3391294 8.083485e-01 -1.923492e+00     1.2452336
## c:mixture2       1.9698630 4.916168e-01  1.006294e+00     2.9334320
## c:time3         -1.1887854 8.298528e-01 -2.815297e+00     0.4377261
## c:time4         -0.3216300 8.302081e-01 -1.948838e+00     1.3055780
## c:time5          0.4774629 8.549629e-01 -1.198264e+00     2.1531903
## c:time6          0.2405356 8.399623e-01 -1.405790e+00     1.8868617
## f0:(Intercept) -40.0802960 2.575041e+04 -5.051089e+04 50430.7280000
##
##
## Real Parameter pi
##
##
## mixture:1 0.6393292
##
##
## Real Parameter p
##
##                   1         2         3         4        5 6
## mixture:1 0.0532857 0.3478255 0.4000004 0.3333329 0.499999 1
## mixture:2 1.0000000 1.0000000 1.0000000 1.0000000 1.000000 1
##
##
## Real Parameter c
##
##                   2         3         4         5         6
## mixture:1 0.4160210 0.1782990 0.3405690 0.5345283 0.4753715
```

```
## mixture:2 0.8362701 0.6087231 0.7873631 0.8916973 0.8666051
##
##
## Real Parameter f0
##
##             1
##  3.920566e-18
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  8  (unadjusted=6)
## -2lnL:  99.67496
## AICc :  116.3325  (unadjusted=112.05505)
##
## Beta
##                      estimate           se           lcl          ucl
## pi:(Intercept)  6.770526e-05  695.7181300 -1363.6075000 1363.6076000
## p:(Intercept)  -4.274436e-01    0.3318807    -1.0779298    0.2230425
## p:time2         5.328040e-01    0.4644355    -0.3774896    1.4430976
## p:time3         1.089899e-01    0.4670110    -0.8063517    1.0243314
## p:time4         4.274436e-01    0.4641206    -0.4822327    1.3371199
## p:time5         1.081370e+00    0.4765163     0.1473982    2.0153423
## p:time6         1.081370e+00    0.4765163     0.1473982    2.0153421
## f0:(Intercept) -1.509489e+01 3069.3092000 -6030.9411000 6000.7513000
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000169
##
##
## Real Parameter p
##
##                   1         2         3   4         5         6
## mixture:1 0.3947369 0.5263158 0.4210526 0.5 0.6578948 0.6578947
## mixture:2 0.3947369 0.5263158 0.4210526 0.5 0.6578948 0.6578947
##
##
## Real Parameter c
##
##                   2         3   4         5         6
## mixture:1 0.5263158 0.4210526 0.5 0.6578948 0.6578947
## mixture:2 0.5263158 0.4210526 0.5 0.6578948 0.6578947
##
##
## Real Parameter f0
##
##             1
##  2.782092e-07
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
```

```
##
## Npar :  13  (unadjusted=10)
## -2lnL:  87.05684
## AICc :  114.7578  (unadjusted=108.07067)
##
## Beta
##                      estimate           se           lcl           ucl
## pi:(Intercept)  2.399331e-04 0.000000e+00  2.399331e-04  2.399331e-04
## p:(Intercept)  -4.274441e-01 3.318811e-01 -1.077931e+00  2.230428e-01
## p:time2        -2.011647e-01 5.493740e-01 -1.277938e+00  8.756085e-01
## p:time3         2.197860e-02 6.228346e-01 -1.198777e+00  1.242734e+00
## p:time4        -2.657027e-01 7.811184e-01 -1.796695e+00  1.265289e+00
## p:time5         4.274440e-01 8.813694e-01 -1.300040e+00  2.154928e+00
## p:time6         2.051320e+01 1.985518e+04 -3.889564e+04  3.893667e+04
## c:(Intercept)   1.386294e+00 6.454968e-01  1.211205e-01  2.651468e+00
## c:time3        -1.648659e+00 7.704474e-01 -3.158736e+00 -1.385817e-01
## c:time4        -1.178655e+00 7.457138e-01 -2.640254e+00  2.829440e-01
## c:time5        -5.978371e-01 7.497471e-01 -2.067341e+00  8.716673e-01
## c:time6        -8.602013e-01 7.341960e-01 -2.299225e+00  5.788229e-01
## f0:(Intercept) -2.103084e+01 6.264938e+03 -1.230031e+04  1.225825e+04
##
##
## Real Parameter pi
##
##
## mixture:1 0.50006
##
##
## Real Parameter p
##
##                    1         2         3         4   5 6
## mixture:1 0.3947368 0.3478261 0.3999999 0.3333334 0.5 1
## mixture:2 0.3947368 0.3478261 0.3999999 0.3333334 0.5 1
##
##
## Real Parameter c
##
##             2         3         4      5         6
## mixture:1 0.8 0.4347826 0.5517241 0.6875 0.6285714
## mixture:2 0.8 0.4347826 0.5517241 0.6875 0.6285714
##
##
## Real Parameter f0
##
##             1
##  7.352307e-10
```

On examine les résultats.

```
mouse.results
```

```
##                                            model npar      AICc DeltaAICc
## 1                          pi(~1)p(~1)c()f0(~1)    3 115.61399        NA
## 2                        pi(~1)p(~1)c(~1)f0(~1)    4 106.16685        NA
```

```
## 3                      pi(~1)p(~mixture)c()f0(~1)    4        NA        NA
## 4               pi(~1)p(~mixture)c(~mixture)f0(~1)    6  98.10978        NA
## 5                pi(~1)p(~time + mixture)c()f0(~1)    9  99.58481        NA
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   15 101.24439        NA
## 7                         pi(~1)p(~time)c()f0(~1)    8 116.33249        NA
## 8                    pi(~1)p(~time)c(~time)f0(~1)   13 114.75778        NA
##   weight Deviance
## 1     NA 85.44111
## 2     NA 73.92174
## 3     NA  2.00000
## 4     NA 61.66395
## 5     NA 56.69338
## 6     NA 44.91450
## 7     NA 75.60922
## 8     NA 62.99110
```

Le nom des modèles n'est pas limpide. On fait le lien entre la première colonne qui donne le numéro du modèle, et la liste des modèles qu'on a définie au-dessus.

```
names(mouse.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

Par exemple, si l'on veut afficher les résultats du modèle M_0, il s'agit du modèle 1 "p.dot". On peut afficher la probabilité de détection avec l'intervalle de confiance associé.

```
mouse.results$p.dot$results$real
```

```
##                 estimate           se          lcl          ucl fixed note
## pi g1 m1    4.998653e-01 0.000000e+00 4.998653e-01 4.998653e-01
## p g1 t1 m1  5.263158e-01 2.418584e-06 5.263111e-01 5.263206e-01
## f0 g1 a0 t1 6.119111e-08 0.000000e+00 6.119111e-08 6.119111e-08
```

On obtient aussi une estimation de l'effectif.

```
mouse.results$p.dot$results$derived
```

```
## $`N Population Size`
##   estimate lcl ucl
## 1       38  38  38
```

Le meilleur modèle selon l'AIC est le modèle numéroté 4 qui correspond à "p.h.behav". On affiche les résults pour ce modèle.

```
mouse.results$p.h.behav$results$real
```

```
##                estimate           se       lcl        ucl fixed note
## pi g1 m1     0.7821804 8.400280e-02 0.5773839  0.9042005
## p g1 t1 m1   0.1808330 1.050763e-01 0.0521031  0.4699347
```

```
## p g1 t1 m2   1.0000000 5.765842e-06 0.9999887  1.0000113
## c g1 t2 m1   0.4618398 6.610220e-02 0.3375535  0.5910576
## c g1 t2 m2   0.8367779 6.128260e-02 0.6802697  0.9251093
## f0 g1 a0 t1 11.2561400 1.323298e+01 1.8128010 69.8922170
```

```
mouse.results$p.h.behav$results$derived
```

```
## $`N Population Size`
##   estimate     lcl      ucl
## 1 49.25614 39.8128 107.8922
```

Analyses séparées, mâles vs. femelles

Ici on sépare mâles et femelles et on reproduit l'analyse ci-dessus.On commence par lire les données. On spécifie le groupe, ici les mâles d'abord, puis les femelles.

```
mouse <- convert.inp("dat/deer-mouse-sex2G-MF.inp",
                     group.df = data.frame(sex = c("M","F")),
                     covariates = NULL)
```

On inspecte les données.

```
head(mouse)
```

```
##         ch freq sex
## 1:1 111111    1   M
## 1:3 110011    1   M
## 1:4 110111    1   M
## 1:5 111111    1   M
## 1:6 110111    1   M
## 1:7 111110    1   M
```

```
tail(mouse)
```

```
##          ch freq sex
## 2:28 001010    1   F
## 2:29 001000    1   F
## 2:30 000100    1   F
## 2:32 000110    1   F
## 2:34 000010    1   F
## 2:38 000001    1   F
```

On sépare mâles et femelles en deux jeux de données.

```
mouseM <- mouse[mouse$sex == "M", ]
mouseF <- mouse[mouse$sex == "F", ]
```

On formate les données pour effectuer les tests de l'hypothèse de fermeture.

```
mouseM_secr <- unRMarkInput(mouseM) # on convertit au bon format
mouseF_secr <- unRMarkInput(mouseF) # on convertit au bon format
```

On fait les tests de fermeture, les mâles d'abord.

```
closure.test(mouseM_secr, SB = TRUE)
```

```
## $Otis
##  statistic        p
##   1.408787 0.920551
##
## $Xc
##  statistic df          p
##   11.31081  6 0.07923259
##
## $NRvsJS
##  statistic df           p
##   9.316319  2 0.009483899
##
## $NMvsJS
##  statistic df p
##          0  0 1
##
## $MtvsNR
##  statistic df         p
##   1.994488  4 0.7367727
##
## $MtvsNM
##  statistic df          p
##   11.31081  6 0.07923259
##
## $compNRvsJS
##   Occasion Chisquare df          p
## 1        2  5.619444  1 0.01776228
## 2        3        NA NA         NA
## 3        4  3.696875  1 0.05451448
## 4        5        NA NA         NA
##
## $compNMvsJS
##   Occasion Chisquare df  p
## 1        2        NA NA NA
## 2        3        NA NA NA
## 3        4        NA NA NA
## 4        5        NA NA NA
```

Les femelles ensuite.

```
closure.test(mouseF_secr, SB = TRUE)
```

```
## $Otis
##  statistic         p
##  0.2255718 0.5892328
```

```
##
## $Xc
##  statistic df         p
##   3.362287  5 0.6443199
##
## $NRvsJS
##  statistic df         p
##    1.63254  1 0.2013521
##
## $NMvsJS
##  statistic df         p
##  0.2539683  1 0.6142947
##
## $MtvsNR
##  statistic df         p
##   1.729747  4 0.7853071
##
## $MtvsNM
##  statistic df        p
##   3.108319  4 0.539865
##
## $compNRvsJS
##   Occasion Chisquare df         p
## 1        2        NA NA        NA
## 2        3   1.63254  1 0.2013521
## 3        4        NA NA        NA
## 4        5        NA NA        NA
##
## $compNMvsJS
##   Occasion Chisquare df         p
## 1        2        NA NA        NA
## 2        3        NA NA        NA
## 3        4        NA NA        NA
## 4        5 0.2539683  1 0.6142947
```

Les modèles maintenant. Commençons par les mâles.

```
mouse.proc <- process.data(mouseM,
                           begin.time = 1,
                           model = "FullHet")
mouse.ddl <- make.design.data(mouse.proc)
```

La liste des modèles.

```
run.mouse <- function() {

  # sans l'effet sexe
  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
```

```
                      c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  mouse.model.list <- create.model.list("FullHet")

  mouse.results <- mark.wrapper(mouse.model.list,
                                data = mouse.proc,
                                ddl = mouse.ddl)

  return(mouse.results)
}
```

On lance Mark.

```
mouse.results <- run.mouse()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=1)
## -2lnL:  75.69613
## AICc :  81.89285  (unadjusted=77.728386)
##
## Beta
##                      estimate           se           lcl          ucl
## pi:(Intercept)  1.634196e-04 2.508687e+03 -4.917027e+03 4.917028e+03
## p:(Intercept)   5.193003e-01 1.842141e-01  1.582407e-01 8.803598e-01
## f0:(Intercept) -2.060154e+01 1.580671e+04 -3.100174e+04 3.096054e+04
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000409
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6
## mixture:1 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841
## mixture:2 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841
##
##
## Real Parameter c
##
##                    2         3         4         5         6
## mixture:1 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841
## mixture:2 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841
```

```
##
##
## Real Parameter f0
##
##             1
##  1.129444e-09
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  66.768
## AICc :  75.09858  (unadjusted=70.865563)
##
## Beta
##                      estimate           se           lcl          ucl
## pi:(Intercept)  5.550111e-05 5016.8334000 -9832.9936000 9832.9937000
## p:(Intercept)  -1.743583e-01    0.2960774    -0.7546701    0.4059535
## c:(Intercept)   9.693970e-01    0.2503913     0.4786300    1.4601640
## f0:(Intercept) -1.157696e+01 2907.8838000 -5711.0294000 5687.8754000
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000139
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6
## mixture:1 0.4565205 0.4565205 0.4565205 0.4565205 0.4565205 0.4565205
## mixture:2 0.4565205 0.4565205 0.4565205 0.4565205 0.4565205 0.4565205
##
##
## Real Parameter c
##
##                   2         3         4         5         6
## mixture:1 0.7249993 0.7249993 0.7249993 0.7249993 0.7249993
## mixture:2 0.7249993 0.7249993 0.7249993 0.7249993 0.7249993
##
##
## Real Parameter f0
##
##             1
##  9.379719e-06
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4
## -2lnL:  63.91043
## AICc :  72.24101
##
```

```
## Beta
##                   estimate        se        lcl        ucl
## pi:(Intercept) -0.2917242 0.8369751  -1.932195  1.3487469
## p:(Intercept)  -0.6286004 0.7041790  -2.008791  0.7515905
## p:mixture2      2.1939314 0.5210753   1.172624  3.2152391
## f0:(Intercept) -1.8195922 7.9447845 -17.391370 13.7521860
##
##
## Real Parameter pi
##
##
## mixture:1 0.4275818
##
##
## Real Parameter p
##
##                   1        2        3        4        5        6
## mixture:1 0.347828 0.347828 0.347828 0.347828 0.347828 0.347828
## mixture:2 0.827117 0.827117 0.827117 0.827117 0.827117 0.827117
##
##
## Real Parameter c
##
##                   2        3        4        5        6
## mixture:1 0.347828 0.347828 0.347828 0.347828 0.347828
## mixture:2 0.827117 0.827117 0.827117 0.827117 0.827117
##
##
## Real Parameter f0
##
##          1
##  0.1620918
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6  (unadjusted=4)
## -2lnL:  58.68762
## AICc :  71.3935  (unadjusted=67.018194)
##
## Beta
##                    estimate           se           lcl           ucl
## pi:(Intercept)   0.1385538 5.863576e-01 -1.010707e+00     1.2878148
## p:(Intercept)   -0.8006214 4.026088e-01 -1.589735e+00    -0.0115081
## p:mixture2      22.9215780 1.341684e+04 -2.627410e+04 26319.9390000
## c:(Intercept)    0.1458514 4.498776e-01 -7.359088e-01     1.0276115
## c:mixture2       1.5511776 5.927194e-01  3.894475e-01     2.7129077
## f0:(Intercept) -44.2474960 0.000000e+00 -4.424750e+01   -44.2474960
##
##
## Real Parameter pi
##
##
## mixture:1 0.5345831
```

```
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6
## mixture:1 0.3098926 0.3098926 0.3098926 0.3098926 0.3098926 0.3098926
## mixture:2 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
##
##
## Real Parameter c
##
##                    2         3         4         5         6
## mixture:1 0.5363983 0.5363983 0.5363983 0.5363983 0.5363983
## mixture:2 0.8451463 0.8451463 0.8451463 0.8451463 0.8451463
##
##
## Real Parameter f0
##
##             1
##  6.075145e-20
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  9  (unadjusted=8)
## -2lnL:  50.46091
## AICc :  70.01264  (unadjusted=67.691682)
##
## Beta
##                       estimate           se           lcl          ucl
## pi:(Intercept) -2.294980e-01    0.6798561    -1.5620159    1.1030199
## p:(Intercept)  -1.054117e+00    0.7076138    -2.4410403    0.3328057
## p:time2         8.890439e-01    0.7822767    -0.6442184    2.4223062
## p:time3        -1.105875e+00    0.7670460    -2.6092846    0.3975357
## p:time4        -7.308239e-07    0.7551230    -1.4800418    1.4800403
## p:time5         1.212073e+00    0.8018796    -0.3596116    2.7837567
## p:time6         1.212073e+00    0.8018796    -0.3596116    2.7837566
## p:mixture2      2.572073e+00    0.5507382     1.4926257    3.6515196
## f0:(Intercept) -1.329588e+01 4456.3090000 -8747.6617000 8721.0700000
##
##
## Real Parameter pi
##
##
## mixture:1 0.442876
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6
## mixture:1 0.2584353 0.4588251 0.1034012 0.2584351 0.5394069 0.5394069
## mixture:2 0.8202372 0.9173595 0.6015867 0.8202371 0.9387754 0.9387754
##
##
```

```
## Real Parameter c
##
##                   2         3         4         5         6
## mixture:1 0.4588251 0.1034012 0.2584351 0.5394069 0.5394069
## mixture:2 0.9173595 0.6015867 0.8202371 0.9387754 0.9387754
##
##
## Real Parameter f0
##
##            1
##  1.68141e-06
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  15  (unadjusted=10)
## -2lnL:  38.56738
## AICc :  72.93102  (unadjusted=60.480423)
##
## Beta
##                    estimate           se           lcl           ucl
## pi:(Intercept)  -0.2876793 4.409584e-01 -1.151958e+00     0.5765992
## p:(Intercept)  -17.3424880 0.000000e+00 -1.734249e+01   -17.3424880
## p:mixture2      39.0513930 5.953899e-04  3.905023e+01    39.0525600
## p:time2         17.1193430 0.000000e+00  1.711934e+01    17.1193430
## p:time3        -29.7749990 0.000000e+00 -2.977500e+01   -29.7749990
## p:time4         15.9561930 0.000000e+00  1.595619e+01    15.9561930
## p:time5         17.3424940 0.000000e+00  1.734249e+01    17.3424940
## p:time6         37.1044730 1.199401e+04 -2.347116e+04 23545.3700000
## c:(Intercept)    0.5823943 1.222971e+00 -1.814628e+00     2.9794170
## c:mixture2       1.8155190 6.361904e-01  5.685859e-01     3.0624521
## c:time3         -1.9881532 1.178541e+00 -4.298094e+00     0.3217878
## c:time4         -1.0726602 1.213955e+00 -3.452013e+00     1.3066922
## c:time5         -0.0981848 1.292354e+00 -2.631199e+00     2.4348296
## c:time6         -0.5256310 1.239291e+00 -2.954641e+00     1.9033794
## f0:(Intercept) -34.6125890 0.000000e+00 -3.461259e+01   -34.6125890
##
##
## Real Parameter pi
##
##
## mixture:1 0.4285721
##
##
## Real Parameter p
##
##                        1        2            3         4         5 6
## mixture:1 2.939362e-08 0.444444 3.444571e-21 0.1999998 0.5000015 1
## mixture:2 1.000000e+00 1.000000 3.139088e-04 1.0000000 1.0000000 1
##
##
## Real Parameter c
##
##                   2         3         4         5         6
```

```
## mixture:1 0.6416181 0.1969038 0.3798309 0.6187414 0.5141870
## mixture:2 0.9166680 0.6010304 0.7900544 0.9088545 0.8667221
##
##
## Real Parameter f0
##
##             1
##  9.288457e-16
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  8  (unadjusted=6)
## -2lnL:  65.74697
## AICc :  82.97774  (unadjusted=78.452851)
##
## Beta
##                      estimate        se           lcl           ucl
## pi:(Intercept)  1.020106e-04 0.0000000  1.020106e-04  1.020106e-04
## p:(Intercept)   2.876821e-01 0.4409582 -5.765961e-01  1.151960e+00
## p:time2         6.286088e-01 0.6540469 -6.533231e-01  1.910541e+00
## p:time3        -7.731899e-01 0.6295768 -2.007161e+00  4.607807e-01
## p:time4         4.877182e-08 0.6236093 -1.222274e+00  1.222274e+00
## p:time5         8.754687e-01 0.6759762 -4.494446e-01  2.200382e+00
## p:time6         8.754687e-01 0.6759762 -4.494447e-01  2.200382e+00
## f0:(Intercept) -2.117350e+01 0.0000000 -2.117350e+01 -2.117350e+01
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000255
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6
## mixture:1 0.5714286 0.7142857 0.3809524 0.5714286 0.7619048 0.7619047
## mixture:2 0.5714286 0.7142857 0.3809524 0.5714286 0.7619048 0.7619047
##
##
## Real Parameter c
##
##                    2         3         4         5         6
## mixture:1 0.7142857 0.3809524 0.5714286 0.7619048 0.7619047
## mixture:2 0.7142857 0.3809524 0.5714286 0.7619048 0.7619047
##
##
## Real Parameter f0
##
##             1
##  6.374796e-10
##
## Output summary for FullHet model
```

```
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  13  (unadjusted=9)
## -2lnL:  47.52058
## AICc :  76.77058  (unadjusted=67.072306)
##
## Beta
##                      estimate           se           lcl           ucl
## pi:(Intercept)  1.063053e-04 9.522541e+02 -1.866418e+03  1866.4181000
## p:(Intercept)   2.876825e-01 4.409585e-01 -5.765963e-01     1.1519612
## p:time2        -5.108265e-01 8.027730e-01 -2.084262e+00     1.0626085
## p:time3        -2.008433e+01 8.907502e+03 -1.747879e+04 17438.6190000
## p:time4        -1.673977e+00 1.201850e+00 -4.029604e+00     0.6816496
## p:time5        -2.876845e-01 1.092906e+00 -2.429781e+00     1.8544117
## p:time6         2.325809e+01 2.309740e+04 -4.524766e+04 45294.1720000
## c:(Intercept)   2.397902e+00 1.044468e+00  3.507443e-01     4.4450600
## c:time3        -2.397902e+00 1.157978e+00 -4.667540e+00    -0.1282646
## c:time4        -1.609445e+00 1.175510e+00 -3.913444e+00     0.6945541
## c:time5        -8.574586e-01 1.222978e+00 -3.254495e+00     1.5395784
## c:time6        -1.368283e+00 1.167194e+00 -3.655984e+00     0.9194177
## f0:(Intercept) -2.417282e+01 2.633138e+04 -5.163368e+04 51585.3310000
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000266
##
##
## Real Parameter p
##
##                    1         2            3   4         5 6
## mixture:1 0.5714287 0.4444443 2.525942e-09 0.2 0.4999995 1
## mixture:2 0.5714287 0.4444443 2.525942e-09 0.2 0.4999995 1
##
##
## Real Parameter c
##
##                    2   3      4         5        6
## mixture:1 0.9166672 0.5 0.6875 0.8235292 0.736842
## mixture:2 0.9166672 0.5 0.6875 0.8235292 0.736842
##
##
## Real Parameter f0
##
##             1
##  3.175967e-11
```

Et on inspecte les résultats.

```
mouse.results
```

```
##                                              model npar     AICc DeltaAICc
## 5                pi(~1)p(~time + mixture)c()f0(~1)    9 70.01264  0.000000
```

```
## 4              pi(~1)p(~mixture)c(~mixture)f0(~1)    6 71.39350  1.380860
## 3                      pi(~1)p(~mixture)c()f0(~1)    4 72.24101  2.228371
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   15 72.93102  2.918378
## 2                          pi(~1)p(~1)c(~1)f0(~1)    4 75.09858  5.085943
## 8                    pi(~1)p(~time)c(~time)f0(~1)   13 76.77058  6.757945
## 1                            pi(~1)p(~1)c()f0(~1)    3 81.89285 11.880212
## 7                        pi(~1)p(~time)c()f0(~1)    8 82.97774 12.965100
##         weight Deviance
## 5 0.4589589792 41.07714
## 4 0.2301038500 49.30384
## 3 0.1506222654 54.52665
## 6 0.1066733886 29.18360
## 2 0.0360890375 57.38422
## 8 0.0156424505 38.13680
## 1 0.0012078655 66.31235
## 7 0.0007021633 56.36319
```

Les noms des modèles.

```
names(mouse.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

On examine les résultats obtenus selon le meilleur modèle (#5).

```
mouse.results$p.h.time$results$real
```

```
##                 estimate        se          lcl       ucl fixed note
## pi g1 m1    4.428760e-01 0.1677455 1.733576e-01 0.7508255
## p g1 t1 m1  2.584353e-01 0.1356117 8.009620e-02 0.5824419
## p g1 t2 m1  4.588251e-01 0.1689833 1.825824e-01 0.7629283
## p g1 t3 m1  1.034012e-01 0.0672794 2.705730e-02 0.3235256
## p g1 t4 m1  2.584351e-01 0.1356116 8.009620e-02 0.5824417
## p g1 t5 m1  5.394069e-01 0.1691697 2.356595e-01 0.8164586
## p g1 t6 m1  5.394069e-01 0.1691697 2.356595e-01 0.8164585
## p g1 t1 m2  8.202372e-01 0.1135912 5.020022e-01 0.9538188
## p g1 t2 m2  9.173595e-01 0.0623668 6.888146e-01 0.9823535
## p g1 t3 m2  6.015867e-01 0.1590738 2.913666e-01 0.8472143
## p g1 t4 m2  8.202371e-01 0.1135913 5.020020e-01 0.9538188
## p g1 t5 m2  9.387754e-01 0.0482114 7.476209e-01 0.9875572
## p g1 t6 m2  9.387754e-01 0.0482114 7.476209e-01 0.9875572
## f0 g1 a0 t1 1.681410e-06 0.0074929 5.448666e-10 0.0051887
```

```
mouse.results$p.h.time$results$derived
```

```
## $`N Population Size`
##   estimate lcl      ucl
## 1       21  21 21.00519
```

On procède de même pour les femelles.

```
mouse.proc <- process.data(mouseF,
                           begin.time = 1,
                           model = "FullHet")
mouse.ddl <- make.design.data(mouse.proc)
```

La liste des modèles.

```
run.mouse <- function() {

  # sans l'effet sexe
  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  mouse.model.list <- create.model.list("FullHet")

  mouse.results <- mark.wrapper(mouse.model.list,
                                data = mouse.proc,
                                ddl = mouse.ddl)

  return(mouse.results)
}
```

On lance Mark.

```
mouse.results <- run.mouse()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=2)
## -2lnL:  70.33432
## AICc :  76.57922  (unadjusted=74.455532)
##
## Beta
##                      estimate       se           lcl           ucl
## pi:(Intercept) -1.135745e-05 0.000000 -1.135745e-05 -1.135745e-05
## p:(Intercept)  -4.302319e-01 0.226895 -8.749461e-01  1.448240e-02
## f0:(Intercept) -1.077745e+00 3.271172 -7.489242e+00  5.333753e+00
##
##
## Real Parameter pi
```

```
##
##
## mixture:1 0.4999972
##
##
## Real Parameter p
##
##                  1        2        3        4        5        6
## mixture:1 0.394071 0.394071 0.394071 0.394071 0.394071 0.394071
## mixture:2 0.394071 0.394071 0.394071 0.394071 0.394071 0.394071
##
##
## Real Parameter c
##
##                  2        3        4        5        6
## mixture:1 0.394071 0.394071 0.394071 0.394071 0.394071
## mixture:2 0.394071 0.394071 0.394071 0.394071 0.394071
##
##
## Real Parameter f0
##
##          1
##  0.3403624
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=3)
## -2lnL:  68.40103
## AICc :  76.8134  (unadjusted=74.645923)
##
## Beta
##                      estimate        se           lcl          ucl
## pi:(Intercept)  2.250846e-06 0.0000000  2.250846e-06 2.250846e-06
## p:(Intercept)  -1.006540e+00 0.5819543 -2.147171e+00 1.340901e-01
## c:(Intercept)  -2.231435e-01 0.2738613 -7.599117e-01 3.136246e-01
## f0:(Intercept)  9.499847e-01 1.5239208 -2.036900e+00 3.936870e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000006
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6
## mixture:1 0.2676574 0.2676574 0.2676574 0.2676574 0.2676574 0.2676574
## mixture:2 0.2676574 0.2676574 0.2676574 0.2676574 0.2676574 0.2676574
##
##
## Real Parameter c
##
```

```
##                   2         3         4         5         6
## mixture:1 0.4444444 0.4444444 0.4444444 0.4444444 0.4444444
## mixture:2 0.4444444 0.4444444 0.4444444 0.4444444 0.4444444
##
##
## Real Parameter f0
##
##        1
##  2.58567
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4
## -2lnL:  69.88198
## AICc :  78.29435
##
## Beta
##                   estimate        se       lcl       ucl
## pi:(Intercept) -0.7074723 2.7619186 -6.120833 4.7058883
## p:(Intercept)   0.2046801 1.0008591 -1.757004 2.1663639
## p:mixture2     -1.0885033 0.8765178 -2.806478 0.6294716
## f0:(Intercept)  0.0850368 2.0866690 -4.004835 4.1749081
##
##
## Real Parameter pi
##
##
## mixture:1 0.3301576
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6
## mixture:1 0.5509921 0.5509921 0.5509921 0.5509921 0.5509921 0.5509921
## mixture:2 0.2923861 0.2923861 0.2923861 0.2923861 0.2923861 0.2923861
##
##
## Real Parameter c
##
##                   2         3         4         5         6
## mixture:1 0.5509921 0.5509921 0.5509921 0.5509921 0.5509921
## mixture:2 0.2923861 0.2923861 0.2923861 0.2923861 0.2923861
##
##
## Real Parameter f0
##
##         1
##  1.088757
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6
```

```
## -2lnL:  67.24578
## AICc :  80.12999
##
## Beta
##                   estimate        se       lcl       ucl
## pi:(Intercept) -0.6855413 2.1665473 -4.931974 3.5608915
## p:(Intercept)  -0.7635877 0.9320587 -2.590423 1.0632473
## p:mixture2     -0.3818855 1.2452912 -2.822656 2.0588854
## c:(Intercept)   0.7816211 1.3230106 -1.811480 3.3747219
## c:mixture2     -1.6553367 0.9806112 -3.577335 0.2666613
## f0:(Intercept)  1.0068613 1.5712108 -2.072712 4.0864345
##
##
## Real Parameter pi
##
##
## mixture:1 0.3350257
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6
## mixture:1 0.3178678 0.3178678 0.3178678 0.3178678 0.3178678 0.3178678
## mixture:2 0.2413169 0.2413169 0.2413169 0.2413169 0.2413169 0.2413169
##
##
## Real Parameter c
##
##                    2         3         4         5         6
## mixture:1 0.6860294 0.6860294 0.6860294 0.6860294 0.6860294
## mixture:2 0.2944818 0.2944818 0.2944818 0.2944818 0.2944818
##
##
## Real Parameter f0
##
##         1
##  2.736997
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  9
## -2lnL:  62.12122
## AICc :  82.07774
##
## Beta
##                   estimate        se        lcl       ucl
## pi:(Intercept) -0.7417549 2.0079724 -4.6773810 3.1938711
## p:(Intercept)  -0.8527032 1.0601432 -2.9305839 1.2251774
## p:time2         0.7040743 0.8546605 -0.9710603 2.3792090
## p:time3         1.5054183 0.8304248 -0.1222143 3.1330509
## p:time4         1.2546832 0.8331167 -0.3782255 2.8875920
## p:time5         1.7491633 0.8315546  0.1193162 3.3790104
## p:time6         1.7491633 0.8315546  0.1193162 3.3790104
```

```
## p:mixture2     -1.3140920 0.8181666 -2.9176986 0.2895145
## f0:(Intercept)  0.0661255 2.0573216 -3.9662249 4.0984760
##
##
## Real Parameter pi
##
##
## mixture:1 0.3226205
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6
## mixture:1 0.2988661 0.4629110 0.6576220 0.5991633 0.7102215 0.7102215
## mixture:2 0.1027722 0.1880515 0.3404304 0.2865678 0.3970835 0.3970835
##
##
## Real Parameter c
##
##                    2         3         4         5         6
## mixture:1 0.4629110 0.6576220 0.5991633 0.7102215 0.7102215
## mixture:2 0.1880515 0.3404304 0.2865678 0.3970835 0.3970835
##
##
## Real Parameter f0
##
##         1
##  1.068361
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  15  (unadjusted=12)
## -2lnL:  54.99452
## AICc :  90.57592  (unadjusted=82.500138)
##
## Beta
##                    estimate           se           lcl           ucl
## pi:(Intercept)   0.5757019 5.653831e-01 -5.324489e-01     1.6838527
## p:(Intercept)   -0.9658840 6.899994e-01 -2.318283e+00     0.3865149
## p:mixture2     -22.6945980 3.697238e+02 -7.473533e+02   701.9640800
## p:time2          0.9959847 9.923352e-01 -9.489924e-01     2.9409617
## p:time3         23.0249860 3.697245e+02 -7.016351e+02   747.6850300
## p:time4         23.6604820 3.697246e+02 -7.009998e+02   748.3207800
## p:time5         23.6604680 3.697260e+02 -7.010025e+02   748.3234200
## p:time6         52.7489380 3.370433e+04 -6.600775e+04 66113.2460000
## c:(Intercept)   -0.6931620 1.224744e+00 -3.093661e+00     1.7073369
## c:mixture2      -2.5284311 1.126029e+00 -4.735449e+00    -0.3214134
## c:time3         -0.2231333 1.483238e+00 -3.130280e+00     2.6840136
## c:time4          0.4831008 1.369536e+00 -2.201191e+00     3.1673921
## c:time5          1.4482042 1.384015e+00 -1.264466e+00     4.1608742
## c:time6          1.4000146 1.381022e+00 -1.306789e+00     4.1068185
## f0:(Intercept) -37.3130720 2.402497e+04 -4.712625e+04 47051.6280000
##
```

```
##
## Real Parameter pi
##
##
## mixture:1 0.6400778
##
##
## Real Parameter p
##
##                      1            2         3   4         5 6
## mixture:1 2.757017e-01 5.075246e-01 1.0000000 1.0 1.0000000 1
## mixture:2 5.301308e-11 1.435270e-10 0.3462654 0.5 0.4999963 1
##
##
## Real Parameter c
##
##                   2         3         4         5         6
## mixture:1 0.3333300 0.2857134 0.4476770 0.6802764 0.6697053
## mixture:2 0.0383612 0.0309265 0.0607399 0.1451214 0.1392446
##
##
## Real Parameter f0
##
##            1
##  6.23934e-17
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  8  (unadjusted=7)
## -2lnL:  62.94848
## AICc :  80.49687  (unadjusted=78.139968)
##
## Beta
##                     estimate        se          lcl          ucl
## pi:(Intercept)  0.000053714 0.0000000  0.000053714  0.000053714
## p:(Intercept)  -1.554470000 0.6220374 -2.773663200 -0.335276700
## p:time2         0.662658500 0.8255781 -0.955474700  2.280791600
## p:time3         1.414955600 0.7984491 -0.150004700  2.979915900
## p:time4         1.178215700 0.8018960 -0.393500500  2.749931800
## p:time5         1.647837800 0.7993695  0.081073600  3.214602000
## p:time6         1.647837900 0.7967073  0.086291600  3.209384200
## f0:(Intercept) -1.620876400 0.7885948 -3.166522300 -0.075230500
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000134
##
##
## Real Parameter p
##
##                   1         2         3         4        5        6
```

```
## mixture:1 0.1744416 0.2907361 0.4651779 0.4070306 0.523325 0.523325
## mixture:2 0.1744416 0.2907361 0.4651779 0.4070306 0.523325 0.523325
##
##
## Real Parameter c
##
##                   2         3         4        5        6
## mixture:1 0.2907361 0.4651779 0.4070306 0.523325 0.523325
## mixture:2 0.2907361 0.4651779 0.4070306 0.523325 0.523325
##
##
## Real Parameter f0
##
##          1
##  0.1977253
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  13  (unadjusted=10)
## -2lnL:  59.78988
## AICc :  89.92625  (unadjusted=82.207466)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept)  1.651881e-05 2.518496e+03 -4.936252e+03  4936.2526000
## p:(Intercept)  -1.540445e+00 6.362090e-01 -2.787415e+00    -0.2934755
## p:time2         6.241545e-01 8.687704e-01 -1.078636e+00     2.3269445
## p:time3         1.945910e+00 9.063270e-01  1.695094e-01     3.7223113
## p:time4         1.540445e+00 1.185227e+00 -7.825989e-01     3.8634895
## p:time5         1.540445e+00 1.550730e+00 -1.498985e+00     4.5798749
## p:time6         2.411006e+01 0.000000e+00  2.411006e+01    24.1100600
## c:(Intercept)  -6.931472e-01 1.224747e+00 -3.093651e+00     1.7073568
## c:time3        -2.231432e-01 1.483242e+00 -3.130297e+00     2.6840102
## c:time4         2.231435e-01 1.350928e+00 -2.424675e+00     2.8709620
## c:time5         8.266786e-01 1.329610e+00 -1.779357e+00     3.4327140
## c:time6         6.931471e-01 1.322878e+00 -1.899693e+00     3.2859876
## f0:(Intercept) -2.445172e+01 2.302503e+04 -4.515350e+04 45104.5980000
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000041
##
##
## Real Parameter p
##
##                   1         2   3   4         5 6
## mixture:1 0.1764706 0.2857143 0.6 0.5 0.4999999 1
## mixture:2 0.1764706 0.2857143 0.6 0.5 0.4999999 1
##
##
## Real Parameter c
```

```
##
##                   2         3         4         5   6
## mixture:1 0.3333333 0.2857143 0.3846154 0.5333333 0.5
## mixture:2 0.3333333 0.2857143 0.3846154 0.5333333 0.5
##
##
## Real Parameter f0
##
##             1
##  2.403002e-11
```

Et on inspecte les résultats.

```
mouse.results
```

```
##                                                model npar     AICc  DeltaAICc
## 1                               pi(~1)p(~1)c()f0(~1)    3 76.57922  0.0000000
## 2                             pi(~1)p(~1)c(~1)f0(~1)    4 76.81340  0.2341782
## 3                         pi(~1)p(~mixture)c()f0(~1)    4 78.29435  1.7151332
## 4                 pi(~1)p(~mixture)c(~mixture)f0(~1)    6 80.12999  3.5507706
## 7                             pi(~1)p(~time)c()f0(~1)    8 80.49687  3.9176471
## 5                  pi(~1)p(~time + mixture)c()f0(~1)    9 82.07774  5.4985248
## 8                       pi(~1)p(~time)c(~time)f0(~1)   13 89.92625 13.3470297
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   15 90.57592 13.9966974
##         weight Deviance
## 1 0.3717066183 46.56039
## 2 0.3306352471 44.62709
## 3 0.1576753694 46.10805
## 4 0.0629738524 43.47185
## 7 0.0524196391 39.17455
## 5 0.0237799430 38.34729
## 8 0.0004698180 36.01595
## 6 0.0003395127 31.22059
```

Les noms des modèles.

```
names(mouse.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

On examine les résultats obtenus selon le meilleur modèle (#1).

```
mouse.results$p.dot$results$real
```

```
##              estimate        se       lcl       ucl fixed note
## pi g1 m1    0.4999972 0.0000000 0.4999972 0.4999972
## p g1 t1 m1  0.3940710 0.0541778 0.2942262 0.5036205
## f0 g1 a0 t1 0.3403624 1.1133838 0.0157383 7.3608013
```

```
mouse.results$p.dot$results$derived
```

```
## $`N Population Size`
##   estimate      lcl     ucl
## 1 17.34036 17.01574 24.3608
```

Analyse avec un effet sexe

Il est un peu dommage de séparer mâles et femelles en deux analyses séparées. En effet, on pourrait vouloir tester un effet sexe sur la probabilité de détection. On reprend l'analyse en considérant le jeu de données dans son entier.

```
mouse <- convert.inp("dat/deer-mouse-sex2G-MF.inp",
                     group.df = data.frame(sex = c("M","F")),
                     covariates = NULL)
head(mouse)
```

```
##         ch freq sex
## 1:1 111111    1   M
## 1:3 110011    1   M
## 1:4 110111    1   M
## 1:5 111111    1   M
## 1:6 110111    1   M
## 1:7 111110    1   M
```

```
tail(mouse)
```

```
##          ch freq sex
## 2:28 001010    1   F
## 2:29 001000    1   F
## 2:30 000100    1   F
## 2:32 000110    1   F
## 2:34 000010    1   F
## 2:38 000001    1   F
```

On passe à la définition des modèles maintenant. On commence par préparer les données. On utilise l'option "groups =”sex"" pour préciser qu'on va considérer des modèles avec l'effet sexe.

```
mouse.proc <- process.data(mouse,
                           begin.time = 1,
                           model = "FullHet",
                           groups = "sex")
mouse.ddl <- make.design.data(mouse.proc)
```

La liste des modèles. Ce sont les mêmes qu'au-dessus, auxquels on a ajouté d'autres modèles avec l'effet sexe.

```
run.mouse <- function() {

  # sans l'effet sexe
  p.dot <- list(formula =  ~ 1, share = TRUE)
```

```
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  # avec l'effet sexe
  p.sex <- list(formula =  ~ sex, share = TRUE)
  p.sex.behav <- list(p = list(formula =  ~ sex),
                      c = list(formula =  ~ sex))
  p.time.sex <- list(formula =  ~ time + sex, share = TRUE)
  p.time.behav.sex <- list(p = list(formula =  ~ sex + time),
                           c = list(formula =  ~ sex + time))
  p.h.sex <- list(formula = ~ mixture + sex, share = TRUE)
  p.h.behav.sex <- list(p = list(formula =  ~ sex + mixture),
                        c = list(formula =  ~ sex + mixture))
  p.h.time.sex <- list(formula = ~ time + mixture + sex, share = TRUE)
  p.h.time.behav.sex <- list(p = list(formula =  ~ sex + mixture + time),
                             c = list(formula =  ~ sex + mixture + time))

  mouse.model.list <- create.model.list("FullHet")

  mouse.results <- mark.wrapper(mouse.model.list,
                                data = mouse.proc,
                                ddl = mouse.ddl)

  return(mouse.results)
}
```

On fait tourner tous ces modèles, et on inspecte le classement.

```
mouse.results <- run.mouse()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=1)
## -2lnL:  157.6728
## AICc :  163.78  (unadjusted=159.69052)
##
## Beta
##                       estimate          se          lcl         ucl
## pi:(Intercept) -2.942618e-04 443.5354800 -869.3298600 869.3292700
## p:(Intercept)   1.053606e-01   0.1326371   -0.1546081   0.3653293
## f0:(Intercept) -2.562462e+01   0.0000000  -25.6246190 -25.6246190
##
```

```
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.4999264
##
## Group:sexM
##
## mixture:1 0.4999264
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3         4         5         6
## mixture:1 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
## mixture:2 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
##
## Group:sexM
##                   1         2         3         4         5         6
## mixture:1 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
## mixture:2 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4         5         6
## mixture:1 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
## mixture:2 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
##
## Group:sexM
##                   2         3         4         5         6
## mixture:1 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
## mixture:2 0.5263158 0.5263158 0.5263158 0.5263158 0.5263158
##
##
## Real Parameter f0
## Group:sexF
##             1
##  7.436517e-12
##
## Group:sexM
##             1
##  7.436517e-12
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=3)
## -2lnL:  147.5555
## AICc :  155.7349  (unadjusted=153.66264)
##
## Beta
##                      estimate           se           lcl          ucl
## pi:(Intercept)  1.495626e-06 2048.0047000 -4014.0894000 4014.0894000
```

```
## p:(Intercept)  -5.331229e-01    0.3104174    -1.1415409    0.0752952
## c:(Intercept)   4.554755e-01    0.1772735     0.1080195    0.8029316
## f0:(Intercept) -3.145559e-01    1.7272224    -3.6999120    3.0708001
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.5000004
##
## Group:sexM
##
## mixture:1 0.5000004
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3         4         5         6
## mixture:1 0.3697888 0.3697888 0.3697888 0.3697888 0.3697888 0.3697888
## mixture:2 0.3697888 0.3697888 0.3697888 0.3697888 0.3697888 0.3697888
##
## Group:sexM
##                   1         2         3         4         5         6
## mixture:1 0.3697888 0.3697888 0.3697888 0.3697888 0.3697888 0.3697888
## mixture:2 0.3697888 0.3697888 0.3697888 0.3697888 0.3697888 0.3697888
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4         5         6
## mixture:1 0.6119403 0.6119403 0.6119403 0.6119403 0.6119403
## mixture:2 0.6119403 0.6119403 0.6119403 0.6119403 0.6119403
##
## Group:sexM
##                   2         3         4         5         6
## mixture:1 0.6119403 0.6119403 0.6119403 0.6119403 0.6119403
## mixture:2 0.6119403 0.6119403 0.6119403 0.6119403 0.6119403
##
##
## Real Parameter f0
## Group:sexF
##         1
##  0.730113
##
## Group:sexM
##         1
##  0.730113
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4
## -2lnL:  142.225
## AICc :  150.4043
```

```
##
## Beta
##                   estimate        se       lcl       ucl
## pi:(Intercept)  0.4152355 0.6397349 -0.838645 1.6691160
## p:(Intercept)  -0.7271250 0.4231258 -1.556452 0.1022015
## p:mixture2      2.0499904 0.3936867  1.278364 2.8216164
## f0:(Intercept) -0.5151981 1.9306821 -4.299335 3.2689390
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.6023426
##
## Group:sexM
##
## mixture:1 0.6023426
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3         4         5         6
## mixture:1 0.3258259 0.3258259 0.3258259 0.3258259 0.3258259 0.3258259
## mixture:2 0.7896580 0.7896580 0.7896580 0.7896580 0.7896580 0.7896580
##
## Group:sexM
##                   1         2         3         4         5         6
## mixture:1 0.3258259 0.3258259 0.3258259 0.3258259 0.3258259 0.3258259
## mixture:2 0.7896580 0.7896580 0.7896580 0.7896580 0.7896580 0.7896580
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4         5         6
## mixture:1 0.3258259 0.3258259 0.3258259 0.3258259 0.3258259
## mixture:2 0.7896580 0.7896580 0.7896580 0.7896580 0.7896580
##
## Group:sexM
##                   2         3         4         5         6
## mixture:1 0.3258259 0.3258259 0.3258259 0.3258259 0.3258259
## mixture:2 0.7896580 0.7896580 0.7896580 0.7896580 0.7896580
##
##
## Real Parameter f0
## Group:sexF
##          1
##  0.5973822
##
## Group:sexM
##          1
##  0.5973822
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
```

```
##
## Npar :  6  (unadjusted=5)
## -2lnL:  136.4229
## AICc :  148.803  (unadjusted=146.69321)
##
## Beta
##                   estimate           se           lcl          ucl
## pi:(Intercept)  1.1917183    0.4726018     0.2654188    2.1180179
## p:(Intercept)  -1.2293207    0.5677747    -2.3421592   -0.1164822
## p:mixture2     19.4632380 3112.1856000 -6080.4207000 6119.3471000
## c:(Intercept)  -0.1304584    0.2667011    -0.6531926    0.3922758
## c:mixture2      1.8012063    0.4932496     0.8344370    2.7679756
## f0:(Intercept)  1.1667420    1.2033275    -1.1917800    3.5252640
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.7670482
##
## Group:sexM
##
## mixture:1 0.7670482
##
##
## Real Parameter p
## Group:sexF
##                    1         2         3         4         5         6
## mixture:1 0.2263003 0.2263003 0.2263003 0.2263003 0.2263003 0.2263003
## mixture:2 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
##
## Group:sexM
##                    1         2         3         4         5         6
## mixture:1 0.2263003 0.2263003 0.2263003 0.2263003 0.2263003 0.2263003
## mixture:2 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
##
##
## Real Parameter c
## Group:sexF
##                    2         3         4         5         6
## mixture:1 0.4674316 0.4674316 0.4674316 0.4674316 0.4674316
## mixture:2 0.8416755 0.8416755 0.8416755 0.8416755 0.8416755
##
## Group:sexM
##                    2         3         4         5         6
## mixture:1 0.4674316 0.4674316 0.4674316 0.4674316 0.4674316
## mixture:2 0.8416755 0.8416755 0.8416755 0.8416755 0.8416755
##
##
## Real Parameter f0
## Group:sexF
##         1
##  3.211513
##
```

```
## Group:sexM
##         1
##  3.211513
##
## Output summary for FullHet model
## Name : pi(~1)p(~sex + mixture)c(~sex + mixture)f0(~1)
##
## Npar :  8
## -2lnL:  132.8003
## AICc :  149.4578
##
## Beta
##                   estimate        se        lcl        ucl
## pi:(Intercept) -0.3408909 1.4377217 -3.1588254  2.4770436
## p:(Intercept)   0.0978083 0.9974962 -1.8572842  2.0529009
## p:sexM          0.6131531 0.7385270 -0.8343599  2.0606660
## p:mixture2     -1.7710078 1.3346326 -4.3868878  0.8448721
## c:(Intercept)   0.4071810 1.0197249 -1.5914798  2.4058418
## c:sexM          1.2375514 0.5228702  0.2127257  2.2623770
## c:mixture2     -1.4345908 0.5668539 -2.5456244 -0.3235571
## f0:(Intercept)  0.9898822 2.1297494 -3.1844267  5.1641910
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.4155931
##
## Group:sexM
##
## mixture:1 0.4155931
##
##
## Real Parameter p
## Group:sexF
##                    1         2         3         4         5         6
## mixture:1 0.5244326 0.5244326 0.5244326 0.5244326 0.5244326 0.5244326
## mixture:2 0.1579981 0.1579981 0.1579981 0.1579981 0.1579981 0.1579981
##
## Group:sexM
##                    1         2         3         4         5         6
## mixture:1 0.6706136 0.6706136 0.6706136 0.6706136 0.6706136 0.6706136
## mixture:2 0.2573006 0.2573006 0.2573006 0.2573006 0.2573006 0.2573006
##
##
## Real Parameter c
## Group:sexF
##                    2         3         4         5         6
## mixture:1 0.6004117 0.6004117 0.6004117 0.6004117 0.6004117
## mixture:2 0.2635866 0.2635866 0.2635866 0.2635866 0.2635866
##
## Group:sexM
##                    2         3         4         5         6
## mixture:1 0.8381778 0.8381778 0.8381778 0.8381778 0.8381778
```

```
## mixture:2 0.5523429 0.5523429 0.5523429 0.5523429 0.5523429
##
##
## Real Parameter f0
## Group:sexF
##         1
##  2.690917
##
## Group:sexM
##         1
##  2.690917
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + sex)c()f0(~1)
##
## Npar :  5
## -2lnL:  136.9887
## AICc :  147.2589
##
## Beta
##                  estimate        se        lcl       ucl
## pi:(Intercept)  0.8595294 0.6488556 -0.4122277 2.1312864
## p:(Intercept)  -0.2402766 0.3895828 -1.0038589 0.5233056
## p:mixture2     -2.6445015 1.5398815 -5.6626693 0.3736662
## p:sexM          1.3318667 0.4291948  0.4906449 2.1730884
## f0:(Intercept)  1.0300690 1.9350710 -2.7626702 4.8228081
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.7025623
##
## Group:sexM
##
## mixture:1 0.7025623
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3         4         5         6
## mixture:1 0.4402182 0.4402182 0.4402182 0.4402182 0.4402182 0.4402182
## mixture:2 0.0529112 0.0529112 0.0529112 0.0529112 0.0529112 0.0529112
##
## Group:sexM
##                   1         2         3         4         5         6
## mixture:1 0.7486810 0.7486810 0.7486810 0.7486810 0.7486810 0.7486810
## mixture:2 0.1746662 0.1746662 0.1746662 0.1746662 0.1746662 0.1746662
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4         5         6
## mixture:1 0.4402182 0.4402182 0.4402182 0.4402182 0.4402182
```

```
## mixture:2 0.0529112 0.0529112 0.0529112 0.0529112 0.0529112
##
## Group:sexM
##                   2         3         4         5         6
## mixture:1 0.7486810 0.7486810 0.7486810 0.7486810 0.7486810
## mixture:2 0.1746662 0.1746662 0.1746662 0.1746662 0.1746662
##
##
## Real Parameter f0
## Group:sexF
##         1
##  2.801259
##
## Group:sexM
##         1
##  2.801259
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  9
## -2lnL:  130.1122
## AICc :  148.9379
##
## Beta
##                   estimate        se        lcl        ucl
## pi:(Intercept) -0.3903999 0.5954133 -1.5574101  0.7766102
## p:(Intercept)   0.7291672 0.5906038 -0.4284162  1.8867506
## p:time2         0.6856496 0.5287545 -0.3507092  1.7220084
## p:time3         0.1412197 0.5316900 -0.9008927  1.1833321
## p:time4         0.5517949 0.5286144 -0.4842893  1.5878791
## p:time5         1.3531221 0.5386834  0.2973026  2.4089415
## p:time6         1.3531220 0.5386833  0.2973027  2.4089414
## p:mixture2     -2.1869349 0.4019846 -2.9748247 -1.3990452
## f0:(Intercept) -0.7217371 2.2059042 -5.0453093  3.6018352
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.403621
##
## Group:sexM
##
## mixture:1 0.403621
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3         4         5         6
## mixture:1 0.6746225 0.8045246 0.7048262 0.7826135 0.8891698 0.8891698
## mixture:2 0.1888090 0.3160211 0.2113932 0.2878246 0.4738624 0.4738624
##
## Group:sexM
```

```
##                    1         2         3         4         5         6
## mixture:1 0.6746225 0.8045246 0.7048262 0.7826135 0.8891698 0.8891698
## mixture:2 0.1888090 0.3160211 0.2113932 0.2878246 0.4738624 0.4738624
##
##
## Real Parameter c
## Group:sexF
##                    2         3         4         5         6
## mixture:1 0.8045246 0.7048262 0.7826135 0.8891698 0.8891698
## mixture:2 0.3160211 0.2113932 0.2878246 0.4738624 0.4738624
##
## Group:sexM
##                    2         3         4         5         6
## mixture:1 0.8045246 0.7048262 0.7826135 0.8891698 0.8891698
## mixture:2 0.3160211 0.2113932 0.2878246 0.4738624 0.4738624
##
##
## Real Parameter f0
## Group:sexF
##          1
##  0.4859075
##
## Group:sexM
##          1
##  0.4859075
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  15  (unadjusted=12)
## -2lnL:  117.1462
## AICc :  149.4104  (unadjusted=142.59738)
##
## Beta
##                     estimate           se           lcl          ucl
## pi:(Intercept)     0.5724612    0.3633270    -0.1396597    1.2845821
## p:(Intercept)     -2.8773093    1.2787124    -5.3835857   -0.3710329
## p:mixture2        21.9457580 4930.2598000 -9641.3636000 9685.2552000
## p:time2            2.2487007    1.3515813    -0.4003988    4.8978002
## p:time3            2.4718441    1.3830702    -0.2389734    5.1826617
## p:time4            2.1841617    1.4612002    -0.6797907    5.0481140
## p:time5            2.8773090    1.5171596    -0.0963238    5.8509419
## p:time6           37.9211310    0.0000000    37.9211310   37.9211310
## c:(Intercept)     -0.3391254    0.8083501    -1.9234916    1.2452408
## c:mixture2         1.9698550    0.4916155     1.0062885    2.9334215
## c:time3           -1.1887883    0.8298535    -2.8153012    0.4377247
## c:time4           -0.3216318    0.8302093    -1.9488422    1.3055785
## c:time5            0.4774505    0.8549640    -1.1982789    2.1531798
## c:time6            0.2405300    0.8399635    -1.4057984    1.8868585
## f0:(Intercept) -50.9761220    0.0000000   -50.9761220  -50.9761220
##
##
## Real Parameter pi
## Group:sexF
```

```
##
## mixture:1 0.6393309
##
## Group:sexM
##
## mixture:1 0.6393309
##
##
## Real Parameter p
## Group:sexF
##                   1         2   3         4         5 6
## mixture:1 0.0532867 0.3478261 0.4 0.3333332 0.4999999 1
## mixture:2 1.0000000 1.0000000 1.0 1.0000000 1.0000000 1
##
## Group:sexM
##                   1         2   3         4         5 6
## mixture:1 0.0532867 0.3478261 0.4 0.3333332 0.4999999 1
## mixture:2 1.0000000 1.0000000 1.0 1.0000000 1.0000000 1
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4         5         6
## mixture:1 0.4160219 0.1782991 0.3405695 0.5345262 0.4753711
## mixture:2 0.8362696 0.6087215 0.7873621 0.8916957 0.8666040
##
## Group:sexM
##                   2         3         4         5         6
## mixture:1 0.4160219 0.1782991 0.3405695 0.5345262 0.4753711
## mixture:2 0.8362696 0.6087215 0.7873621 0.8916957 0.8666040
##
##
## Real Parameter f0
## Group:sexF
##             1
##  7.266936e-23
##
## Group:sexM
##             1
##  7.266936e-23
##
## Output summary for FullHet model
## Name : pi(~1)p(~sex + mixture + time)c(~sex + mixture + time)f0(~1)
##
## Npar :  17  (unadjusted=12)
## -2lnL:  108.3403
## AICc :  145.2546  (unadjusted=133.7915)
##
## Beta
##                   estimate           se           lcl           ucl
## pi:(Intercept)   1.6739851 4.448796e-01  8.020210e-01     2.5459491
## p:(Intercept)   -0.9923103 5.125915e-01 -1.996990e+00     0.0123692
## p:sexM           1.5838920 6.015673e-01  4.048200e-01     2.7629639
## p:mixture2     -54.5325350 2.741290e+02 -5.918254e+02   482.7603700
```

```
## p:time2          0.4213451 6.686066e-01 -8.891239e-01     1.7318142
## p:time3          1.5591449 8.712048e-01 -1.484165e-01     3.2667064
## p:time4         18.0428990 6.738151e+03 -1.318873e+04 13224.8200000
## p:time5         54.4444540 2.741290e+02 -4.828485e+02   591.7373600
## p:time6        115.5772800 0.000000e+00  1.155773e+02   115.5772800
## c:(Intercept)    0.3482995 7.244629e-01 -1.071648e+00     1.7682468
## c:sexM           1.4135540 4.097317e-01  6.104798e-01     2.2166281
## c:mixture2     -20.2610750 9.390677e+03 -1.842599e+04 18385.4660000
## c:time3         -1.6391837 8.023387e-01 -3.211768e+00    -0.0665998
## c:time4         -0.8999684 7.808499e-01 -2.430434e+00     0.6304975
## c:time5         -0.2173971 7.891889e-01 -1.764207e+00     1.3294131
## c:time6         -0.2174081 7.891885e-01 -1.764217e+00     1.3294013
## f0:(Intercept) -32.3112060 3.001339e+04 -5.885856e+04 58793.9400000
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.8421064
##
## Group:sexM
##
## mixture:1 0.8421064
##
##
## Real Parameter p
## Group:sexF
##                      1            2            3            4        5 6
## mixture:1 2.70456e-01 3.610142e-01 6.380325e-01 1.000000e+00 1.000000 1
## mixture:2 7.68893e-25 1.171801e-24 3.655897e-24 5.269837e-17 0.253432 1
##
## Group:sexM
##                       1            2            3           4         5 6
## mixture:1 6.437280e-01 7.335925e-01 8.957367e-01 1.00000e+00 1.0000000 1
## mixture:2 3.747498e-24 5.711226e-24 1.781843e-23 2.56846e-16 0.6232816 1
##
##
## Real Parameter c
## Group:sexF
##                       2            3            4            5            6
## mixture:1 5.862052e-01 2.157032e-01 3.654773e-01 5.326790e-01 5.326762e-01
## mixture:2 2.249011e-09 4.366196e-10 9.144087e-10 1.809578e-09 1.809558e-09
##
## Group:sexM
##                       2            3            4            5            6
## mixture:1 8.534416e-01 5.306290e-01 7.030544e-01 8.241116e-01 8.241100e-01
## mixture:2 9.244647e-09 1.794741e-09 3.758712e-09 7.438339e-09 7.438257e-09
##
##
## Real Parameter f0
## Group:sexF
##             1
##  9.277302e-15
##
```

```
## Group:sexM
##             1
##  9.277302e-15
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture + sex)c()f0(~1)
##
## Npar :  10
## -2lnL:  125.3031
## AICc :  146.3169
##
## Beta
##                   estimate        se        lcl       ucl
## pi:(Intercept)  0.8562572 0.6675078 -0.4520581 2.1645725
## p:(Intercept)  -0.8381402 0.6738151 -2.1588179 0.4825374
## p:time2         0.6470860 0.5129321 -0.3582609 1.6524329
## p:time3         0.1318703 0.5137405 -0.8750612 1.1388017
## p:time4         0.5190746 0.5121577 -0.4847545 1.5229036
## p:time5         1.3006933 0.5277912  0.2662225 2.3351640
## p:time6         1.3006934 0.5277912  0.2662225 2.3351642
## p:mixture2     -2.5544265 1.9136223 -6.3051262 1.1962732
## p:sexM          1.3736222 0.5177322  0.3588671 2.3883772
## f0:(Intercept)  0.7154277 2.5701253 -4.3220180 5.7528734
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.7018781
##
## Group:sexM
##
## mixture:1 0.7018781
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3         4         5         6
## mixture:1 0.3019266 0.4523812 0.3304236 0.4209035 0.6136196 0.6136197
## mixture:2 0.0325286 0.0603424 0.0369444 0.0534796 0.1098892 0.1098892
##
## Group:sexM
##                   1         2         3         4         5         6
## mixture:1 0.6307608 0.7654092 0.6609100 0.7416489 0.8624957 0.8624957
## mixture:2 0.1172282 0.2023197 0.1315784 0.1824449 0.3277782 0.3277782
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4         5         6
## mixture:1 0.4523812 0.3304236 0.4209035 0.6136196 0.6136197
## mixture:2 0.0603424 0.0369444 0.0534796 0.1098892 0.1098892
##
## Group:sexM
```

```
##                    2         3         4         5         6
## mixture:1 0.7654092 0.6609100 0.7416489 0.8624957 0.8624957
## mixture:2 0.2023197 0.1315784 0.1824449 0.3277782 0.3277782
##
##
## Real Parameter f0
## Group:sexF
##         1
##  2.045061
##
## Group:sexM
##         1
##  2.045061
##
## Output summary for FullHet model
## Name : pi(~1)p(~sex)c()f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  146.1409
## AICc :  154.3203  (unadjusted=150.19425)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept) -1.217604e-04  458.0024800 -8.976850e+02   897.6847600
## p:(Intercept)  -3.973018e-01    0.2019497 -7.931232e-01    -0.0014804
## p:sexM          9.166021e-01    0.2733468  3.808423e-01     1.4523619
## f0:(Intercept) -1.902688e+01 6653.5195000 -1.305992e+04 13021.8720000
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.4999696
##
## Group:sexM
##
## mixture:1 0.4999696
##
##
## Real Parameter p
## Group:sexF
##                    1         2         3         4         5         6
## mixture:1 0.4019608 0.4019608 0.4019608 0.4019608 0.4019608 0.4019608
## mixture:2 0.4019608 0.4019608 0.4019608 0.4019608 0.4019608 0.4019608
##
## Group:sexM
##                    1         2         3         4         5         6
## mixture:1 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841
## mixture:2 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841
##
##
## Real Parameter c
## Group:sexF
##                    2         3         4         5         6
```

```
## mixture:1 0.4019608 0.4019608 0.4019608 0.4019608 0.4019608
## mixture:2 0.4019608 0.4019608 0.4019608 0.4019608 0.4019608
##
## Group:sexM
##                   2         3         4         5         6
## mixture:1 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841
## mixture:2 0.6269841 0.6269841 0.6269841 0.6269841 0.6269841
##
##
## Real Parameter f0
## Group:sexF
##             1
##  5.454203e-09
##
## Group:sexM
##             1
##  5.454203e-09
##
## Output summary for FullHet model
## Name : pi(~1)p(~sex)c(~sex)f0(~1)
##
## Npar :  6  (unadjusted=5)
## -2lnL:  135.9211
## AICc :  148.3012  (unadjusted=146.19141)
##
## Beta
##                      estimate        se           lcl           ucl
## pi:(Intercept)  3.899414e-06 0.0000000  3.899414e-06  3.899414e-06
## p:(Intercept)  -7.198824e-01 0.3614788 -1.428381e+00 -1.138390e-02
## p:sexM          3.998282e-01 0.4141434 -4.118928e-01  1.211549e+00
## c:(Intercept)  -2.231436e-01 0.2738613 -7.599117e-01  3.136246e-01
## c:sexM          1.192544e+00 0.3710740  4.652391e-01  1.919849e+00
## f0:(Intercept) -4.253489e-01 1.8511642 -4.053631e+00  3.202933e+00
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.500001
##
## Group:sexM
##
## mixture:1 0.500001
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3         4         5         6
## mixture:1 0.3274189 0.3274189 0.3274189 0.3274189 0.3274189 0.3274189
## mixture:2 0.3274189 0.3274189 0.3274189 0.3274189 0.3274189 0.3274189
##
## Group:sexM
##                   1         2         3         4         5         6
## mixture:1 0.4206626 0.4206626 0.4206626 0.4206626 0.4206626 0.4206626
```

```
## mixture:2 0.4206626 0.4206626 0.4206626 0.4206626 0.4206626 0.4206626
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4         5         6
## mixture:1 0.4444444 0.4444444 0.4444444 0.4444444 0.4444444
## mixture:2 0.4444444 0.4444444 0.4444444 0.4444444 0.4444444
##
## Group:sexM
##               2     3     4     5     6
## mixture:1 0.725 0.725 0.725 0.725 0.725
## mixture:2 0.725 0.725 0.725 0.725 0.725
##
##
## Real Parameter f0
## Group:sexF
##          1
##  0.6535418
##
## Group:sexM
##          1
##  0.6535418
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  8  (unadjusted=6)
## -2lnL:  147.8409
## AICc :  164.4985  (unadjusted=160.22102)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept) -1.330655e-05    0.0000000 -1.330655e-05 -1.330655e-05
## p:(Intercept)  -4.274438e-01    0.3318806 -1.077930e+00  2.230422e-01
## p:time2         5.328043e-01    0.4644354 -3.774890e-01  1.443098e+00
## p:time3         1.089901e-01    0.4670109 -8.063512e-01  1.024331e+00
## p:time4         4.274438e-01    0.4641205 -4.822324e-01  1.337120e+00
## p:time5         1.081370e+00    0.4765163  1.473982e-01  2.015342e+00
## p:time6         1.081370e+00    0.4765163  1.473983e-01  2.015342e+00
## f0:(Intercept) -2.165329e+01 9536.5795000 -1.871335e+04  1.867004e+04
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.4999967
##
## Group:sexM
##
## mixture:1 0.4999967
##
##
## Real Parameter p
```

```
## Group:sexF
##                    1         2         3   4         5         6
## mixture:1 0.3947369 0.5263158 0.4210526 0.5 0.6578947 0.6578947
## mixture:2 0.3947369 0.5263158 0.4210526 0.5 0.6578947 0.6578947
##
## Group:sexM
##                    1         2         3   4         5         6
## mixture:1 0.3947369 0.5263158 0.4210526 0.5 0.6578947 0.6578947
## mixture:2 0.3947369 0.5263158 0.4210526 0.5 0.6578947 0.6578947
##
##
## Real Parameter c
## Group:sexF
##                    2         3   4         5         6
## mixture:1 0.5263158 0.4210526 0.5 0.6578947 0.6578947
## mixture:2 0.5263158 0.4210526 0.5 0.6578947 0.6578947
##
## Group:sexM
##                    2         3   4         5         6
## mixture:1 0.5263158 0.4210526 0.5 0.6578947 0.6578947
## mixture:2 0.5263158 0.4210526 0.5 0.6578947 0.6578947
##
##
## Real Parameter f0
## Group:sexF
##             1
##  3.945453e-10
##
## Group:sexM
##             1
##  3.945453e-10
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  13  (unadjusted=10)
## -2lnL:  135.2228
## AICc :  162.9238  (unadjusted=156.23664)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept) -5.996697e-04    0.0000000 -5.996697e-04 -5.996697e-04
## p:(Intercept)  -4.274439e-01    0.3318811 -1.077931e+00  2.230430e-01
## p:time2        -2.011649e-01    0.5493741 -1.277938e+00  8.756083e-01
## p:time3         2.197850e-02    0.6228352 -1.198778e+00  1.242736e+00
## p:time4        -2.657033e-01    0.7811185 -1.796696e+00  1.265289e+00
## p:time5         4.274434e-01    0.8813690 -1.300040e+00  2.154927e+00
## p:time6         2.630830e+01 9519.9627000 -1.863282e+04  1.868544e+04
## c:(Intercept)   1.386294e+00    0.6454977  1.211183e-01  2.651470e+00
## c:time3        -1.648658e+00    0.7704482 -3.158737e+00 -1.385795e-01
## c:time4        -1.178654e+00    0.7457147 -2.640255e+00  2.829464e-01
## c:time5        -5.978365e-01    0.7497479 -2.067343e+00  8.716695e-01
## c:time6        -8.602006e-01    0.7341970 -2.299227e+00  5.788255e-01
## f0:(Intercept) -2.448091e+01    0.0000000 -2.448091e+01 -2.448091e+01
```

```
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.4998501
##
## Group:sexM
##
## mixture:1 0.4998501
##
##
## Real Parameter p
## Group:sexF
##                   1         2   3         4         5 6
## mixture:1 0.3947369 0.3478261 0.4 0.3333333 0.4999999 1
## mixture:2 0.3947369 0.3478261 0.4 0.3333333 0.4999999 1
##
## Group:sexM
##                   1         2   3         4         5 6
## mixture:1 0.3947369 0.3478261 0.4 0.3333333 0.4999999 1
## mixture:2 0.3947369 0.3478261 0.4 0.3333333 0.4999999 1
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4      5         6
## mixture:1 0.7999999 0.4347826 0.5517241 0.6875 0.6285715
## mixture:2 0.7999999 0.4347826 0.5517241 0.6875 0.6285715
##
## Group:sexM
##                   2         3         4      5         6
## mixture:1 0.7999999 0.4347826 0.5517241 0.6875 0.6285715
## mixture:2 0.7999999 0.4347826 0.5517241 0.6875 0.6285715
##
##
## Real Parameter f0
## Group:sexF
##             1
##  2.333859e-11
##
## Group:sexM
##             1
##  2.333859e-11
##
## Output summary for FullHet model
## Name : pi(~1)p(~sex + time)c(~sex + time)f0(~1)
##
## Npar :  15  (unadjusted=12)
## -2lnL:  123.0009
## AICc :  155.2651  (unadjusted=148.45211)
##
## Beta
##                     estimate           se           lcl           ucl
```

```
## pi:(Intercept)  1.399543e-04 0.000000e+00  1.399543e-04  1.399543e-04
## p:(Intercept)  -6.382103e-01 4.191036e-01 -1.459653e+00  1.832328e-01
## p:sexM          3.745848e-01 4.435510e-01 -4.947752e-01  1.243945e+00
## p:time2        -1.419028e-01 5.558625e-01 -1.231393e+00  9.475877e-01
## p:time3         1.050512e-01 6.332037e-01 -1.136028e+00  1.346130e+00
## p:time4        -2.689025e-01 7.841468e-01 -1.805830e+00  1.268025e+00
## p:time5         3.881631e-01 8.858552e-01 -1.348113e+00  2.124439e+00
## p:time6         2.212799e+01 0.000000e+00  2.212799e+01  2.212799e+01
## c:(Intercept)   4.237544e-01 7.181426e-01 -9.838051e-01  1.831314e+00
## c:sexM          1.302281e+00 3.949167e-01  5.282439e-01  2.076318e+00
## c:time3        -1.629313e+00 7.970582e-01 -3.191547e+00 -6.707920e-02
## c:time4        -9.168675e-01 7.755348e-01 -2.436916e+00  6.031807e-01
## c:time5        -2.480116e-01 7.834287e-01 -1.783532e+00  1.287509e+00
## c:time6        -5.521778e-01 7.652609e-01 -2.052089e+00  9.477337e-01
## f0:(Intercept) -2.365315e+01 1.040015e+04 -2.040794e+04  2.036063e+04
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.500035
##
## Group:sexM
##
## mixture:1 0.500035
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3        4         5 6
## mixture:1 0.3456512 0.3142955 0.3697804 0.287591 0.4378119 1
## mixture:2 0.3456512 0.3142955 0.3697804 0.287591 0.4378119 1
##
## Group:sexM
##                   1         2         3         4         5 6
## mixture:1 0.4344727 0.3999848 0.4604393 0.3699275 0.5310942 1
## mixture:2 0.4344727 0.3999848 0.4604393 0.3699275 0.5310942 1
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4        5         6
## mixture:1 0.6043813 0.2304878 0.3791605 0.543823 0.4679382
## mixture:2 0.6043813 0.2304878 0.3791605 0.543823 0.4679382
##
## Group:sexM
##                   2         3         4         5         6
## mixture:1 0.8489046 0.5241616 0.6919321 0.8142739 0.7638416
## mixture:2 0.8489046 0.5241616 0.6919321 0.8142739 0.7638416
##
##
## Real Parameter f0
## Group:sexF
##             1
```

```
##  5.340302e-11
##
## Group:sexM
##             1
##  5.340302e-11
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + sex)c()f0(~1)
##
## Npar :  9  (unadjusted=7)
## -2lnL:  135.7705
## AICc :  154.5961  (unadjusted=150.27955)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept) -2.066549e-05 2.289782e+03 -4.487973e+03  4487.9727000
## p:(Intercept)  -9.848604e-01 3.813510e-01 -1.732308e+00    -0.2374124
## p:time2         5.630688e-01 4.776015e-01 -3.730301e-01     1.4991677
## p:time3         1.149492e-01 4.796139e-01 -8.250941e-01     1.0549924
## p:time4         4.515726e-01 4.771379e-01 -4.836177e-01     1.3867630
## p:time5         1.142637e+00 4.904565e-01  1.813419e-01     2.1039316
## p:time6         1.142637e+00 4.904566e-01  1.813419e-01     2.1039317
## p:sexM          9.614725e-01 2.811732e-01  4.103731e-01     1.5125720
## f0:(Intercept) -2.397509e+01 4.429635e+04 -8.684482e+04 86796.8680000
##
##
## Real Parameter pi
## Group:sexF
##
## mixture:1 0.4999948
##
## Group:sexM
##
## mixture:1 0.4999948
##
##
## Real Parameter p
## Group:sexF
##                   1         2         3         4         5         6
## mixture:1 0.2719284 0.3960881 0.2952728 0.3697504 0.5393625 0.5393625
## mixture:2 0.2719284 0.3960881 0.2952728 0.3697504 0.5393625 0.5393625
##
## Group:sexM
##                   1         2         3         4         5         6
## mixture:1 0.4941533 0.6317382 0.5228743 0.6054401 0.7538494 0.7538494
## mixture:2 0.4941533 0.6317382 0.5228743 0.6054401 0.7538494 0.7538494
##
##
## Real Parameter c
## Group:sexF
##                   2         3         4         5         6
## mixture:1 0.3960881 0.2952728 0.3697504 0.5393625 0.5393625
## mixture:2 0.3960881 0.2952728 0.3697504 0.5393625 0.5393625
##
```

```
## Group:sexM
##                   2         3         4         5         6
## mixture:1 0.6317382 0.5228743 0.6054401 0.7538494 0.7538494
## mixture:2 0.6317382 0.5228743 0.6054401 0.7538494 0.7538494
##
##
## Real Parameter f0
## Group:sexF
##             1
##  3.870368e-11
##
## Group:sexM
##             1
##  3.870368e-11
```

```
mouse.results
```

```
##                                                                 model npar     AICc
## 9  pi(~1)p(~sex + mixture + time)c(~sex + mixture + time)f0(~1)   17 145.2546
## 10                      pi(~1)p(~time + mixture + sex)c()f0(~1)   10 146.3169
## 6                              pi(~1)p(~mixture + sex)c()f0(~1)    5 147.2589
## 12                                   pi(~1)p(~sex)c(~sex)f0(~1)    6 148.3012
## 4                             pi(~1)p(~mixture)c(~mixture)f0(~1)    6 148.8030
## 7                              pi(~1)p(~time + mixture)c()f0(~1)    9 148.9379
## 8               pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   15 149.4104
## 5                 pi(~1)p(~sex + mixture)c(~sex + mixture)f0(~1)    8 149.4578
## 3                                    pi(~1)p(~mixture)c()f0(~1)    4 150.4044
## 11                                       pi(~1)p(~sex)c()f0(~1)    4 154.3203
## 16                                 pi(~1)p(~time + sex)c()f0(~1)    9 154.5961
## 15                      pi(~1)p(~sex + time)c(~sex + time)f0(~1)   15 155.2651
## 2                                        pi(~1)p(~1)c(~1)f0(~1)    4 155.7349
## 14                                 pi(~1)p(~time)c(~time)f0(~1)   13 162.9238
## 1                                          pi(~1)p(~1)c()f0(~1)    3 163.7800
## 13                                     pi(~1)p(~time)c()f0(~1)    8 164.4985
##    DeltaAICc       weight  Deviance
## 9   0.000000 3.499891e-01  75.18263
## 10  1.062299 2.057686e-01  92.14539
## 6   2.004305 1.284770e-01 103.83095
## 12  3.046605 7.629440e-02 102.76344
## 4   3.548405 5.936469e-02 103.26524
## 7   3.683282 5.549322e-02  96.95452
## 8   4.155735 4.381755e-02  83.98851
## 5   4.203169 4.279057e-02  99.64255
## 3   5.149726 2.665665e-02 109.06727
## 11  9.065656 3.762463e-03 112.98321
## 16  9.341522 3.277696e-03 102.61275
## 15 10.010465 2.345901e-03  89.84324
## 2  10.480246 1.854803e-03 114.39780
## 14 17.669129 5.096264e-05 102.06511
## 1  18.525337 3.321457e-05 124.51511
## 13 19.243839 2.319039e-05 114.68322
```

Les noms des modèles.

```
names(mouse.results)
```

```
##  [1] "p.dot"              "p.dot.behav"        "p.h"
##  [4] "p.h.behav"          "p.h.behav.sex"      "p.h.sex"
##  [7] "p.h.time"           "p.h.time.behav"     "p.h.time.behav.sex"
## [10] "p.h.time.sex"       "p.sex"              "p.sex.behav"
## [13] "p.time"             "p.time.behav"       "p.time.behav.sex"
## [16] "p.time.sex"         "model.table"
```

On examine le meilleur modèle selon l'AIC (#9).

```
mouse.results$p.h.time.behav.sex$results$real
```

```
##                 estimate           se            lcl          ucl fixed note
## pi gF m1    8.421064e-01 5.915260e-02   6.904066e-01 9.273009e-01
## p gF t1 m1  2.704560e-01 1.011392e-01   1.195193e-01 5.030922e-01
## p gF t2 m1  3.610142e-01 1.245751e-01   1.639099e-01 6.195147e-01
## p gF t3 m1  6.380325e-01 1.659037e-01   3.012914e-01 8.781284e-01
## p gF t4 m1  1.000000e+00 2.651944e-04  1.413386e-301 1.000000e+00
## p gF t5 m1  1.000000e+00 0.000000e+00   1.000000e+00 1.000000e+00
## p gF t6 m1  1.000000e+00 0.000000e+00   1.000000e+00 1.000000e+00
## p gF t1 m2  7.688930e-25 2.107761e-22  -4.123523e-22 4.138901e-22
## p gF t2 m2  1.171801e-24 3.212253e-22  -6.284297e-22 6.307733e-22
## p gF t3 m2  3.655897e-24 1.002191e-21  -1.960638e-21 1.967950e-21
## p gF t4 m2  5.269837e-17 3.553933e-13  -6.965182e-13 6.966236e-13
## p gF t5 m2  2.534320e-01 1.837152e-01   4.817550e-02 6.948193e-01
## p gF t6 m2  1.000000e+00 0.000000e+00   1.000000e+00 1.000000e+00
## p gM t1 m1  6.437280e-01 1.058943e-01   4.222827e-01 8.170628e-01
## p gM t2 m1  7.335925e-01 1.332229e-01   4.199067e-01 9.128555e-01
## p gM t3 m1  8.957367e-01 8.575360e-02   5.868703e-01 9.811167e-01
## p gM t4 m1  1.000000e+00 5.441126e-05   9.998933e-01 1.000107e+00
## p gM t5 m1  1.000000e+00 0.000000e+00   1.000000e+00 1.000000e+00
## p gM t6 m1  1.000000e+00 0.000000e+00   1.000000e+00 1.000000e+00
## p gM t1 m2  3.747498e-24 1.027298e-21  -2.009757e-21 2.017252e-21
## p gM t2 m2  5.711226e-24 1.565617e-21  -3.062899e-21 3.074321e-21
## p gM t3 m2  1.781843e-23 4.884575e-21  -9.555949e-21 9.591586e-21
## p gM t4 m2  2.568460e-16 1.732147e-12  -3.394752e-12 3.395265e-12
## p gM t5 m2  6.232816e-01 2.085373e-01   2.249135e-01 9.041542e-01
## p gM t6 m2  1.000000e+00 0.000000e+00   1.000000e+00 1.000000e+00
## c gF t2 m1  5.862052e-01 1.757320e-01   2.550898e-01 8.542395e-01
## c gF t3 m1  2.157032e-01 9.160870e-02   8.688890e-02 4.428653e-01
## c gF t4 m1  3.654773e-01 1.046745e-01   1.921104e-01 5.824934e-01
## c gF t5 m1  5.326790e-01 1.078980e-01   3.276911e-01 7.271978e-01
## c gF t6 m1  5.326762e-01 1.078979e-01   3.276888e-01 7.271954e-01
## c gF t2 m2  2.249011e-09 2.111974e-05  -4.139244e-05 4.139694e-05
## c gF t3 m2  4.366196e-10 4.100153e-06  -8.035864e-06 8.036737e-06
## c gF t4 m2  9.144087e-10 8.586917e-06  -1.682944e-05 1.683127e-05
## c gF t5 m2  1.809578e-09 1.699316e-05  -3.330479e-05 3.330841e-05
## c gF t6 m2  1.809558e-09 1.699297e-05  -3.330442e-05 3.330804e-05
## c gM t2 m1  8.534416e-01 8.543910e-02   6.042044e-01 9.569213e-01
## c gM t3 m1  5.306290e-01 1.120124e-01   3.189035e-01 7.318748e-01
## c gM t4 m1  7.030544e-01 9.222180e-02   4.990181e-01 8.491177e-01
```

```
## c gM t5 m1  8.241116e-01 6.833760e-02   6.503122e-01 9.219039e-01
## c gM t6 m1  8.241100e-01 6.833800e-02   6.503101e-01 9.219030e-01
## c gM t2 m2  9.244647e-09 8.681349e-05  -1.701452e-04 1.701637e-04
## c gM t3 m2  1.794741e-09 1.685384e-05  -3.303173e-05 3.303532e-05
## c gM t4 m2  3.758712e-09 3.529685e-05  -6.917807e-05 6.918558e-05
## c gM t5 m2  7.438339e-09 6.985104e-05  -1.369006e-04 1.369155e-04
## c gM t6 m2  7.438257e-09 6.985027e-05  -1.368991e-04 1.369140e-04
## f0 gF a0 t1 9.277302e-15 2.784433e-10   1.265380e-18 6.801779e-11
```

```
mouse.results$p.h.time.behav.sex$results$derived
```

```
## $`N Population Size`
##   estimate lcl ucl
## 1       17  17  17
## 2       21  21  21
```

Et un autre modèle, le modèle #2 classé 13ème.

```
mouse.results$p.dot.behav$results$real
```

```
##              estimate          se           lcl       ucl fixed note
## pi gF m1    0.5000004 512.0011900 5.562693e-309 1.0000000
## p gF t1 m1  0.3697888   0.0723412  2.420376e-01 0.5188149
## c gF t2 m1  0.6119403   0.0420970  5.269786e-01 0.6906012
## f0 gF a0 t1 0.7301130   1.2610676  7.289070e-02 7.3132101
```

```
mouse.results$p.dot.behav$results$derived
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 17.73011 17.07289 24.31321
## 2 21.73011 21.07289 28.31321
```

Exercice 2 : cigognes

Les données.

```
cigogne <- convert.inp("dat/cigognes-2002-3G.inp",
                   group.df = data.frame(bagues = c("metal","couleur", "darvic")),
                   covariates = NULL)
head(cigogne)
```

```
##                 ch freq bagues
## 1:1 00000000000010    1  metal
## 1:2 00000000000110    1  metal
## 1:3 00000000000100    1  metal
## 1:4 00000000000110    1  metal
## 1:8 00000000000100    1  metal
## 1:9 00000010101000    1  metal
```

```
tail(cigogne)
```

```
##                   ch freq bagues
## 3:36 00000000100010    1 darvic
## 3:38 00000000001011    1 darvic
## 3:42 00000101101111    1 darvic
## 3:43 00000000000101    1 darvic
## 3:45 01000000010111    1 darvic
## 3:46 11100001000101    1 darvic
```

On formate les données.

```
cigogne_secr <- unRMarkInput(cigogne) # on convertit au bon format
```

On fait les tests de fermeture.

```
closure.test(cigogne_secr, SB = TRUE)
```

```
## $Otis
##  statistic          p
##  -1.374711 0.08461054
##
## $Xc
##  statistic df        p
##    8.07373 16 0.946641
##
## $NRvsJS
##  statistic df         p
##   3.475137  4 0.4816688
##
## $NMvsJS
##  statistic df        p
##  0.3244725  3 0.955362
##
## $MtvsNR
##  statistic df         p
##   4.598593 12 0.9700621
##
## $MtvsNM
##  statistic df         p
##   7.749257 13 0.8595432
##
## $compNRvsJS
##    Occasion  Chisquare df         p
## 1         2         NA NA        NA
## 2         3         NA NA        NA
## 3         4         NA NA        NA
## 4         5         NA NA        NA
## 5         6         NA NA        NA
## 6         7         NA NA        NA
## 7         8         NA NA        NA
## 8         9 2.26149907  1 0.1326256
```

```
## 9        10         NA NA        NA
## 10       11 0.01238597  1 0.9113846
## 11       12 0.86498856  1 0.3523464
## 12       13 0.33626374  1 0.5619938
##
## $compNMvsJS
##    Occasion   Chisquare df         p
## 1         2          NA NA        NA
## 2         3          NA NA        NA
## 3         4          NA NA        NA
## 4         5          NA NA        NA
## 5         6          NA NA        NA
## 6         7          NA NA        NA
## 7         8          NA NA        NA
## 8         9          NA NA        NA
## 9        10          NA NA        NA
## 10       11 0.273944805  1 0.6006978
## 11       12 0.001124195  1 0.9732527
## 12       13 0.049403509  1 0.8241045
```

Les modèles maintenant. On sépare selon le type de bagues.

Couleur d'abord.

```
cigogne_bague <- cigogne[cigogne$bagues=="couleur",]
cigogne.proc <- process.data(cigogne_bague, begin.time = 1, model = "FullHet")
cigogne.ddl <- make.design.data(cigogne.proc)
```

Liste des modèles (pas d'effet comportement).

```
run.cigogne <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  cigogne.model.list <- create.model.list("FullHet")
  cigogne.results <- mark.wrapper(cigogne.model.list,
                                  data = cigogne.proc,
                                  ddl = cigogne.ddl)
  return(cigogne.results)
}
```

On fait tourner.

```
cigogne.results <- run.cigogne()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=2)
## -2lnL:  75.81818
```

```
## AICc :  81.99465  (unadjusted=79.90577)
##
## Beta
##                      estimate        se           lcl           ucl
## pi:(Intercept) -3.430510e-07 0.0000000 -3.430510e-07 -3.430510e-07
## p:(Intercept)  -2.129388e+00 0.3383854 -2.792624e+00 -1.466153e+00
## f0:(Intercept)  7.410863e-01 1.1789782 -1.569711e+00  3.051884e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999999
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731
## mixture:2 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731
##                   8         9        10        11        12        13        14
## mixture:1 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731
## mixture:2 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731
## mixture:2 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731
##                   9        10        11        12        13        14
## mixture:1 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731
## mixture:2 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731 0.1062731
##
##
## Real Parameter f0
##
##         1
##  2.098214
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  75.81818
## AICc :  84.11447  (unadjusted=79.90577)
##
## Beta
##                     estimate           se           lcl          ucl
## pi:(Intercept) -13.8349490 21484.092000 -42122.655000 42094.986000
## p:(Intercept)   -2.1189434   578.458510  -1135.897600  1131.659800
## p:mixture2      -0.0104560   578.458990  -1133.790100  1133.769200
## f0:(Intercept)   0.7411009     1.178982     -1.569703     3.051905
##
```

```
##
## Real Parameter pi
##
##
## mixture:1 9.807483e-07
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692
## mixture:2 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720
##                   8         9        10        11        12        13        14
## mixture:1 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692
## mixture:2 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692
## mixture:2 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720
##                   9        10        11        12        13        14
## mixture:1 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692 0.1072692
## mixture:2 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720 0.1062720
##
##
## Real Parameter f0
##
##         1
##  2.098244
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  17  (unadjusted=10)
## -2lnL:  42.22034
## AICc :  81.23674  (unadjusted=63.925771)
##
## Beta
##                     estimate           se           lcl          ucl
## pi:(Intercept) -15.7402830   793.198460  -1570.409300  1538.928700
## p:(Intercept)   -8.0182600  3147.814800  -6177.735300  6161.698800
## p:time2         19.1012950  4621.278900  -9038.605600  9076.808200
## p:time3         -9.9089843 12512.807000 -24535.012000 24515.194000
## p:time4         -9.9090008  9413.556800 -18460.481000 18440.663000
## p:time5         -9.9089915     0.000000     -9.908992    -9.908992
## p:time6         19.1012850  4621.278900  -9038.605600  9076.808200
## p:time7         19.1012960  4621.278900  -9038.605600  9076.808200
## p:time8         19.1012910  4621.278900  -9038.605600  9076.808200
## p:time9         -9.9089628 16845.032000 -33026.171000 33006.353000
## p:time10        19.1012760  4621.279000  -9038.605700  9076.808200
## p:time11        19.1013060  4621.279000  -9038.605600  9076.808200
## p:time12        21.2301070  4621.272500  -9036.464100  9078.924300
```

```
## p:time13        19.1012860  4621.278900  -9038.605600  9076.808200
## p:time14        21.5990520  4621.272400  -9036.095000  9079.293100
## p:mixture2     -13.3729270   588.055130  -1165.961000  1139.215200
## f0:(Intercept)  -0.1348204     1.918917     -3.895898     3.626257
##
##
## Real Parameter pi
##
##
## mixture:1 1.45909e-07
##
##
## Real Parameter p
##
##                       1         2            3            4            5
## mixture:1 3.292842e-04 0.9999846 1.637935e-08 1.637908e-08 1.637923e-08
## mixture:2 5.127736e-10 0.0919636 2.549814e-14 2.549772e-14 2.549795e-14
##                    6         7         8            9        10        11
## mixture:1 0.9999846 0.9999846 0.9999846 1.637970e-08 0.9999846 0.9999846
## mixture:2 0.0919627 0.0919637 0.0919633 2.549869e-14 0.0919620 0.0919645
##                   12        13        14
## mixture:1 0.9999982 0.9999846 0.9999987
## mixture:2 0.4598170 0.0919629 0.5517800
##
##
## Real Parameter c
##
##                    2            3            4            5         6         7
## mixture:1 0.9999846 1.637935e-08 1.637908e-08 1.637923e-08 0.9999846 0.9999846
## mixture:2 0.0919636 2.549814e-14 2.549772e-14 2.549795e-14 0.0919627 0.0919637
##                    8            9        10        11        12        13
## mixture:1 0.9999846 1.637970e-08 0.9999846 0.9999846 0.9999982 0.9999846
## mixture:2 0.0919633 2.549869e-14 0.0919620 0.0919645 0.4598170 0.0919629
##                   14
## mixture:1 0.9999987
## mixture:2 0.5517800
##
##
## Real Parameter f0
##
##          1
##  0.8738729
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  16  (unadjusted=10)
## -2lnL:  42.22034
## AICc :  78.64311  (unadjusted=63.925768)
##
## Beta
##                       estimate          se           lcl           ucl
## pi:(Intercept) -1.692153e-04     0.00000 -1.692153e-04 -1.692153e-04
## p:(Intercept)  -1.875961e+01     0.00000 -1.875961e+01 -1.875961e+01
```

```
## p:time2         1.646975e+01     0.00000  1.646975e+01  1.646975e+01
## p:time3        -1.003111e+01 34980.14000 -6.857111e+04  6.855104e+04
## p:time4        -1.003109e+01 31010.75000 -6.079110e+04  6.077104e+04
## p:time5        -1.003110e+01     0.00000 -1.003110e+01 -1.003110e+01
## p:time6         1.646972e+01     0.00000  1.646972e+01  1.646972e+01
## p:time7         1.646972e+01     0.00000  1.646972e+01  1.646972e+01
## p:time8         1.646972e+01     0.00000  1.646972e+01  1.646972e+01
## p:time9        -1.003108e+01     0.00000 -1.003108e+01 -1.003108e+01
## p:time10        1.646972e+01     0.00000  1.646972e+01  1.646972e+01
## p:time11        1.646972e+01     0.00000  1.646972e+01  1.646972e+01
## p:time12        1.859855e+01     0.00000  1.859855e+01  1.859855e+01
## p:time13        1.646972e+01     0.00000  1.646972e+01  1.646972e+01
## p:time14        1.896749e+01     0.00000  1.896749e+01  1.896749e+01
## f0:(Intercept) -1.349131e-01     1.91908 -3.896310e+00  3.626484e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999577
##
##
## Real Parameter p
##
##                      1         2            3            4            5
## mixture:1 7.125338e-09 0.0919662 3.135807e-13 3.135879e-13 3.135855e-13
## mixture:2 7.125338e-09 0.0919662 3.135807e-13 3.135879e-13 3.135855e-13
##                    6         7         8          9        10        11
## mixture:1 0.0919638 0.0919636 0.0919634 3.1359e-13 0.0919635 0.0919635
## mixture:2 0.0919638 0.0919636 0.0919634 3.1359e-13 0.0919635 0.0919635
##                   12        13        14
## mixture:1 0.4598208 0.0919641 0.5517851
## mixture:2 0.4598208 0.0919641 0.5517851
##
##
## Real Parameter c
##
##                    2            3            4            5         6         7
## mixture:1 0.0919662 3.135807e-13 3.135879e-13 3.135855e-13 0.0919638 0.0919636
## mixture:2 0.0919662 3.135807e-13 3.135879e-13 3.135855e-13 0.0919638 0.0919636
##                    8          9        10        11        12        13
## mixture:1 0.0919634 3.1359e-13 0.0919635 0.0919635 0.4598208 0.0919641
## mixture:2 0.0919634 3.1359e-13 0.0919635 0.0919635 0.4598208 0.0919641
##                   14
## mixture:1 0.5517851
## mixture:2 0.5517851
##
##
## Real Parameter f0
##
##          1
##  0.8737919
```

Le classement des modèles.

```
cigogne.results
```

```
##                                model npar     AICc DeltaAICc     weight Deviance
## 4           pi(~1)p(~time)c()f0(~1)   16 78.64311  0.000000 0.65555966 34.69523
## 3 pi(~1)p(~time + mixture)c()f0(~1)   17 81.23674  2.593632 0.17923059 34.69523
## 1              pi(~1)p(~1)c()f0(~1)    3 81.99465  3.351543 0.12269697 68.29307
## 2        pi(~1)p(~mixture)c()f0(~1)    4 84.11447  5.471369 0.04251278 68.29307
```

Les noms.

```
names(cigogne.results)
```

```
## [1] "p.dot"       "p.h"         "p.h.time"    "p.time"      "model.table"
```

Les résultats selon le meilleur modèle.

```
(pcouleur <- cigogne.results$p.time$results$real)
```

```
##                 estimate           se           lcl          ucl fixed note
## pi g1 m1    4.999577e-01 0.000000e+00  4.999577e-01 4.999577e-01
## p g1 t1 m1  7.125338e-09 0.000000e+00  7.125338e-09 7.125338e-09
## p g1 t2 m1  9.196620e-02 8.877460e-02  1.245060e-02 4.486169e-01
## p g1 t3 m1  3.135807e-13 1.094815e-08 -2.145805e-08 2.145868e-08
## p g1 t4 m1  3.135879e-13 9.500250e-09 -1.862018e-08 1.862080e-08
## p g1 t5 m1  3.135855e-13 0.000000e+00  3.135855e-13 3.135855e-13
## p g1 t6 m1  9.196380e-02 8.877350e-02  1.244990e-02 4.486157e-01
## p g1 t7 m1  9.196360e-02 8.877340e-02  1.244990e-02 4.486156e-01
## p g1 t8 m1  9.196340e-02 8.877330e-02  1.244980e-02 4.486155e-01
## p g1 t9 m1  3.135900e-13 0.000000e+00  3.135900e-13 3.135900e-13
## p g1 t10 m1 9.196350e-02 8.877330e-02  1.244980e-02 4.486155e-01
## p g1 t11 m1 9.196350e-02 8.877340e-02  1.244980e-02 4.486155e-01
## p g1 t12 m1 4.598208e-01 1.669452e-01  1.856660e-01 7.606585e-01
## p g1 t13 m1 9.196410e-02 8.877360e-02  1.245000e-02 4.486158e-01
## p g1 t14 m1 5.517851e-01 1.731617e-01  2.378647e-01 8.292320e-01
## f0 g1 a0 t1 8.737919e-01 1.676877e+00  7.651290e-02 9.978865e+00
```

```
(Ncouleur <- cigogne.results$p.time$results$derived)
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 10.87379 10.07651 19.97887
```

Darvic ensuite.

```
cigogne_bague <- cigogne[cigogne$bagues=="darvic",]
cigogne.proc <- process.data(cigogne_bague, begin.time = 1, model = "FullHet")
cigogne.ddl <- make.design.data(cigogne.proc)
```

On appelle Mark.

```
cigogne.results <- run.cigogne()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=2)
## -2lnL:  144.0227
## AICc :  150.1576  (unadjusted=148.08977)
##
## Beta
##                      estimate           se           lcl           ucl
## pi:(Intercept)  2.544778e-05    0.0000000  2.544778e-05  2.544778e-05
## p:(Intercept)  -1.299283e+00    0.1806489 -1.653355e+00 -9.452111e-01
## f0:(Intercept) -1.602690e+01 7307.1450000 -1.433803e+04  1.430598e+04
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000064
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857
## mixture:2 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857
##                    8         9        10        11        12        13        14
## mixture:1 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857
## mixture:2 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857
## mixture:2 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857
##                    9        10        11        12        13        14
## mixture:1 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857
## mixture:2 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857 0.2142857
##
##
## Real Parameter f0
##
##             1
##  1.095484e-07
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4
## -2lnL:  142.2156
```

```
## AICc :  150.4415
##
## Beta
##                   estimate        se       lcl        ucl
## pi:(Intercept) -1.4323803 1.0430929 -3.476842  0.6120818
## p:(Intercept)  -0.3699149 0.4896269 -1.329584  0.5897539
## p:mixture2     -1.2980384 0.5502856 -2.376598 -0.2194786
## f0:(Intercept) -0.7611865 2.8777711 -6.401618  4.8792448
##
##
## Real Parameter pi
##
##
## mixture:1 0.1927281
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616
## mixture:2 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973
##                    8         9        10        11        12        13        14
## mixture:1 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616
## mixture:2 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616
## mixture:2 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973
##                    9        10        11        12        13        14
## mixture:1 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616 0.4085616
## mixture:2 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973 0.1586973
##
##
## Real Parameter f0
##
##          1
##  0.4671119
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  17  (unadjusted=15)
## -2lnL:  91.16379
## AICc :  128.8955  (unadjusted=124.05535)
##
## Beta
##                      estimate           se           lcl           ucl
## pi:(Intercept) -1.296273e+00     0.770368 -2.806195e+00     0.2136479
## p:(Intercept)  -1.231717e+00     1.133739 -3.453845e+00     0.9904117
## p:time2         8.801768e-01     1.370184 -1.805383e+00     3.5657367
## p:time3        -3.667040e-06     1.539390 -3.017209e+00     3.0172015
```

```
## p:time4        -1.999274e+01 10748.291000 -2.108664e+04 21046.6580000
## p:time5        -1.999261e+01 10748.221000 -2.108651e+04 21046.5200000
## p:time6         8.801766e-01     1.370183 -1.805383e+00     3.5657362
## p:time7         8.801772e-01     1.370183 -1.805381e+00     3.5657356
## p:time8         1.473597e+00     1.312096 -1.098111e+00     4.0453047
## p:time9         8.801771e-01     1.370183 -1.805382e+00     3.5657367
## p:time10       -3.188884e-06     1.539392 -3.017211e+00     3.0172046
## p:time11        8.801771e-01     1.370183 -1.805382e+00     3.5657367
## p:time12        3.431836e+00     1.276384  9.301225e-01     5.9335487
## p:time13        2.726648e+00     1.267437  2.424710e-01     5.2108241
## p:time14        3.802116e+00     1.293823  1.266222e+00     6.3380088
## p:mixture2     -2.057455e+00     0.594639 -3.222948e+00    -0.8919629
## f0:(Intercept) -3.480700e+00    31.893072 -6.599112e+01    59.0297220
##
##
## Real Parameter pi
##
##
## mixture:1 0.2147929
##
##
## Real Parameter p
##
##                    1         2         3            4            5         6
## mixture:1 0.2258811 0.4130091 0.2258805 6.058069e-10 6.058890e-10 0.4130090
## mixture:2 0.0359445 0.0824893 0.0359444 7.740922e-11 7.741971e-11 0.0824893
##                    7         8         9        10        11        12        13
## mixture:1 0.4130092 0.5601769 0.4130091 0.2258806 0.4130091 0.9002602 0.8168172
## mixture:2 0.0824894 0.1399656 0.0824894 0.0359444 0.0824894 0.5356055 0.3629635
##                   14
## mixture:1 0.9289320
## mixture:2 0.6254962
##
##
## Real Parameter c
##
##                    2         3            4            5         6         7
## mixture:1 0.4130091 0.2258805 6.058069e-10 6.058890e-10 0.4130090 0.4130092
## mixture:2 0.0824893 0.0359444 7.740922e-11 7.741971e-11 0.0824893 0.0824894
##                    8         9        10        11        12        13        14
## mixture:1 0.5601769 0.4130091 0.2258806 0.4130091 0.9002602 0.8168172 0.9289320
## mixture:2 0.1399656 0.0824894 0.0359444 0.0824894 0.5356055 0.3629635 0.6254962
##
##
## Real Parameter f0
##
##          1
##  0.0307859
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  16  (unadjusted=12)
## -2lnL:  97.2221
```

```
## AICc :  132.5191  (unadjusted=123.06825)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept)  4.943438e-05     0.000000  4.943438e-05  4.943438e-05
## p:(Intercept)  -2.484901e+00     1.040833 -4.524934e+00 -4.448671e-01
## p:time2         7.801534e-01     1.293926 -1.755942e+00  3.316249e+00
## p:time3        -7.242202e-06     1.471962 -2.885053e+00  2.885038e+00
## p:time4        -4.918244e+01     0.000000 -4.918244e+01 -4.918244e+01
## p:time5        -4.918245e+01     0.000000 -4.918245e+01 -4.918245e+01
## p:time6         7.801505e-01     1.293926 -1.755945e+00  3.316246e+00
## p:time7         7.801504e-01     1.293926 -1.755945e+00  3.316246e+00
## p:time8         1.280927e+00     1.231531 -1.132873e+00  3.694728e+00
## p:time9         7.801536e-01     1.293926 -1.755942e+00  3.316249e+00
## p:time10       -7.463170e-06     1.471961 -2.885051e+00  2.885036e+00
## p:time11        7.801537e-01     1.293926 -1.755941e+00  3.316248e+00
## p:time12        2.954904e+00     1.186733  6.289082e-01  5.280900e+00
## p:time13        2.330750e+00     1.180194  1.756930e-02  4.643930e+00
## p:time14        3.295831e+00     1.201851  9.402031e-01  5.651459e+00
## f0:(Intercept) -1.871736e+01 17485.552000 -3.429040e+04  3.425296e+04
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000124
##
##
## Real Parameter p
##
##                    1         2        3            4            5         6
## mixture:1 0.0769235 0.1538463 0.076923 3.640469e-23 3.640438e-23 0.1538459
## mixture:2 0.0769235 0.1538463 0.076923 3.640469e-23 3.640438e-23 0.1538459
##                    7         8         9       10        11        12        13
## mixture:1 0.1538459 0.2307692 0.1538463 0.076923 0.1538463 0.6153846 0.4615384
## mixture:2 0.1538459 0.2307692 0.1538463 0.076923 0.1538463 0.6153846 0.4615384
##                   14
## mixture:1 0.6923077
## mixture:2 0.6923077
##
##
## Real Parameter c
##
##                    2        3            4            5         6         7
## mixture:1 0.1538463 0.076923 3.640469e-23 3.640438e-23 0.1538459 0.1538459
## mixture:2 0.1538463 0.076923 3.640469e-23 3.640438e-23 0.1538459 0.1538459
##                    8         9       10        11        12        13        14
## mixture:1 0.2307692 0.1538463 0.076923 0.1538463 0.6153846 0.4615384 0.6923077
## mixture:2 0.2307692 0.1538463 0.076923 0.1538463 0.6153846 0.4615384 0.6923077
##
##
## Real Parameter f0
##
##             1
```

```
##  7.432848e-09
```

Les résultats.

```
cigogne.results
```

```
##                                model npar     AICc DeltaAICc       weight
## 3 pi(~1)p(~time + mixture)c()f0(~1)   17 128.8955   0.00000 8.595442e-01
## 4           pi(~1)p(~time)c()f0(~1)   16 132.5191   3.62357 1.404171e-01
## 1              pi(~1)p(~1)c()f0(~1)    3 150.1576  21.26207 2.076201e-05
## 2        pi(~1)p(~mixture)c()f0(~1)    4 150.4415  21.54604 1.801377e-05
##    Deviance
## 3  76.17111
## 4  82.22942
## 1 129.03005
## 2 127.22287
```

Les noms.

```
names(cigogne.results)
```

```
## [1] "p.dot"       "p.h"         "p.h.time"    "p.time"      "model.table"
```

Les résultats selon le meilleur modèle.

```
(pdarvic <- cigogne.results$p.h.time$results$real)
```

```
##                 estimate           se           lcl          ucl fixed note
## pi g1 m1    2.147929e-01 1.299279e-01  5.699030e-02 5.532097e-01
## p g1 t1 m1  2.258811e-01 1.982443e-01  3.065440e-02 7.291692e-01
## p g1 t2 m1  4.130091e-01 2.205405e-01  1.057839e-01 8.071301e-01
## p g1 t3 m1  2.258805e-01 1.982447e-01  3.065400e-02 7.291703e-01
## p g1 t4 m1  6.058069e-10 6.511389e-06 -1.276172e-05 1.276293e-05
## p g1 t5 m1  6.058890e-10 6.512229e-06 -1.276336e-05 1.276457e-05
## p g1 t6 m1  4.130090e-01 2.205405e-01  1.057839e-01 8.071301e-01
## p g1 t7 m1  4.130092e-01 2.205405e-01  1.057840e-01 8.071301e-01
## p g1 t8 m1  5.601769e-01 2.062997e-01  1.979301e-01 8.679601e-01
## p g1 t9 m1  4.130091e-01 2.205405e-01  1.057840e-01 8.071302e-01
## p g1 t10 m1 2.258806e-01 1.982448e-01  3.065400e-02 7.291705e-01
## p g1 t11 m1 4.130091e-01 2.205405e-01  1.057840e-01 8.071302e-01
## p g1 t12 m1 9.002602e-01 7.305470e-02  6.469046e-01 9.780067e-01
## p g1 t13 m1 8.168172e-01 1.187962e-01  4.847020e-01 9.548288e-01
## p g1 t14 m1 9.289320e-01 5.560710e-02  7.149338e-01 9.855332e-01
## p g1 t1 m2  3.594450e-02 4.018410e-02  3.826200e-03 2.657495e-01
## p g1 t2 m2  8.248930e-02 6.815300e-02  1.515810e-02 3.443325e-01
## p g1 t3 m2  3.594440e-02 4.018410e-02  3.826200e-03 2.657506e-01
## p g1 t4 m2  7.740922e-11 8.320167e-07 -1.630675e-06 1.630830e-06
## p g1 t5 m2  7.741971e-11 8.321241e-07 -1.630886e-06 1.631041e-06
## p g1 t6 m2  8.248930e-02 6.815300e-02  1.515810e-02 3.443324e-01
## p g1 t7 m2  8.248940e-02 6.815300e-02  1.515810e-02 3.443324e-01
## p g1 t8 m2  1.399656e-01 9.422510e-02  3.390210e-02 4.301196e-01
```

```
## p g1 t9 m2  8.248940e-02 6.815300e-02  1.515810e-02 3.443325e-01
## p g1 t10 m2 3.594440e-02 4.018420e-02  3.826200e-03 2.657507e-01
## p g1 t11 m2 8.248940e-02 6.815300e-02  1.515810e-02 3.443325e-01
## p g1 t12 m2 5.356055e-01 1.610052e-01  2.448906e-01 8.039832e-01
## p g1 t13 m2 3.629635e-01 1.484667e-01  1.393094e-01 6.672979e-01
## p g1 t14 m2 6.254962e-01 1.602375e-01  3.041147e-01 8.645571e-01
## f0 g1 a0 t1 3.078590e-02 9.818555e-01  1.770992e-04 5.351627e+00
```

```
(Ndarvic <- cigogne.results$p.h.time$results$derived)
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 13.03079 13.00018 18.35163
```

Metal enfin.

```
cigogne_bague <- cigogne[cigogne$bagues=="metal",]
cigogne.proc <- process.data(cigogne_bague, begin.time = 1, model = "FullHet")
cigogne.ddl <- make.design.data(cigogne.proc)
```

```
cigogne.results <- run.cigogne()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=2)
## -2lnL:  189.3116
## AICc :  195.3809  (unadjusted=193.34616)
##
## Beta
##                     estimate        se           lcl           ucl
## pi:(Intercept)  1.955984e-06 0.0000000  1.955984e-06  1.955984e-06
## p:(Intercept)  -1.776719e+00 0.1734307 -2.116643e+00 -1.436794e+00
## f0:(Intercept)  9.714289e-01 0.8583840 -7.110038e-01  2.653862e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000005
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088
## mixture:2 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088
##                   8         9        10        11        12        13        14
## mixture:1 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088
## mixture:2 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088
##
```

```
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088
## mixture:2 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088
##                   9        10        11        12        13        14
## mixture:1 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088
## mixture:2 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088 0.1447088
##
##
## Real Parameter f0
##
##         1
##  2.641716
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  189.3116
## AICc :  197.4275  (unadjusted=193.34616)
##
## Beta
##                    estimate           se           lcl         ucl
## pi:(Intercept) -13.0568140 4849.5755000 -9518.2249000 9492.111300
## p:(Intercept)   -1.7635400  200.6516700  -395.0408200  391.513740
## p:mixture2      -0.0131870  200.6520100  -393.2911300  393.264750
## f0:(Intercept)   0.9714322    0.8583931    -0.7110182    2.653883
##
##
## Real Parameter pi
##
##
## mixture:1 2.135487e-06
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475
## mixture:2 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078
##                   8         9        10        11        12        13        14
## mixture:1 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475
## mixture:2 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475
## mixture:2 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078
##                   9        10        11        12        13        14
## mixture:1 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475 0.1463475
```

```
## mixture:2 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078 0.1447078
##
##
## Real Parameter f0
##
##         1
##  2.641725
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  17  (unadjusted=11)
## -2lnL:  115.2832
## AICc :  151.1265  (unadjusted=138.06422)
##
## Beta
##                     estimate          se           lcl          ucl
## pi:(Intercept) -13.4321210  160.033670   -327.098120   300.233880
## p:(Intercept)  -21.3736180  255.556560   -522.264490   479.517260
## p:time2         38.1670350  160.163410   -275.753250   352.087320
## p:time3         -4.6682281    0.000000     -4.668228    -4.668228
## p:time4         37.4340670  160.165100   -276.489540   351.357670
## p:time5         38.6139580  160.162750   -275.305040   352.532960
## p:time6         38.1670280  160.163410   -275.753250   352.087310
## p:time7         38.9449100  160.162370   -274.973340   352.863160
## p:time8         -4.6681597 5373.667100 -10537.056000 10527.720000
## p:time9         39.2132780  160.162100   -274.704440   353.131000
## p:time10        -4.6680645    0.000000     -4.668064    -4.668064
## p:time11        39.8326830  160.161610   -274.084070   353.749440
## p:time12        40.1694770  160.161430   -273.746930   354.085880
## p:time13        40.6309530  160.161330   -273.285260   354.547160
## p:time14        39.8326870  160.161610   -274.084070   353.749440
## p:mixture2     -19.3036880  260.361330   -529.611900   491.004530
## f0:(Intercept)   0.4803699    1.112926     -1.700966     2.661706
##
##
## Real Parameter pi
##
##
## mixture:1 1.467248e-06
##
##
## Real Parameter p
##
##                       1         2            3         4         5         6
## mixture:1 5.218619e-10 0.9999999 4.899705e-12 0.9999999 1.0000000 0.9999999
## mixture:2 2.158095e-18 0.0751413 2.026212e-20 0.0375706 0.1127107 0.0751408
##                     7            8        9           10       11        12
## mixture:1 1.0000000 4.900040e-12 1.000000 4.900506e-12 1.000000 1.0000000
## mixture:2 0.1502815 2.026351e-20 0.187852 2.026544e-20 0.300562 0.3757028
##                    13       14
## mixture:1 1.0000000 1.000000
## mixture:2 0.4884138 0.300563
##
```

```
##
## Real Parameter c
##
##                    2            3         4         5         6         7
## mixture:1 0.9999999 4.899705e-12 0.9999999 1.0000000 0.9999999 1.0000000
## mixture:2 0.0751413 2.026212e-20 0.0375706 0.1127107 0.0751408 0.1502815
##                        8        9           10       11        12        13
## mixture:1 4.900040e-12 1.000000 4.900506e-12 1.000000 1.0000000 1.0000000
## mixture:2 2.026351e-20 0.187852 2.026544e-20 0.300562 0.3757028 0.4884138
##                   14
## mixture:1 1.000000
## mixture:2 0.300563
##
##
## Real Parameter f0
##
##         1
##  1.616672
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  16  (unadjusted=11)
## -2lnL:  115.2831
## AICc :  148.9167  (unadjusted=138.06414)
##
## Beta
##                       estimate         se           lcl           ucl
## pi:(Intercept)  3.961503e-05    0.00000  3.961503e-05  3.961503e-05
## p:(Intercept)  -1.919384e+01  246.71452 -5.027543e+02  4.643666e+02
## p:time2         1.668356e+01  246.71585 -4.668795e+02  5.002466e+02
## p:time3        -5.292353e+00    0.00000 -5.292353e+00 -5.292353e+00
## p:time4         1.595059e+01  246.71694 -4.676146e+02  4.995158e+02
## p:time5         1.713049e+01  246.71544 -4.664318e+02  5.006928e+02
## p:time6         1.668356e+01  246.71585 -4.668795e+02  5.002466e+02
## p:time7         1.746144e+01  246.71520 -4.661004e+02  5.010233e+02
## p:time8        -5.292413e+00 6727.55090 -1.319129e+04  1.318071e+04
## p:time9         1.772981e+01  246.71504 -4.658317e+02  5.012913e+02
## p:time10       -5.292415e+00    0.00000 -5.292415e+00 -5.292415e+00
## p:time11        1.834922e+01  246.71474 -4.652117e+02  5.019101e+02
## p:time12        1.868601e+01  246.71463 -4.648747e+02  5.022467e+02
## p:time13        1.914749e+01  246.71456 -4.644131e+02  5.027080e+02
## p:time14        1.834922e+01  246.71474 -4.652117e+02  5.019101e+02
## f0:(Intercept)  4.804047e-01    1.11288 -1.700840e+00  2.661649e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000099
##
##
## Real Parameter p
##
```

```
##                       1         2            3         4        5         6
## mixture:1 4.615542e-09 0.0751407 2.321576e-11 0.0375704 0.112711 0.0751407
## mixture:2 4.615542e-09 0.0751407 2.321576e-11 0.0375704 0.112711 0.0751407
##                     7           8         9           10        11        12
## mixture:1 0.1502814 2.321438e-11 0.1878517 2.321432e-11 0.3005628 0.3757036
## mixture:2 0.1502814 2.321438e-11 0.1878517 2.321432e-11 0.3005628 0.3757036
##                    13        14
## mixture:1 0.4884146 0.3005628
## mixture:2 0.4884146 0.3005628
##
##
## Real Parameter c
##
##                     2            3         4        5         6         7
## mixture:1 0.0751407 2.321576e-11 0.0375704 0.112711 0.0751407 0.1502814
## mixture:2 0.0751407 2.321576e-11 0.0375704 0.112711 0.0751407 0.1502814
##                       8         9           10        11        12        13
## mixture:1 2.321438e-11 0.1878517 2.321432e-11 0.3005628 0.3757036 0.4884146
## mixture:2 2.321438e-11 0.1878517 2.321432e-11 0.3005628 0.3757036 0.4884146
##                    14
## mixture:1 0.3005628
## mixture:2 0.3005628
##
##
## Real Parameter f0
##
##         1
##  1.616729
```

```
cigogne.results
```

```
##                               model npar     AICc DeltaAICc       weight
## 4           pi(~1)p(~time)c()f0(~1)   16 148.9167   0.00000 7.511789e-01
## 3 pi(~1)p(~time + mixture)c()f0(~1)   17 151.1265   2.20982 2.488211e-01
## 1              pi(~1)p(~1)c()f0(~1)    3 195.3809  46.46424 6.111696e-11
## 2        pi(~1)p(~mixture)c()f0(~1)    4 197.4275  48.51082 2.196610e-11
##    Deviance
## 4  91.84761
## 3  91.84768
## 1 165.87611
## 2 165.87611
```

```
names(cigogne.results)
```

```
## [1] "p.dot"       "p.h"         "p.h.time"    "p.time"      "model.table"
```

```
(pmetal <- cigogne.results$p.time$results$real)
```

```
##                 estimate           se           lcl          ucl fixed note
## pi g1 m1    5.000099e-01 0.000000e+00  5.000099e-01 5.000099e-01
## p g1 t1 m1  4.615542e-09 1.138721e-06 -2.227278e-06 2.236509e-06
## p g1 t2 m1  7.514070e-02 5.134920e-02  1.873380e-02 2.569186e-01
```

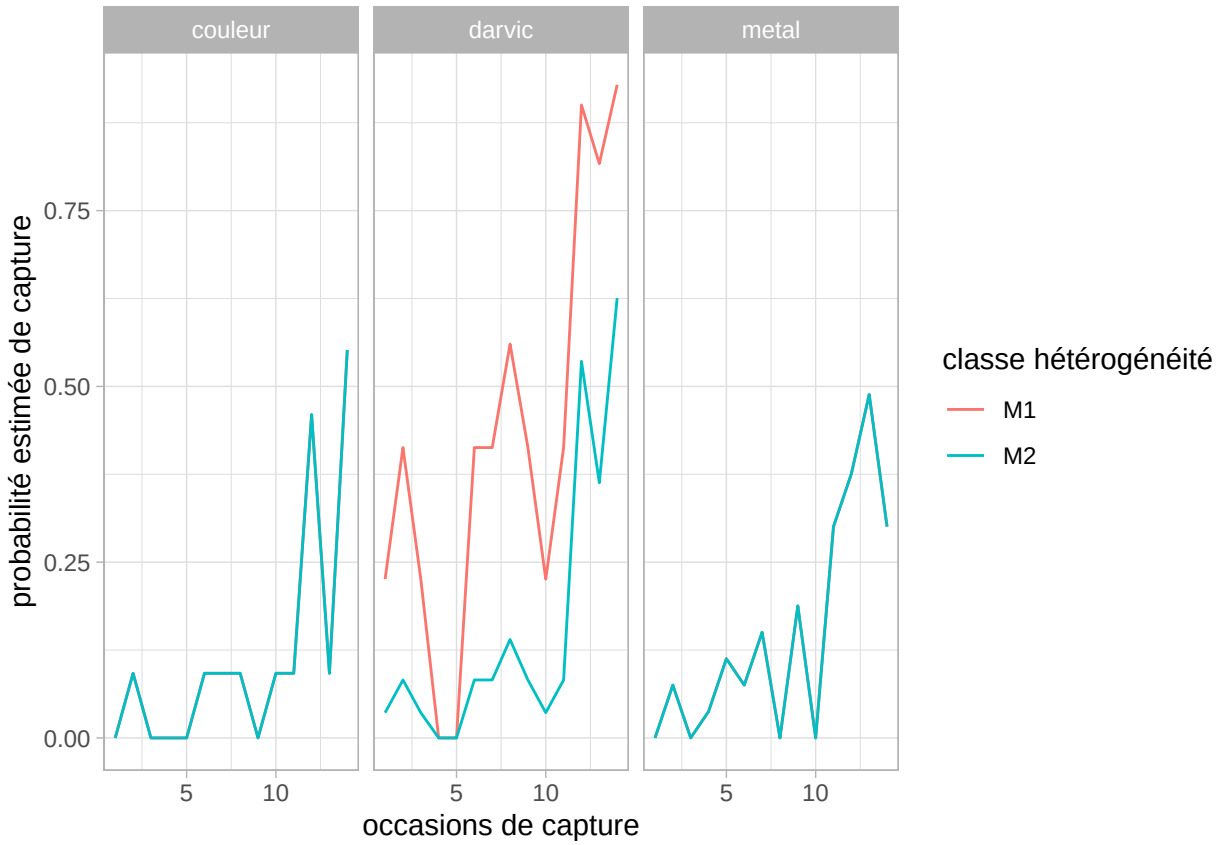
```
## p g1 t3 m1  2.321576e-11 0.000000e+00  2.321576e-11 2.321576e-11
## p g1 t4 m1  3.757040e-02 3.694520e-02  5.241600e-03 2.243284e-01
## p g1 t5 m1  1.127110e-01 6.176860e-02  3.647680e-02 2.988527e-01
## p g1 t6 m1  7.514070e-02 5.134920e-02  1.873380e-02 2.569187e-01
## p g1 t7 m1  1.502814e-01 7.000580e-02  5.695220e-02 3.412144e-01
## p g1 t8 m1  2.321438e-11 1.561480e-07 -3.060269e-07 3.060733e-07
## p g1 t9 m1  1.878517e-01 7.676660e-02  7.941960e-02 3.827715e-01
## p g1 t10 m1 2.321432e-11 0.000000e+00  2.321432e-11 2.321432e-11
## p g1 t11 m1 3.005628e-01 9.116480e-02  1.551744e-01 5.013355e-01
## p g1 t12 m1 3.757036e-01 9.724780e-02  2.107405e-01 5.756199e-01
## p g1 t13 m1 4.884146e-01 1.023601e-01  2.995831e-01 6.806117e-01
## p g1 t14 m1 3.005628e-01 9.116480e-02  1.551744e-01 5.013355e-01
## f0 g1 a0 t1 1.616729e+00 1.799225e+00  2.783089e-01 9.391761e+00
```

```
(Nmetal <- cigogne.results$p.time$results$derived)
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 26.61673 25.27831 34.39176
```

On visualise les probabilités de détection.

```
p.estim <- data.frame(couleur = pcouleur[-c(1,16),1],
                      darvic = pdarvic[-c(1,30),1],
                      metal = pmetal[-c(1,16),1],
                      mixture = c(rep("M1", 14), rep("M2", 14)),
                      occ = c(1:14, 1:14))
# pivote les données
library(tidyr)
p.estim <- pivot_longer(p.estim,
                              cols = couleur:metal,
                              names_to = "type_bague",
                              values_to = "p_estim")
# visualise
library(ggplot2)
ggplot(data = p.estim,
       aes(x = occ, y = p_estim, color = mixture)) +
  geom_line() +
  facet_wrap(~type_bague) +
  theme_light() +
  labs(x = "occasions de capture",
       y = "probabilité estimée de capture",
       color = "classe hétérogénéité")
```



Exercice 3 : cistudes

Les données.

```
library(readr)
dat <- read_csv2("dat/BDD-CMR-Cistudes-Vigueirat.csv")
library(janitor)
dat <- clean_names(dat)
```

Quelles sont les années avec le plus de marquages et recaptures?

```
library(dplyr)
dat %>%
  count(action, mois, annee, sort = TRUE)
```

```
## # A tibble: 168 x 4
##    action     mois annee     n
##    <chr>     <dbl> <dbl> <int>
##  1 Recapture     4  2007   114
##  2 Recapture     6  2007    65
##  3 Marquage      6  1997    50
##  4 Recapture     7  2006    44
##  5 Recapture     5  2007    38
##  6 Recapture     3  2007    37
```

```
##  7 Marquage      7  2006    33
##  8 Recapture     8  2006    31
##  9 Marquage      4  2007    27
## 10 Marquage      9  2005    26
## # ... with 158 more rows
```

```
dat <- dat %>% select(id_ind, jour, mois, annee)
```

On extrait les mois de juin des années 1997 et 2007.

```
library(tibble)
dat1997 <- dat %>%
  filter(mois == 6, annee == 1997) %>%
  select(id_ind, jour) %>%
  add_column(det = 1) %>%
  arrange(id_ind)
dat2007 <- dat %>%
  filter(mois == 6, annee == 2007) %>%
  select(id_ind, jour) %>%
  add_column(det = 1) %>%
  arrange(id_ind)
```

On fait les histoires pour 1997.

```
histories1997 <- dat1997 %>%
  group_by(id_ind) %>%
  mutate(id2 = row_number()) %>%
  pivot_wider(values_from = det,
              names_from = jour) %>% # les jours en colonnes
  select(-id2) %>%
  group_by(id_ind) %>%
  summarise(across(everything(), sum, na.rm = TRUE)) %>% # on rassemble les evenements pour chaque ind
  select(-id_ind)
histories1997[is.na(histories1997)] <- 0 # les Na sont des non-détections = 0
histories1997[histories1997 > 1] <- 1 # les observations mens multiples = 1
(histories1997 <- as.matrix(histories1997))
```

```
##       7 13 10 12 25 27 3 6 11 29 14 15 16 17 18 19 20 26 30
##  [1,] 1  0  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
##  [2,] 0  1  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
##  [3,] 0  0  1  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
##  [4,] 0  0  0  1  1  0 0 0  0  0  0  0  0  0  0  0  0  0  0
##  [5,] 0  0  1  0  1  0 0 0  0  0  0  0  0  0  0  0  0  0  0
##  [6,] 0  0  0  0  0  1 0 0  0  0  0  0  0  0  0  0  0  0  0
##  [7,] 0  0  0  0  0  0 1 0  0  0  0  0  0  0  0  0  0  0  0
##  [8,] 0  0  0  0  0  0 0 1  0  0  0  0  0  0  0  0  0  0  0
##  [9,] 0  0  0  0  0  0 0 1  0  0  0  0  0  0  0  0  0  0  0
## [10,] 0  0  0  0  0  0 0 1  0  0  0  0  0  0  0  0  0  0  0
## [11,] 0  0  1  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [12,] 0  0  1  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [13,] 0  0  1  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [14,] 0  0  1  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
```

```
## [15,] 0  0  0  0  0  0 0 0  1  1  0  0  0  0  0  0  0  0  0
## [16,] 0  0  0  1  0  0 0 0  1  0  0  0  0  0  0  0  0  0  0
## [17,] 0  0  0  0  0  0 0 0  1  0  0  0  0  0  0  0  0  0  0
## [18,] 0  0  0  0  0  0 0 0  1  0  0  0  0  0  0  0  0  0  0
## [19,] 0  1  0  0  0  0 0 0  1  0  0  0  0  0  0  0  0  0  0
## [20,] 0  0  0  1  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [21,] 0  0  0  1  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [22,] 0  0  0  1  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [23,] 0  0  0  1  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [24,] 0  1  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [25,] 0  1  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [26,] 0  1  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [27,] 0  1  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [28,] 0  1  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [29,] 0  1  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [30,] 0  1  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [31,] 0  0  0  0  0  0 0 0  0  0  1  0  0  0  0  0  0  0  0
## [32,] 0  0  0  0  0  0 0 0  0  0  1  0  0  0  0  0  0  0  0
## [33,] 0  0  0  0  0  0 0 0  0  0  1  0  0  0  0  0  0  0  0
## [34,] 0  0  0  0  0  0 0 0  0  0  0  1  0  0  0  0  0  0  0
## [35,] 0  0  0  0  0  0 0 0  0  0  0  0  1  0  0  0  0  0  0
## [36,] 0  0  0  0  0  0 0 0  0  0  0  0  1  0  0  0  0  0  0
## [37,] 0  0  0  0  0  0 0 0  0  0  0  0  0  1  0  0  0  0  0
## [38,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  1  0  0  0  0
## [39,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  1  0  0  0  0
## [40,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  0  1  0  0  0
## [41,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  0  1  0  0  0
## [42,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  0  1  0  0  0
## [43,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  0  0  1  0  0
## [44,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  0  0  1  0  0
## [45,] 0  0  0  0  1  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [46,] 0  0  0  0  1  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [47,] 0  0  0  0  1  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [48,] 0  0  0  0  1  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [49,] 0  0  0  0  1  0 0 0  0  0  0  0  0  0  0  0  0  0  0
## [50,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  1  0
## [51,] 0  0  0  0  0  1 0 0  0  0  0  0  0  0  0  0  0  0  0
## [52,] 0  0  0  0  0  1 0 0  0  0  0  0  0  0  0  0  0  0  0
## [53,] 0  0  0  0  0  1 0 0  0  0  0  0  0  0  0  0  0  0  0
## [54,] 0  0  0  0  0  1 0 0  0  0  0  0  0  0  0  0  0  0  0
## [55,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  1
## [56,] 0  0  0  0  0  0 0 0  0  0  0  0  0  0  0  0  0  0  1
```

Et pour 2007.

```
histories2007 <- dat2007 %>%
  group_by(id_ind) %>%
  mutate(id2 = row_number()) %>%
  pivot_wider(values_from = det,
              names_from = jour) %>% # les jours en colonnes
  select(-id2) %>%
  group_by(id_ind) %>%
  summarise(across(everything(), sum, na.rm = TRUE)) %>% # on rassemble les evenements pour chaque ind
  select(-id_ind)
```

```r
histories2007[is.na(histories2007)] <- 0 # les Na sont des non-détections = 0
histories2007[histories2007 > 1] <- 1 # les observations mens multiples = 1
(histories2007 <- as.matrix(histories2007))
```

```
##       18 13 16 25 28 20 26 4 8 11 22 14 12 21 27 5 6 24 1 19 29 7
##  [1,]  1  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
##  [2,]  0  1  1  1  1  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
##  [3,]  0  0  0  0  0  1  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
##  [4,]  0  0  0  0  0  0  1 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
##  [5,]  0  0  0  0  0  0  0 1 0  0  0  0  0  0  0 0 0  0 0  0  0 0
##  [6,]  0  0  0  0  0  1  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
##  [7,]  0  0  0  0  1  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
##  [8,]  0  0  0  0  0  0  0 0 1  1  0  0  0  0  0 0 0  0 0  0  0 0
##  [9,]  0  0  0  0  0  0  1 0 0  0  1  0  0  0  0 0 0  0 0  0  0 0
## [10,]  0  0  0  0  0  0  0 0 0  0  0  1  0  0  0 0 0  0 0  0  0 0
## [11,]  0  0  0  0  0  0  0 0 0  0  0  0  1  0  0 0 0  0 0  0  0 0
## [12,]  0  0  0  0  0  0  0 0 0  0  0  0  0  1  0 0 0  0 0  0  0 0
## [13,]  0  0  0  0  0  0  0 1 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [14,]  0  0  0  0  1  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [15,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  1 0 0  0 0  0  0 0
## [16,]  0  0  0  0  0  0  0 0 0  1  0  0  0  0  0 0 0  0 0  0  0 0
## [17,]  0  0  0  0  0  0  0 1 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [18,]  0  0  0  0  0  0  0 0 0  0  0  0  0  1  0 0 0  0 0  0  0 0
## [19,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 1 0  0 0  0  0 0
## [20,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 1  0 0  0  0 0
## [21,]  0  0  0  0  0  0  1 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [22,]  0  0  0  0  1  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [23,]  1  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [24,]  0  0  0  0  0  0  0 0 0  0  0  0  0  1  0 0 0  0 0  0  0 0
## [25,]  0  0  0  1  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [26,]  1  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [27,]  0  0  0  0  0  0  0 1 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [28,]  0  0  0  0  1  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [29,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  1 0  0  0 0
## [30,]  0  0  0  0  0  0  0 0 1  0  0  0  0  0  0 0 0  0 0  0  0 0
## [31,]  0  0  0  0  0  0  0 1 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [32,]  0  1  0  0  0  0  0 0 0  0  0  0  0  0  0 1 0  0 0  0  0 0
## [33,]  0  0  0  0  0  0  0 0 0  0  0  0  0  1  0 0 0  0 0  0  0 0
## [34,]  0  0  0  0  0  0  0 0 0  0  0  1  0  0  0 0 0  0 0  0  0 0
## [35,]  0  0  0  0  0  0  1 0 0  0  0  0  0  1  0 0 0  0 0  0  0 0
## [36,]  0  0  0  0  0  1  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [37,]  0  0  0  0  0  1  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [38,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 1  0  0 0
## [39,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  1 0 0  0 0  0  0 0
## [40,]  0  0  0  0  0  0  0 0 0  0  1  0  0  0  0 0 0  0 0  0  0 0
## [41,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  1  0 0
## [42,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  1 0
## [43,]  0  0  0  0  0  0  0 1 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [44,]  0  0  0  0  0  1  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [45,]  0  0  0  1  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [46,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 1 0  0 0  0  0 0
## [47,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 1
## [48,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 1  0 0  0  0 0
```

```
## [49,]  0  0  0  1  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [50,]  0  0  0  0  0  1  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [51,]  1  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [52,]  0  0  0  0  0  0  0 0 0  0  0  0  0  1  0 0 0  0 0  0  0 0
## [53,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 1  0 0  0  0 0
## [54,]  0  0  0  0  0  0  0 1 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [55,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 1  0  0 0
## [56,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 1  0  0 0
## [57,]  0  0  0  0  0  0  0 1 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [58,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 1 0  0 0  0  0 0
## [59,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 1 0  0 0  0  0 0
## [60,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 1 0  0 0  0  0 0
## [61,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 1 0  0 0  0  0 0
## [62,]  0  1  0  0  0  0  0 0 0  0  0  0  0  0  0 0 1  0 0  0  0 0
## [63,]  0  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 1
## [64,]  0  0  0  0  0  0  0 0 1  0  0  0  0  0  0 0 0  0 0  0  0 0
## [65,]  0  0  0  0  0  0  0 0 0  1  0  0  0  0  0 0 0  0 0  0  0 0
## [66,]  0  0  0  0  0  0  0 0 0  0  1  1  0  0  0 0 0  0 0  0  0 0
## [67,]  1  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [68,]  1  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  0  0 0
## [69,]  1  0  0  0  0  0  0 0 0  0  0  0  0  0  0 0 0  0 0  1  0 0
```

On fait les tests et l'ajustement pour 1997.

```
cistude <- data.frame(ch = collapseCH(histories1997),
                      freq = rep(1, nrow(histories1997)))
head(cistude)
```

```
##                     ch freq
## 1 1000000000000000000    1
## 2 0100000000000000000    1
## 3 0010000000000000000    1
## 4 0001100000000000000    1
## 5 0010100000000000000    1
## 6 0000010000000000000    1
```

```
tail(cistude)
```

```
##                      ch freq
## 51 0000010000000000000    1
## 52 0000010000000000000    1
## 53 0000010000000000000    1
## 54 0000010000000000000    1
## 55 0000000000000000001    1
## 56 0000000000000000001    1
```

On fait les tests de fermeture.

```
cistude_secr <- unRMarkInput(cistude) # on convertit au bon format
summary(cistude_secr) # resumes
```

```
## Object class       capthist
```

```
##
## Counts by occasion
##             1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 Total
## n           1  9  6  6  7  5  1  3  5  1  3  1  2  1  2  3  2  1  2    61
## u           1  9  6  6  5  5  1  3  3  0  3  1  2  1  2  3  2  1  2    56
## f          51  5  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0    56
## M(t+1)      1 10 16 22 27 32 33 36 39 39 42 43 45 46 48 51 53 54 56    56
## losses      0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0     0
## detections  1  9  6  6  7  5  1  3  5  1  3  1  2  1  2  3  2  1  2    61
```

```
closure.test(cistude_secr, SB = TRUE)
```

```
## $Otis
##  statistic          p
##  -1.783585 0.03724554
##
## $Xc
##  statistic df         p
##   7.130646 17 0.9817931
##
## $NRvsJS
##  statistic df p
##          0  0 1
##
## $NMvsJS
##  statistic df p
##          0  0 1
##
## $MtvsNR
##  statistic df         p
##   7.130646 17 0.9817931
##
## $MtvsNM
##  statistic df         p
##   7.130646 17 0.9817931
##
## $compNRvsJS
##    Occasion Chisquare df  p
## 1         2        NA NA NA
## 2         3        NA NA NA
## 3         4        NA NA NA
## 4         5        NA NA NA
## 5         6        NA NA NA
## 6         7        NA NA NA
## 7         8        NA NA NA
## 8         9        NA NA NA
## 9        10        NA NA NA
## 10       11        NA NA NA
## 11       12        NA NA NA
## 12       13        NA NA NA
## 13       14        NA NA NA
## 14       15        NA NA NA
## 15       16        NA NA NA
## 16       17        NA NA NA
```

```
## 17       18        NA NA NA
##
## $compNMvsJS
##    Occasion Chisquare df  p
## 1         2        NA NA NA
## 2         3        NA NA NA
## 3         4        NA NA NA
## 4         5        NA NA NA
## 5         6        NA NA NA
## 6         7        NA NA NA
## 7         8        NA NA NA
## 8         9        NA NA NA
## 9        10        NA NA NA
## 10       11        NA NA NA
## 11       12        NA NA NA
## 12       13        NA NA NA
## 13       14        NA NA NA
## 14       15        NA NA NA
## 15       16        NA NA NA
## 16       17        NA NA NA
## 17       18        NA NA NA
```

On passe à l'ajustement des modèles.

```
cistude.proc <- process.data(cistude,
                             begin.time = 1,
                             model = "FullHet")
cistude.ddl <- make.design.data(cistude.proc)
```

```
run.cistude <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  cistude.model.list <- create.model.list("FullHet")

  cistude.results <- mark.wrapper(cistude.model.list,
                              data = cistude.proc,
                              ddl = cistude.ddl)

  return(cistude.results)
}
```

```
cistude.results <- run.cistude()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=2)
## -2lnL:  46.99586
## AICc :  53.0185  (unadjusted=51.007166)
##
## Beta
##                     estimate           se          lcl          ucl
## pi:(Intercept) -0.000166678 0.000000e+00 -0.000166678 -0.000166678
## p:(Intercept)  -4.617107500 2.193813e-07 -4.617107900 -4.617107000
## f0:(Intercept)  5.606238200 1.469847e-01  5.318148200  5.894328200
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999583
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
## mixture:2 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
##                    8         9        10        11        12        13        14
## mixture:1 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
## mixture:2 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
##                   15        16        17        18        19
## mixture:1 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
## mixture:2 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
## mixture:2 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
##                    9        10        11        12        13        14        15
## mixture:1 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
## mixture:2 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847 0.0097847
##                   16        17        18        19
## mixture:1 0.0097847 0.0097847 0.0097847 0.0097847
## mixture:2 0.0097847 0.0097847 0.0097847 0.0097847
##
##
## Real Parameter f0
##
##         1
##  272.1187
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=3)
## -2lnL:  37.00433
## AICc :  45.04211  (unadjusted=43.026975)
##
## Beta
##                      estimate           se           lcl           ucl
## pi:(Intercept)  2.736937e-06 0.000000e+00  2.736937e-06  2.736937e-06
## p:(Intercept)  -2.376334e+00 1.396993e-01 -2.650144e+00 -2.102523e+00
## c:(Intercept)  -4.839451e+00 4.489791e-01 -5.719451e+00 -3.959452e+00
## f0:(Intercept)  2.501695e+00 1.110112e-07  2.501695e+00  2.501696e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000007
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953
## mixture:2 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953
##                    8         9        10        11        12        13        14
## mixture:1 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953
## mixture:2 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953
##                   15        16        17        18        19
## mixture:1 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953
## mixture:2 0.0849953 0.0849953 0.0849953 0.0849953 0.0849953
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493
## mixture:2 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493
##                    9        10        11        12        13        14        15
## mixture:1 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493
## mixture:2 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493 0.0078493
##                   16        17        18        19
## mixture:1 0.0078493 0.0078493 0.0078493 0.0078493
## mixture:2 0.0078493 0.0078493 0.0078493 0.0078493
##
##
## Real Parameter f0
##
##         1
##  12.20317
##
## Output summary for FullHet model
```

```
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  46.99586
## AICc :  55.03363  (unadjusted=51.007167)
##
## Beta
##                   estimate           se          lcl         ucl
## pi:(Intercept) -18.889788 3331.5093000 -6548.648100 6510.868500
## p:(Intercept)   -2.985543    0.0000000    -2.985543   -2.985543
## p:mixture2      -1.631554    0.0000000    -1.631554   -1.631554
## f0:(Intercept)   5.606226    0.5052697     4.615897    6.596554
##
##
## Real Parameter pi
##
##
## mixture:1 6.255606e-09
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833
## mixture:2 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848
##                    8         9        10        11        12        13        14
## mixture:1 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833
## mixture:2 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848
##                   15        16        17        18        19
## mixture:1 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833
## mixture:2 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833
## mixture:2 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848
##                    9        10        11        12        13        14        15
## mixture:1 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833 0.0480833
## mixture:2 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848 0.0097848
##                   16        17        18        19
## mixture:1 0.0480833 0.0480833 0.0480833 0.0480833
## mixture:2 0.0097848 0.0097848 0.0097848 0.0097848
##
##
## Real Parameter f0
##
##         1
##  272.1153
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
```

```
## Npar :  6  (unadjusted=3)
## -2lnL:  37.00433
## AICc :  49.0838  (unadjusted=43.026976)
##
## Beta
##                    estimate           se          lcl        ucl
## pi:(Intercept) -17.6068040 2158.5342000 -4248.333900 4213.12030
## p:(Intercept)   -0.2140151  291.1029500  -570.775810  570.34778
## p:mixture2      -2.1622927  291.1030700  -572.724310  568.39973
## c:(Intercept)   -3.7610253 1142.8306000 -2243.709100 2236.18710
## c:mixture2      -1.0783905 1142.8307000 -2241.026600 2238.86980
## f0:(Intercept)   2.5016562    0.7124561     1.105242    3.89807
##
##
## Real Parameter pi
##
##
## mixture:1 2.256639e-08
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.4466995 0.4466995 0.4466995 0.4466995 0.4466995 0.4466995 0.4466995
## mixture:2 0.0849973 0.0849973 0.0849973 0.0849973 0.0849973 0.0849973 0.0849973
##                    8         9        10        11        12        13        14
## mixture:1 0.4466995 0.4466995 0.4466995 0.4466995 0.4466995 0.4466995 0.4466995
## mixture:2 0.0849973 0.0849973 0.0849973 0.0849973 0.0849973 0.0849973 0.0849973
##                   15        16        17        18        19
## mixture:1 0.4466995 0.4466995 0.4466995 0.4466995 0.4466995
## mixture:2 0.0849973 0.0849973 0.0849973 0.0849973 0.0849973
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0227312 0.0227312 0.0227312 0.0227312 0.0227312 0.0227312 0.0227312
## mixture:2 0.0078496 0.0078496 0.0078496 0.0078496 0.0078496 0.0078496 0.0078496
##                    9        10        11        12        13        14        15
## mixture:1 0.0227312 0.0227312 0.0227312 0.0227312 0.0227312 0.0227312 0.0227312
## mixture:2 0.0078496 0.0078496 0.0078496 0.0078496 0.0078496 0.0078496 0.0078496
##                   16        17        18        19
## mixture:1 0.0227312 0.0227312 0.0227312 0.0227312
## mixture:2 0.0078496 0.0078496 0.0078496 0.0078496
##
##
## Real Parameter f0
##
##         1
##  12.20269
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
```

```
## Npar :  22  (unadjusted=20)
## -2lnL:  16.12256
## AICc :  61.0947  (unadjusted=56.927927)
##
## Beta
##                       estimate           se           lcl         ucl
## pi:(Intercept) -1.843557e+01 1571.0610000 -3097.7152000 3060.844000
## p:(Intercept)  -3.762360e+00    0.0000000    -3.7623603   -3.762360
## p:time2         2.222941e+00    1.0573081     0.1506171    4.295265
## p:time3         1.807824e+00    1.0832135    -0.3152742    3.930923
## p:time4         1.807836e+00    1.0832140    -0.3152638    3.930935
## p:time5         1.965178e+00    1.0721822    -0.1362993    4.066655
## p:time6         1.622317e+00    1.0984810    -0.5307063    3.775339
## p:time7         1.786692e-04    1.4165715    -2.7763015    2.776659
## p:time8         1.105132e+00    1.1575659    -1.1636973    3.373961
## p:time9         1.622322e+00    1.0984816    -0.5307018    3.775346
## p:time10        1.819504e-04    1.4165400    -2.7762365    2.776600
## p:time11        1.105128e+00    1.1575654    -1.1636999    3.373957
## p:time12        2.394612e-04    1.4165539    -2.7762063    2.776685
## p:time13        6.965006e-01    1.2274441    -1.7092898    3.102291
## p:time14        1.972803e-04    1.4165664    -2.7762729    2.776667
## p:time15        6.965150e-01    1.2274356    -1.7092588    3.102289
## p:time16        1.105138e+00    1.1575620    -1.1636835    3.373960
## p:time17        6.965264e-01    1.2274370    -1.7092502    3.102303
## p:time18        2.220656e-04    1.4165392    -2.7761949    2.776639
## p:time19        6.965075e-01    1.2274319    -1.7092591    3.102274
## p:mixture2     -1.998945e+00    0.0000000    -1.9989446   -1.998945
## f0:(Intercept)  5.570999e+00    0.5064154     4.5784247    6.563573
##
##
## Real Parameter pi
##
##
## mixture:1 9.852257e-09
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0227015 0.1766197 0.1240596 0.1240608 0.1421944 0.1052653 0.0227055
## mixture:2 0.0031371 0.0282402 0.0188266 0.0188268 0.0219643 0.0156889 0.0031377
##                    8         9        10        11        12        13        14
## mixture:1 0.0655449 0.1052658 0.0227056 0.0655447 0.0227068 0.0445377 0.0227059
## mixture:2 0.0094133 0.0156890 0.0031377 0.0094133 0.0031379 0.0062755 0.0031377
##                   15        16        17        18        19
## mixture:1 0.0445383 0.0655453 0.0445388 0.0227064 0.0445380
## mixture:2 0.0062756 0.0094134 0.0062757 0.0031378 0.0062756
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.1766197 0.1240596 0.1240608 0.1421944 0.1052653 0.0227055 0.0655449
## mixture:2 0.0282402 0.0188266 0.0188268 0.0219643 0.0156889 0.0031377 0.0094133
```

```
##                    9        10        11        12        13        14        15
## mixture:1 0.1052658 0.0227056 0.0655447 0.0227068 0.0445377 0.0227059 0.0445383
## mixture:2 0.0156890 0.0031377 0.0094133 0.0031379 0.0062755 0.0031377 0.0062756
##                   16        17        18        19
## mixture:1 0.0655453 0.0445388 0.0227064 0.0445380
## mixture:2 0.0094134 0.0062757 0.0031378 0.0062756
##
##
## Real Parameter f0
##
##         1
##  262.6964
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  41  (unadjusted=20)
## -2lnL:  -7.910773
## AICc :  77.45909  (unadjusted=32.894596)
##
## Beta
##                     estimate           se           lcl           ucl
## pi:(Intercept) -62.2092680 62873.944000 -1.232951e+05 123170.720000
## p:(Intercept)   71.2043020     0.000000  7.120430e+01     71.204302
## p:mixture2     -75.2120410     0.000000 -7.521204e+01    -75.212041
## p:time2          2.3760513     1.073111  2.727547e-01      4.479348
## p:time3          2.1105835     1.100167 -4.574300e-02      4.266910
## p:time4          2.2731118     1.102168  1.128618e-01      4.433362
## p:time5          2.2499201     1.119450  5.579720e-02      4.444043
## p:time6          2.4392297     1.122649  2.388383e-01      4.639621
## p:time7          0.8718805     1.436152 -1.942978e+00      3.686739
## p:time8          2.1105476     1.184082 -2.102524e-01      4.431348
## p:time9          2.2731441     1.187791 -5.492730e-02      4.601216
## p:time10       -15.9449890  5759.422100 -1.130441e+04  11272.522000
## p:time11         2.4673018     1.193085  1.288561e-01      4.805747
## p:time12         1.4428527     1.447608 -1.394460e+00      4.280165
## p:time13         2.3028916     1.268717 -1.837945e-01      4.789578
## p:time14         1.7051100     1.455589 -1.147844e+00      4.558064
## p:time15         2.6215308     1.282050  1.087118e-01      5.134350
## p:time16         3.4969716     1.245794  1.055216e+00      5.938728
## p:time17         3.6016989     1.360920  9.342958e-01      6.269102
## p:time18         3.3146242     1.587030  2.040464e-01      6.425202
## p:time19        54.0822080     0.000000  5.408221e+01     54.082208
## c:(Intercept)  -42.3267860     0.000000 -4.232679e+01    -42.326786
## c:mixture2      15.4362390     0.000000  1.543624e+01     15.436239
## c:time3         -6.6593560 26223.801000 -5.140531e+04  51391.992000
## c:time4         -7.7070110 17478.104000 -3.426479e+04  34249.378000
## c:time5         24.5879030     0.000000  2.458790e+01     24.587903
## c:time6         -7.7995317 12439.856000 -2.438992e+04  24374.318000
## c:time7         -7.6967671 13276.955000 -2.603053e+04  26015.136000
## c:time8         -7.6803344     0.000000 -7.680334e+00     -7.680334
## c:time9         24.0574230     0.000000  2.405742e+01     24.057423
## c:time10        23.2526020     0.000000  2.325260e+01     23.252602
## c:time11        -7.6634471  5014.371200 -9.835831e+03   9820.504300
```

```
## c:time12        -7.7110573  5825.572800 -1.142583e+04  11410.412000
## c:time13        -7.7286459  9003.136600 -1.765388e+04  17638.419000
## c:time14        -7.7541838  5342.680400 -1.047941e+04  10463.900000
## c:time15        -7.7588754 20077.978000 -3.936060e+04  39345.078000
## c:time16        -7.7413629     0.000000 -7.741363e+00     -7.741363
## c:time17        -7.6331049 19272.980000 -3.778268e+04  37767.409000
## c:time18        -7.4948565  5569.235100 -1.092320e+04  10908.206000
## c:time19        -7.4031229     0.000000 -7.403123e+00     -7.403123
## f0:(Intercept) -35.1521880 18342.550000 -3.598655e+04  35916.246000
##
##
## Real Parameter pi
##
##
## mixture:1 9.612983e-28
##
##
## Real Parameter p
##
##                 1         2         3         4         5        6         7
## mixture:1 1.00000 1.0000000 1.0000000 1.0000000 1.0000000 1.000000 1.0000000
## mixture:2 0.01785 0.1635993 0.1304307 0.1499967 0.1470637 0.172429 0.0416521
##                   8         9           10        11        12        13
## mixture:1 1.0000000 1.0000000 1.000000e+00 1.0000000 1.0000000 1.0000000
## mixture:2 0.1304267 0.1500008 2.160929e-09 0.1764717 0.0714328 0.1538332
##                  14        15        16       17        18 19
## mixture:1 1.0000000 1.0000000 1.0000000 1.000000 1.0000000  1
## mixture:2 0.0909055 0.2000138 0.3750136 0.399862 0.3333405  1
##
##
## Real Parameter c
##
##                       2            3            4            5            6
## mixture:1 4.146775e-19 5.316048e-22 1.864653e-22 1.977431e-08 1.699875e-22
## mixture:2 2.096931e-12 2.688206e-15 9.429133e-16 9.090430e-02 8.595884e-16
##                       7            8            9           10           11
## mixture:1 1.883853e-22 1.915065e-22 1.163366e-08 5.202201e-09 1.947680e-22
## mixture:2 9.526220e-16 9.684055e-16 5.556030e-02 2.563210e-02 9.848981e-16
##                      12           13           14           15           16
## mixture:1 1.857124e-22 1.824745e-22 1.778735e-22 1.770409e-22 1.801687e-22
## mixture:2 9.391057e-16 9.227326e-16 8.994662e-16 8.952562e-16 9.110725e-16
##                      17           18           19
## mixture:1 2.007683e-22 2.305344e-22 2.526824e-22
## mixture:2 1.015240e-15 1.165760e-15 1.277758e-15
##
##
## Real Parameter f0
##
##             1
##  5.415004e-16
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
```

```
## Npar :  20  (unadjusted=21)
## -2lnL:  16.12256
## AICc :  56.92793  (unadjusted=56.927926)
##
## Beta
##                      estimate se           lcl           ucl
## pi:(Intercept)  0.000000e+00  0  0.000000e+00  0.000000e+00
## p:(Intercept)  -5.761098e+00  0 -5.761098e+00 -5.761098e+00
## p:time2         2.222744e+00  0  2.222744e+00  2.222744e+00
## p:time3         1.807639e+00  0  1.807639e+00  1.807639e+00
## p:time4         1.807639e+00  0  1.807639e+00  1.807639e+00
## p:time5         1.964994e+00  0  1.964994e+00  1.964994e+00
## p:time6         1.622124e+00  0  1.622124e+00  1.622124e+00
## p:time7         1.544669e-05  0  1.544669e-05  1.544669e-05
## p:time8         1.104944e+00  0  1.104944e+00  1.104944e+00
## p:time9         1.622124e+00  0  1.622124e+00  1.622124e+00
## p:time10        1.677016e-05  0  1.677016e-05  1.677016e-05
## p:time11        1.104943e+00  0  1.104943e+00  1.104943e+00
## p:time12        1.599138e-05  0  1.599138e-05  1.599138e-05
## p:time13        6.963144e-01  0  6.963144e-01  6.963144e-01
## p:time14        1.565671e-05  0  1.565671e-05  1.565671e-05
## p:time15        6.963166e-01  0  6.963166e-01  6.963166e-01
## p:time16        1.104945e+00  0  1.104945e+00  1.104945e+00
## p:time17        6.963165e-01  0  6.963165e-01  6.963165e-01
## p:time18        1.444744e-05  0  1.444744e-05  1.444744e-05
## p:time19        6.963166e-01  0  6.963166e-01  6.963166e-01
## f0:(Intercept)  5.570983e+00  0  5.570983e+00  5.570983e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.5
##
##
## Real Parameter p
##
##                    1         2        3        4         5         6         7
## mixture:1 0.0031378 0.0282404 0.018827 0.018827 0.0219648 0.0156891 0.0031378
## mixture:2 0.0031378 0.0282404 0.018827 0.018827 0.0219648 0.0156891 0.0031378
##                    8         9        10        11        12        13        14
## mixture:1 0.0094135 0.0156891 0.0031378 0.0094135 0.0031378 0.0062756 0.0031378
## mixture:2 0.0094135 0.0156891 0.0031378 0.0094135 0.0031378 0.0062756 0.0031378
##                   15        16        17        18        19
## mixture:1 0.0062757 0.0094135 0.0062757 0.0031378 0.0062757
## mixture:2 0.0062757 0.0094135 0.0062757 0.0031378 0.0062757
##
##
## Real Parameter c
##
##                    2        3        4         5         6         7         8
## mixture:1 0.0282404 0.018827 0.018827 0.0219648 0.0156891 0.0031378 0.0094135
## mixture:2 0.0282404 0.018827 0.018827 0.0219648 0.0156891 0.0031378 0.0094135
##                    9        10        11        12        13        14        15
```

```
## mixture:1 0.0156891 0.0031378 0.0094135 0.0031378 0.0062756 0.0031378 0.0062757
## mixture:2 0.0156891 0.0031378 0.0094135 0.0031378 0.0062756 0.0031378 0.0062757
##                  16        17        18        19
## mixture:1 0.0094135 0.0062757 0.0031378 0.0062757
## mixture:2 0.0094135 0.0062757 0.0031378 0.0062757
##
##
## Real Parameter f0
##
##         1
##  262.6921
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  39  (unadjusted=20)
## -2lnL:  -7.910774
## AICc :  73.1361  (unadjusted=32.894595)
##
## Beta
##                    estimate          se           lcl          ucl
## pi:(Intercept)   0.0010268    0.000000     0.0010268    0.0010268
## p:(Intercept)   -4.0073336    1.009056    -5.9850830   -2.0295842
## p:time2          2.3759201    1.072867     0.2731005    4.4787397
## p:time3          2.1102121    1.099937    -0.0456641    4.2660883
## p:time4          2.2727365    1.101940     0.1129337    4.4325392
## p:time5          2.2494773    1.119230     0.0557858    4.4431689
## p:time6          2.4387184    1.122435     0.2387457    4.6386912
## p:time7          0.8718375    1.435853    -1.9424348    3.6861098
## p:time8          2.1102104    1.183862    -0.2101590    4.4305797
## p:time9          2.2727320    1.187582    -0.0549292    4.6003931
## p:time10       -72.5799950    0.000000   -72.5799950  -72.5799950
## p:time11         2.4668899    1.192877     0.1288508    4.8049289
## p:time12         1.4423869    1.447453    -1.3946207    4.2793944
## p:time13         2.3025902    1.268504    -0.1836770    4.7888574
## p:time14         1.7047541    1.455400    -1.1478304    4.5573386
## p:time15         2.6210444    1.281871     0.1085780    5.1335109
## p:time16         3.4965122    1.245603     1.0551307    5.9378937
## p:time17         3.6018731    1.360708     0.9348853    6.2688609
## p:time18         3.3141934    1.586881     0.2039067    6.4244802
## p:time19        21.2374800 4329.912800 -8465.3917000 8507.8667000
## c:(Intercept)  -39.8732980    0.000000   -39.8732980  -39.8732980
## c:time3        -12.0494680    0.000000   -12.0494680  -12.0494680
## c:time4        -14.7613440    0.000000   -14.7613440  -14.7613440
## c:time5         37.5707170    0.000000    37.5707170   37.5707170
## c:time6        -10.5951340    0.000000   -10.5951340  -10.5951340
## c:time7         -5.2591513    0.000000    -5.2591513   -5.2591513
## c:time8         -4.7078986    0.000000    -4.7078986   -4.7078986
## c:time9         37.0401040    0.000000    37.0401040   37.0401040
## c:time10        36.2357280    0.000000    36.2357280   36.2357280
## c:time11        -5.5895487    0.000000    -5.5895487   -5.5895487
## c:time12        -7.9124933    0.000000    -7.9124933   -7.9124933
## c:time13        -8.7693127    0.000000    -8.7693127   -8.7693127
## c:time14       -10.4057770    0.000000   -10.4057770  -10.4057770
```

```
## c:time15       -11.1272450    0.000000   -11.1272450  -11.1272450
## c:time16       -12.2520790    0.000000   -12.2520790  -12.2520790
## c:time17       -12.9016880    0.000000   -12.9016880  -12.9016880
## c:time18       -12.5510730    0.000000   -12.5510730  -12.5510730
## c:time19       -12.1398170    0.000000   -12.1398170  -12.1398170
## f0:(Intercept) -17.2249480 1408.713100 -2778.3026000 2743.8527000
##
##
## Real Parameter pi
##
##
## mixture:1 0.5002567
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.0178571 0.1636368 0.1304346 0.1500005 0.147059 0.1724139 0.0416666
## mixture:2 0.0178571 0.1636368 0.1304346 0.1500005 0.147059 0.1724139 0.0416666
##                   8         9           10        11        12        13
## mixture:1 0.1304344 0.1499999 5.477041e-34 0.1764708 0.0714287 0.1538468
## mixture:2 0.1304344 0.1499999 5.477041e-34 0.1764708 0.0714287 0.1538468
##                  14        15       16        17        18 19
## mixture:1 0.0909096 0.2000008 0.375001 0.4000011 0.3333349  1
## mixture:2 0.0909096 0.2000008 0.375001 0.4000011 0.3333349  1
##
##
## Real Parameter c
##
##                       2            3            4         5            6
## mixture:1 4.822214e-18 2.819869e-23 1.872735e-24 0.0909094 1.207365e-22
## mixture:2 4.822214e-18 2.819869e-23 1.872735e-24 0.0909094 1.207365e-22
##                       7            8         9        10           11
## mixture:1 2.507414e-20 4.351431e-20 0.0555565 0.0256414 1.801923e-20
## mixture:2 2.507414e-20 4.351431e-20 0.0555565 0.0256414 1.801923e-20
##                      12           13           14           15           16
## mixture:1 1.765608e-21 7.495185e-22 1.459065e-22 7.091617e-23 2.302695e-23
## mixture:2 1.765608e-21 7.495185e-22 1.459065e-22 7.091617e-23 2.302695e-23
##                      17           18           19
## mixture:1 1.202582e-23 1.707594e-23 2.576268e-23
## mixture:2 1.202582e-23 1.707594e-23 2.576268e-23
##
##
## Real Parameter f0
##
##             1
##  3.305979e-08
```

```
cistude.results
```

```
##                                           model npar     AICc DeltaAICc
## 2                          pi(~1)p(~1)c(~1)f0(~1)    4 45.04211  0.000000
## 4               pi(~1)p(~mixture)c(~mixture)f0(~1)    6 49.08380  4.041699
## 1                            pi(~1)p(~1)c()f0(~1)    3 53.01850  7.976392
```

```
## 3                      pi(~1)p(~mixture)c()f0(~1)    4 55.03363  9.991522
## 7                         pi(~1)p(~time)c()f0(~1)   20 56.92793 11.885821
## 5                pi(~1)p(~time + mixture)c()f0(~1)   22 61.09470 16.052595
## 8                     pi(~1)p(~time)c(~time)f0(~1)   39 73.13610 28.093996
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   41 77.45909 32.416984
##         weight Deviance
## 2 8.614789e-01 57.15306
## 4 1.141829e-01 57.15306
## 1 1.596589e-02 67.14458
## 3 5.829257e-03 67.14458
## 7 2.260849e-03 36.27128
## 5 2.814933e-04 36.27128
## 8 6.834566e-07 12.23795
## 6 7.870203e-08 12.23795
```

```
names(cistude.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

```
cistude.results$p.dot.behav$results$real
```

```
##               estimate           se        lcl        ucl fixed note
## pi g1 m1     0.5000007 0.000000e+00  0.5000007  0.5000007
## p g1 t1 m1   0.0849953 1.086460e-02  0.0659801  0.1088519
## c g1 t2 m1   0.0078493 3.496500e-03  0.0032708  0.0187166
## f0 g1 a0 t1 12.2031660 1.354687e-06 12.2031630 12.2031680
```

```
cistude.results$p.dot.behav$results$derived
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 68.20317 68.20316 68.20317
```

Idem avec 2007.

```
cistude <- data.frame(ch = collapseCH(histories2007), freq = rep(1, nrow(histories2007)))
head(cistude)
```

```
##                         ch freq
## 1 10000000000000000000000    1
## 2 01111000000000000000000    1
## 3 00000100000000000000000    1
## 4 00000010000000000000000    1
## 5 00000001000000000000000    1
## 6 00000100000000000000000    1
```

```
tail(cistude)
```

```
##                         ch freq
## 64 00000000100000000000000    1
## 65 00000000010000000000000    1
## 66 00000000001100000000000    1
## 67 10000000000000000000000    1
## 68 10000000000000000000000    1
## 69 10000000000000000000100    1
```

```
cistude_secr <- unRMarkInput(cistude) # on convertit au bon format
summary(cistude_secr) # resumes
```

```
## Object class       capthist
##
## Counts by occasion
##              1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22
## n            7  3  1  4  5  6  4  8  3  3  3  3  1  6  2  7  4  1  3  2  1  2
## u            7  3  0  3  4  6  4  8  3  2  2  2  1  5  2  6  3  1  3  1  1  2
## f           61  7  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## M(t+1)       7 10 10 13 17 23 27 35 38 40 42 44 45 50 52 58 61 62 65 66 67 69
## losses       0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## detections   7  3  1  4  5  6  4  8  3  3  3  3  1  6  2  7  4  1  3  2  1  2
##             Total
## n              79
## u              69
## f              69
## M(t+1)         69
## losses          0
## detections     79
```

```
closure.test(cistude_secr, SB = TRUE)
```

```
## $Otis
##  statistic          p
##  -2.169297 0.01503008
##
## $Xc
##  statistic df         p
##   25.54082 20 0.1815182
##
## $NRvsJS
##  statistic df p
##          0  0 1
##
## $NMvsJS
##  statistic df p
##          0  0 1
##
## $MtvsNR
##  statistic df         p
##   25.54082 20 0.1815182
##
## $MtvsNM
##  statistic df         p
```

```
##   25.54082 20 0.1815182
##
## $compNRvsJS
##    Occasion Chisquare df  p
## 1         2         NA NA NA
## 2         3         NA NA NA
## 3         4         NA NA NA
## 4         5         NA NA NA
## 5         6         NA NA NA
## 6         7         NA NA NA
## 7         8         NA NA NA
## 8         9         NA NA NA
## 9        10         NA NA NA
## 10       11         NA NA NA
## 11       12         NA NA NA
## 12       13         NA NA NA
## 13       14         NA NA NA
## 14       15         NA NA NA
## 15       16         NA NA NA
## 16       17         NA NA NA
## 17       18         NA NA NA
## 18       19         NA NA NA
## 19       20         NA NA NA
## 20       21         NA NA NA
##
## $compNMvsJS
##    Occasion Chisquare df  p
## 1         2         NA NA NA
## 2         3         NA NA NA
## 3         4         NA NA NA
## 4         5         NA NA NA
## 5         6         NA NA NA
## 6         7         NA NA NA
## 7         8         NA NA NA
## 8         9         NA NA NA
## 9        10         NA NA NA
## 10       11         NA NA NA
## 11       12         NA NA NA
## 12       13         NA NA NA
## 13       14         NA NA NA
## 14       15         NA NA NA
## 15       16         NA NA NA
## 16       17         NA NA NA
## 17       18         NA NA NA
## 18       19         NA NA NA
## 19       20         NA NA NA
## 20       21         NA NA NA
```

```
cistude.proc <- process.data(cistude, begin.time = 1, model = "FullHet")
cistude.ddl <- make.design.data(cistude.proc)
```

```
run.cistude <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
```

```
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  cistude.model.list <- create.model.list("FullHet")

  cistude.results <- mark.wrapper(cistude.model.list,
                              data = cistude.proc,
                              ddl = cistude.ddl)

  return(cistude.results)
}
```

```
cistude.results <- run.cistude()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  2  (unadjusted=3)
## -2lnL:  85.99303
## AICc :  90.00095  (unadjusted=90.000953)
##
## Beta
##                 estimate se       lcl       ucl
## pi:(Intercept)  0.000000  0  0.000000  0.000000
## p:(Intercept)  -4.304988  0 -4.304988 -4.304988
## f0:(Intercept)  5.301131  0  5.301131  5.301131
##
##
## Real Parameter pi
##
##
## mixture:1 0.5
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
## mixture:2 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
##                    8         9        10        11        12        13        14
## mixture:1 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
## mixture:2 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
##                   15        16        17        18        19        20        21
```

```
## mixture:1 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
## mixture:2 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
##                  22
## mixture:1 0.0133212
## mixture:2 0.0133212
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
## mixture:2 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
##                   9        10        11        12        13        14        15
## mixture:1 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
## mixture:2 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
##                  16        17        18        19        20        21        22
## mixture:1 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
## mixture:2 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212 0.0133212
##
##
## Real Parameter f0
##
##         1
##  200.5635
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=3)
## -2lnL:  83.46629
## AICc :  91.49273  (unadjusted=89.48214)
##
## Beta
##                      estimate           se          lcl         ucl
## pi:(Intercept)  0.0004958509 1774.5000000 -3478.019500 3478.020500
## p:(Intercept)  -3.1173556000    0.4578073    -4.014658   -2.220053
## c:(Intercept)  -4.4091553000    0.3181455    -5.032720   -3.785590
## f0:(Intercept)  3.7564037000    0.7299594     2.325683    5.187124
##
##
## Real Parameter pi
##
##
## mixture:1 0.500124
##
##
## Real Parameter p
##
##                   1        2        3        4        5        6        7
## mixture:1 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397
## mixture:2 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397
##                   8        9       10       11       12       13       14
## mixture:1 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397
## mixture:2 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397
```

```
##                 15       16       17       18       19       20       21
## mixture:1 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397
## mixture:2 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397 0.042397
##                 22
## mixture:1 0.042397
## mixture:2 0.042397
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192
## mixture:2 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192
##                   9        10        11        12        13        14        15
## mixture:1 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192
## mixture:2 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192
##                  16        17        18        19        20        21        22
## mixture:1 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192
## mixture:2 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192 0.0120192
##
##
## Real Parameter f0
##
##         1
##  42.79425
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4
## -2lnL:  83.21729
## AICc :  91.24373
##
## Beta
##                  estimate        se       lcl        ucl
## pi:(Intercept) -5.259834 1.6096039 -8.414658 -2.1050107
## p:(Intercept)  -1.956460 1.0035338 -3.923386  0.0104666
## p:mixture2     -2.720611 0.9669151 -4.615765 -0.8254574
## f0:(Intercept)  5.693511 0.4901406  4.732836  6.6541868
##
##
## Real Parameter pi
##
##
## mixture:1 0.0051693
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507
## mixture:2 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204
##                   8         9        10        11        12        13        14
## mixture:1 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507
```

```
## mixture:2 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204
##                  15        16        17        18        19        20        21
## mixture:1 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507
## mixture:2 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204
##                  22
## mixture:1 0.1238507
## mixture:2 0.0092204
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507
## mixture:2 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204
##                   9        10        11        12        13        14        15
## mixture:1 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507
## mixture:2 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204
##                  16        17        18        19        20        21        22
## mixture:1 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507 0.1238507
## mixture:2 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204 0.0092204
##
##
## Real Parameter f0
##
##         1
##  296.9344
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6
## -2lnL:  79.38652
## AICc :  91.44211
##
## Beta
##                  estimate        se       lcl        ucl
## pi:(Intercept) -4.081525 1.3215291 -6.671722 -1.4913279
## p:(Intercept)   0.159102 1.5312621 -2.842172  3.1603758
## p:mixture2     -3.431431 1.6906324 -6.745071 -0.1177915
## c:(Intercept)  -2.301627 1.0099950 -4.281218 -0.3220373
## c:mixture2     -2.522457 0.9763939 -4.436189 -0.6087248
## f0:(Intercept)  3.957614 0.8412523  2.308760  5.6064689
##
##
## Real Parameter pi
##
##
## mixture:1 0.0166014
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918
```

```
## mixture:2 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328
##                   8         9        10        11        12        13        14
## mixture:1 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918
## mixture:2 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328
##                  15        16        17        18        19        20        21
## mixture:1 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918 0.5396918
## mixture:2 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328 0.0365328
##                  22
## mixture:1 0.5396918
## mixture:2 0.0365328
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883
## mixture:2 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699
##                   9        10        11        12        13        14        15
## mixture:1 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883
## mixture:2 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699
##                  16        17        18        19        20        21        22
## mixture:1 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883 0.0909883
## mixture:2 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699 0.0079699
##
##
## Real Parameter f0
##
##         1
##  52.33233
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  25
## -2lnL:  56.76562
## AICc :  107.6369
##
## Beta
##                      estimate        se        lcl        ucl
## pi:(Intercept) -5.283650e+00 1.5634189 -8.3479512 -2.2193489
## p:(Intercept)  -1.205607e+00 1.0757028 -3.3139849  0.9027701
## p:time2        -8.664614e-01 0.6970411 -2.2326621  0.4997392
## p:time3        -1.975413e+00 1.0737510 -4.0799645  0.1291394
## p:time4        -5.738171e-01 0.6343285 -1.8171010  0.6694668
## p:time5        -3.458356e-01 0.5934948 -1.5090853  0.8174142
## p:time6        -1.587829e-01 0.5646123 -1.2654232  0.9478573
## p:time7        -5.738177e-01 0.6343298 -1.8171042  0.6694688
## p:time8         1.380618e-01 0.5262444 -0.8933772  1.1695007
## p:time9        -8.664605e-01 0.6970419 -2.2326626  0.4997417
## p:time10       -8.664632e-01 0.6970409 -2.2326634  0.4997370
## p:time11       -8.664595e-01 0.6970412 -2.2326604  0.4997413
## p:time12       -8.664600e-01 0.6970414 -2.2326611  0.4997411
## p:time13       -1.975415e+00 1.0737548 -4.0799748  0.1291440
## p:time14       -1.587840e-01 0.5646124 -1.2654244  0.9478564
```

```
## p:time15       -1.277024e+00 0.8079127 -2.8605327  0.3064852
## p:time16       -4.804107e-06 0.5430254 -1.0643347  1.0643251
## p:time17       -5.738152e-01 0.6343288 -1.8170996  0.6694693
## p:time18       -1.975412e+00 1.0737520 -4.0799664  0.1291416
## p:time19       -8.664623e-01 0.6970423 -2.2326653  0.4997407
## p:time20       -1.277020e+00 0.8079113 -2.8605263  0.3064860
## p:time21       -1.975402e+00 1.0737469 -4.0799464  0.1291417
## p:time22       -1.277025e+00 0.8079125 -2.8605331  0.3064841
## p:mixture2     -2.772609e+00 0.9754472 -4.6844860 -0.8607328
## f0:(Intercept)  5.673243e+00 0.4870518  4.7186213  6.6278645
##
##
## Real Parameter pi
##
##
## mixture:1 0.0050483
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.2304792 0.1118414 0.0398863 0.1443742 0.1748780 0.2035277 0.1443741
## mixture:2 0.0183750 0.0078087 0.0025897 0.0104357 0.0130729 0.0157196 0.0104357
##                    8         9        10        11        12        13        14
## mixture:1 0.2558701 0.1118415 0.1118412 0.1118416 0.1118415 0.0398861 0.2035275
## mixture:2 0.0210382 0.0078087 0.0078087 0.0078087 0.0078087 0.0025897 0.0157196
##                   15        16        17        18        19        20        21
## mixture:1 0.0770848 0.2304783 0.1443745 0.0398863 0.1118413 0.0770851 0.0398866
## mixture:2 0.0051930 0.0183749 0.0104357 0.0025897 0.0078087 0.0051930 0.0025897
##                   22
## mixture:1 0.0770848
## mixture:2 0.0051930
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.1118414 0.0398863 0.1443742 0.1748780 0.2035277 0.1443741 0.2558701
## mixture:2 0.0078087 0.0025897 0.0104357 0.0130729 0.0157196 0.0104357 0.0210382
##                    9        10        11        12        13        14        15
## mixture:1 0.1118415 0.1118412 0.1118416 0.1118415 0.0398861 0.2035275 0.0770848
## mixture:2 0.0078087 0.0078087 0.0078087 0.0078087 0.0025897 0.0157196 0.0051930
##                   16        17        18        19        20        21        22
## mixture:1 0.2304783 0.1443745 0.0398863 0.1118413 0.0770851 0.0398866 0.0770848
## mixture:2 0.0183749 0.0104357 0.0025897 0.0078087 0.0051930 0.0025897 0.0051930
##
##
## Real Parameter f0
##
##         1
##  290.9766
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
```

```
##
## Npar :  47  (unadjusted=33)
## -2lnL:  29.49561
## AICc :  126.565  (unadjusted=97.007739)
##
## Beta
##                      estimate           se           lcl           ucl
## pi:(Intercept)   -3.8195569 1.512882e+00 -6.784806e+00    -0.8543079
## p:(Intercept)     0.0343588 2.189413e+00 -4.256890e+00     4.3256078
## p:mixture2       -2.3176224 2.233387e+00 -6.695061e+00     2.0598166
## p:time2          -0.8261684 7.299714e-01 -2.256912e+00     0.6045756
## p:time3         -17.0701210 2.058939e+03 -4.052590e+03  4018.4493000
## p:time4          -0.6673841 7.347138e-01 -2.107423e+00     0.7726550
## p:time5          -0.3001238 6.779702e-01 -1.628945e+00     1.0286978
## p:time6           0.2345078 6.156861e-01 -9.722369e-01     1.4412525
## p:time7          -0.0795182 6.824596e-01 -1.417139e+00     1.2581025
## p:time8           0.8343459 5.848933e-01 -3.120449e-01     1.9807367
## p:time9          -0.0544368 7.443871e-01 -1.513435e+00     1.4045619
## p:time10         -0.3921381 8.498283e-01 -2.057802e+00     1.2735255
## p:time11         -0.3205279 8.512699e-01 -1.989017e+00     1.3479611
## p:time12         -0.2427024 8.523745e-01 -1.913356e+00     1.4279516
## p:time13         -0.8949896 1.108231e+00 -3.067122e+00     1.2771425
## p:time14          0.9481996 6.624907e-01 -3.502823e-01     2.2466814
## p:time15          0.1431846 8.631554e-01 -1.548600e+00     1.8349692
## p:time16          1.6770939 6.661344e-01  3.714705e-01     2.9827173
## p:time17          1.3024467 8.027920e-01 -2.710256e-01     2.8759191
## p:time18          0.3373239 1.152843e+00 -1.922249e+00     2.5968971
## p:time19          1.9955889 8.771922e-01  2.762922e-01     3.7148856
## p:time20          1.1846222 1.232675e+00 -1.231421e+00     3.6006649
## p:time21          1.5901500 1.298505e+00 -9.549204e-01     4.1352203
## p:time22        167.0475500 0.000000e+00  1.670476e+02   167.0475500
## c:(Intercept)   -17.8013620 0.000000e+00 -1.780136e+01   -17.8013620
## c:mixture2       -2.4078994 1.135998e+00 -4.634456e+00    -0.1813430
## c:time3          17.4000460 0.000000e+00  1.740005e+01    17.4000460
## c:time4          17.4000470 0.000000e+00  1.740005e+01    17.4000470
## c:time5          17.1896240 0.000000e+00  1.718962e+01    17.1896240
## c:time6         -22.7248980 3.516988e+03 -6.916021e+03  6870.5709000
## c:time7         -14.5761820 0.000000e+00 -1.457618e+01   -14.5761820
## c:time8         -10.6132000 0.000000e+00 -1.061320e+01   -10.6132000
## c:time9          -5.8569230 1.374652e+04 -2.694903e+04 26937.3210000
## c:time10         16.3142270 0.000000e+00  1.631423e+01    16.3142270
## c:time11         16.2722510 0.000000e+00  1.627225e+01    16.2722510
## c:time12         16.2316790 0.000000e+00  1.623168e+01    16.2316790
## c:time13         -4.2652259 4.747351e+03 -9.309073e+03  9300.5428000
## c:time14         16.1749230 0.000000e+00  1.617492e+01    16.1749230
## c:time15         -4.0775453 3.182847e+03 -6.242457e+03  6234.3016000
## c:time16         16.0541890 0.000000e+00  1.605419e+01    16.0541890
## c:time17         15.9619240 0.000000e+00  1.596192e+01    15.9619240
## c:time18         -4.3087818 8.151162e+03 -1.598059e+04 15971.9690000
## c:time19         -4.3182024 8.233744e+03 -1.614246e+04 16133.8200000
## c:time20         15.8642620 0.000000e+00  1.586426e+01    15.8642620
## c:time21         -4.2952427 2.241070e+03 -4.396792e+03  4388.2014000
## c:time22         -4.2739539 3.198209e+03 -6.272764e+03  6264.2158000
## f0:(Intercept) -163.0714300 0.000000e+00 -1.630714e+02  -163.0714300
```

```
##
##
## Real Parameter pi
##
##
## mixture:1 0.0214666
##
##
## Real Parameter p
##
##                    1         2            3         4         5         6
## mixture:1 0.5085888 0.3117802 3.994500e-08 0.3468249 0.4339471 0.5668146
## mixture:2 0.0925186 0.0427199 3.934883e-09 0.0497059 0.0702153 0.1141782
##                    7         8         9        10        11        12        13
## mixture:1 0.4887121 0.7044761 0.4949807 0.4114972 0.4289420 0.4481017 0.2972076
## mixture:2 0.0860552 0.1901682 0.0880484 0.0644405 0.0688948 0.0740578 0.0399923
##                   14        15        16        17        18        19        20
## mixture:1 0.7276155 0.5442696 0.8470246 0.7919641 0.5918655 0.8839057 0.7718842
## mixture:2 0.2083229 0.1052619 0.3529334 0.2727297 0.1249968 0.4285732 0.2499945
##                   21 22
## mixture:1 0.8354160  1
## mixture:2 0.3333408  1
##
##
## Real Parameter c
##
##                        2         3         4         5            6            7
## mixture:1 1.857662e-08 0.4009961 0.4009965 0.3516628 2.509972e-18 8.681828e-15
## mixture:2 1.671973e-09 0.0568282 0.0568283 0.0465466 2.259079e-19 7.814006e-16
##                        8            9        10        11        12           13
## mixture:1 4.567854e-13 5.312969e-11 0.1843521 0.1781238 0.1722615 2.609772e-10
## mixture:2 4.111259e-14 4.781893e-12 0.0199371 0.0191332 0.0183865 2.348903e-11
##                   14           15        16        17           18           19
## mixture:1 0.1643188 3.148554e-10 0.1484041 0.1371177 2.498541e-10 2.475114e-10
## mixture:2 0.0173896 2.833830e-11 0.0154424 0.0141006 2.248791e-11 2.227705e-11
##                   20           21           22
## mixture:1 0.1259668 2.532599e-10 2.587093e-10
## mixture:2 0.0128054 2.279444e-11 2.328491e-11
##
##
## Real Parameter f0
##
##             1
##  1.510008e-71
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  24  (unadjusted=23)
## -2lnL:  59.63505
## AICc :  108.4388  (unadjusted=106.374)
##
## Beta
##                      estimate        se           lcl           ucl
```

```
## pi:(Intercept) -4.652298e-04 0.0000000 -0.0004652298 -0.0004652298
## p:(Intercept)  -3.609588e+00 0.4818252 -4.5539650000 -2.6652102000
## p:time2        -8.626479e-01 0.6956217 -2.2260664000  0.5007707000
## p:time3        -1.968846e+00 1.0726413 -4.0712236000  0.1335305000
## p:time4        -5.711515e-01 0.6329005 -1.8116365000  0.6693335000
## p:time5        -3.441787e-01 0.5920912 -1.5046775000  0.8163201000
## p:time6        -1.580127e-01 0.5632488 -1.2619803000  0.9459549000
## p:time7        -5.711509e-01 0.6328999 -1.8116348000  0.6693330000
## p:time8         1.374019e-01 0.5249871 -0.8915729000  1.1663766000
## p:time9        -8.626467e-01 0.6956217 -2.2260654000  0.5007719000
## p:time10       -8.626467e-01 0.6956231 -2.2260680000  0.5007746000
## p:time11       -8.626479e-01 0.6956218 -2.2260666000  0.5007708000
## p:time12       -8.626463e-01 0.6956217 -2.2260649000  0.5007723000
## p:time13       -1.968846e+00 1.0726393 -4.0712193000  0.1335266000
## p:time14       -1.580136e-01 0.5632500 -1.2619837000  0.9459564000
## p:time15       -1.271914e+00 0.8065698 -2.8527906000  0.3089631000
## p:time16       -3.104676e-06 0.5417137 -1.0617620000  1.0617557000
## p:time17       -5.711517e-01 0.6329015 -1.8116386000  0.6693352000
## p:time18       -1.968847e+00 1.0726408 -4.0712232000  0.1335289000
## p:time19       -8.626468e-01 0.6956213 -2.2260647000  0.5007710000
## p:time20       -1.271911e+00 0.8065677 -2.8527839000  0.3089615000
## p:time21       -1.968846e+00 1.0726401 -4.0712207000  0.1335286000
## p:time22       -1.271912e+00 0.8065700 -2.8527892000  0.3089654000
## f0:(Intercept)  5.281458e+00 0.3844261  4.5279833000  6.0349336000
##
##
## Real Parameter pi
##
##
## mixture:1 0.4998837
##
##
## Real Parameter p
##
##                    1         2         3        4         5         6        7
## mixture:1 0.0263499 0.0112928 0.0037643 0.015057 0.0188213 0.0225856 0.015057
## mixture:2 0.0263499 0.0112928 0.0037643 0.015057 0.0188213 0.0225856 0.015057
##                    8         9        10        11        12        13        14
## mixture:1 0.0301141 0.0112928 0.0112928 0.0112928 0.0112928 0.0037643 0.0225855
## mixture:2 0.0301141 0.0112928 0.0112928 0.0112928 0.0112928 0.0037643 0.0225855
##                   15        16       17        18        19        20        21
## mixture:1 0.0075285 0.0263498 0.015057 0.0037643 0.0112928 0.0075285 0.0037643
## mixture:2 0.0075285 0.0263498 0.015057 0.0037643 0.0112928 0.0075285 0.0037643
##                   22
## mixture:1 0.0075285
## mixture:2 0.0075285
##
##
## Real Parameter c
##
##                    2         3        4         5         6        7         8
## mixture:1 0.0112928 0.0037643 0.015057 0.0188213 0.0225856 0.015057 0.0301141
## mixture:2 0.0112928 0.0037643 0.015057 0.0188213 0.0225856 0.015057 0.0301141
##                    9        10        11        12        13        14        15
```

```
## mixture:1 0.0112928 0.0112928 0.0112928 0.0112928 0.0037643 0.0225855 0.0075285
## mixture:2 0.0112928 0.0112928 0.0112928 0.0112928 0.0037643 0.0225855 0.0075285
##                  16       17        18        19        20        21        22
## mixture:1 0.0263498 0.015057 0.0037643 0.0112928 0.0075285 0.0037643 0.0075285
## mixture:2 0.0263498 0.015057 0.0037643 0.0112928 0.0075285 0.0037643 0.0075285
##
##
## Real Parameter f0
##
##         1
##  196.6565
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  45  (unadjusted=30)
## -2lnL:  31.33084
## AICc :  124.1433  (unadjusted=92.581683)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept) -8.419393e-04 0.000000e+00 -8.419393e-04 -8.419393e-04
## p:(Intercept)  -2.181227e+00 3.987340e-01 -2.962746e+00 -1.399709e+00
## p:time2        -7.976980e-01 7.136337e-01 -2.196420e+00  6.010241e-01
## p:time3        -4.289535e+01 5.288292e+04 -1.036934e+05  1.036076e+05
## p:time4        -7.455117e-01 7.142686e-01 -2.145478e+00  6.544548e-01
## p:time5        -3.837218e-01 6.543859e-01 -1.666318e+00  8.988746e-01
## p:time6         1.443457e-01 5.894028e-01 -1.010884e+00  1.299575e+00
## p:time7        -1.701469e-01 6.578736e-01 -1.459579e+00  1.119285e+00
## p:time8         7.343086e-01 5.598216e-01 -3.629418e-01  1.831559e+00
## p:time9        -1.541471e-01 7.242789e-01 -1.573734e+00  1.265440e+00
## p:time10       -4.929200e-01 8.327511e-01 -2.125112e+00  1.139272e+00
## p:time11       -4.214615e-01 8.342815e-01 -2.056653e+00  1.213730e+00
## p:time12       -3.445008e-01 8.360572e-01 -1.983173e+00  1.294171e+00
## p:time13       -9.968261e-01 1.095744e+00 -3.144484e+00  1.150832e+00
## p:time14        8.462262e-01 6.415764e-01 -4.112635e-01  2.103716e+00
## p:time15        4.116230e-02 8.472405e-01 -1.619429e+00  1.701754e+00
## p:time16        1.575092e+00 6.454177e-01  3.100730e-01  2.840111e+00
## p:time17        1.200397e+00 7.856986e-01 -3.395720e-01  2.740366e+00
## p:time18        2.353179e-01 1.140993e+00 -2.001029e+00  2.471665e+00
## p:time19        1.893545e+00 8.615819e-01  2.048444e-01  3.582245e+00
## p:time20        1.082616e+00 1.221608e+00 -1.311736e+00  3.476968e+00
## p:time21        1.488081e+00 1.288019e+00 -1.036436e+00  4.012599e+00
## p:time22        2.374828e+01 0.000000e+00  2.374828e+01  2.374828e+01
## c:(Intercept)  -2.387901e+01 0.000000e+00 -2.387901e+01 -2.387901e+01
## c:time3         2.168179e+01 0.000000e+00  2.168179e+01  2.168179e+01
## c:time4         2.168179e+01 0.000000e+00  2.168179e+01  2.168179e+01
## c:time5         2.139410e+01 0.000000e+00  2.139410e+01  2.139410e+01
## c:time6        -1.300174e+01 0.000000e+00 -1.300174e+01 -1.300174e+01
## c:time7        -1.473403e+01 2.524510e+04 -4.949513e+04  4.946566e+04
## c:time8        -1.583671e+01 7.511565e+03 -1.473850e+04  1.470683e+04
## c:time9        -1.823540e+01 0.000000e+00 -1.823540e+01 -1.823540e+01
## c:time10        2.026809e+01 0.000000e+00  2.026809e+01  2.026809e+01
## c:time11        2.021545e+01 0.000000e+00  2.021545e+01  2.021545e+01
```

```
## c:time12        2.016544e+01 0.000000e+00  2.016544e+01  2.016544e+01
## c:time13       -1.928864e+01 5.058070e+04 -9.915746e+04  9.911888e+04
## c:time14        2.009482e+01 0.000000e+00  2.009482e+01  2.009482e+01
## c:time15       -1.965391e+01 0.000000e+00 -1.965391e+01 -1.965391e+01
## c:time16        1.994718e+01 0.000000e+00  1.994718e+01  1.994718e+01
## c:time17        1.983596e+01 0.000000e+00  1.983596e+01  1.983596e+01
## c:time18       -1.429703e+01 1.220633e+04 -2.393871e+04  2.391011e+04
## c:time19       -1.417663e+01 2.116385e+04 -4.149532e+04  4.146697e+04
## c:time20        1.972013e+01 0.000000e+00  1.972013e+01  1.972013e+01
## c:time21       -1.609996e+01 2.942672e+04 -5.769247e+04  5.766027e+04
## c:time22       -1.703121e+01 0.000000e+00 -1.703121e+01 -1.703121e+01
## f0:(Intercept) -1.764185e+01 1.504953e+03 -2.967349e+03  2.932066e+03
##
##
## Real Parameter pi
##
##
## mixture:1 0.4997895
##
##
## Real Parameter p
##
##                  1         2            3         4         5         6
## mixture:1 0.101449 0.0483871 2.651499e-20 0.0508475 0.0714286 0.1153847
## mixture:2 0.101449 0.0483871 2.651499e-20 0.0508475 0.0714286 0.1153847
##                   7         8         9        10        11        12   13
## mixture:1 0.0869566 0.1904762 0.0882353 0.0645162 0.0689656 0.0740741 0.04
## mixture:2 0.0869566 0.1904762 0.0882353 0.0645162 0.0689656 0.0740741 0.04
##                  14        15        16        17        18        19        20
## mixture:1 0.2083333 0.1052633 0.3529412 0.2727271 0.1250001 0.4285714 0.2500001
## mixture:2 0.2083333 0.1052633 0.3529412 0.2727271 0.1250001 0.4285714 0.2500001
##                  21 22
## mixture:1 0.3333336  1
## mixture:2 0.3333336  1
##
##
## Real Parameter c
##
##                       2   3   4         5            6            7            8
## mixture:1 4.260666e-11 0.1 0.1 0.0769231 9.613736e-17 1.700481e-17 5.645207e-18
## mixture:2 4.260666e-11 0.1 0.1 0.0769231 9.613736e-17 1.700481e-17 5.645207e-18
##                       9        10    11        12           13        14
## mixture:1 5.127974e-19 0.0263158 0.025 0.0238095 1.788657e-19 0.0222222
## mixture:2 5.127974e-19 0.0263158 0.025 0.0238095 1.788657e-19 0.0222222
##                      15        16        17           18           19        20
## mixture:1 1.241351e-19 0.0192308 0.0172414 2.632416e-17 2.969246e-17 0.0153846
## mixture:2 1.241351e-19 0.0192308 0.0172414 2.632416e-17 2.969246e-17 0.0153846
##                      21          22
## mixture:1 4.338642e-18 1.70969e-18
## mixture:2 4.338642e-18 1.70969e-18
##
##
## Real Parameter f0
##
```

```
##             1
##  2.178928e-08
```

```
cistude.results
```

```
##                                             model npar      AICc DeltaAICc
## 1                             pi(~1)p(~1)c()f0(~1)    2  90.00095  0.000000
## 3                         pi(~1)p(~mixture)c()f0(~1)    4  91.24373  1.242779
## 4                 pi(~1)p(~mixture)c(~mixture)f0(~1)    6  91.44211  1.441160
## 2                             pi(~1)p(~1)c(~1)f0(~1)    4  91.49273  1.491773
## 5                  pi(~1)p(~time + mixture)c()f0(~1)   25 107.63693 17.635979
## 7                            pi(~1)p(~time)c()f0(~1)   24 108.43880 18.437844
## 8                        pi(~1)p(~time)c(~time)f0(~1)   45 124.14334 34.142389
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   47 126.56500 36.564045
##         weight  Deviance
## 1 4.002836e-01 115.43712
## 3 2.150314e-01 112.66139
## 4 1.947260e-01 108.83061
## 2 1.898600e-01 112.91038
## 5 5.926028e-05  86.20971
## 7 3.968632e-05  89.07914
## 8 1.543271e-08  60.77493
## 6 4.598184e-09  58.93970
```

```
names(cistude.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

```
cistude.results$p.h$results$real
```

```
##                 estimate          se          lcl         ucl fixed note
## pi g1 m1       0.0051693   0.0082775 2.215461e-04   0.1086108
## p g1 t1 m1     0.1238507   0.1088952 1.939060e-02   0.5026166
## p g1 t1 m2     0.0092204   0.0040212 3.911900e-03   0.0215766
## f0 g1 a0 t1 296.9343900 145.5395900 1.195884e+02 737.2789200
```

```
cistude.results$p.h$results$derived
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 365.9344 188.5884 806.2789
```

Exercice 4 : iguanes

Données 2006

Les données.

```
iguane <- convert.inp("dat/iguanes-2006-2sexes-FM.inp",
                      group.df = data.frame(sex = c("F","M")),
                      covariates = NULL)
head(iguane)
```

```
##                     ch freq sex
## 1:1 00000000000001000    1   F
## 1:2 00000000000001000    1   F
## 1:3 00000000000010000    1   F
## 1:4 00010000000000000    1   F
## 1:5 00001000000000000    1   F
## 1:6 00000000000010000    1   F
```

```
tail(iguane)
```

```
##                       ch freq sex
## 2:156 00000010000010000    1   M
## 2:157 00000001000000010    1   M
## 2:158 00000100100000000    1   M
## 2:159 00000010000000100    1   M
## 2:160 01000000100000000    1   M
## 2:161 01100000100000000    1   M
```

On sépare mâles et femelles.

```
iguaneM <- iguane[iguane$sex == "M", ]
iguaneF <- iguane[iguane$sex == "F", ]
```

On formate les données.

```
iguane_secr <- unRMarkInput(iguane) # on convertit au bon format
iguaneM_secr <- unRMarkInput(iguaneM) # on convertit au bon format
iguaneF_secr <- unRMarkInput(iguaneF) # on convertit au bon format
summary(iguane_secr) # resumes
```

```
## Object class       capthist
##
## Counts by occasion
##              1  2  3  4  5  6  7  8  9 10 11  12  13  14  15  16  17 Total
## n            1 10  4 11 12 11 13 10 10  4 18  17  16  11  12  19   1   180
## u            1 10  3 11 12 10 12 10  7  3 16  16  14  11   8  16   1   161
## f          145 13  3  0  0  0  0  0  0  0  0   0   0   0   0   0   0   161
## M(t+1)       1 11 14 25 37 47 59 69 76 79 95 111 125 136 144 160 161   161
## losses       0  0  0  0  0  0  0  0  0  0  0   0   0   0   0   0   0     0
## detections   1 10  4 11 12 11 13 10 10  4 18  17  16  11  12  19   1   180
##
## Individual covariates
##  sex
##  F:89
##  M:72
```

```r
summary(iguaneM_secr) # resumes
```

```
## Object class       capthist
##
## Counts by occasion
##             1 2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 Total
## n           0 9  3  4  8  6  6  2  5  1  5  5  9  4  6  9  1    83
## u           0 9  2  4  8  5  5  2  2  1  5  5  8  4  4  7  1    72
## f          62 9  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0    72
## M(t+1)      0 9 11 15 23 28 33 35 37 38 43 48 56 60 64 71 72    72
## losses      0 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0     0
## detections  0 9  3  4  8  6  6  2  5  1  5  5  9  4  6  9  1    83
##
## Individual covariates
##  sex
##  M:72
```

```r
summary(iguaneF_secr) # resumes
```

```
## Object class       capthist
##
## Counts by occasion
##             1 2 3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 Total
## n           1 1 1  7  4  5  7  8  5  3 13 12  7  7  6 10  0    97
## u           1 1 1  7  4  5  7  8  5  2 11 11  6  7  4  9  0    89
## f          83 4 2  0  0  0  0  0  0  0  0  0  0  0  0  0  0    89
## M(t+1)      1 2 3 10 14 19 26 34 39 41 52 63 69 76 80 89 89    89
## losses      0 0 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0     0
## detections  1 1 1  7  4  5  7  8  5  3 13 12  7  7  6 10  0    97
##
## Individual covariates
##  sex
##  F:89
```

Les deux sexes ensemble.

```r
closure.test(iguane_secr, SB = TRUE)
```

```
## $Otis
##  statistic          p
##  -1.894954 0.02904928
##
## $Xc
##  statistic df         p
##   10.06825 16 0.8630401
##
## $NRvsJS
##  statistic df        p
##   1.475048  1 0.224551
##
## $NMvsJS
```

```
##   statistic df         p
##  0.04058442  1 0.8403422
##
## $MtvsNR
##  statistic df         p
##   8.593198 15 0.8978099
##
## $MtvsNM
##  statistic df         p
##   10.02766 15 0.8179963
##
## $compNRvsJS
##    Occasion Chisquare df        p
## 1         2        NA NA       NA
## 2         3        NA NA       NA
## 3         4        NA NA       NA
## 4         5        NA NA       NA
## 5         6        NA NA       NA
## 6         7        NA NA       NA
## 7         8        NA NA       NA
## 8         9        NA NA       NA
## 9        10        NA NA       NA
## 10       11        NA NA       NA
## 11       12        NA NA       NA
## 12       13        NA NA       NA
## 13       14        NA NA       NA
## 14       15  1.475048  1 0.224551
## 15       16        NA NA       NA
##
## $compNMvsJS
##    Occasion  Chisquare df         p
## 1         2         NA NA        NA
## 2         3         NA NA        NA
## 3         4 0.04058442  1 0.8403422
## 4         5         NA NA        NA
## 5         6         NA NA        NA
## 6         7         NA NA        NA
## 7         8         NA NA        NA
## 8         9         NA NA        NA
## 9        10         NA NA        NA
## 10       11         NA NA        NA
## 11       12         NA NA        NA
## 12       13         NA NA        NA
## 13       14         NA NA        NA
## 14       15         NA NA        NA
## 15       16         NA NA        NA
```

On fait les tests de fermeture, mâles d'abord.

```
closure.test(iguaneM_secr, SB = TRUE)
```

```
## $Otis
##   statistic        p
```

```
##  -0.5883371 0.278153
##
## $Xc
##  statistic df  p
##          0 NA NA
##
## $NRvsJS
##  statistic df p
##          0  0 1
##
## $NMvsJS
##  statistic df p
##          0  0 1
##
## $MtvsNR
##  statistic df  p
##         NA NA NA
##
## $MtvsNM
##  statistic df  p
##         NA NA NA
##
## $compNRvsJS
##    Occasion Chisquare df  p
## 1         2        NA NA NA
## 2         3        NA NA NA
## 3         4        NA NA NA
## 4         5        NA NA NA
## 5         6        NA NA NA
## 6         7        NA NA NA
## 7         8        NA NA NA
## 8         9        NA NA NA
## 9        10        NA NA NA
## 10       11        NA NA NA
## 11       12        NA NA NA
## 12       13        NA NA NA
## 13       14        NA NA NA
## 14       15        NA NA NA
## 15       16        NA NA NA
##
## $compNMvsJS
##    Occasion Chisquare df  p
## 1         2        NA NA NA
## 2         3        NA NA NA
## 3         4        NA NA NA
## 4         5        NA NA NA
## 5         6        NA NA NA
## 6         7        NA NA NA
## 7         8        NA NA NA
## 8         9        NA NA NA
## 9        10        NA NA NA
## 10       11        NA NA NA
## 11       12        NA NA NA
## 12       13        NA NA NA
```

```
## 13       14        NA NA NA
## 14       15        NA NA NA
## 15       16        NA NA NA
```

Femelles ensuite.

```
closure.test(iguaneF_secr, SB = TRUE)
```

```
## $Otis
##  statistic          p
##  -1.813781 0.03485574
##
## $Xc
##  statistic df  p
##          0 NA NA
##
## $NRvsJS
##  statistic df p
##          0  0 1
##
## $NMvsJS
##  statistic df p
##          0  0 1
##
## $MtvsNR
##  statistic df  p
##         NA NA NA
##
## $MtvsNM
##  statistic df  p
##         NA NA NA
##
## $compNRvsJS
##    Occasion Chisquare df  p
## 1         2        NA NA NA
## 2         3        NA NA NA
## 3         4        NA NA NA
## 4         5        NA NA NA
## 5         6        NA NA NA
## 6         7        NA NA NA
## 7         8        NA NA NA
## 8         9        NA NA NA
## 9        10        NA NA NA
## 10       11        NA NA NA
## 11       12        NA NA NA
## 12       13        NA NA NA
## 13       14        NA NA NA
## 14       15        NA NA NA
## 15       16        NA NA NA
##
## $compNMvsJS
##    Occasion Chisquare df  p
## 1         2        NA NA NA
```

```
## 2         3        NA NA NA
## 3         4        NA NA NA
## 4         5        NA NA NA
## 5         6        NA NA NA
## 6         7        NA NA NA
## 7         8        NA NA NA
## 8         9        NA NA NA
## 9        10        NA NA NA
## 10       11        NA NA NA
## 11       12        NA NA NA
## 12       13        NA NA NA
## 13       14        NA NA NA
## 14       15        NA NA NA
## 15       16        NA NA NA
```

Les modèles maintenant. On commence par le jeu de données avec les deux sexes ensemble.

```
iguane.proc <- process.data(iguane,
                            begin.time = 1,
                            model = "FullHet")
iguane.ddl <- make.design.data(iguane.proc)
```

Liste des modèles.

```
run.iguane <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  iguane.model.list <- create.model.list("FullHet")

  iguane.results <- mark.wrapper(iguane.model.list,
                              data = iguane.proc,
                              ddl = iguane.ddl)

  return(iguane.results)
}
```

```
iguane.results <- run.iguane()
```

```
##
## Output summary for FullHet model
```

```
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3
## -2lnL:  -203.4014
## AICc :  -199.397
##
## Beta
##                      estimate se           lcl           ucl
## pi:(Intercept)  0.0005253906  0  0.0005253906  0.0005253906
## p:(Intercept)  -4.2377900000  0 -4.2377900000 -4.2377900000
## f0:(Intercept)  6.3679685000  0  6.3679685000  6.3679685000
##
##
## Real Parameter pi
##
##
## mixture:1 0.5001313
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339
## mixture:2 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339
##                    8         9        10        11        12        13        14
## mixture:1 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339
## mixture:2 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339
##                   15        16        17
## mixture:1 0.0142339 0.0142339 0.0142339
## mixture:2 0.0142339 0.0142339 0.0142339
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339
## mixture:2 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339
##                    9        10        11        12        13        14        15
## mixture:1 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339
## mixture:2 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339 0.0142339
##                   16        17
## mixture:1 0.0142339 0.0142339
## mixture:2 0.0142339 0.0142339
##
##
## Real Parameter f0
##
##         1
##  582.8725
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=3)
```

```
## -2lnL:  -207.0379
## AICc :  -199.0233  (unadjusted=-201.02915)
##
## Beta
##                    estimate se         lcl         ucl
## pi:(Intercept)  -0.0377687  0  -0.0377687  -0.0377687
## p:(Intercept)  -15.0183660  0 -15.0183660 -15.0183660
## c:(Intercept)   -4.1162323  0  -4.1162323  -4.1162323
## f0:(Intercept)  17.2675430  0  17.2675430  17.2675430
##
##
## Real Parameter pi
##
##
## mixture:1 0.4905589
##
##
## Real Parameter p
##
##                        1            2            3            4            5
## mixture:1 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07
## mixture:2 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07
##                        6            7            8            9           10
## mixture:1 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07
## mixture:2 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07
##                       11           12           13           14           15
## mixture:1 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07
## mixture:2 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07 3.003352e-07
##                       16           17
## mixture:1 3.003352e-07 3.003352e-07
## mixture:2 3.003352e-07 3.003352e-07
##
##
## Real Parameter c
##
##                     2         3         4         5         6         7         8
## mixture:1 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442
## mixture:2 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442
##                     9        10        11        12        13        14        15
## mixture:1 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442
## mixture:2 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442 0.0160442
##                    16        17
## mixture:1 0.0160442 0.0160442
## mixture:2 0.0160442 0.0160442
##
##
## Real Parameter f0
##
##         1
##  31564495
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
```

```
## Npar :  4  (unadjusted=3)
## -2lnL:  -205.2279
## AICc :  -197.2133  (unadjusted=-199.21913)
##
## Beta
##                 estimate         se        lcl       ucl
## pi:(Intercept) -5.970951 40.9697710 -86.271704 74.329801
## p:(Intercept)  -3.346847  0.5850769  -4.493598 -2.200097
## p:mixture2     -5.826159 41.5221040 -87.209484 75.557166
## f0:(Intercept) 10.925029 41.4374620 -70.292398 92.142457
##
##
## Real Parameter pi
##
##
## mixture:1 0.0025453
##
##
## Real Parameter p
##
##                        1            2            3            4            5
## mixture:1 0.0339985000 0.0339985000 0.0339985000 0.0339985000 0.0339985000
## mixture:2 0.0001037932 0.0001037932 0.0001037932 0.0001037932 0.0001037932
##                        6            7            8            9           10
## mixture:1 0.0339985000 0.0339985000 0.0339985000 0.0339985000 0.0339985000
## mixture:2 0.0001037932 0.0001037932 0.0001037932 0.0001037932 0.0001037932
##                       11           12           13           14           15
## mixture:1 0.0339985000 0.0339985000 0.0339985000 0.0339985000 0.0339985000
## mixture:2 0.0001037932 0.0001037932 0.0001037932 0.0001037932 0.0001037932
##                       16           17
## mixture:1 0.0339985000 0.0339985000
## mixture:2 0.0001037932 0.0001037932
##
##
## Real Parameter c
##
##                        2            3            4            5            6
## mixture:1 0.0339985000 0.0339985000 0.0339985000 0.0339985000 0.0339985000
## mixture:2 0.0001037932 0.0001037932 0.0001037932 0.0001037932 0.0001037932
##                        7            8            9           10           11
## mixture:1 0.0339985000 0.0339985000 0.0339985000 0.0339985000 0.0339985000
## mixture:2 0.0001037932 0.0001037932 0.0001037932 0.0001037932 0.0001037932
##                       12           13           14           15           16
## mixture:1 0.0339985000 0.0339985000 0.0339985000 0.0339985000 0.0339985000
## mixture:2 0.0001037932 0.0001037932 0.0001037932 0.0001037932 0.0001037932
##                       17
## mixture:1 0.0339985000
## mixture:2 0.0001037932
##
##
## Real Parameter f0
##
##         1
##  55549.47
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6  (unadjusted=2)
## -2lnL:  -207.0381
## AICc :  -195.0074  (unadjusted=-203.03374)
##
## Beta
##                  estimate se       lcl       ucl
## pi:(Intercept) -64.55069  0 -64.55069 -64.55069
## p:(Intercept)   22.38049  0  22.38049  22.38049
## p:mixture2     -37.94049  0 -37.94049 -37.94049
## c:(Intercept)  -14.90697  0 -14.90697 -14.90697
## c:mixture2      10.78455  0  10.78455  10.78455
## f0:(Intercept)  17.80704  0  17.80704  17.80704
##
##
## Real Parameter pi
##
##
## mixture:1 9.24685e-29
##
##
## Real Parameter p
##
##                         1            2            3            4            5
## mixture:1 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00
## mixture:2 1.747338e-07 1.747338e-07 1.747338e-07 1.747338e-07 1.747338e-07
##                         6            7            8            9           10
## mixture:1 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00
## mixture:2 1.747338e-07 1.747338e-07 1.747338e-07 1.747338e-07 1.747338e-07
##                        11           12           13           14           15
## mixture:1 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00
## mixture:2 1.747338e-07 1.747338e-07 1.747338e-07 1.747338e-07 1.747338e-07
##                        16           17
## mixture:1 1.000000e+00 1.000000e+00
## mixture:2 1.747338e-07 1.747338e-07
##
##
## Real Parameter c
##
##                         2            3            4            5            6
## mixture:1 3.357249e-07 3.357249e-07 3.357249e-07 3.357249e-07 3.357249e-07
## mixture:2 1.594680e-02 1.594680e-02 1.594680e-02 1.594680e-02 1.594680e-02
##                         7            8            9           10           11
## mixture:1 3.357249e-07 3.357249e-07 3.357249e-07 3.357249e-07 3.357249e-07
## mixture:2 1.594680e-02 1.594680e-02 1.594680e-02 1.594680e-02 1.594680e-02
##                        12           13           14           15           16
## mixture:1 3.357249e-07 3.357249e-07 3.357249e-07 3.357249e-07 3.357249e-07
## mixture:2 1.594680e-02 1.594680e-02 1.594680e-02 1.594680e-02 1.594680e-02
##                        17
## mixture:1 3.357249e-07
## mixture:2 1.594680e-02
```

```
##
##
## Real Parameter f0
##
##         1
##  54137695
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  20  (unadjusted=18)
## -2lnL:  -260.1053
## AICc :  -219.7961  (unadjusted=-223.85369)
##
## Beta
##                      estimate           se           lcl         ucl
## pi:(Intercept) -2.166464e+01 1608.1138000 -3173.5678000 3130.238500
## p:(Intercept)  -2.487699e+00    0.0000000    -2.4876992   -2.487699
## p:time2         2.314980e+00    1.0501345     0.2567159    4.373243
## p:time3         1.390423e+00    1.1192702    -0.8033465    3.584193
## p:time4         2.411674e+00    1.0457992     0.3619073    4.461440
## p:time5         2.500071e+00    1.0421725     0.4574132    4.542729
## p:time6         2.411673e+00    1.0457990     0.3619070    4.461439
## p:time7         2.581501e+00    1.0390948     0.5448754    4.618127
## p:time8         2.314979e+00    1.0501346     0.2567150    4.373243
## p:time9         2.314980e+00    1.0501353     0.2567145    4.373245
## p:time10        1.390424e+00    1.1192710    -0.8033473    3.584195
## p:time11        2.913893e+00    1.0287720     0.8974998    4.930286
## p:time12        2.855337e+00    1.0303570     0.8358369    4.874836
## p:time13        2.793317e+00    1.0321372     0.7703280    4.816306
## p:time14        2.411675e+00    1.0457990     0.3619089    4.461441
## p:time15        2.500072e+00    1.0421724     0.4574142    4.542730
## p:time16        2.969360e+00    1.0273525     0.9557493    4.982971
## p:time17        4.346461e-05    1.4151717    -2.7736931    2.773780
## p:mixture2     -4.108119e+00    0.0000000    -4.1081188   -4.108119
## f0:(Intercept)  6.349157e+00    0.2691008     5.8217193    6.876595
##
##
## Real Parameter pi
##
##
## mixture:1 3.900907e-10
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0767250 0.4569271 0.2502506 0.4810028 0.5030930 0.4810026 0.5234333
## mixture:2 0.0013642 0.0136424 0.0054569 0.0150066 0.0163708 0.0150066 0.0177351
##                    8         9        10        11        12        13        14
## mixture:1 0.4569269 0.4569271 0.2502508 0.6049644 0.590888 0.5758152 0.4810031
## mixture:2 0.0136424 0.0136424 0.0054569 0.0245563 0.023192 0.0218278 0.0150066
##                   15        16        17
## mixture:1 0.5030932 0.6181400 0.0767281
```

```
## mixture:2 0.0163709 0.0259205 0.0013643
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.4569271 0.2502506 0.4810028 0.5030930 0.4810026 0.5234333 0.4569269
## mixture:2 0.0136424 0.0054569 0.0150066 0.0163708 0.0150066 0.0177351 0.0136424
##                   9        10        11        12        13        14        15
## mixture:1 0.4569271 0.2502508 0.6049644 0.590888 0.5758152 0.4810031 0.5030932
## mixture:2 0.0136424 0.0054569 0.0245563 0.023192 0.0218278 0.0150066 0.0163709
##                  16        17
## mixture:1 0.6181400 0.0767281
## mixture:2 0.0259205 0.0013643
##
##
## Real Parameter f0
##
##         1
##  572.0102
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  37  (unadjusted=26)
## -2lnL:  -285.6764
## AICc :  -210.6345  (unadjusted=-233.15832)
##
## Beta
##                    estimate          se           lcl           ucl
## pi:(Intercept) -26.8885930 6121.785300 -1.202559e+04 11971.8110000
## p:(Intercept)    0.7847324    0.000000  7.847324e-01     0.7847324
## p:mixture2      -5.8599723    0.000000 -5.859972e+00    -5.8599723
## p:time2          2.3671867    1.054973  2.994395e-01     4.4349339
## p:time3          1.1834156    1.160362 -1.090893e+00     3.4577241
## p:time4          2.5604802    1.050982  5.005552e-01     4.6204053
## p:time5          2.7398674    1.047711  6.863531e-01     4.7933817
## p:time6          2.6416294    1.055970  5.719272e-01     4.7113315
## p:time7          2.9351731    1.048541  8.800321e-01     4.9903142
## p:time8          2.8560365    1.056963  7.843894e-01     4.9276836
## p:time9          2.5785014    1.077462  4.666766e-01     4.6903263
## p:time10         1.7671330    1.162682 -5.117234e-01     4.0459894
## p:time11         3.6581731    1.041131  1.617557e+00     5.6987895
## p:time12         3.9358061    1.043457  1.890631e+00     5.9809814
## p:time13         4.1307791    1.051431  2.069973e+00     6.1915847
## p:time14         4.2542670    1.066401  2.164122e+00     6.3444124
## p:time15         4.3214709    1.090929  2.183251e+00     6.4596910
## p:time16         7.8477799    1.438317  5.028678e+00    10.6668810
## p:time17       101.9337500    0.000000  1.019338e+02   101.9337500
## c:(Intercept)    2.8126864    0.000000  2.812686e+00     2.8126864
## c:mixture2     -20.7944380    0.000000 -2.079444e+01   -20.7944380
## c:time3         15.6791540    0.000000  1.567915e+01    15.6791540
## c:time4        -25.9141340    0.000000 -2.591413e+01   -25.9141340
## c:time5        -26.9595130    0.000000 -2.695951e+01   -26.9595130
```

```
## c:time6         14.3982110    0.000000  1.439821e+01    14.3982110
## c:time7         14.1530950    0.000000  1.415310e+01    14.1530950
## c:time8        -26.7407390    0.000000 -2.674074e+01   -26.7407390
## c:time9         14.8907080    0.000000  1.489071e+01    14.8907080
## c:time10        13.6642760    0.000000  1.366428e+01    13.6642760
## c:time11        14.3310920    0.000000  1.433109e+01    14.3310920
## c:time12        13.4384640    0.000000  1.343846e+01    13.4384640
## c:time13        13.9835470    0.000000  1.398355e+01    13.9835470
## c:time14       -24.9404450    0.000000 -2.494045e+01   -24.9404450
## c:time15        14.4852570    0.000000  1.448526e+01    14.4852570
## c:time16        14.1315960    0.000000  1.413160e+01    14.1315960
## c:time17       -23.6865540    0.000000 -2.368655e+01   -23.6865540
## f0:(Intercept) -88.7615240    0.000000 -8.876152e+01   -88.7615240
##
##
## Real Parameter pi
##
##
## mixture:1 2.10103e-12
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.6866991 0.9589843 0.8774120 0.9659477 0.9713797 0.9685183 0.9763372
## mixture:2 0.0062108 0.0624998 0.0199999 0.0748299 0.0882355 0.0806454 0.1052631
##                   8         9        10        11        12        13        14
## mixture:1 0.9744384 0.9665355 0.9276987 0.9883750 0.9911683 0.9927214 0.9935615
## mixture:2 0.0980392 0.0760871 0.0352941 0.1951218 0.2424243 0.2800002 0.3055572
##                  15        16 17
## mixture:1 0.9939774 0.9998218  1
## mixture:2 0.3200006 0.9411738  1
##
##
## Real Parameter c
##
##                      2         3            4            5         6         7
## mixture:1 9.433575e-01 1.0000000 9.271903e-11 3.259615e-11 1.0000000 1.0000000
## mixture:2 1.551045e-08 0.0909081 8.634937e-20 3.035685e-20 0.0270265 0.0212763
##                      8         9        10        11        12        13
## mixture:1 4.056756e-11 1.0000000 0.9999999 1.0000000 0.9999999 0.9999999
## mixture:2 3.778063e-20 0.0434782 0.0131581 0.0253164 0.0105264 0.0180180
##                     14        15        16           17
## mixture:1 2.454915e-10 1.0000000 1.0000000 8.601899e-10
## mixture:2 2.286266e-19 0.0294121 0.0208332 8.010962e-19
##
##
## Real Parameter f0
##
##             1
##  2.827221e-39
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
```

```
##
## Npar :  19  (unadjusted=18)
## -2lnL:  -260.1053
## AICc :  -221.8256  (unadjusted=-223.85369)
##
## Beta
##                      estimate        se        lcl        ucl
## pi:(Intercept)  1.664600e-03 0.0000000  0.0016646  0.0016646
## p:(Intercept)  -6.595838e+00 0.4161509 -7.4114933 -5.7801818
## p:time2         2.314996e+00 0.1971148  1.9286510  2.7013411
## p:time3         1.390445e+00 0.6158500  0.1833789  2.5975107
## p:time4         2.411695e+00 0.4692441  1.4919763  3.3314132
## p:time5         2.500091e+00 0.4611038  1.5963271  3.4038540
## p:time6         2.411695e+00 0.4692441  1.4919761  3.3314130
## p:time7         2.581522e+00 0.3745537  1.8473971  3.3156477
## p:time8         2.314998e+00 0.4788310  1.3764891  3.2535067
## p:time9         2.314997e+00 0.4788311  1.3764881  3.2535059
## p:time10        1.390444e+00 0.6158498  0.1833781  2.5975096
## p:time11        2.913908e+00 0.4299493  2.0712077  3.7566089
## p:time12        2.855355e+00 0.4337290  2.0052459  3.7054636
## p:time13        2.793334e+00 0.4379431  1.9349652  3.6517023
## p:time14        2.411693e+00 0.5462855  1.3409737  3.4824128
## p:time15        2.500091e+00 0.4611037  1.5963277  3.4038544
## p:time16        2.969378e+00 0.4265393  2.1333608  3.8053948
## p:time17        3.939179e-05 1.0627112 -2.0828746  2.0829533
## f0:(Intercept)  6.349158e+00 0.2691002  5.8217220  6.8765948
##
##
## Real Parameter pi
##
##
## mixture:1 0.5004162
##
##
## Real Parameter p
##
##                    1         2        3         4         5         6         7
## mixture:1 0.0013642 0.0136423 0.005457 0.0150066 0.0163708 0.0150066 0.0177351
## mixture:2 0.0013642 0.0136423 0.005457 0.0150066 0.0163708 0.0150066 0.0177351
##                    8         9        10        11        12        13        14
## mixture:1 0.0136424 0.0136423 0.0054569 0.0245562 0.023192 0.0218277 0.0150066
## mixture:2 0.0136424 0.0136423 0.0054569 0.0245562 0.023192 0.0218277 0.0150066
##                   15        16        17
## mixture:1 0.0163709 0.0259205 0.0013642
## mixture:2 0.0163709 0.0259205 0.0013642
##
##
## Real Parameter c
##
##                    2        3         4         5         6         7         8
## mixture:1 0.0136423 0.005457 0.0150066 0.0163708 0.0150066 0.0177351 0.0136424
## mixture:2 0.0136423 0.005457 0.0150066 0.0163708 0.0150066 0.0177351 0.0136424
##                    9        10        11        12        13        14        15
## mixture:1 0.0136423 0.0054569 0.0245562 0.023192 0.0218277 0.0150066 0.0163709
```

```
## mixture:2 0.0136423 0.0054569 0.0245562 0.023192 0.0218277 0.0150066 0.0163709
##                  16        17
## mixture:1 0.0259205 0.0013642
## mixture:2 0.0259205 0.0013642
##
##
## Real Parameter f0
##
##         1
##  572.0111
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  35  (unadjusted=26)
## -2lnL:  -285.6764
## AICc :  -214.7434  (unadjusted=-233.15832)
##
## Beta
##                      estimate           se           lcl           ucl
## pi:(Intercept)  8.766533e-05     0.000000  8.766533e-05  8.766533e-05
## p:(Intercept)  -5.075174e+00     1.003130 -7.041308e+00 -3.109039e+00
## p:time2         2.367123e+00     1.054958  2.994047e-01  4.434841e+00
## p:time3         1.183352e+00     1.160348 -1.090929e+00  3.457633e+00
## p:time4         2.560414e+00     1.050967  5.005175e-01  4.620310e+00
## p:time5         2.739798e+00     1.047697  6.863132e-01  4.793283e+00
## p:time6         2.641560e+00     1.055956  5.718868e-01  4.711233e+00
## p:time7         2.935107e+00     1.048526  8.799953e-01  4.990219e+00
## p:time8         2.855970e+00     1.056948  7.843512e-01  4.927589e+00
## p:time9         2.578432e+00     1.077447  4.666359e-01  4.690229e+00
## p:time10        1.767065e+00     1.162669 -5.117662e-01  4.045897e+00
## p:time11        3.658108e+00     1.041116  1.617521e+00  5.698694e+00
## p:time12        3.935739e+00     1.043441  1.890594e+00  5.980884e+00
## p:time13        4.130712e+00     1.051416  2.069936e+00  6.191488e+00
## p:time14        4.254193e+00     1.066386  2.164076e+00  6.344309e+00
## p:time15        4.321402e+00     1.090914  2.183210e+00  6.459593e+00
## p:time16        7.847763e+00     1.438323  5.028651e+00  1.066687e+01
## p:time17        6.168997e+01     0.000000  6.168997e+01  6.168997e+01
## c:(Intercept)  -1.638693e+01     0.000000 -1.638693e+01 -1.638693e+01
## c:time3         1.408434e+01     0.000000  1.408434e+01  1.408434e+01
## c:time4        -2.209096e+01     0.000000 -2.209096e+01 -2.209096e+01
## c:time5        -2.215828e+01     0.000000 -2.215828e+01 -2.215828e+01
## c:time6         1.280341e+01     0.000000  1.280341e+01  1.280341e+01
## c:time7         1.255828e+01     0.000000  1.255828e+01  1.255828e+01
## c:time8        -1.863624e+01     0.000000 -1.863624e+01 -1.863624e+01
## c:time9         1.329588e+01     0.000000  1.329588e+01  1.329588e+01
## c:time10        1.206944e+01     0.000000  1.206944e+01  1.206944e+01
## c:time11        1.273627e+01     0.000000  1.273627e+01  1.273627e+01
## c:time12        1.184363e+01     0.000000  1.184363e+01  1.184363e+01
## c:time13        1.238873e+01     0.000000  1.238873e+01  1.238873e+01
## c:time14       -2.639679e+01 27195.429000 -5.332944e+04  5.327664e+04
## c:time15        1.289042e+01     0.000000  1.289042e+01  1.289042e+01
## c:time16        1.253678e+01     0.000000  1.253678e+01  1.253678e+01
## c:time17       -3.218709e+01     0.000000 -3.218709e+01 -3.218709e+01
```

```
## f0:(Intercept) -4.462829e+01     0.000000 -4.462829e+01 -4.462829e+01
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000219
##
##
## Real Parameter p
##
##                    1      2    3         4         5         6         7
## mixture:1 0.0062112 0.0625 0.02 0.0748299 0.0882353 0.0806451 0.1052631
## mixture:2 0.0062112 0.0625 0.02 0.0748299 0.0882353 0.0806451 0.1052631
##                    8        9        10       11        12   13        14   15
## mixture:1 0.0980392 0.076087 0.0352941 0.195122 0.2424242 0.28 0.3055555 0.32
## mixture:2 0.0980392 0.076087 0.0352941 0.195122 0.2424242 0.28 0.3055555 0.32
##                   16 17
## mixture:1 0.9411765  1
## mixture:2 0.9411765  1
##
##
## Real Parameter c
##
##                        2         3            4            5        6         7
## mixture:1 7.642725e-08 0.0909091 1.946546e-17 1.819824e-17 0.027027 0.0212766
## mixture:2 7.642725e-08 0.0909091 1.946546e-17 1.819824e-17 0.027027 0.0212766
##                        8         9        10        11        12       13
## mixture:1 6.160744e-16 0.0434783 0.0131579 0.0253165 0.0105263 0.018018
## mixture:2 6.160744e-16 0.0434783 0.0131579 0.0253165 0.0105263 0.018018
##                       14        15        16           17
## mixture:1 2.625833e-19 0.0294118 0.0208333 8.027324e-22
## mixture:2 2.625833e-19 0.0294118 0.0208333 8.027324e-22
##
##
## Real Parameter f0
##
##             1
##  4.151259e-20
```

```
iguane.results
```

```
##                                                model npar      AICc DeltaAICc
## 7                           pi(~1)p(~time)c()f0(~1)   19 -221.8256  0.000000
## 5                  pi(~1)p(~time + mixture)c()f0(~1)   20 -219.7961  2.029558
## 8                       pi(~1)p(~time)c(~time)f0(~1)   35 -214.7434  7.082218
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   37 -210.6345 11.191097
## 2                             pi(~1)p(~1)c(~1)f0(~1)    4 -199.0233 22.802341
## 1                               pi(~1)p(~1)c()f0(~1)    3 -197.3926 24.433021
## 3                         pi(~1)p(~mixture)c()f0(~1)    4 -197.2133 24.612361
## 4                 pi(~1)p(~mixture)c(~mixture)f0(~1)    6 -195.0074 26.818269
##         weight  Deviance
## 7 7.167430e-01  99.47194
## 5 2.598068e-01  99.47194
```

```
## 8 2.077206e-02  73.90089
## 6 2.662243e-03  73.90089
## 2 8.014899e-06 152.53936
## 1 3.546503e-06 156.17590
## 3 3.242330e-06 154.34938
## 4 1.076094e-06 152.53916
```

```
names(iguane.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

examine the output from top-ranked model (#8)

```
iguane.results$p.time$results$real
```

```
##                estimate           se          lcl         ucl fixed note
## pi g1 m1      0.5004162 0.000000e+00 5.004162e-01   0.5004162
## p g1 t1 m1    0.0013642 5.669298e-04 6.039027e-04   0.0030786
## p g1 t2 m1    0.0136423 4.984600e-03 6.647200e-03   0.0277927
## p g1 t3 m1    0.0054570 2.952500e-03 1.885500e-03   0.0156869
## p g1 t4 m1    0.0150066 5.486000e-03 7.307100e-03   0.0305695
## p g1 t5 m1    0.0163708 5.812600e-03 8.136300e-03   0.0326647
## p g1 t6 m1    0.0150066 5.486000e-03 7.307100e-03   0.0305695
## p g1 t7 m1    0.0177351 6.104100e-03 9.003500e-03   0.0346385
## p g1 t8 m1    0.0136424 5.154100e-03 6.486200e-03   0.0284676
## p g1 t9 m1    0.0136423 5.154100e-03 6.486200e-03   0.0284676
## p g1 t10 m1   0.0054569 2.952500e-03 1.885500e-03   0.0156869
## p g1 t11 m1   0.0245562 7.698600e-03 1.323090e-02   0.0451321
## p g1 t12 m1   0.0231920 7.390800e-03 1.237130e-02   0.0430644
## p g1 t13 m1   0.0218277 7.080900e-03 1.151510e-02   0.0409930
## p g1 t14 m1   0.0150066 5.450300e-03 7.341400e-03   0.0304296
## p g1 t15 m1   0.0163709 5.812600e-03 8.136400e-03   0.0326647
## p g1 t16 m1   0.0259205 8.004600e-03 1.409360e-02   0.0471969
## p g1 t17 m1   0.0013642 1.393100e-03 1.840645e-04   0.0100353
## f0 g1 a0 t1 572.0111100 1.539283e+02 3.406697e+02 960.4515000
```

```
iguane.results$p.time$results$derived
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 733.0111 501.6697 1121.451
```

En séparant les sexes. Femelles, puis mâles.

```
iguane.proc <- process.data(iguaneF,
                            begin.time = 1,
                            model = "FullHet")
iguane.ddl <- make.design.data(iguane.proc)
```

Liste des modèles.

```
run.iguane <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  iguane.model.list <- create.model.list("FullHet")

  iguane.results <- mark.wrapper(iguane.model.list,
                              data = iguane.proc,
                              ddl = iguane.ddl)

  return(iguane.results)
}
```

```
iguane.results <- run.iguane()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=2)
## -2lnL:  -28.86054
## AICc :  -22.84464  (unadjusted=-24.852597)
##
## Beta
##                      estimate          se          lcl         ucl
## pi:(Intercept) -0.0001229705 627.1465100 -1229.207300 1229.207100
## p:(Intercept)  -4.4985790000   0.3498553    -5.184296   -3.812863
## f0:(Intercept)  6.0628633000   0.3995056     5.279832    6.845894
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999693
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024
## mixture:2 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024
##                    8         9        10        11        12        13        14
```

```
## mixture:1 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024
## mixture:2 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024
##                  15        16        17
## mixture:1 0.0110024 0.0110024 0.0110024
## mixture:2 0.0110024 0.0110024 0.0110024
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024
## mixture:2 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024
##                   9        10        11        12        13        14        15
## mixture:1 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024
## mixture:2 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024 0.0110024
##                  16        17
## mixture:1 0.0110024 0.0110024
## mixture:2 0.0110024 0.0110024
##
##
## Real Parameter f0
##
##         1
##  429.6038
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  -31.2143
## AICc :  -23.18778  (unadjusted=-27.206357)
##
## Beta
##                      estimate se           lcl           ucl
## pi:(Intercept)  9.980094e-04  0  9.980094e-04  9.980094e-04
## p:(Intercept)  -1.158299e+01  0 -1.158299e+01 -1.158299e+01
## c:(Intercept)  -4.343083e+00  0 -4.343083e+00 -4.343083e+00
## f0:(Intercept)  1.323871e+01  0  1.323871e+01  1.323871e+01
##
##
## Real Parameter pi
##
##
## mixture:1 0.5002495
##
##
## Real Parameter p
##
##                       1            2            3            4            5
## mixture:1 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06
## mixture:2 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06
##                       6            7            8            9           10
## mixture:1 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06
## mixture:2 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06
```

```
##                      11           12           13           14           15
## mixture:1 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06
## mixture:2 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06 9.323211e-06
##                      16           17
## mixture:1 9.323211e-06 9.323211e-06
## mixture:2 9.323211e-06 9.323211e-06
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297
## mixture:2 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297
##                    9        10        11        12        13        14        15
## mixture:1 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297
## mixture:2 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297 0.0128297
##                   16        17
## mixture:1 0.0128297 0.0128297
## mixture:2 0.0128297 0.0128297
##
##
## Real Parameter f0
##
##         1
##  561694.2
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=3)
## -2lnL:  -32.69512
## AICc :  -24.66859  (unadjusted=-26.679214)
##
## Beta
##                   estimate         se        lcl       ucl
## pi:(Intercept) -11.005684 12.6477880 -35.795348 13.783980
## p:(Intercept)   -2.813986  0.6778462  -4.142564 -1.485407
## p:mixture2      -9.909051 12.6177190 -34.639782 14.821679
## f0:(Intercept)  14.193075 12.5971000 -10.497241 38.883391
##
##
## Real Parameter pi
##
##
## mixture:1 1.660676e-05
##
##
## Real Parameter p
##
##                      1           2           3           4           5
## mixture:1 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02
## mixture:2 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06
##                      6           7           8           9          10
## mixture:1 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02
```

```
## mixture:2 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06
##                    11          12          13          14          15
## mixture:1 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02
## mixture:2 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06
##                    16          17
## mixture:1 5.65731e-02 5.65731e-02
## mixture:2 2.98163e-06 2.98163e-06
##
##
## Real Parameter c
##
##                     2           3           4           5           6
## mixture:1 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02
## mixture:2 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06
##                     7           8           9          10          11
## mixture:1 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02
## mixture:2 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06
##                    12          13          14          15          16
## mixture:1 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02 5.65731e-02
## mixture:2 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06 2.98163e-06
##                    17
## mixture:1 5.65731e-02
## mixture:2 2.98163e-06
##
##
## Real Parameter f0
##
##        1
##  1458727
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6  (unadjusted=2)
## -2lnL:  -31.2153
## AICc :  -19.15952  (unadjusted=-27.207353)
##
## Beta
##                   estimate      se        lcl        ucl
## pi:(Intercept)  -5.950038  0.0000  -5.950038  -5.950038
## p:(Intercept)  -20.225662  0.0000 -20.225662 -20.225662
## p:mixture2       8.165155 28.2662 -47.236591  63.566901
## c:(Intercept)   23.298043  0.0000  23.298043  23.298043
## c:mixture2     -27.634451  0.0000 -27.634451 -27.634451
## f0:(Intercept)  13.719497  0.0000  13.719497  13.719497
##
##
## Real Parameter pi
##
##
## mixture:1 0.002599
##
##
## Real Parameter p
```

```
##
##                      1            2            3            4            5
## mixture:1 1.644775e-09 1.644775e-09 1.644775e-09 1.644775e-09 1.644775e-09
## mixture:2 5.783436e-06 5.783436e-06 5.783436e-06 5.783436e-06 5.783436e-06
##                      6            7            8            9           10
## mixture:1 1.644775e-09 1.644775e-09 1.644775e-09 1.644775e-09 1.644775e-09
## mixture:2 5.783436e-06 5.783436e-06 5.783436e-06 5.783436e-06 5.783436e-06
##                     11           12           13           14           15
## mixture:1 1.644775e-09 1.644775e-09 1.644775e-09 1.644775e-09 1.644775e-09
## mixture:2 5.783436e-06 5.783436e-06 5.783436e-06 5.783436e-06 5.783436e-06
##                     16           17
## mixture:1 1.644775e-09 1.644775e-09
## mixture:2 5.783436e-06 5.783436e-06
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## mixture:2 0.0129145 0.0129145 0.0129145 0.0129145 0.0129145 0.0129145 0.0129145
##                   9        10        11        12        13        14        15
## mixture:1 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## mixture:2 0.0129145 0.0129145 0.0129145 0.0129145 0.0129145 0.0129145 0.0129145
##                  16        17
## mixture:1 1.0000000 1.0000000
## mixture:2 0.0129145 0.0129145
##
##
## Real Parameter f0
##
##         1
##  908451.6
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  20  (unadjusted=18)
## -2lnL:  -81.40947
## AICc :  -40.84647  (unadjusted=-47.000105)
##
## Beta
##                     estimate           se           lcl           ucl
## pi:(Intercept)  -10.5291570 2.430035e+01 -5.815785e+01  3.709954e+01
## p:(Intercept)    -4.5091747 1.079204e+00 -6.624415e+00 -2.393934e+00
## p:time2           0.0094231 1.183837e+00 -2.310898e+00  2.329744e+00
## p:time3           0.0164064 1.219268e+00 -2.373359e+00  2.406172e+00
## p:time4           1.9692251 9.233887e-01  1.593833e-01  3.779067e+00
## p:time5           1.4002658 9.790297e-01 -5.186323e-01  3.319164e+00
## p:time6           1.6250453 9.578620e-01 -2.523644e-01  3.502455e+00
## p:time7           1.9694676 9.260631e-01  1.543838e-01  3.784551e+00
## p:time8           2.1045692 9.160089e-01  3.091917e-01  3.899947e+00
## p:time9           1.6262076 9.623650e-01 -2.600279e-01  3.512443e+00
## p:time10          1.1132358 1.029752e+00 -9.050784e-01  3.131550e+00
## p:time11          2.6014709 8.919449e-01  8.532589e-01  4.349683e+00
```

```
## p:time12          2.5194265 8.946813e-01  7.658510e-01  4.273002e+00
## p:time13          1.9684349 9.258667e-01  1.537362e-01  3.783134e+00
## p:time14          1.9688545 9.258399e-01  1.542082e-01  3.783501e+00
## p:time15          1.8117854 9.388455e-01 -2.835170e-02  3.651923e+00
## p:time16          2.3317457 9.057749e-01  5.564269e-01  4.107065e+00
## p:time17       -282.9259400 2.212051e+08 -4.335623e+08  4.335618e+08
## p:mixture2       -9.4374070 2.431476e+01 -5.709434e+01  3.821952e+01
## f0:(Intercept)   13.6554410 2.432251e+01 -3.401668e+01  6.132756e+01
##
##
## Real Parameter pi
##
##
## mixture:1 2.674445e-05
##
##
## Real Parameter p
##
##                        1            2            3            4            5
## mixture:1 1.088770e-02 1.098960e-02 1.106580e-02 7.310460e-02 4.274130e-02
## mixture:2 8.771546e-07 8.854591e-07 8.916642e-07 6.284886e-06 3.557973e-06
##                        6            7            8            9           10
## mixture:1 5.294370e-02 7.312100e-02 8.282220e-02 5.300200e-02 3.242260e-02
## mixture:2 4.454744e-06 6.286409e-06 7.195751e-06 4.459925e-06 2.670223e-06
##                       11           12           13           14           15
## mixture:1 1.292390e-01 1.202835e-01 7.305110e-02 7.307950e-02 6.312760e-02
## mixture:2 1.182703e-05 1.089544e-05 6.279921e-06 6.282557e-06 5.369361e-06
##                       16           17
## mixture:1 1.017958e-01 1.474064e-125
## mixture:2 9.031021e-06 1.174634e-129
##
##
## Real Parameter c
##
##                        2            3            4            5            6
## mixture:1 1.098960e-02 1.106580e-02 7.310460e-02 4.274130e-02 5.294370e-02
## mixture:2 8.854591e-07 8.916642e-07 6.284886e-06 3.557973e-06 4.454744e-06
##                        7            8            9           10           11
## mixture:1 7.312100e-02 8.282220e-02 5.300200e-02 3.242260e-02 1.292390e-01
## mixture:2 6.286409e-06 7.195751e-06 4.459925e-06 2.670223e-06 1.182703e-05
##                       12           13           14           15           16
## mixture:1 1.202835e-01 7.305110e-02 7.307950e-02 6.312760e-02 1.017958e-01
## mixture:2 1.089544e-05 6.279921e-06 6.282557e-06 5.369361e-06 9.031021e-06
##                       17
## mixture:1 1.474064e-125
## mixture:2 1.174634e-129
##
##
## Real Parameter f0
##
##         1
##  852084.5
##
## Output summary for FullHet model
```

```
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  37  (unadjusted=21)
## -2lnL:  -92.34232
## AICc :  -16.43588  (unadjusted=-49.722601)
##
## Beta
##                     estimate           se           lcl          ucl
## pi:(Intercept)  -21.5164370  7525.560300 -1.477161e+04 14728.582000
## p:(Intercept)   -74.6994850     0.000000 -7.469948e+01   -74.699485
## p:mixture2       70.2222920     0.000000  7.022229e+01    70.222292
## p:time2           0.0111532     1.422350 -2.776653e+00     2.798960
## p:time3           0.0226989     1.422403 -2.765211e+00     2.810609
## p:time4           2.0537132     1.080252 -6.358100e-02     4.171007
## p:time5           1.5460489     1.129054 -6.668970e-01     3.758995
## p:time6           1.8381871     1.107120 -3.317686e-01     4.008143
## p:time7           2.2800255     1.081738  1.598187e-01     4.400232
## p:time8           2.5493474     1.074527  4.432743e-01     4.655421
## p:time9           2.1746662     1.109696 -3.376473e-04     4.349670
## p:time10          1.2991801     1.237844 -1.126993e+00     3.725354
## p:time11          3.2641727     1.062712  1.181258e+00     5.347088
## p:time12          3.6169712     1.068076  1.523542e+00     5.710401
## p:time13          3.2732007     1.108192  1.101145e+00     5.445257
## p:time14          3.8581410     1.109591  1.683342e+00     6.032940
## p:time15          3.6662483     1.171550  1.370011e+00     5.962485
## p:time16         40.9091790     0.000000  4.090918e+01    40.909179
## p:time17        -21.9172490 13220.536000 -2.593417e+04 25890.334000
## c:(Intercept)    77.3361270     0.000000  7.733613e+01    77.336127
## c:mixture2     -114.6731500     0.000000 -1.146732e+02  -114.673150
## c:time3          -3.6745396  3507.697700 -6.878762e+03  6871.413100
## c:time4          -7.1162139  3888.095700 -7.627784e+03  7613.551500
## c:time5          -9.9788693 11982.489000 -2.349566e+04 23475.700000
## c:time6          -3.8072979   624.225510 -1.227289e+03  1219.674700
## c:time7          -1.3644847     0.000000 -1.364485e+00    -1.364485
## c:time8         -11.2289900 15020.991000 -2.945237e+04 29429.913000
## c:time9         -26.8868230     0.000000 -2.688682e+01   -26.886823
## c:time10         33.6993900     0.000000  3.369939e+01    33.699390
## c:time11         34.3666070     0.000000  3.436661e+01    34.366607
## c:time12         33.4051720     0.000000  3.340517e+01    33.405172
## c:time13         33.2098550     0.000000  3.320985e+01    33.209855
## c:time14        -31.4898510     0.000000 -3.148985e+01   -31.489851
## c:time15         33.7261340     0.000000  3.372613e+01    33.726134
## c:time16         32.9678480     0.000000  3.296785e+01    32.967848
## c:time17        -29.1575990     0.000000 -2.915760e+01   -29.157599
## f0:(Intercept)  -25.3324750  7038.962600 -1.382170e+04 13771.035000
##
##
## Real Parameter pi
##
##
## mixture:1 4.52408e-10
##
##
## Real Parameter p
```

```
##
##                       1           2           3           4           5
## mixture:1 3.617645e-33 3.65822e-33 3.700701e-33 2.820605e-32 1.697722e-32
## mixture:2 1.123760e-02 1.13622e-02 1.149260e-02 8.139970e-02 5.063530e-02
##                       6           7           8           9          10
## mixture:1 2.273738e-32 3.536946e-32 4.630134e-32 3.183256e-32 1.326334e-32
## mixture:2 6.666990e-02 1.000052e-01 1.269893e-01 9.091400e-02 4.000160e-02
##                      11          12          13          14          15
## mixture:1 9.463204e-32 1.346656e-31 9.549024e-32 1.713939e-31 1.414677e-31
## mixture:2 2.291672e-01 2.972931e-01 2.307659e-01 3.499973e-01 3.076894e-01
##                      16          17
## mixture:1 2.113766e-15 1.096190e-42
## mixture:2 1.000000e+00 3.443816e-12
##
##
## Real Parameter c
##
##                       2           3           4           5          6
## mixture:1 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00 1.00000e+00
## mixture:2 6.091651e-17 1.544908e-18 4.945413e-20 2.824666e-21 1.35284e-18
##                       7           8           9        10        11        12
## mixture:1 1.000000e+00 1.000000e+00 1.000000e+00 1.0000000 1.0000000 1.0000000
## mixture:2 1.556492e-17 8.091831e-22 1.282142e-28 0.0256397 0.0487802 0.0192302
##                  13          14        15        16          17
## mixture:1 1.0000000 1.000000e+00 1.0000000 1.0000000 1.000000e+00
## mixture:2 0.0158724 1.284892e-30 0.0263164 0.0125033 1.323581e-29
##
##
## Real Parameter f0
##
##            1
##  9.959696e-12
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  19  (unadjusted=17)
## -2lnL:  -77.46358
## AICc :  -38.95454  (unadjusted=-43.054214)
##
## Beta
##                       estimate          se          lcl          ucl
## pi:(Intercept) -3.421200e-03    0.0000000    -0.0034212   -0.0034212
## p:(Intercept)  -6.223777e+00    1.0504116    -8.2825839   -4.1649701
## p:time2         1.464489e-04    1.1168146    -2.1888102    2.1891031
## p:time3         1.192058e-04    1.4127539    -2.7688784    2.7691168
## p:time4         1.957965e+00    1.0621277    -0.1238055    4.0397351
## p:time5         1.392364e+00    1.1033801    -0.7702608    3.5549891
## p:time6         1.617503e+00    1.0935968    -0.5259470    3.7609526
## p:time7         1.957970e+00    1.0671586    -0.1336611    4.0496008
## p:time8         2.093507e+00    1.0587627     0.0183324    4.1686823
## p:time9         1.617490e+00    1.0935994    -0.5259650    3.7609448
## p:time10        1.102689e+00    1.1529445    -1.1570822    3.3624605
## p:time11        2.589109e+00    1.0358402     0.5588626    4.6193562
```

```
## p:time12        2.507041e+00    1.0389225     0.4707525    4.5433287
## p:time13        1.957967e+00    1.0671588    -0.1336644    4.0495980
## p:time14        1.957975e+00    1.0621265    -0.1237927    4.0397432
## p:time15        1.801819e+00    1.0782522    -0.3115557    3.9151930
## p:time16        2.320677e+00    1.0469013     0.2687509    4.3726039
## p:time17       -1.382583e+01 1008.3839000 -1990.2584000 1962.6067000
## f0:(Intercept)  6.032024e+00    0.4002787     5.2474775    6.8165701
##
##
## Real Parameter pi
##
##
## mixture:1 0.4991447
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0019778 0.0019781 0.0019781 0.0138461 0.0079121 0.0098902 0.0138461
## mixture:2 0.0019778 0.0019781 0.0019781 0.0138461 0.0079121 0.0098902 0.0138461
##                    8       9        10       11        12        13        14
## mixture:1 0.0158241 0.00989 0.0059341 0.025714 0.0237361 0.0138461 0.0138462
## mixture:2 0.0158241 0.00989 0.0059341 0.025714 0.0237361 0.0138461 0.0138462
##                   15        16           17
## mixture:1 0.0118681 0.0197801 1.961399e-09
## mixture:2 0.0118681 0.0197801 1.961399e-09
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0019781 0.0019781 0.0138461 0.0079121 0.0098902 0.0138461 0.0158241
## mixture:2 0.0019781 0.0019781 0.0138461 0.0079121 0.0098902 0.0138461 0.0158241
##                   9        10       11        12        13        14        15
## mixture:1 0.00989 0.0059341 0.025714 0.0237361 0.0138461 0.0138462 0.0118681
## mixture:2 0.00989 0.0059341 0.025714 0.0237361 0.0138461 0.0138462 0.0118681
##                  16           17
## mixture:1 0.0197801 1.961399e-09
## mixture:2 0.0197801 1.961399e-09
##
##
## Real Parameter f0
##
##         1
##  416.5572
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  35  (unadjusted=21)
## -2lnL:  -92.34232
## AICc :  -20.63616  (unadjusted=-49.7226)
##
## Beta
```

```
##                      estimate          se           lcl           ucl
## pi:(Intercept)  -0.000187132    0.000000 -1.871320e-04 -1.871320e-04
## p:(Intercept)   -4.477352400    1.005690 -6.448506e+00 -2.506199e+00
## p:time2          0.011446800    1.422297 -2.776256e+00  2.799149e+00
## p:time3          0.023009200    1.422348 -2.764792e+00  2.810811e+00
## p:time4          2.053832200    1.080244 -6.344560e-02  4.171110e+00
## p:time5          1.546183800    1.129045 -6.667437e-01  3.759111e+00
## p:time6          1.838307900    1.107112 -3.316315e-01  4.008247e+00
## p:time7          2.280125000    1.081732  1.599303e-01  4.400320e+00
## p:time8          2.549458600    1.074521  4.433973e-01  4.655520e+00
## p:time9          2.174761200    1.109691 -2.337518e-04  4.349756e+00
## p:time10         1.299296100    1.237841 -1.126873e+00  3.725465e+00
## p:time11         3.264322000    1.062709  1.181413e+00  5.347231e+00
## p:time12         3.617149800    1.068075  1.523723e+00  5.710577e+00
## p:time13         3.273379800    1.108188  1.101332e+00  5.445428e+00
## p:time14         3.858315700    1.109592  1.683516e+00  6.033115e+00
## p:time15         3.666426300    1.171548  1.370193e+00  5.962660e+00
## p:time16        22.003440000 2185.661100 -4.261892e+03  4.305899e+03
## p:time17         4.068694900    0.000000  4.068695e+00  4.068695e+00
## c:(Intercept)  -15.249136000    0.000000 -1.524914e+01 -1.524914e+01
## c:time3         -5.422602500    0.000000 -5.422602e+00 -5.422602e+00
## c:time4         -6.601737700    0.000000 -6.601738e+00 -6.601738e+00
## c:time5         -7.656183800    0.000000 -7.656184e+00 -7.656184e+00
## c:time6         -8.509128600    0.000000 -8.509129e+00 -8.509129e+00
## c:time7        -10.902328000    0.000000 -1.090233e+01 -1.090233e+01
## c:time8        -11.033573000    0.000000 -1.103357e+01 -1.103357e+01
## c:time9         -6.763989300    0.000000 -6.763989e+00 -6.763989e+00
## c:time10        11.611560000    0.000000  1.161156e+01  1.161156e+01
## c:time11        12.278727000    0.000000  1.227873e+01  1.227873e+01
## c:time12        11.317330000    0.000000  1.131733e+01  1.131733e+01
## c:time13        11.122029000    0.000000  1.112203e+01  1.112203e+01
## c:time14        -9.915447100    0.000000 -9.915447e+00 -9.915447e+00
## c:time15        11.638204000    0.000000  1.163820e+01  1.163820e+01
## c:time16        10.879705000    0.000000  1.087970e+01  1.087970e+01
## c:time17        -9.825350200    0.000000 -9.825350e+00 -9.825350e+00
## f0:(Intercept) -27.903498000    0.000000 -2.790350e+01 -2.790350e+01
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999532
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0112358 0.0113637 0.0114943 0.0813967 0.0506341 0.0666675 0.0999997
## mixture:2 0.0112358 0.0113637 0.0114943 0.0813967 0.0506341 0.0666675 0.0999997
##                    8         9        10        11        12        13        14
## mixture:1 0.1269839 0.0909086 0.0399999 0.2291653 0.297297 0.2307693 0.3500006
## mixture:2 0.1269839 0.0909086 0.0399999 0.2291653 0.297297 0.2307693 0.3500006
##                   15 16        17
## mixture:1 0.3076932  1 0.3992341
```

```
## mixture:2 0.3076932  1 0.3992341
##
##
## Real Parameter c
##
##                      2            3           4            5            6
## mixture:1 2.384429e-07 1.052878e-09 3.23807e-10 1.128096e-10 4.807473e-11
## mixture:2 2.384429e-07 1.052878e-09 3.23807e-10 1.128096e-10 4.807473e-11
##                      7           8            9        10        11        12
## mixture:1 4.390999e-12 3.85092e-12 2.753095e-10 0.0256413 0.0487808 0.0192312
## mixture:2 4.390999e-12 3.85092e-12 2.753095e-10 0.0256413 0.0487808 0.0192312
##                   13           14        15        16           17
## mixture:1 0.0158735 1.178041e-11 0.0263154 0.0125002 1.289107e-11
## mixture:2 0.0158735 1.178041e-11 0.0263154 0.0125002 1.289107e-11
##
##
## Real Parameter f0
##
##             1
##  7.614909e-13
```

```
iguane.results
```

```
##                                           model npar      AICc DeltaAICc
## 5               pi(~1)p(~time + mixture)c()f0(~1)   20 -40.84647  0.000000
## 7                         pi(~1)p(~time)c()f0(~1)   19 -38.95454  1.891931
## 3                      pi(~1)p(~mixture)c()f0(~1)    4 -24.66859 16.177874
## 2                          pi(~1)p(~1)c(~1)f0(~1)    4 -23.18778 17.658689
## 1                            pi(~1)p(~1)c()f0(~1)    3 -22.84464 18.001828
## 8                   pi(~1)p(~time)c(~time)f0(~1)   35 -20.63616 20.210310
## 4               pi(~1)p(~mixture)c(~mixture)f0(~1)    6 -19.15952 21.686944
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   37 -16.43588 24.410589
##         weight  Deviance
## 5 7.199701e-01  53.62863
## 7 2.795677e-01  57.57452
## 3 2.209703e-04 102.34298
## 2 1.053850e-04 103.82379
## 1 8.877020e-05 106.17755
## 8 2.942397e-05  42.69578
## 4 1.406224e-05 103.82280
## 6 3.602653e-06  42.69578
```

```
names(iguane.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

```
iguane.results$p.h.time$results$real
```

```
##                   estimate            se            lcl           ucl fixed note
## pi g1 m1     2.674445e-05  6.498822e-04   5.525422e-26  1.000000e+00
```

```
## p g1 t1 m1   1.088770e-02  1.162210e-02   1.325800e-03  8.363640e-02
## p g1 t2 m1   1.098960e-02  1.260610e-02   1.142900e-03  9.739830e-02
## p g1 t3 m1   1.106580e-02  1.266650e-02   1.156300e-03  9.760240e-02
## p g1 t4 m1   7.310460e-02  5.216510e-02   1.714340e-02  2.628811e-01
## p g1 t5 m1   4.274130e-02  3.412140e-02   8.633000e-03  1.862853e-01
## p g1 t6 m1   5.294370e-02  4.036460e-02   1.140780e-02  2.131105e-01
## p g1 t7 m1   7.312100e-02  5.219310e-02   1.713910e-02  2.630242e-01
## p g1 t8 m1   8.282220e-02  5.766420e-02   1.998740e-02  2.856213e-01
## p g1 t9 m1   5.300200e-02  4.041330e-02   1.141800e-02  2.133497e-01
## p g1 t10 m1  3.242260e-02  2.769080e-02   5.905300e-03  1.589722e-01
## p g1 t11 m1  1.292390e-01  8.217980e-02   3.425730e-02  3.831000e-01
## p g1 t12 m1  1.202835e-01  7.765990e-02   3.142480e-02  3.655703e-01
## p g1 t13 m1  7.305110e-02  5.215510e-02   1.711780e-02  2.628691e-01
## p g1 t14 m1  7.307950e-02  5.215870e-02   1.713220e-02  2.628657e-01
## p g1 t15 m1  6.312760e-02  4.640620e-02   1.426880e-02  2.387630e-01
## p g1 t16 m1  1.017958e-01  6.803730e-02   2.568310e-02  3.276229e-01
## p g1 t17 m1 1.474064e-125 3.260706e-117 -6.390984e-117 6.390984e-117
## p g1 t1 m2   8.771546e-07  2.129668e-05   1.888497e-27  1.000000e+00
## p g1 t2 m2   8.854591e-07  2.161797e-05   1.462773e-27  1.000000e+00
## p g1 t3 m2   8.916642e-07  2.174285e-05   1.561775e-27  1.000000e+00
## p g1 t4 m2   6.284886e-06  1.529063e-04   1.226661e-26  1.000000e+00
## p g1 t5 m2   3.557973e-06  8.652820e-05   7.078418e-27  1.000000e+00
## p g1 t6 m2   4.454744e-06  1.083931e-04   8.647019e-27  1.000000e+00
## p g1 t7 m2   6.286409e-06  1.529343e-04   1.230428e-26  1.000000e+00
## p g1 t8 m2   7.195751e-06  1.751039e-04   1.390343e-26  1.000000e+00
## p g1 t9 m2   4.459925e-06  1.084913e-04   8.763829e-27  1.000000e+00
## p g1 t10 m2  2.670223e-06  6.498480e-05   5.135141e-27  1.000000e+00
## p g1 t11 m2  1.182703e-05  2.877402e-04   2.308607e-26  1.000000e+00
## p g1 t12 m2  1.089544e-05  2.650544e-04   2.134933e-26  1.000000e+00
## p g1 t13 m2  6.279921e-06  1.528339e-04   1.207337e-26  1.000000e+00
## p g1 t14 m2  6.282557e-06  1.528741e-04   1.216879e-26  1.000000e+00
## p g1 t15 m2  5.369361e-06  1.306281e-04   1.049652e-26  1.000000e+00
## p g1 t16 m2  9.031021e-06  2.197296e-04   1.757871e-26  1.000000e+00
## p g1 t17 m2 1.174634e-129 2.598351e-121 -5.092769e-121 5.092769e-121
## f0 g1 a0 t1  8.520845e+05  2.072483e+07   6.020948e+03  1.205870e+08
```

```
iguane.results$p.h.time$results$derived
```

```
## $`N Population Size`
##   estimate      lcl       ucl
## 1 852173.5 6109.948 120587071
```

```
iguane.results$p.time$results$real
```

```
##                  estimate           se           lcl          ucl fixed note
## pi g1 m1    4.991447e-01 0.000000e+00  4.991447e-01 4.991447e-01
## p g1 t1 m1  1.977800e-03 2.073400e-03  2.528190e-04 1.529270e-02
## p g1 t2 m1  1.978100e-03 8.619453e-04  8.415906e-04 4.642300e-03
## p g1 t3 m1  1.978100e-03 2.081000e-03  2.510213e-04 1.540420e-02
## p g1 t4 m1  1.384610e-02 6.887100e-03  5.197300e-03 3.636110e-02
## p g1 t5 m1  7.912100e-03 4.657700e-03  2.486400e-03 2.488200e-02
## p g1 t6 m1  9.890200e-03 5.478100e-03  3.325700e-03 2.903460e-02
## p g1 t7 m1  1.384610e-02 6.918300e-03  5.174200e-03 3.651850e-02
```

```
## p g1 t8 m1  1.582410e-02 7.618600e-03  6.125900e-03 4.025450e-02
## p g1 t9 m1  9.890000e-03 5.478000e-03  3.325600e-03 2.903440e-02
## p g1 t10 m1 5.934100e-03 3.936800e-03  1.611200e-03 2.160440e-02
## p g1 t11 m1 2.571400e-02 1.102180e-02  1.102010e-02 5.883480e-02
## p g1 t12 m1 2.373610e-02 1.034990e-02  1.002940e-02 5.513190e-02
## p g1 t13 m1 1.384610e-02 6.918300e-03  5.174200e-03 3.651850e-02
## p g1 t14 m1 1.384620e-02 6.887100e-03  5.197400e-03 3.636140e-02
## p g1 t15 m1 1.186810e-02 6.206300e-03  4.238800e-03 3.277740e-02
## p g1 t16 m1 1.978010e-02 8.995000e-03  8.062800e-03 4.770670e-02
## p g1 t17 m1 1.961399e-09 1.977841e-06 -3.874607e-06 3.878529e-06
## f0 g1 a0 t1 4.165572e+02 1.667390e+02  1.956718e+02 8.867906e+02
```

```
iguane.results$p.time$results$derived
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 505.5572 284.6718 975.7906
```

Les mâles maintenant.

```
iguane.proc <- process.data(iguaneM, begin.time = 1, model = "FullHet")
iguane.ddl <- make.design.data(iguane.proc)
```

Liste des modèles.

```
run.iguane <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  iguane.model.list <- create.model.list("FullHet")

  iguane.results <- mark.wrapper(iguane.model.list,
                                 data = iguane.proc,
                                 ddl = iguane.ddl)

  return(iguane.results)
}
```

```
iguane.results <- run.iguane()
```

```
##
```

```
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3  (unadjusted=2)
## -2lnL:  45.30694
## AICc :  51.32661  (unadjusted=49.316764)
##
## Beta
##                      estimate          se         lcl        ucl
## pi:(Intercept) -0.0002074937 221.7485100 -434.627290 434.626870
## p:(Intercept)  -3.9795877000   0.2964736   -4.560676  -3.398499
## f0:(Intercept)  5.2681864000   0.3701053    4.542780   5.993593
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999481
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503
## mixture:2 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503
##                    8         9        10        11        12        13        14
## mixture:1 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503
## mixture:2 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503
##                   15        16        17
## mixture:1 0.0183503 0.0183503 0.0183503
## mixture:2 0.0183503 0.0183503 0.0183503
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503
## mixture:2 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503
##                    9        10        11        12        13        14        15
## mixture:1 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503
## mixture:2 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503 0.0183503
##                   16        17
## mixture:1 0.0183503 0.0183503
## mixture:2 0.0183503 0.0183503
##
##
## Real Parameter f0
##
##         1
##  194.0637
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
```

```
## Npar :  4  (unadjusted=3)
## -2lnL:  44.81129
## AICc :  52.84411  (unadjusted=50.830966)
##
## Beta
##                     estimate se           lcl           ucl
## pi:(Intercept)  0.0007664197  0  0.0007664197  0.0007664197
## p:(Intercept)  -6.1993362000  0 -6.1993362000 -6.1993362000
## c:(Intercept)  -3.9300485000  0 -3.9300485000 -3.9300485000
## f0:(Intercept)  7.6262630000  0  7.6262630000  7.6262630000
##
##
## Real Parameter pi
##
##
## mixture:1 0.5001916
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267
## mixture:2 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267
##                    8         9        10        11        12        13        14
## mixture:1 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267
## mixture:2 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267 0.0020267
##                   15        16        17
## mixture:1 0.0020267 0.0020267 0.0020267
## mixture:2 0.0020267 0.0020267 0.0020267
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643
## mixture:2 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643
##                    9        10        11        12        13        14        15
## mixture:1 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643
## mixture:2 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643 0.0192643
##                   16        17
## mixture:1 0.0192643 0.0192643
## mixture:2 0.0192643 0.0192643
##
##
## Real Parameter f0
##
##        1
##  2051.37
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  45.30694
```

```
## AICc :  53.33975  (unadjusted=49.316765)
##
## Beta
##                   estimate           se          lcl        ucl
## pi:(Intercept) -17.218804 3845.0511000 -7553.519100 7519.08140
## p:(Intercept)   -2.589567  548.7375400 -1078.115200 1072.93600
## p:mixture2      -1.390017  548.7368400 -1076.914200 1074.13420
## f0:(Intercept)   5.268183    0.3701059     4.542775    5.99359
##
##
## Real Parameter pi
##
##
## mixture:1 3.326353e-08
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129
## mixture:2 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504
##                    8         9        10        11        12        13        14
## mixture:1 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129
## mixture:2 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504
##                   15        16        17
## mixture:1 0.0698129 0.0698129 0.0698129
## mixture:2 0.0183504 0.0183504 0.0183504
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129
## mixture:2 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504
##                    9        10        11        12        13        14        15
## mixture:1 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129 0.0698129
## mixture:2 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504 0.0183504
##                   16        17
## mixture:1 0.0698129 0.0698129
## mixture:2 0.0183504 0.0183504
##
##
## Real Parameter f0
##
##        1
##  194.063
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6  (unadjusted=3)
## -2lnL:  44.81134
## AICc :  56.88037  (unadjusted=50.831016)
##
```

```
## Beta
##                   estimate        se        lcl       ucl
## pi:(Intercept)  -6.533210 197.65898 -393.94482 380.87840
## p:(Intercept)  -21.533497   0.00000  -21.53350 -21.53350
## p:mixture2      15.330941   0.00000   15.33094  15.33094
## c:(Intercept)   18.401325   0.00000   18.40132  18.40132
## c:mixture2     -22.331347   0.00000  -22.33135 -22.33135
## f0:(Intercept)   7.631046  12.21152  -16.30354  31.56564
##
##
## Real Parameter pi
##
##
## mixture:1 0.0014522
##
##
## Real Parameter p
##
##                        1           2           3           4           5
## mixture:1 4.44755e-10 4.44755e-10 4.44755e-10 4.44755e-10 4.44755e-10
## mixture:2 2.02020e-03 2.02020e-03 2.02020e-03 2.02020e-03 2.02020e-03
##                        6           7           8           9          10
## mixture:1 4.44755e-10 4.44755e-10 4.44755e-10 4.44755e-10 4.44755e-10
## mixture:2 2.02020e-03 2.02020e-03 2.02020e-03 2.02020e-03 2.02020e-03
##                       11          12          13          14          15
## mixture:1 4.44755e-10 4.44755e-10 4.44755e-10 4.44755e-10 4.44755e-10
## mixture:2 2.02020e-03 2.02020e-03 2.02020e-03 2.02020e-03 2.02020e-03
##                       16          17
## mixture:1 4.44755e-10 4.44755e-10
## mixture:2 2.02020e-03 2.02020e-03
##
##
## Real Parameter c
##
##                      2         3         4         5         6         7         8
## mixture:1 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## mixture:2 0.0192648 0.0192648 0.0192648 0.0192648 0.0192648 0.0192648 0.0192648
##                      9        10        11        12        13        14        15
## mixture:1 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## mixture:2 0.0192648 0.0192648 0.0192648 0.0192648 0.0192648 0.0192648 0.0192648
##                     16        17
## mixture:1 1.0000000 1.0000000
## mixture:2 0.0192648 0.0192648
##
##
## Real Parameter f0
##
##         1
##  2061.205
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  20  (unadjusted=17)
```

```
## -2lnL:  11.75916
## AICc :  52.45742  (unadjusted=46.266623)
##
## Beta
##                   estimate          se          lcl         ucl
## pi:(Intercept) -17.815214 857.0799700 -1697.692000 1662.061600
## p:(Intercept)  -17.076305   0.0000000   -17.076305  -17.076305
## p:time2         16.151433   0.0000000    16.151433   16.151433
## p:time3         15.028891   0.0000000    15.028891   15.028891
## p:time4         15.320493   0.0000000    15.320493   15.320493
## p:time5         16.029789   0.0000000    16.029789   16.029789
## p:time6         15.734073   0.0000000    15.734073   15.734073
## p:time7         15.734303   0.0000000    15.734303   15.734303
## p:time8         14.619479   0.0000000    14.619479   14.619479
## p:time9         15.547585   0.0000000    15.547585   15.547585
## p:time10        13.922424   0.0000000    13.922424   13.922424
## p:time11        15.547831   0.0000000    15.547831   15.547831
## p:time12        15.547840   0.0000000    15.547840   15.547840
## p:time13        16.151521   0.0000000    16.151521   16.151521
## p:time14        15.320579   0.0000000    15.320579   15.320579
## p:time15        15.734082   0.0000000    15.734082   15.734082
## p:time16        16.151580   0.0000000    16.151580   16.151580
## p:time17        13.922383   0.0000000    13.922383   13.922383
## p:mixture2      -2.407524   0.0000000    -2.407524   -2.407524
## f0:(Intercept)   5.242106   0.3710513     4.514846    5.969367
##
##
## Real Parameter pi
##
##
## mixture:1 1.832106e-08
##
##
## Real Parameter p
##
##                        1         2         3         4         5         6
## mixture:1 3.835792e-08 0.2839662 0.1143140 0.1473157 0.2598947 0.2071433
## mixture:2 3.453669e-09 0.0344764 0.0114875 0.0153173 0.0306486 0.0229829
##                   7         8         9        10        11        12        13
## mixture:1 0.207181 0.0789408 0.1781811 0.0409386 0.1782170 0.1782185 0.2839842
## mixture:2 0.022988 0.0076578 0.0191476 0.0038287 0.0191522 0.0191524 0.0344793
##                  14        15        16        17
## mixture:1 0.1473265 0.2071448 0.2839961 0.0409370
## mixture:2 0.0153186 0.0229831 0.0344813 0.0038285
##
##
## Real Parameter c
##
##                   2         3         4         5         6        7         8
## mixture:1 0.2839662 0.1143140 0.1473157 0.2598947 0.2071433 0.207181 0.0789408
## mixture:2 0.0344764 0.0114875 0.0153173 0.0306486 0.0229829 0.022988 0.0076578
##                   9        10        11        12        13        14        15
## mixture:1 0.1781811 0.0409386 0.1782170 0.1782185 0.2839842 0.1473265 0.2071448
## mixture:2 0.0191476 0.0038287 0.0191522 0.0191524 0.0344793 0.0153186 0.0229831
```

```
##                   16        17
## mixture:1 0.2839961 0.0409370
## mixture:2 0.0344813 0.0038285
##
##
## Real Parameter f0
##
##         1
##  189.0679
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  37  (unadjusted=22)
## -2lnL:  -12.74982
## AICc :  63.62117  (unadjusted=32.092809)
##
## Beta
##                  estimate         se          lcl         ucl
## pi:(Intercept) -17.60388   776.7334  -1540.00150  1504.79370
## p:(Intercept)  -89.47712     0.0000    -89.47712   -89.47712
## p:mixture2      57.94937     0.0000     57.94937    57.94937
## p:time2         29.58127     0.0000     29.58127    29.58127
## p:time3         28.11106     0.0000     28.11106    28.11106
## p:time4         28.87135     0.0000     28.87135    28.87135
## p:time5         29.71483     0.0000     29.71483    29.71483
## p:time6         29.35338     0.0000     29.35338    29.35338
## p:time7         29.47397     0.0000     29.47397    29.47397
## p:time8         28.61111     0.0000     28.61111    28.61111
## p:time9         28.66631     0.0000     28.66631    28.66631
## p:time10        28.00357     0.0000     28.00357    28.00357
## p:time11        29.77046     0.0000     29.77046    29.77046
## p:time12        29.95956     0.0000     29.95956    29.95956
## p:time13        30.83451     0.0000     30.83451    30.83451
## p:time14        30.42919     0.0000     30.42919    30.42919
## p:time15        30.83463     0.0000     30.83463    30.83463
## p:time16        33.47253     0.0000     33.47253    33.47253
## p:time17        71.32974 23771.6050 -46521.01600 46663.67600
## c:(Intercept)   54.73609     0.0000     54.73609    54.73609
## c:mixture2     -80.78374     0.0000    -80.78374   -80.78374
## c:time3         23.96806     0.0000     23.96806    23.96806
## c:time4        -11.65389  4118.5963  -8084.10270  8060.79500
## c:time5        -11.69183  4086.2382  -8020.71890  7997.33520
## c:time6         22.95592     0.0000     22.95592    22.95592
## c:time7         22.75161     0.0000     22.75161    22.75161
## c:time8        -12.24299  3861.4719  -7580.72820  7556.24220
## c:time9         23.68009     0.0000     23.68009    23.68009
## c:time10       -12.76889  4489.6064  -8812.39760  8786.85980
## c:time11       -12.89913  4531.7468  -8895.12290  8869.32470
## c:time12       -13.53349  4769.7406  -9362.22530  9335.15830
## c:time13        22.19757     0.0000     22.19757    22.19757
## c:time14       -14.41992  5053.3869  -9919.05850  9890.21860
## c:time15        22.68019     0.0000     22.68019    22.68019
## c:time16        22.61377     0.0000     22.61377    22.61377
```

```
## c:time17       -16.90277  5811.7221 -11407.87800 11374.07300
## f0:(Intercept) -23.27312  7067.7834 -13876.12900 13829.58300
##
##
## Real Parameter pi
##
##
## mixture:1 2.263254e-08
##
##
## Real Parameter p
##
##                      1            2            3            4            5
## mixture:1 1.382233e-39 9.717691e-27 2.233883e-27 4.778035e-27 1.110626e-26
## mixture:2 2.030824e-14 1.249376e-01 3.177800e-02 6.559570e-02 1.402856e-01
##                      6            7            8            9           10
## mixture:1 7.737385e-27 8.728978e-27 3.683229e-27 3.892268e-27 2.006208e-27
## mixture:2 1.020763e-01 1.136709e-01 5.133710e-02 5.409310e-02 2.863190e-02
##                     11           12           13           14           15
## mixture:1 1.17416e-26 1.418572e-26 3.402800e-26 2.268880e-26 3.403240e-26
## mixture:2 1.47130e-01 1.724741e-01 3.333116e-01 2.500103e-01 3.333403e-01
##                     16           17
## mixture:1 4.758985e-25 1.314294e-08
## mixture:2 8.748759e-01 1.000000e+00
##
##
## Real Parameter c
##
##                      2        3            4            5         6         7
## mixture:1 1.000000e+00 1.000000 1.000000e+00 1.000000e+00 1.0000000 1.0000000
## mixture:2 4.871366e-12 0.111097 4.230884e-17 4.073363e-17 0.0434499 0.0357075
##                      8         9           10           11           12
## mixture:1 1.000000e+00 1.0000000 1.000000e+00 1.000000e+00 1.000000e+00
## mixture:2 2.347397e-17 0.0856806 1.387368e-17 1.217956e-17 6.458491e-18
##                    13           14        15        16           17
## mixture:1 1.0000000 1.000000e+00 1.0000000 1.0000000 1.000000e+00
## mixture:2 0.0208348 2.661689e-18 0.0333283 0.0312533 2.222644e-19
##
##
## Real Parameter f0
##
##            1
##  7.80932e-11
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  19  (unadjusted=17)
## -2lnL:  11.75916
## AICc :  50.39039  (unadjusted=46.266624)
##
## Beta
##                    estimate        se         lcl         ucl
## pi:(Intercept)  -0.0021973 0.0000000  -0.0021973  -0.0021973
```

```
## p:(Intercept)  -17.9311360 0.0000000 -17.9311360 -17.9311360
## p:time2         14.5984980 0.0000000  14.5984980  14.5984980
## p:time3         13.4763340 0.0000000  13.4763340  13.4763340
## p:time4         13.7679710 0.0000000  13.7679710  13.7679710
## p:time5         14.4767510 0.0000000  14.4767510  14.4767510
## p:time6         14.1812070 0.0000000  14.1812070  14.1812070
## p:time7         14.1811990 0.0000000  14.1811990  14.1811990
## p:time8         13.0671300 0.0000000  13.0671300  13.0671300
## p:time9         13.9949910 0.0000000  13.9949910  13.9949910
## p:time10        12.3700320 0.0000000  12.3700320  12.3700320
## p:time11        13.9949970 0.0000000  13.9949970  13.9949970
## p:time12        13.9949940 0.0000000  13.9949940  13.9949940
## p:time13        14.5985020 0.0000000  14.5985020  14.5985020
## p:time14        13.7679790 0.0000000  13.7679790  13.7679790
## p:time15        14.1812110 0.0000000  14.1812110  14.1812110
## p:time16        14.5985030 0.0000000  14.5985030  14.5985030
## p:time17        12.3700330 0.0000000  12.3700330  12.3700330
## f0:(Intercept)   5.2423082 0.3710682   4.5150146   5.9696019
##
##
## Real Parameter pi
##
##
## mixture:1 0.4994507
##
##
## Real Parameter p
##
##                       1         2         3         4         5        6
## mixture:1 1.631574e-08 0.0344683 0.0114891 0.0153199 0.0306384 0.022979
## mixture:2 1.631574e-08 0.0344683 0.0114891 0.0153199 0.0306384 0.022979
##                     7         8         9        10        11        12        13
## mixture:1 0.0229788 0.0076604 0.0191495 0.0038298 0.0191496 0.0191495 0.0344685
## mixture:2 0.0229788 0.0076604 0.0191495 0.0038298 0.0191496 0.0191495 0.0344685
##                14        15        16        17
## mixture:1 0.01532 0.0229791 0.0344685 0.0038298
## mixture:2 0.01532 0.0229791 0.0344685 0.0038298
##
##
## Real Parameter c
##
##                     2         3         4         5        6         7         8
## mixture:1 0.0344683 0.0114891 0.0153199 0.0306384 0.022979 0.0229788 0.0076604
## mixture:2 0.0344683 0.0114891 0.0153199 0.0306384 0.022979 0.0229788 0.0076604
##                     9        10        11        12        13      14        15
## mixture:1 0.0191495 0.0038298 0.0191496 0.0191495 0.0344685 0.01532 0.0229791
## mixture:2 0.0191495 0.0038298 0.0191496 0.0191495 0.0344685 0.01532 0.0229791
##                   16        17
## mixture:1 0.0344685 0.0038298
## mixture:2 0.0344685 0.0038298
##
##
## Real Parameter f0
##
```

```
##         1
##  189.1061
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  35  (unadjusted=22)
## -2lnL:  -12.74985
## AICc :  59.37137  (unadjusted=32.092785)
##
## Beta
##                       estimate         se           lcl           ucl
## pi:(Intercept)  4.471132e-04      0.000  4.471132e-04  4.471132e-04
## p:(Intercept)  -5.675594e+01      0.000 -5.675594e+01 -5.675594e+01
## p:time2         5.481003e+01      0.000  5.481003e+01  5.481003e+01
## p:time3         5.333823e+01      0.000  5.333823e+01  5.333823e+01
## p:time4         5.409919e+01      0.000  5.409919e+01  5.409919e+01
## p:time5         5.494357e+01      0.000  5.494357e+01  5.494357e+01
## p:time6         5.458120e+01      0.000  5.458120e+01  5.458120e+01
## p:time7         5.470182e+01      0.000  5.470182e+01  5.470182e+01
## p:time8         5.383819e+01      0.000  5.383819e+01  5.383819e+01
## p:time9         5.389375e+01      0.000  5.389375e+01  5.389375e+01
## p:time10        5.322960e+01      0.000  5.322960e+01  5.322960e+01
## p:time11        5.499809e+01      0.000  5.499809e+01  5.499809e+01
## p:time12        5.518733e+01      0.000  5.518733e+01  5.518733e+01
## p:time13        5.606280e+01      0.000  5.606280e+01  5.606280e+01
## p:time14        5.565733e+01      0.000  5.565733e+01  5.565733e+01
## p:time15        5.606280e+01      0.000  5.606280e+01  5.606280e+01
## p:time16        5.870183e+01      0.000  5.870183e+01  5.870183e+01
## p:time17        7.746072e+01  23261.839 -4.551575e+04  4.567067e+04
## c:(Intercept)  -3.319199e+01      0.000 -3.319199e+01 -3.319199e+01
## c:time3         3.111254e+01      0.000  3.111254e+01  3.111254e+01
## c:time4        -2.433088e+01   6481.616 -1.272830e+04  1.267964e+04
## c:time5        -1.778074e+01      0.000 -1.778074e+01 -1.778074e+01
## c:time6         3.010094e+01      0.000  3.010094e+01  3.010094e+01
## c:time7         2.989615e+01      0.000  2.989615e+01  2.989615e+01
## c:time8        -3.312633e+01 132558.350 -2.598475e+05  2.597812e+05
## c:time9         3.082487e+01      0.000  3.082487e+01  3.082487e+01
## c:time10       -3.223385e+01      0.000 -3.223385e+01 -3.223385e+01
## c:time11       -3.188087e+01  36264.544 -7.111039e+04  7.104663e+04
## c:time12       -3.114870e+01  49756.675 -9.755424e+04  9.749194e+04
## c:time13        2.934183e+01      0.000  2.934183e+01  2.934183e+01
## c:time14       -3.674709e+01      0.000 -3.674709e+01 -3.674709e+01
## c:time15        2.982469e+01      0.000  2.982469e+01  2.982469e+01
## c:time16        2.975800e+01      0.000  2.975800e+01  2.975800e+01
## c:time17       -3.677771e+01  89515.870 -1.754879e+05  1.754143e+05
## f0:(Intercept) -2.005700e+01   4063.981 -7.985460e+03  7.945346e+03
##
##
## Real Parameter pi
##
##
## mixture:1 0.5001118
##
```

```
##
## Real Parameter p
##
##                      1     2         3         4         5        6         7
## mixture:1 2.244947e-25 0.125 0.0317464 0.0655741 0.1403513 0.102041 0.1136366
## mixture:2 2.244947e-25 0.125 0.0317464 0.0655741 0.1403513 0.102041 0.1136366
##                   8         9        10       11        12       13        14
## mixture:1 0.051283 0.0540541 0.0285718 0.147059 0.1724134 0.333334 0.2499995
## mixture:2 0.051283 0.0540541 0.0285718 0.147059 0.1724134 0.333334 0.2499995
##                  15        16 17
## mixture:1 0.3333333 0.8749971  1
## mixture:2 0.3333333 0.8749971  1
##
##
## Real Parameter c
##
##                      2         3            4            5         6         7
## mixture:1 3.845057e-15 0.1111108 1.042644e-25 7.291609e-23 0.0434781 0.0357142
## mixture:2 3.845057e-15 0.1111108 1.042644e-25 7.291609e-23 0.0434781 0.0357142
##                    8         9           10           11           12
## mixture:1 1.57878e-29 0.0857145 3.854062e-29 5.485504e-29 1.140759e-28
## mixture:2 1.57878e-29 0.0857145 3.854062e-29 5.485504e-29 1.140759e-28
##                   13          14        15        16           17
## mixture:1 0.0208332 4.22519e-31 0.0333331 0.0312499 4.097771e-31
## mixture:2 0.0208332 4.22519e-31 0.0333331 0.0312499 4.097771e-31
##
##
## Real Parameter f0
##
##             1
##  1.946956e-09
```

```
iguane.results
```

```
##                                              model npar     AICc  DeltaAICc
## 7                          pi(~1)p(~time)c()f0(~1)   19 50.39039  0.0000000
## 1                             pi(~1)p(~1)c()f0(~1)    3 51.32661  0.9362179
## 5                 pi(~1)p(~time + mixture)c()f0(~1)   20 52.45742  2.0670251
## 2                           pi(~1)p(~1)c(~1)f0(~1)    4 52.84411  2.4537175
## 3                        pi(~1)p(~mixture)c()f0(~1)    4 53.33975  2.9493605
## 4                 pi(~1)p(~mixture)c(~mixture)f0(~1)    6 56.88037  6.4899759
## 8                       pi(~1)p(~time)c(~time)f0(~1)   35 59.37137  8.9809749
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   37 63.62117 13.2307827
##         weight Deviance
## 7 0.3913085193 61.29371
## 1 0.2450316420 94.84148
## 5 0.1392100212 61.29371
## 2 0.1147364235 94.34584
## 3 0.0895516925 94.84148
## 4 0.0152489146 94.34589
## 8 0.0043885938 36.78470
## 6 0.0005241932 36.78472
```

```
names(iguane.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

```
iguane.results$p.time$results$real
```

```
##                  estimate         se          lcl          ucl fixed note
## pi g1 m1    4.994507e-01  0.0000000 4.994507e-01 4.994507e-01
## p g1 t1 m1  1.631574e-08  0.0000000 1.631574e-08 1.631574e-08
## p g1 t2 m1  3.446830e-02  0.0146036 1.488070e-02 7.780330e-02
## p g1 t3 m1  1.148910e-02  0.0072821 3.296600e-03 3.923910e-02
## p g1 t4 m1  1.531990e-02  0.0086444 5.034900e-03 4.565060e-02
## p g1 t5 m1  3.063840e-02  0.0134738 1.282340e-02 7.141240e-02
## p g1 t6 m1  2.297900e-02  0.0111410 8.814100e-03 5.856290e-02
## p g1 t7 m1  2.297880e-02  0.0111409 8.814000e-03 5.856260e-02
## p g1 t8 m1  7.660400e-03  0.0057751 1.738400e-03 3.308690e-02
## p g1 t9 m1  1.914950e-02  0.0099207 6.885800e-03 5.210860e-02
## p g1 t10 m1 3.829800e-03  0.0039586 5.027958e-04 2.854310e-02
## p g1 t11 m1 1.914960e-02  0.0099207 6.885900e-03 5.210880e-02
## p g1 t12 m1 1.914950e-02  0.0099207 6.885900e-03 5.210870e-02
## p g1 t13 m1 3.446850e-02  0.0146037 1.488070e-02 7.780350e-02
## p g1 t14 m1 1.532000e-02  0.0086444 5.034900e-03 4.565090e-02
## p g1 t15 m1 2.297910e-02  0.0111410 8.814100e-03 5.856300e-02
## p g1 t16 m1 3.446850e-02  0.0146037 1.488070e-02 7.780360e-02
## p g1 t17 m1 3.829800e-03  0.0039586 5.027964e-04 2.854310e-02
## f0 g1 a0 t1 1.891061e+02 70.1712540 9.353539e+01 3.823271e+02
```

```
iguane.results$p.time$results$derived
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 261.1061 165.5354 454.3271
```

Données 2010

Les données

```
iguane <- convert.inp("dat/iguanes-2010-2sexes-FM.inp",
                      group.df = data.frame(sex = c("F","M")),
                      covariates = NULL)
head(iguane)
```

```
##           ch freq sex
## 1:1 00000010    1   F
## 1:2 00000010    1   F
## 1:3 00000001    1   F
## 1:4 01000000    1   F
## 1:5 00010000    1   F
## 1:6 00100000    1   F
```

```
tail(iguane)
```

```
##             ch freq sex
## 2:119 00000010    1   M
## 2:120 10010000    1   M
## 2:121 01000000    1   M
## 2:122 00000100    1   M
## 2:123 01000000    1   M
## 2:124 00000001    1   M
```

On sépare mâles et femelles.

```
iguaneM <- iguane[iguane$sex == "M", ]
iguaneF <- iguane[iguane$sex == "F", ]
```

On formate les données.

```
iguane_secr <- unRMarkInput(iguane) # on convertit au bon format
summary(iguane_secr) # resumes
```

```
## Object class       capthist
##
## Counts by occasion
##               1  2  3  4  5  6   7   8 Total
## n            14 17 18 22 21 14  16  14   136
## u            14 17 18 16 19 13  15  12   124
## f           113 10  1  0  0  0   0   0   124
## M(t+1)       14 31 49 65 84 97 112 124   124
## losses        0  0  0  0  0  0   0   0     0
## detections   14 17 18 22 21 14  16  14   136
##
## Individual covariates
##  sex
##  F:50
##  M:74
```

Les deux sexes ensemble.

```
closure.test(iguane_secr, SB = TRUE)
```

```
## $Otis
##   statistic         p
##  -0.5636019 0.2865126
##
## $Xc
##  statistic df          p
##   13.61476  7 0.05847307
##
## $NRvsJS
##  statistic df           p
##   8.542874  1 0.003468775
```

```
##
## $NMvsJS
##  statistic df       p
##   3.203634  2 0.20153
##
## $MtvsNR
##  statistic df         p
##   5.071888  6 0.5346266
##
## $MtvsNM
##  statistic df          p
##   10.41113  5 0.06438979
##
## $compNRvsJS
##   Occasion Chisquare df           p
## 1        2        NA NA          NA
## 2        3        NA NA          NA
## 3        4  8.542874  1 0.003468775
## 4        5        NA NA          NA
## 5        6        NA NA          NA
## 6        7        NA NA          NA
##
## $compNMvsJS
##   Occasion Chisquare df          p
## 1        2 2.9216548  1 0.08739819
## 2        3 0.2819793  1 0.59540684
## 3        4        NA NA         NA
## 4        5        NA NA         NA
## 5        6        NA NA         NA
## 6        7        NA NA         NA
```

Les modèles maintenant. On commence par le jeu de données avec les deux sexes ensemble.

```
iguane.proc <- process.data(iguane,
                            begin.time = 1,
                            model = "FullHet")
iguane.ddl <- make.design.data(iguane.proc)
```

Liste des modèles.

```
run.iguane <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(p = list(formula =  ~ 1),
                      c = list(formula =  ~ 1))
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
```

```
                        c = list(formula =  ~ mixture + time))

  iguane.model.list <- create.model.list("FullHet")

  iguane.results <- mark.wrapper(iguane.model.list,
                                 data = iguane.proc,
                                 ddl = iguane.ddl)

  return(iguane.results)
}
```

```
iguane.results <- run.iguane()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  2  (unadjusted=3)
## -2lnL:  -321.6732
## AICc :  -317.661  (unadjusted=-317.66102)
##
## Beta
##                  estimate se       lcl       ucl
## pi:(Intercept)  0.000000  0  0.000000  0.000000
## p:(Intercept)  -3.591984  0 -3.591984 -3.591984
## f0:(Intercept)  6.234808  0  6.234808  6.234808
##
##
## Real Parameter pi
##
##
## mixture:1 0.5
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053
## mixture:2 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053
##                   8
## mixture:1 0.0268053
## mixture:2 0.0268053
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053
## mixture:2 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053
##
##
## Real Parameter f0
##
```

```
##         1
##  510.2027
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  3  (unadjusted=4)
## -2lnL:  -321.7031
## AICc :  -315.6788  (unadjusted=-315.67884)
##
## Beta
##                 estimate se       lcl       ucl
## pi:(Intercept)  0.000000  0  0.000000  0.000000
## p:(Intercept)  -3.369194  0 -3.369194 -3.369194
## c:(Intercept)  -3.601867  0 -3.601867 -3.601867
## f0:(Intercept)  5.987342  0  5.987342  5.987342
##
##
## Real Parameter pi
##
##
## mixture:1 0.5
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0332722 0.0332722 0.0332722 0.0332722 0.0332722 0.0332722 0.0332722
## mixture:2 0.0332722 0.0332722 0.0332722 0.0332722 0.0332722 0.0332722 0.0332722
##                    8
## mixture:1 0.0332722
## mixture:2 0.0332722
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0265487 0.0265487 0.0265487 0.0265487 0.0265487 0.0265487 0.0265487
## mixture:2 0.0265487 0.0265487 0.0265487 0.0265487 0.0265487 0.0265487 0.0265487
##
##
## Real Parameter f0
##
##         1
##  398.3542
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  -321.6732
## AICc :  -313.6326  (unadjusted=-317.66102)
##
## Beta
```

```
##                    estimate           se          lcl         ucl
## pi:(Intercept) -21.2709240 1760.0958000 -3471.058800 3428.516900
## p:(Intercept)    0.2787395  179.9929300  -352.507410  353.064890
## p:mixture2      -3.8707254  179.9933000  -356.657600  348.916150
## f0:(Intercept)   6.2348100    0.3308174     5.586408    6.883212
##
##
## Real Parameter pi
##
##
## mixture:1 5.783027e-10
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.5692372 0.5692372 0.5692372 0.5692372 0.5692372 0.5692372 0.5692372
## mixture:2 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053
##                    8
## mixture:1 0.5692372
## mixture:2 0.0268053
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.5692372 0.5692372 0.5692372 0.5692372 0.5692372 0.5692372 0.5692372
## mixture:2 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053 0.0268053
##
##
## Real Parameter f0
##
##         1
##  510.2037
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6  (unadjusted=5)
## -2lnL:  -322.6272
## AICc :  -310.5419  (unadjusted=-312.56634)
##
## Beta
##                   estimate       se        lcl         ucl
## pi:(Intercept)  -5.998696 1.820929  -9.567716  -2.4296759
## p:(Intercept)   18.038526 0.000000  18.038526  18.0385260
## p:mixture2     -21.701917 0.000000 -21.701917 -21.7019170
## c:(Intercept)   -1.505431 1.026257  -3.516895   0.5060324
## c:mixture2      -2.267446 1.061083  -4.347169  -0.1877232
## f0:(Intercept)   6.299565 1.781710   2.807413   9.7917164
##
##
## Real Parameter pi
##
```

```
##
## mixture:1 0.0024758
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## mixture:2 0.0250042 0.0250042 0.0250042 0.0250042 0.0250042 0.0250042 0.0250042
##                   8
## mixture:1 1.0000000
## mixture:2 0.0250042
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.1816169 0.1816169 0.1816169 0.1816169 0.1816169 0.1816169 0.1816169
## mixture:2 0.0224694 0.0224694 0.0224694 0.0224694 0.0224694 0.0224694 0.0224694
##
##
## Real Parameter f0
##
##        1
##  544.335
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  11
## -2lnL:  -325.9341
## AICc :  -303.6647
##
## Beta
##                      estimate        se         lcl        ucl
## pi:(Intercept) -2.513251e+00 9.8145231 -21.7497170 16.7232140
## p:(Intercept)  -2.899410e+00 3.2452989  -9.2601960  3.4613760
## p:time2         1.991706e-01 0.3655095  -0.5172281  0.9155692
## p:time3         2.579996e-01 0.3610128  -0.4495856  0.9655848
## p:time4         4.653497e-01 0.3467577  -0.2142954  1.1449949
## p:time5         4.171610e-01 0.3498599  -0.2685643  1.1028864
## p:time6         4.773091e-06 0.3823615  -0.7494239  0.7494334
## p:time7         1.368774e-01 0.3705033  -0.5893092  0.8630639
## p:time8         5.325689e-06 0.3823610  -0.7494223  0.7494330
## p:mixture2     -1.357539e+00 1.9232733  -5.1271545  2.4120770
## f0:(Intercept)  6.562137e+00 1.8519936   2.9322293 10.1920440
##
##
## Real Parameter pi
##
##
## mixture:1 0.0749344
##
##
```

```
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.0521827 0.0629592 0.0665204 0.0806120 0.0771120 0.0521830 0.0593827
## mixture:2 0.0139676 0.0169936 0.0180048 0.0220618 0.0210457 0.0139677 0.0159837
##                   8
## mixture:1 0.0521830
## mixture:2 0.0139677
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.0629592 0.0665204 0.0806120 0.0771120 0.0521830 0.0593827 0.0521830
## mixture:2 0.0169936 0.0180048 0.0220618 0.0210457 0.0139677 0.0159837 0.0139677
##
##
## Real Parameter f0
##
##         1
##  707.7824
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  19  (unadjusted=12)
## -2lnL:  -344.7641
## AICc :  -305.9822  (unadjusted=-320.44544)
##
## Beta
##                     estimate           se           lcl           ucl
## pi:(Intercept) -20.7778980 2.974445e+03 -5.850689e+03   5809.133600
## p:(Intercept)    3.7681924 1.840322e+03 -3.603263e+03   3610.799000
## p:mixture2      -5.8295827 1.840322e+03 -3.612860e+03   3601.201300
## p:time2          0.3620756 3.874150e-01 -3.972579e-01      1.121409
## p:time3          0.6343281 3.865283e-01 -1.232673e-01      1.391924
## p:time4          0.7563482 3.999636e-01 -2.758060e-02      1.540277
## p:time5          1.3167883 3.976852e-01  5.373252e-01      2.096251
## p:time6          1.3305751 4.409929e-01  4.662291e-01      2.194921
## p:time7          2.2844973 4.801217e-01  1.343459e+00      3.225536
## p:time8         54.2824180 5.696722e+04 -1.116015e+05 111710.030000
## c:(Intercept)  -19.3540200 0.000000e+00 -1.935402e+01    -19.354020
## c:mixture2      -7.7757452 0.000000e+00 -7.775745e+00     -7.775745
## c:time3        -29.1695840 3.345579e+04 -6.560252e+04  65544.181000
## c:time4         25.1604000 0.000000e+00  2.516040e+01     25.160400
## c:time5         23.6798700 0.000000e+00  2.367987e+01     23.679870
## c:time6         22.7109500 0.000000e+00  2.271095e+01     22.710950
## c:time7         22.5655710 0.000000e+00  2.256557e+01     22.565571
## c:time8         23.1225290 0.000000e+00  2.312253e+01     23.122529
## f0:(Intercept) -73.3266960 0.000000e+00 -7.332670e+01    -73.326696
##
##
## Real Parameter pi
##
```

```
##
## mixture:1 9.468333e-10
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.9774275 0.9841759 0.9879017 0.9892765 0.9938491 0.9939328 0.9976540
## mixture:2 0.1129065 0.1545548 0.1935568 0.2133177 0.3219986 0.3250159 0.5555465
##           8
## mixture:1 1
## mixture:2 1
##
##
## Real Parameter c
##
##                       2            3         4         5         6         7
## mixture:1 3.932385e-09 8.442417e-22 0.9970007 0.9869502 0.9663310 0.9612667
## mixture:2 1.650794e-12 3.544080e-25 0.1224571 0.0307720 0.0119051 0.0103109
##                   8
## mixture:1 0.9774345
## mixture:2 0.0178588
##
##
## Real Parameter f0
##
##             1
##  1.427646e-32
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  10  (unadjusted=9)
## -2lnL:  -325.815
## AICc :  -305.5907  (unadjusted=-307.63167)
##
## Beta
##                      estimate        se           lcl           ucl
## pi:(Intercept)  3.879046e-05 0.0000000  3.879046e-05  3.879046e-05
## p:(Intercept)  -3.786758e+00 0.3834494 -4.538319e+00 -3.035198e+00
## p:time2         1.990300e-01 0.3653789 -5.171126e-01  9.151727e-01
## p:time3         2.578170e-01 0.3608848 -4.495173e-01  9.651513e-01
## p:time4         4.650273e-01 0.3466364 -2.143799e-01  1.144435e+00
## p:time5         4.168677e-01 0.3497369 -2.686165e-01  1.102352e+00
## p:time6         1.054177e-06 0.3822273 -7.491645e-01  7.491666e-01
## p:time7         1.367773e-01 0.3703710 -5.891499e-01  8.627044e-01
## p:time8         3.678204e-06 0.3822274 -7.491620e-01  7.491694e-01
## f0:(Intercept)  6.229660e+00 0.3309465  5.581004e+00  6.878315e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000097
```

```
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0221665 0.0269166 0.0284999 0.0348332 0.0332498 0.0221665 0.0253332
## mixture:2 0.0221665 0.0269166 0.0284999 0.0348332 0.0332498 0.0221665 0.0253332
##                    8
## mixture:1 0.0221666
## mixture:2 0.0221666
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0269166 0.0284999 0.0348332 0.0332498 0.0221665 0.0253332 0.0221666
## mixture:2 0.0269166 0.0284999 0.0348332 0.0332498 0.0221665 0.0253332 0.0221666
##
##
## Real Parameter f0
##
##         1
##  507.5827
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  17  (unadjusted=12)
## -2lnL:  -344.7641
## AICc :  -310.1358  (unadjusted=-320.44544)
##
## Beta
##                       estimate           se           lcl           ucl
## pi:(Intercept) -4.797273e-04 4.998344e-01 -9.801552e-01  9.791957e-01
## p:(Intercept)  -2.061415e+00 2.837638e-01 -2.617593e+00 -1.505238e+00
## p:time2         3.620462e-01 3.874240e-01 -3.973048e-01  1.121397e+00
## p:time3         6.343110e-01 3.865362e-01 -1.232999e-01  1.391922e+00
## p:time4         7.564656e-01 3.999698e-01 -2.747530e-02  1.540407e+00
## p:time5         1.316975e+00 3.976851e-01  5.375121e-01  2.096438e+00
## p:time6         1.330534e+00 4.410008e-01  4.661725e-01  2.194896e+00
## p:time7         2.284552e+00 4.801268e-01  1.343503e+00  3.225601e+00
## p:time8         2.078257e+01 3.414796e+03 -6.672217e+03  6.713782e+03
## c:(Intercept)  -2.074504e+01 1.407822e+00 -2.350436e+01 -1.798570e+01
## c:time3        -2.415594e+01 6.266198e+05 -1.228199e+06  1.228151e+06
## c:time4         1.877557e+01 1.444373e+00  1.594460e+01  2.160654e+01
## c:time5         1.729501e+01 1.580461e+00  1.419731e+01  2.039272e+01
## c:time6         1.632634e+01 1.397090e+00  1.358805e+01  1.906464e+01
## c:time7         1.618093e+01 1.570867e+00  1.310203e+01  1.925983e+01
## c:time8         1.673783e+01 1.578289e+00  1.364438e+01  1.983128e+01
## f0:(Intercept) -3.265977e+01 2.058762e+04 -4.038440e+04  4.031908e+04
##
##
## Real Parameter pi
##
```

```
##
## mixture:1 0.4998801
##
##
## Real Parameter p
##
##                  1         2         3         4         5         6         7
## mixture:1 0.112904 0.1545477 0.1935502 0.2133331 0.3220339 0.3250014 0.5555538
## mixture:2 0.112904 0.1545477 0.1935502 0.2133331 0.3220339 0.3250014 0.5555538
##           8
## mixture:1 1
## mixture:2 1
##
##
## Real Parameter c
##
##                      2            3         4         5         6         7
## mixture:1 9.784663e-10 3.160493e-20 0.1224466 0.0307683 0.0119065 0.0103118
## mixture:2 9.784663e-10 3.160493e-20 0.1224466 0.0307683 0.0119065 0.0103118
##                   8
## mixture:1 0.0178594
## mixture:2 0.0178594
##
##
## Real Parameter f0
##
##             1
##  6.547022e-15
```

```
iguane.results
```

```
##                                             model npar      AICc DeltaAICc
## 1                           pi(~1)p(~1)c()f0(~1)    2 -317.6610  0.000000
## 2                         pi(~1)p(~1)c(~1)f0(~1)    3 -315.6788  1.982168
## 3                      pi(~1)p(~mixture)c()f0(~1)    4 -313.6326  4.028393
## 4              pi(~1)p(~mixture)c(~mixture)f0(~1)    6 -310.5419  7.119106
## 8                    pi(~1)p(~time)c(~time)f0(~1)   17 -310.1358  7.525223
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   19 -305.9822 11.678780
## 7                        pi(~1)p(~time)c()f0(~1)   10 -305.5907 12.070307
## 5               pi(~1)p(~time + mixture)c()f0(~1)   11 -303.6647 13.996284
##         weight Deviance
## 1 0.6400026470 48.31201
## 2 0.2375524158 48.28202
## 3 0.0853939813 48.31201
## 4 0.0182090633 47.35797
## 8 0.0148627884 25.22103
## 6 0.0018628034 25.22103
## 7 0.0015316086 44.17018
## 5 0.0005846921 44.05104
```

```
names(iguane.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
```

```
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

```
iguane.results$p.dot$results$real
```

```
##                 estimate se         lcl         ucl fixed note
## pi g1 m1       0.5000000  0   0.5000000   0.5000000
## p g1 t1 m1     0.0268053  0   0.0268053   0.0268053
## f0 g1 a0 t1 510.2027400  0 510.2027400 510.2027400
```

```
iguane.results$p.dot$results$derived
```

```
## $`N Population Size`
##   estimate      lcl      ucl
## 1 634.2027 634.2027 634.2027
```

En séparant les sexes. Femelles, puis mâles.

```
iguane.proc <- process.data(iguaneF, begin.time = 1, model = "FullHet")
iguane.ddl <- make.design.data(iguane.proc)
```

Liste des modèles.

```
run.iguane <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(formula =  ~ 1)
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))

  iguane.model.list <- create.model.list("FullHet")

  iguane.results <- mark.wrapper(iguane.model.list,
                                 data = iguane.proc,
                                 ddl = iguane.ddl)

  return(iguane.results)
}
```

```
iguane.results <- run.iguane()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
```

```
##
## Npar :  2
## -2lnL:  -70.97173
## AICc :  -66.94151
##
## Beta
##                  estimate se       lcl       ucl
## pi:(Intercept)  0.000000  0  0.000000  0.000000
## p:(Intercept)  -5.144723  0 -5.144723 -5.144723
## f0:(Intercept)  6.956393  0  6.956393  6.956393
##
##
## Real Parameter pi
##
##
## mixture:1 0.5
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963
## mixture:2 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963
##                    8
## mixture:1 0.0057963
## mixture:2 0.0057963
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963
## mixture:2 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963 0.0057963
##
##
## Real Parameter f0
##
##         1
##  1049.841
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  -71.17701
## AICc :  -63.07575  (unadjusted=-67.146786)
##
## Beta
##                      estimate se           lcl           ucl
## pi:(Intercept)  3.332714e-04  0  3.332714e-04  3.332714e-04
## p:(Intercept)  -1.111622e+01  0 -1.111622e+01 -1.111622e+01
## c:(Intercept)  -5.022252e+00  0 -5.022252e+00 -5.022252e+00
## f0:(Intercept)  1.294982e+01  0  1.294982e+01  1.294982e+01
##
```

```
##
## Real Parameter pi
##
##
## mixture:1 0.5000833
##
##
## Real Parameter p
##
##                      1            2            3            4            5
## mixture:1 1.486891e-05 1.486891e-05 1.486891e-05 1.486891e-05 1.486891e-05
## mixture:2 1.486891e-05 1.486891e-05 1.486891e-05 1.486891e-05 1.486891e-05
##                      6            7            8
## mixture:1 1.486891e-05 1.486891e-05 1.486891e-05
## mixture:2 1.486891e-05 1.486891e-05 1.486891e-05
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.0065465 0.0065465 0.0065465 0.0065465 0.0065465 0.0065465 0.0065465
## mixture:2 0.0065465 0.0065465 0.0065465 0.0065465 0.0065465 0.0065465 0.0065465
##
##
## Real Parameter f0
##
##         1
##  420762.1
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  -70.97173
## AICc :  -62.87047  (unadjusted=-66.941506)
##
## Beta
##                   estimate       se        lcl        ucl
## pi:(Intercept) -22.574189 0.000000 -22.574189 -22.574189
## p:(Intercept)   -1.915354 0.000000  -1.915354  -1.915354
## p:mixture2      -3.228636 0.000000  -3.228636  -3.228636
## f0:(Intercept)   6.955656 1.029287   4.938253   8.973059
##
##
## Real Parameter pi
##
##
## mixture:1 1.570921e-10
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1283805 0.1283805 0.1283805 0.1283805 0.1283805 0.1283805 0.1283805
```

```
## mixture:2 0.0058005 0.0058005 0.0058005 0.0058005 0.0058005 0.0058005 0.0058005
##                   8
## mixture:1 0.1283805
## mixture:2 0.0058005
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.1283805 0.1283805 0.1283805 0.1283805 0.1283805 0.1283805 0.1283805
## mixture:2 0.0058005 0.0058005 0.0058005 0.0058005 0.0058005 0.0058005 0.0058005
##
##
## Real Parameter f0
##
##         1
##  1049.066
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6
## -2lnL:  -71.17721
## AICc :  -58.96347
##
## Beta
##                  estimate        se         lcl       ucl
## pi:(Intercept) -24.68513 505.77094 -1015.99620 966.62593
## p:(Intercept)   19.69732   0.00000    19.69732  19.69732
## p:mixture2     -30.67895   0.00000   -30.67895 -30.67895
## c:(Intercept)  -27.20782   0.00000   -27.20782 -27.20782
## c:mixture2      22.17237   0.00000    22.17237  22.17237
## f0:(Intercept)  12.81416  64.42384  -113.45657 139.08488
##
##
## Real Parameter pi
##
##
## mixture:1 1.902767e-11
##
##
## Real Parameter p
##
##                       1            2            3            4            5
## mixture:1 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00
## mixture:2 1.701112e-05 1.701112e-05 1.701112e-05 1.701112e-05 1.701112e-05
##                       6            7            8
## mixture:1 1.000000e+00 1.000000e+00 1.000000e+00
## mixture:2 1.701112e-05 1.701112e-05 1.701112e-05
##
##
## Real Parameter c
##
##                       2            3            4            5            6
```

```
## mixture:1 1.526843e-12 1.526843e-12 1.526843e-12 1.526843e-12 1.526843e-12
## mixture:2 6.461300e-03 6.461300e-03 6.461300e-03 6.461300e-03 6.461300e-03
##                      7            8
## mixture:1 1.526843e-12 1.526843e-12
## mixture:2 6.461300e-03 6.461300e-03
##
##
## Real Parameter f0
##
##         1
##  367381.8
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  11  (unadjusted=9)
## -2lnL:  -73.53263
## AICc :  -50.85222  (unadjusted=-55.071095)
##
## Beta
##                     estimate          se           lcl         ucl
## pi:(Intercept) -1.915241e+01 699.1447900 -1389.4762000 1351.171400
## p:(Intercept)  -1.250227e+00   0.0000000    -1.2502272   -1.250227
## p:time2         1.832314e-01   0.6070577    -1.0066017    1.373064
## p:time3         9.042576e-05   0.6339070    -1.2423673    1.242548
## p:time4         1.832142e-01   0.6070586    -1.0066207    1.373049
## p:time5         3.383091e-01   0.5871189    -0.8124439    1.489062
## p:time6         1.832241e-01   0.6070550    -1.0066038    1.373052
## p:time7         1.832287e-01   0.6070583    -1.0066057    1.373063
## p:time8         6.977527e-01   0.5494293    -0.3791288    1.774634
## p:mixture2     -4.130607e+00   0.0000000    -4.1306074   -4.130607
## f0:(Intercept)  6.947960e+00   1.0297773     4.9295966    8.966324
##
##
## Real Parameter pi
##
##
## mixture:1 4.81075e-09
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.2226608 0.2559748 0.2226765 0.2559715 0.2866075 0.2559734 0.2559743
## mixture:2 0.0045829 0.0054994 0.0045833 0.0054993 0.0064160 0.0054994 0.0054994
##                   8
## mixture:1 0.3652905
## mixture:2 0.0091657
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.2559748 0.2226765 0.2559715 0.2866075 0.2559734 0.2559743 0.3652905
```

```
## mixture:2 0.0054994 0.0045833 0.0054993 0.0064160 0.0054994 0.0054994 0.0091657
##
##
## Real Parameter f0
##
##         1
##  1041.024
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  19  (unadjusted=9)
## -2lnL:  -86.83013
## AICc :  -46.83013  (unadjusted=-68.368593)
##
## Beta
##                     estimate           se           lcl           ucl
## pi:(Intercept)   -3.8917340 1.010111e+00 -5.871551e+00     -1.911917
## p:(Intercept)   190.2388400 0.000000e+00  1.902388e+02    190.238840
## p:mixture2     -192.6591600 0.000000e+00 -1.926592e+02   -192.659160
## p:time2           0.5485214 6.815641e-01 -7.873443e-01      1.884387
## p:time3           0.5034096 7.082607e-01 -8.847814e-01      1.891601
## p:time4           0.6624407 7.118329e-01 -7.327518e-01      2.057633
## p:time5           1.2751751 6.786125e-01 -5.490550e-02      2.605256
## p:time6           1.4394963 7.080703e-01  5.167840e-02      2.827314
## p:time7           1.9094947 7.340662e-01  4.707250e-01      3.348264
## p:time8         228.0775500 1.385856e+05 -2.713997e+05 271855.890000
## c:(Intercept)   -86.3377280 4.411925e+04 -8.656008e+04  86387.402000
## c:mixture2     -306.7888800 0.000000e+00 -3.067889e+02   -306.788880
## c:time3         -35.9536140 2.469477e+04 -4.843770e+04  48365.797000
## c:time4         244.0365700 1.619142e+05 -3.171078e+05 317595.840000
## c:time5          43.3054820 2.769669e+04 -5.424222e+04  54328.828000
## c:time6          61.4143810 3.300418e+04 -6.462679e+04  64749.615000
## c:time7          64.2464710 5.201670e+04 -1.018885e+05 102016.980000
## c:time8          62.1545780 0.000000e+00  6.215458e+01     62.154578
## f0:(Intercept) -275.3541000 1.843156e+05 -3.615340e+05 360983.270000
##
##
## Real Parameter pi
##
##
## mixture:1 0.0200017
##
##
## Real Parameter p
##
##                   1         2        3         4         5         6        7 8
## mixture:1 1.0000000 1.0000000 1.000000 1.0000000 1.0000000 1.0000000 1.000000 1
## mixture:2 0.0816359 0.1333332 0.128206 0.1470556 0.2413762 0.2727275 0.374999 1
##
##
## Real Parameter c
##
##                       2             3            4             5             6
```

```
## mixture:1  3.191548e-38  7.754346e-54 1.000000e+00  2.048015e-19  1.499436e-11
## mixture:2 1.850469e-171 4.495994e-187 1.782448e-65 1.187445e-152 8.693780e-145
##                       7             8
## mixture:1  2.546179e-10  3.143342e-11
## mixture:2 1.476283e-143 1.822520e-144
##
##
## Real Parameter f0
##
##              1
##  2.601567e-120
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  10
## -2lnL:  -73.53264
## AICc :  -55.0711
##
## Beta
##                     estimate se           lcl           ucl
## pi:(Intercept) -2.087945e-04  0 -2.087945e-04 -2.087945e-04
## p:(Intercept)  -5.380942e+00  0 -5.380942e+00 -5.380942e+00
## p:time2         1.832668e-01  0  1.832668e-01  1.832668e-01
## p:time3         2.333271e-05  0  2.333271e-05  2.333271e-05
## p:time4         1.832643e-01  0  1.832643e-01  1.832643e-01
## p:time5         3.383414e-01  0  3.383414e-01  3.383414e-01
## p:time6         1.832674e-01  0  1.832674e-01  1.832674e-01
## p:time7         1.832701e-01  0  1.832701e-01  1.832701e-01
## p:time8         6.977827e-01  0  6.977827e-01  6.977827e-01
## f0:(Intercept)  6.948043e+00  0  6.948043e+00  6.948043e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999478
##
##
## Real Parameter p
##
##                   1        2         3        4         5        6        7
## mixture:1 0.0045824 0.005499 0.0045825 0.005499 0.0064155 0.005499 0.005499
## mixture:2 0.0045824 0.005499 0.0045825 0.005499 0.0064155 0.005499 0.005499
##                   8
## mixture:1 0.009165
## mixture:2 0.009165
##
##
## Real Parameter c
##
##                  2         3        4         5        6        7        8
## mixture:1 0.005499 0.0045825 0.005499 0.0064155 0.005499 0.005499 0.009165
## mixture:2 0.005499 0.0045825 0.005499 0.0064155 0.005499 0.005499 0.009165
```

```
##
##
## Real Parameter f0
##
##         1
##  1041.111
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  17  (unadjusted=8)
## -2lnL:  -84.35282
## AICc :  -48.75073  (unadjusted=-67.984536)
##
## Beta
##                      estimate           se           lcl          ucl
## pi:(Intercept)  1.603684e-04 4.926108e+02 -9.655170e+02   965.517330
## p:(Intercept)  -2.197221e+00 4.714042e-01 -3.121174e+00    -1.273269
## p:time2         3.255746e-01 6.438227e-01 -9.363180e-01     1.587467
## p:time3         2.803626e-01 6.720288e-01 -1.036814e+00     1.597539
## p:time4         4.394516e-01 6.757889e-01 -8.850948e-01     1.763998
## p:time5         1.052057e+00 6.407313e-01 -2.037762e-01     2.307891
## p:time6         1.216370e+00 6.718563e-01 -1.004682e-01     2.533209
## p:time7         1.686418e+00 6.992047e-01  3.159769e-01     3.056860
## p:time8         3.492840e+01 0.000000e+00  3.492840e+01    34.928397
## c:(Intercept)  -2.182193e+01 0.000000e+00 -2.182193e+01   -21.821932
## c:time3        -1.366718e+00 0.000000e+00 -1.366718e+00    -1.366718
## c:time4         1.911379e+01 0.000000e+00  1.911379e+01    19.113789
## c:time5        -3.081465e+00 0.000000e+00 -3.081465e+00    -3.081465
## c:time6        -2.896498e+00 0.000000e+00 -2.896498e+00    -2.896498
## c:time7        -2.931573e+00 1.790568e+04 -3.509806e+04 35092.196000
## c:time8        -3.966191e+00 0.000000e+00 -3.966191e+00    -3.966191
## f0:(Intercept) -3.721030e+01 0.000000e+00 -3.721030e+01   -37.210301
##
##
## Real Parameter pi
##
##
## mixture:1 0.5000401
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1000003 0.1333513 0.1282122 0.1470699 0.2413734 0.2727229 0.3750052
## mixture:2 0.1000003 0.1333513 0.1282122 0.1470699 0.2413734 0.2727229 0.3750052
##           8
## mixture:1 1
## mixture:2 1
##
##
## Real Parameter c
##
##                      2           3         4           5           6
```

```
## mixture:1 3.333155e-10 8.497622e-11 0.0624946 1.529651e-11 1.840443e-11
## mixture:2 3.333155e-10 8.497622e-11 0.0624946 1.529651e-11 1.840443e-11
##                       7            8
## mixture:1 1.777009e-11 6.314816e-12
## mixture:2 1.777009e-11 6.314816e-12
##
##
## Real Parameter f0
##
##             1
##  6.914673e-17
```

```
iguane.results
```

```
##                                              model npar      AICc DeltaAICc
## 1                           pi(~1)p(~1)c()f0(~1)    2 -66.94151  0.000000
## 2                         pi(~1)p(~1)c(~1)f0(~1)    4 -63.07575  3.865759
## 3                       pi(~1)p(~mixture)c()f0(~1)    4 -62.87047  4.071040
## 4               pi(~1)p(~mixture)c(~mixture)f0(~1)    6 -58.96347  7.978037
## 7                         pi(~1)p(~time)c()f0(~1)   10 -52.96708 13.974422
## 5                pi(~1)p(~time + mixture)c()f0(~1)   11 -50.85222 16.089286
## 8                     pi(~1)p(~time)c(~time)f0(~1)   17 -48.75073 18.190779
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   19 -46.83013 20.111375
##         weight     Deviance
## 1 7.720453e-01 1.585840e+01
## 2 1.117388e-01 1.565312e+01
## 3 1.008388e-01 1.585840e+01
## 4 1.429664e-02 1.565292e+01
## 7 7.130756e-04 1.329749e+01
## 5 2.476845e-04 1.329750e+01
## 8 8.660947e-05 2.477309e+00
## 6 3.315226e-05 1.963517e-08
```

```
names(iguane.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

```
iguane.results$p.dot$results$real
```

```
##                 estimate se          lcl          ucl fixed note
## pi g1 m1       0.5000000  0    0.5000000    0.5000000
## p g1 t1 m1     0.0057963  0    0.0057963    0.0057963
## f0 g1 a0 t1 1049.8405000  0 1049.8405000 1049.8405000
```

```
iguane.results$p.dot$results$derived
```

```
## $`N Population Size`
##   estimate     lcl     ucl
## 1  1099.84 1099.84 1099.84
```

Les mâles maintenant.

```
iguane.proc <- process.data(iguaneM, begin.time = 1, model = "FullHet")
iguane.ddl <- make.design.data(iguane.proc)
```

Liste des modèles.

```
run.iguane <- function() {

  p.dot <- list(formula =  ~ 1, share = TRUE)
  p.dot.behav <- list(formula =  ~ 1)
  p.time <- list(formula =  ~ time, share = TRUE)
  p.h <- list(formula = ~ mixture, share = TRUE)
  p.time.behav <- list(p = list(formula =  ~ time),
                       c = list(formula =  ~ time))
  p.h.behav <- list(p = list(formula =  ~ mixture),
                    c = list(formula =  ~ mixture))
  p.h.time <- list(formula = ~ time + mixture, share = TRUE)
  p.h.time.behav <- list(p = list(formula =  ~ mixture + time),
                         c = list(formula =  ~ mixture + time))


  iguane.model.list <- create.model.list("FullHet")

  iguane.results <- mark.wrapper(iguane.model.list,
                                 data = iguane.proc,
                                 ddl = iguane.ddl)

  return(iguane.results)
}
```

```
iguane.results <- run.iguane()
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c()f0(~1)
##
## Npar :  3
## -2lnL:  -89.86369
## AICc :  -85.84332
##
## Beta
##                     estimate se           lcl           ucl
## pi:(Intercept) -3.100491e-05  0 -3.100491e-05 -3.100491e-05
## p:(Intercept)  -3.163024e+00  0 -3.163024e+00 -3.163024e+00
## f0:(Intercept)  5.235489e+00  0  5.235489e+00  5.235489e+00
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999922
##
```

```
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812
## mixture:2 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812
##                   8
## mixture:1 0.0405812
## mixture:2 0.0405812
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812
## mixture:2 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812 0.0405812
##
##
## Real Parameter f0
##
##        1
##  187.821
##
## Output summary for FullHet model
## Name : pi(~1)p(~1)c(~1)f0(~1)
##
## Npar :  4  (unadjusted=3)
## -2lnL:  -91.71901
## AICc :  -83.65086  (unadjusted=-85.67819)
##
## Beta
##                      estimate           se          lcl         ucl
## pi:(Intercept) -0.0001223796 1773.8372000 -3476.721000 3476.720800
## p:(Intercept)  -2.1563012000    0.4986272    -3.133611   -1.178992
## c:(Intercept)  -3.2580964000    0.3072549    -3.860316   -2.655877
## f0:(Intercept)  3.9567459000    0.7386007     2.509088    5.404403
##
##
## Real Parameter pi
##
##
## mixture:1 0.4999694
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1037439 0.1037439 0.1037439 0.1037439 0.1037439 0.1037439 0.1037439
## mixture:2 0.1037439 0.1037439 0.1037439 0.1037439 0.1037439 0.1037439 0.1037439
##                   8
## mixture:1 0.1037439
## mixture:2 0.1037439
##
##
```

```
## Real Parameter c
##
##                  2        3        4        5        6        7        8
## mixture:1 0.037037 0.037037 0.037037 0.037037 0.037037 0.037037 0.037037
## mixture:2 0.037037 0.037037 0.037037 0.037037 0.037037 0.037037 0.037037
##
##
## Real Parameter f0
##
##        1
##  52.2869
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c()f0(~1)
##
## Npar :  4  (unadjusted=2)
## -2lnL:  -89.86369
## AICc :  -81.79555  (unadjusted=-85.843319)
##
## Beta
##                   estimate           se          lcl         ucl
## pi:(Intercept) -16.041497 2038.9981000 -4012.477800 3980.394800
## p:(Intercept)   -1.661523  323.4795600  -635.681480  632.358430
## p:mixture2      -1.501502  323.4788300  -635.520020  632.517020
## f0:(Intercept)   5.235490    0.3713771     4.507591    5.963389
##
##
## Real Parameter pi
##
##
## mixture:1 1.079609e-07
##
##
## Real Parameter p
##
##                   1         2         3         4         5         6         7
## mixture:1 0.1595577 0.1595577 0.1595577 0.1595577 0.1595577 0.1595577 0.1595577
## mixture:2 0.0405811 0.0405811 0.0405811 0.0405811 0.0405811 0.0405811 0.0405811
##                   8
## mixture:1 0.1595577
## mixture:2 0.0405811
##
##
## Real Parameter c
##
##                   2         3         4         5         6         7         8
## mixture:1 0.1595577 0.1595577 0.1595577 0.1595577 0.1595577 0.1595577 0.1595577
## mixture:2 0.0405811 0.0405811 0.0405811 0.0405811 0.0405811 0.0405811 0.0405811
##
##
## Real Parameter f0
##
##         1
##  187.8211
```

```
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture)c(~mixture)f0(~1)
##
## Npar :  6  (unadjusted=5)
## -2lnL:  -91.90357
## AICc :  -79.75998  (unadjusted=-81.801179)
##
## Beta
##                   estimate        se        lcl         ucl
## pi:(Intercept)  -5.265143 2.5837683 -10.329329  -0.2009574
## p:(Intercept)   27.595342 0.0000000  27.595342  27.5953420
## p:mixture2     -29.803267 0.0000000 -29.803267 -29.8032670
## c:(Intercept)   -1.270220 1.4040898  -4.022236   1.4817956
## c:mixture2      -2.072754 1.4412325  -4.897569   0.7520621
## f0:(Intercept)   4.021079 0.7761954   2.499736   5.5424221
##
##
## Real Parameter pi
##
##
## mixture:1 0.0051421
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## mixture:2 0.0990411 0.0990411 0.0990411 0.0990411 0.0990411 0.0990411 0.0990411
##                    8
## mixture:1 1.0000000
## mixture:2 0.0990411
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.2192195 0.2192195 0.2192195 0.2192195 0.2192195 0.2192195 0.2192195
## mixture:2 0.0341260 0.0341260 0.0341260 0.0341260 0.0341260 0.0341260 0.0341260
##
##
## Real Parameter f0
##
##         1
##  55.76125
##
## Output summary for FullHet model
## Name : pi(~1)p(~time + mixture)c()f0(~1)
##
## Npar :  11  (unadjusted=9)
## -2lnL:  -100.5401
## AICc :  -78.08498  (unadjusted=-82.230875)
##
## Beta
```

```
##                    estimate        se         lcl         ucl
## pi:(Intercept) -16.7813430 0.0000000 -16.7813430 -16.7813430
## p:(Intercept)   -1.6212845 0.0000000  -1.6212845  -1.6212845
## p:time2          0.2087376 0.4583544  -0.6896370   1.1071123
## p:time3          0.3839223 0.4428889  -0.4841400   1.2519846
## p:time4          0.6038826 0.4264054  -0.2318720   1.4396371
## p:time5          0.4621201 0.4366748  -0.3937626   1.3180027
## p:time6         -0.1217887 0.4940924  -1.0902098   0.8466325
## p:time7          0.1093867 0.4681438  -0.8081751   1.0269486
## p:time8         -0.8308092 0.6075287  -2.0215655   0.3599472
## p:mixture2      -1.6989140 0.0000000  -1.6989140  -1.6989140
## f0:(Intercept)   5.2148924 0.3722101   4.4853607   5.9444242
##
##
## Real Parameter pi
##
##
## mixture:1 5.151756e-08
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.1650278 0.1958327 0.2248955 0.2655338 0.2388191 0.1489230 0.1806577
## mixture:2 0.0348847 0.0426370 0.0503892 0.0620174 0.0542652 0.0310087 0.0387609
##                    8
## mixture:1 0.0792856
## mixture:2 0.0155044
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.1958327 0.2248955 0.2655338 0.2388191 0.1489230 0.1806577 0.0792856
## mixture:2 0.0426370 0.0503892 0.0620174 0.0542652 0.0310087 0.0387609 0.0155044
##
##
## Real Parameter f0
##
##        1
##  183.992
##
## Output summary for FullHet model
## Name : pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)
##
## Npar :  19  (unadjusted=14)
## -2lnL:  -118.1362
## AICc :  -78.80751  (unadjusted=-89.408279)
##
## Beta
##                    estimate           se           lcl           ucl
## pi:(Intercept)  -3.2896582 1.489788e+00 -6.209642e+00 -3.696747e-01
## p:(Intercept)   15.9648680 3.336577e+02 -6.380043e+02  6.699340e+02
## p:mixture2     -18.2921630 3.336576e+02 -6.722610e+02  6.356767e+02
```

```
## p:time2          0.7362058 7.624729e-01 -7.582411e-01  2.230653e+00
## p:time3          1.1786721 7.571330e-01 -3.053087e-01  2.662653e+00
## p:time4          1.3239926 7.721266e-01 -1.893755e-01  2.837361e+00
## p:time5          1.9218297 7.815535e-01  3.899848e-01  3.453674e+00
## p:time6          1.8753095 8.400613e-01  2.287893e-01  3.521830e+00
## p:time7          3.8313720 1.040696e+00  1.791608e+00  5.871136e+00
## p:time8         89.1842560 3.937758e+04 -7.709088e+04  7.726925e+04
## c:(Intercept)  -41.0618640 0.000000e+00 -4.106186e+01 -4.106186e+01
## c:mixture2      -2.0188153 1.508305e+00 -4.975093e+00  9.374628e-01
## c:time3        -41.3431170 7.509708e+04 -1.472316e+05  1.471489e+05
## c:time4         41.0913940 0.000000e+00  4.109139e+01  4.109139e+01
## c:time5         39.7545100 0.000000e+00  3.975451e+01  3.975451e+01
## c:time6         38.8223990 0.000000e+00  3.882240e+01  3.882240e+01
## c:time7         38.7261770 0.000000e+00  3.872618e+01  3.872618e+01
## c:time8         39.3342390 0.000000e+00  3.933424e+01  3.933424e+01
## f0:(Intercept) -95.0939110 1.704336e+05 -3.341450e+05  3.339548e+05
##
##
## Real Parameter pi
##
##
## mixture:1 0.0359277
##
##
## Real Parameter p
##
##                   1         2         3         4   5         6         7 8
## mixture:1 0.9999999 0.9999999 1.0000000 1.0000000 1.0 1.0000000 1.0000000 1
## mixture:2 0.0888875 0.1692307 0.2407407 0.2682926 0.4 0.3888888 0.8181818 1
##
##
## Real Parameter c
##
##                       2            3         4         5         6         7
## mixture:1 1.469125e-18 1.629188e-36 0.5073818 0.2129299 0.0962620 0.0882101
## mixture:2 1.951185e-19 2.163769e-37 0.1203324 0.0346842 0.0139493 0.0126858
##                   8
## mixture:1 0.1508915
## mixture:2 0.0230574
##
##
## Real Parameter f0
##
##             1
##  5.026192e-42
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c()f0(~1)
##
## Npar :  9
## -2lnL:  -100.5401
## AICc :  -82.23088
##
## Beta
```

```
##                   estimate        se        lcl        ucl
## pi:(Intercept)  0.0000000 0.0000000  0.0000000  0.0000000
## p:(Intercept)  -3.3201911 0.4357975 -4.1743542 -2.4660280
## p:time2         0.2087288 0.4574967 -0.6879648  1.1054224
## p:time3         0.3839136 0.4420021 -0.4824106  1.2502378
## p:time4         0.6038748 0.4030022 -0.1860095  1.3937590
## p:time5         0.4621125 0.3673819 -0.2579560  1.1821810
## p:time6        -0.1217972 0.4932956 -1.0886565  0.8450621
## p:time7         0.1093787 0.4673042 -0.8065376  1.0252950
## p:time8        -0.8308198 0.6068809 -2.0203064  0.3586668
## f0:(Intercept)  5.2148925 0.3722074  4.4853659  5.9444190
##
##
## Real Parameter pi
##
##
## mixture:1 0.5
##
##
## Real Parameter p
##
##                    1         2         3         4         5         6         7
## mixture:1 0.034885 0.0426369 0.0503891 0.0620174 0.0542652 0.0310087 0.0387609
## mixture:2 0.034885 0.0426369 0.0503891 0.0620174 0.0542652 0.0310087 0.0387609
##                    8
## mixture:1 0.0155043
## mixture:2 0.0155043
##
##
## Real Parameter c
##
##                    2         3         4         5         6         7         8
## mixture:1 0.0426369 0.0503891 0.0620174 0.0542652 0.0310087 0.0387609 0.0155043
## mixture:2 0.0426369 0.0503891 0.0620174 0.0542652 0.0310087 0.0387609 0.0155043
##
##
## Real Parameter f0
##
##        1
##  183.992
##
## Output summary for FullHet model
## Name : pi(~1)p(~time)c(~time)f0(~1)
##
## Npar :  17  (unadjusted=12)
## -2lnL:  -116.1689
## AICc :  -81.10268  (unadjusted=-91.630016)
##
## Beta
##                    estimate           se           lcl           ucl
## pi:(Intercept)  -0.0013078 4.649216e+02 -9.112477e+02   911.245130
## p:(Intercept)   -1.9771799 3.556646e-01 -2.674282e+00    -1.280077
## p:time2          0.3860784 4.857219e-01 -5.659366e-01     1.338093
## p:time3          0.8285353 4.772963e-01 -1.069656e-01     1.764036
```

```
## p:time4          0.9738379 5.007415e-01 -7.615400e-03     1.955291
## p:time5          1.5717066 5.151567e-01  5.619994e-01     2.581414
## p:time6          1.5251574 6.002212e-01  3.487238e-01     2.701591
## p:time7          3.4812246 8.588340e-01  1.797910e+00     5.164539
## p:time8         22.4801820 1.094122e+04 -2.142230e+04 21467.263000
## c:(Intercept)  -19.0355310 0.000000e+00 -1.903553e+01   -19.035531
## c:time3         -9.2555603 0.000000e+00 -9.255560e+00    -9.255560
## c:time4         17.3128050 0.000000e+00  1.731281e+01    17.312805
## c:time5         15.9910010 0.000000e+00  1.599100e+01    15.991001
## c:time6         15.0282690 0.000000e+00  1.502827e+01    15.028269
## c:time7         14.9084010 0.000000e+00  1.490840e+01    14.908401
## c:time8         15.4802250 0.000000e+00  1.548023e+01    15.480225
## f0:(Intercept) -17.5117840 1.497012e+03 -2.951656e+03  2916.632400
##
##
## Real Parameter pi
##
##
## mixture:1 0.4996731
##
##
## Real Parameter p
##
##                   1        2         3         4        5       6        7 8
## mixture:1 0.1216198 0.169229 0.2407367 0.2682848 0.399998 0.38888 0.818177 1
## mixture:2 0.1216198 0.169229 0.2407367 0.2682848 0.399998 0.38888 0.818177 1
##
##
## Real Parameter c
##
##                     2            3         4         5         6         7
## mixture:1 5.40722e-09 5.168152e-13 0.1515204 0.0454542 0.0178584 0.0158731
## mixture:2 5.40722e-09 5.168152e-13 0.1515204 0.0454542 0.0178584 0.0158731
##                   8
## mixture:1 0.0277789
## mixture:2 0.0277789
##
##
## Real Parameter f0
##
##             1
##  2.481584e-08
```

```
iguane.results
```

```
##                                              model npar      AICc DeltaAICc
## 1                            pi(~1)p(~1)c()f0(~1)    3 -83.82288 0.0000000
## 2                          pi(~1)p(~1)c(~1)f0(~1)    4 -83.65086 0.1720138
## 7                         pi(~1)p(~time)c()f0(~1)    9 -82.23087 1.5920050
## 3                       pi(~1)p(~mixture)c()f0(~1)    4 -81.79555 2.0273268
## 8                     pi(~1)p(~time)c(~time)f0(~1)   17 -81.10268 2.7201988
## 4                pi(~1)p(~mixture)c(~mixture)f0(~1)    6 -79.75998 4.0628984
## 6 pi(~1)p(~mixture + time)c(~mixture + time)f0(~1)   19 -78.80751 5.0153680
## 5                 pi(~1)p(~time + mixture)c()f0(~1)   11 -78.08498 5.7378991
```

```
##       weight Deviance
## 1 0.30697450 50.25967
## 2 0.28167609 48.40436
## 7 0.13848502 39.58321
## 3 0.11139710 50.25967
## 8 0.07878048 23.95449
## 4 0.04025827 48.21980
## 6 0.02500512 21.98719
## 5 0.01742342 39.58321
```

```
names(iguane.results)
```

```
## [1] "p.dot"          "p.dot.behav"    "p.h"            "p.h.behav"
## [5] "p.h.time"       "p.h.time.behav" "p.time"         "p.time.behav"
## [9] "model.table"
```

```
iguane.results$p.dot$results$real
```

```
##                 estimate se         lcl         ucl fixed note
## pi g1 m1       0.4999922  0   0.4999922   0.4999922
## p g1 t1 m1     0.0405812  0   0.0405812   0.0405812
## f0 g1 a0 t1 187.8209500  0 187.8209500 187.8209500
```

```
iguane.results$p.dot$results$derived
```

```
## $`N Population Size`
##   estimate     lcl     ucl
## 1  261.821 261.821 261.821
```

Nettoyage

On supprime les fichiers temporaires.

```
rm(list = ls(all = TRUE))
cleanup(ask = FALSE)
```