caphistory2

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Using CJS and JS. JS -> for population estimates. CJS -> for time-dependent survival and recapture rates of a given species

library(marked)

## Loading required package: lme4

## Loading required package: Matrix

## Loading required package: parallel

## This is marked 1.2.1

library(RMark)

## This is RMark 2.2.6  
## Documentation available at http://www.phidot.org/software/mark/rmark/RMarkDocumentation.zip

##   
## Attaching package: 'RMark'

## The following objects are masked from 'package:marked':  
##   
## collapseCH, compute.real, create.model.list, make.design.data,  
## merge\_design.covariates, model.table, process.ch,  
## process.data, setup.model, setup.parameters, splitCH

library(ggplot2)

abundance/effort AIC vvvv

data <- read.csv("Dragonfly1718Abundance.csv", stringsAsFactors = F)  
  
### Each possible combination of variables needs to be analyzed. The lowest score (not counting the full model?) wins. #####  
mod1<-glm(data$adjusted.abundance~data$pH)  
mod2<-glm(data$adjusted.abundance~data$elevation)  
mod3<-glm(data$adjusted.abundance~data$fishpresence)  
mod4<-glm(data$adjusted.abundance~data$lenticlotic)   
mod5<-glm(data$adjusted.abundance~data$openwater)  
mod6<-glm(data$adjusted.abundance~data$pH\*data$elevation)  
mod7<-glm(data$adjusted.abundance~data$pH\*data$elevation\*data$fishpresence)  
mod8<-glm(data$adjusted.abundance~data$pH\*data$elevation\*data$fishpresence\*data$lenticlotic)  
mod9<-glm(data$adjusted.abundance~data$pH\*data$elevation\*data$fishpresence\*data$lenticlotic\*data$openwater)   
mod10<-glm(data$adjusted.abundance~data$elevation\*data$fishpresence)  
mod11<-glm(data$adjusted.abundance~data$elevation\*data$fishpresence\*data$lenticlotic)  
mod12<-glm(data$adjusted.abundance~data$elevation\*data$fishpresence\*data$lenticlotic\*data$openwater)  
mod13<-glm(data$adjusted.abundance~data$fishpresence\*data$lenticlotic)  
mod14<-glm(data$adjusted.abundance~data$fishpresence\*data$openwater) #### Chicken dinner #####  
mod15<-glm(data$adjusted.abundance~data$fishpresence\*data$lenticlotic\*data$openwater) #### Almost the same ####  
mod16<-glm(data$adjusted.abundance~data$lenticlotic\*data$openwater)  
  
  
  
AIC(mod1, k=2) ### k = 2 is the "penalty" for adding more factors #####

## [1] 217.9664

AIC(mod2, k=2)

## [1] 213.6784

AIC(mod3, k=2)

## [1] 217.9817

AIC(mod4, k=2)

## [1] 214.9074

AIC(mod5, k=2)

## [1] 212.3012

AIC(mod6, k=2)

## [1] 214.0008

AIC(mod7, k=2)

## [1] 215.5311

AIC(mod8, k=2)

## [1] 213.7232

AIC(mod9, k=2)

## [1] -1048.434

AIC(mod10, k=2)

## [1] 214.5525

AIC(mod11, k=2)

## [1] 220.7797

AIC(mod12, k=2)

## [1] 197.7667

AIC(mod13, k=2)

## [1] 218.3964

AIC(mod14, k=2) #### Chicken dinner #####

## [1] 196.2977

AIC(mod15, k=2) #### Almost the same, 0.1258 difference ####

## [1] 196.4235

AIC(mod16, k=2)

## [1] 214.1306

richness (just to see) vvvvv

### Each possible combination of variables needs to be analyzed. The lowest score (not counting the full model?) wins. #####  
mod1<-glm(data$Richness~data$pH)  
mod2<-glm(data$Richness~data$elevation)  
mod3<-glm(data$Richness~data$fishpresence)  
mod4<-glm(data$Richness~data$lenticlotic) #### Chicken dinner #####  
mod5<-glm(data$Richness~data$openwater)  
mod6<-glm(data$Richness~data$pH\*data$elevation)  
mod7<-glm(data$Richness~data$pH\*data$elevation\*data$fishpresence)  
mod8<-glm(data$Richness~data$pH\*data$elevation\*data$fishpresence\*data$lenticlotic)  
mod9<-glm(data$Richness~data$pH\*data$elevation\*data$fishpresence\*data$lenticlotic\*data$openwater)  
mod10<-glm(data$Richness~data$elevation\*data$fishpresence)  
mod11<-glm(data$Richness~data$elevation\*data$fishpresence\*data$lenticlotic)  
mod12<-glm(data$Richness~data$elevation\*data$fishpresence\*data$lenticlotic\*data$openwater)  
mod13<-glm(data$Richness~data$fishpresence\*data$lenticlotic)  
mod14<-glm(data$Richness~data$fishpresence\*data$openwater)  
mod15<-glm(data$Richness~data$fishpresence\*data$lenticlotic\*data$openwater)  
mod16<-glm(data$Richness~data$lenticlotic\*data$openwater)  
  
  
  
AIC(mod1, k=2) ### k = 2 is the "penalty" for adding more factors #####

## [1] 164.235

AIC(mod2, k=2)

## [1] 160.759

AIC(mod3, k=2)

## [1] 165.8397

AIC(mod4, k=2) #### Chicken dinner #####

## [1] 149.5434

AIC(mod5, k=2)

## [1] 163.4084

AIC(mod6, k=2)

## [1] 162.3076

AIC(mod7, k=2)

## [1] 165.6165

AIC(mod8, k=2)

## [1] 160.8072

AIC(mod9, k=2)

## [1] -1049.622

AIC(mod10, k=2)

## [1] 161.3178

AIC(mod11, k=2)

## [1] 155.129

AIC(mod12, k=2)

## [1] 151.3847

AIC(mod13, k=2)

## [1] 151.8263

AIC(mod14, k=2)

## [1] 166.4625

AIC(mod15, k=2)

## [1] 154.0367

AIC(mod16, k=2)

## [1] 150.7628

these are all the JS and CJS for each location. Starting with NMBS

capNMBS <- read.csv("capturehistoryNMBS.csv", stringsAsFactors = F)  
str(capNMBS)

## 'data.frame': 210 obs. of 17 variables:  
## $ location : chr "NMBS" "NMBS" "NMBS" "NMBS" ...  
## $ species : chr "CGrDar" "BeaBas" "PaiSki" "BeaBas" ...  
## $ sex : chr "m" "m" "m" "m" ...  
## $ mark.number : int 1 42 43 44 45 46 47 48 49 50 ...  
## $ Date.of.initial.capture: chr "2-May-18" "25-May-18" "25-May-18" "25-May-18" ...  
## $ c1 : int 1 0 0 0 0 0 0 0 0 0 ...  
## $ c2 : int 0 1 1 1 1 1 1 1 1 1 ...  
## $ c3 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c4 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c5 : int 0 0 0 0 0 1 0 0 0 0 ...  
## $ c6 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c7 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c8 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c9 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c10 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c11 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c12 : int 0 0 0 0 0 0 0 0 0 0 ...

print(capNMBS)

## location species sex mark.number Date.of.initial.capture c1 c2 c3 c4  
## 1 NMBS CGrDar m 1 2-May-18 1 0 0 0  
## 2 NMBS BeaBas m 42 25-May-18 0 1 0 0  
## 3 NMBS PaiSki m 43 25-May-18 0 1 0 0  
## 4 NMBS BeaBas m 44 25-May-18 0 1 0 0  
## 5 NMBS PaiSki m 45 25-May-18 0 1 0 0  
## 6 NMBS PaiSki m 46 25-May-18 0 1 0 0  
## 7 NMBS PaiSki m 47 25-May-18 0 1 0 0  
## 8 NMBS CarSad m 48 25-May-18 0 1 0 0  
## 9 NMBS PaiSki m 49 25-May-18 0 1 0 0  
## 10 NMBS PaiSki m 50 25-May-18 0 1 0 0  
## 11 NMBS PaiSki f 51 25-May-18 0 1 0 0  
## 12 NMBS PaiSki m 52 25-May-18 0 1 1 0  
## 13 NMBS PaiSki m 53 25-May-18 0 1 0 0  
## 14 NMBS PaiSki m 54 25-May-18 0 1 0 0  
## 15 NMBS PaiSki m 55 25-May-18 0 1 0 0  
## 16 NMBS PaiSki m 56 25-May-18 0 1 0 0  
## 17 NMBS PaiSki m 57 25-May-18 0 1 0 0  
## 18 NMBS CarSad m 58 25-May-18 0 1 0 0  
## 19 NMBS PaiSki m 59 25-May-18 0 1 0 0  
## 20 NMBS PaiSki m 60 25-May-18 0 1 0 0  
## 21 NMBS BeaBas m 61 25-May-18 0 1 0 0  
## 22 NMBS BeaBas m 62 25-May-18 0 1 0 0  
## 23 NMBS PaiSki m 63 25-May-18 0 1 0 0  
## 24 NMBS ChFCor m 151 29-May-18 0 0 1 0  
## 25 NMBS ChFCor m 152 29-May-18 0 0 1 0  
## 26 NMBS CarSad m 153 29-May-18 0 0 1 0  
## 27 NMBS PaiSki m 154 29-May-18 0 0 1 0  
## 28 NMBS ChFCor m 155 29-May-18 0 0 1 0  
## 29 NMBS PaiSki m 156 29-May-18 0 0 1 0  
## 30 NMBS ComWhi m 157 29-May-18 0 0 1 0  
## 31 NMBS ChFCor m 158 29-May-18 0 0 1 0  
## 32 NMBS AmeEme m 160 29-May-18 0 0 1 0  
## 33 NMBS BeaBas m 161 29-May-18 0 0 1 0  
## 34 NMBS PaiSki m 163 29-May-18 0 0 1 0  
## 35 NMBS PaiSki m 164 29-May-18 0 0 1 0  
## 36 NMBS PaiSki m 165 29-May-18 0 0 1 0  
## 37 NMBS PaiSki m 167 29-May-18 0 0 1 0  
## 38 NMBS PaiSki m 168 29-May-18 0 0 1 0  
## 39 NMBS PaiSki m 169 29-May-18 0 0 1 0  
## 40 NMBS ChFCor m 170 29-May-18 0 0 1 0  
## 41 NMBS ComWhi m 171 29-May-18 0 0 1 0  
## 42 NMBS AmeEme m 253 7-Jun-18 0 0 0 1  
## 43 NMBS BeaBas m 254 7-Jun-18 0 0 0 1  
## 44 NMBS CrRWhi m 255 7-Jun-18 0 0 0 1  
## 45 NMBS AmeEme m 256 7-Jun-18 0 0 0 1  
## 46 NMBS DtTWhi m 257 7-Jun-18 0 0 0 1  
## 47 NMBS CrRWhi m 258 7-Jun-18 0 0 0 1  
## 48 NMBS ChFCor m 262 9-Jun-18 0 0 0 0  
## 49 NMBS CrRWhi m 263 9-Jun-18 0 0 0 0  
## 50 NMBS DeSSpi m 264 9-Jun-18 0 0 0 0  
## 51 NMBS ChFCor m 265 9-Jun-18 0 0 0 0  
## 52 NMBS DeSSpi m 266 9-Jun-18 0 0 0 0  
## 53 NMBS AmeEme m 267 9-Jun-18 0 0 0 0  
## 54 NMBS ChFCor m 268 9-Jun-18 0 0 0 0  
## 55 NMBS AmeEme m 269 9-Jun-18 0 0 0 0  
## 56 NMBS CGrDar m 270 9-Jun-18 0 0 0 0  
## 57 NMBS ChFCor m 271 9-Jun-18 0 0 0 0  
## 58 NMBS AmeEme m 272 9-Jun-18 0 0 0 0  
## 59 NMBS AmeEme m 273 9-Jun-18 0 0 0 0  
## 60 NMBS CrRWhi m 274 9-Jun-18 0 0 0 0  
## 61 NMBS PaiSki m 275 9-Jun-18 0 0 0 0  
## 62 NMBS AmeEme m 276 9-Jun-18 0 0 0 0  
## 63 NMBS CrRWhi m 277 9-Jun-18 0 0 0 0  
## 64 NMBS ChFCor m 278 9-Jun-18 0 0 0 0  
## 65 NMBS CrRWhi m 279 9-Jun-18 0 0 0 0  
## 66 NMBS AmeEme m 280 9-Jun-18 0 0 0 0  
## 67 NMBS PaiSki m 281 9-Jun-18 0 0 0 0  
## 68 NMBS PaiSki m 282 9-Jun-18 0 0 0 0  
## 69 NMBS UniClu m 283 9-Jun-18 0 0 0 0  
## 70 NMBS CarSad f 284 9-Jun-18 0 0 0 0  
## 71 NMBS CarSad m 285 9-Jun-18 0 0 0 0  
## 72 NMBS CrRWhi m 286 9-Jun-18 0 0 0 0  
## 73 NMBS CrRWhi m 289 9-Jun-18 0 0 0 0  
## 74 NMBS HudWhi m 290 9-Jun-18 0 0 0 0  
## 75 NMBS PaiSki m 291 9-Jun-18 0 0 0 0  
## 76 NMBS LanClu m 292 9-Jun-18 0 0 0 0  
## 77 NMBS CrRWhi m 293 9-Jun-18 0 0 0 0  
## 78 NMBS ChFCor m 294 9-Jun-18 0 0 0 0  
## 79 NMBS AmeEme m 295 9-Jun-18 0 0 0 0  
## 80 NMBS AmeEme m 296 9-Jun-18 0 0 0 0  
## 81 NMBS AmeEme m 297 9-Jun-18 0 0 0 0  
## 82 NMBS ChFCor m 298 9-Jun-18 0 0 0 0  
## 83 NMBS AmeEme m 299 9-Jun-18 0 0 0 0  
## 84 NMBS AmeEme f 300 9-Jun-18 0 0 0 0  
## 85 NMBS BluDas m 301 9-Jun-18 0 0 0 0  
## 86 NMBS AmeEme m 302 9-Jun-18 0 0 0 0  
## 87 NMBS ComWhi m 303 9-Jun-18 0 0 0 0  
## 88 NMBS CrRWhi m 357 15-Jun-18 0 0 0 0  
## 89 NMBS ChFCor m 358 15-Jun-18 0 0 0 0  
## 90 NMBS ChFCor m 359 15-Jun-18 0 0 0 0  
## 91 NMBS ChFCor m 360 15-Jun-18 0 0 0 0  
## 92 NMBS CrRWhi m 361 15-Jun-18 0 0 0 0  
## 93 NMBS ChFCor m 362 15-Jun-18 0 0 0 0  
## 94 NMBS CrRWhi m 363 15-Jun-18 0 0 0 0  
## 95 NMBS CrRWhi m 364 15-Jun-18 0 0 0 0  
## 96 NMBS ChFCor m 365 15-Jun-18 0 0 0 0  
## 97 NMBS ComWhi m 366 15-Jun-18 0 0 0 0  
## 98 NMBS ChFCor m 368 15-Jun-18 0 0 0 0  
## 99 NMBS ChFCor m 369 15-Jun-18 0 0 0 0  
## 100 NMBS AmeEme m 370 15-Jun-18 0 0 0 0  
## 101 NMBS ChFCor m 371 15-Jun-18 0 0 0 0  
## 102 NMBS AmeEme m 372 15-Jun-18 0 0 0 0  
## 103 NMBS CrRWhi f 374 15-Jun-18 0 0 0 0  
## 104 NMBS AmeEme m 376 15-Jun-18 0 0 0 0  
## 105 NMBS CrRWhi m 377 15-Jun-18 0 0 0 0  
## 106 NMBS AmeEme m 378 15-Jun-18 0 0 0 0  
## 107 NMBS AmeEme m 379 15-Jun-18 0 0 0 0  
## 108 NMBS AmeEme m 380 15-Jun-18 0 0 0 0  
## 109 NMBS ChFCor m 381 15-Jun-18 0 0 0 0  
## 110 NMBS ChFCor m 382 15-Jun-18 0 0 0 0  
## 111 NMBS CrRWhi m 383 15-Jun-18 0 0 0 0  
## 112 NMBS ChFCor m 384 15-Jun-18 0 0 0 0  
## 113 NMBS ChFCor m 386 15-Jun-18 0 0 0 0  
## 114 NMBS CrRWhi m 387 15-Jun-18 0 0 0 0  
## 115 NMBS ChFCor m 388 15-Jun-18 0 0 0 0  
## 116 NMBS AmeEme m 389 15-Jun-18 0 0 0 0  
## 117 NMBS ChFCor m 390 15-Jun-18 0 0 0 0  
## 118 NMBS ChFCor m 391 15-Jun-18 0 0 0 0  
## 119 NMBS ChFCor m 392 15-Jun-18 0 0 0 0  
## 120 NMBS PaiSki m 393 15-Jun-18 0 0 0 0  
## 121 NMBS DeSSpi m 394 15-Jun-18 0 0 0 0  
## 122 NMBS PaiSki m 395 15-Jun-18 0 0 0 0  
## 123 NMBS AmeEme m 396 15-Jun-18 0 0 0 0  
## 124 NMBS CrRWhi m 397 15-Jun-18 0 0 0 0  
## 125 NMBS CrRWhi m 398 15-Jun-18 0 0 0 0  
## 126 NMBS CrRWhi f 399 15-Jun-18 0 0 0 0  
## 127 NMBS CrRWhi f 401 15-Jun-18 0 0 0 0  
## 128 NMBS CrRWhi m 402 15-Jun-18 0 0 0 0  
## 129 NMBS ChFCor m 403 15-Jun-18 0 0 0 0  
## 130 NMBS ChFCor m 454 30-Jun-18 0 0 0 0  
## 131 NMBS ChFCor m 455 30-Jun-18 0 0 0 0  
## 132 NMBS CrRWhi m 456 30-Jun-18 0 0 0 0  
## 133 NMBS UniClu m 457 30-Jun-18 0 0 0 0  
## 134 NMBS CalPen m 458 30-Jun-18 0 0 0 0  
## 135 NMBS ComWhi m 460 30-Jun-18 0 0 0 0  
## 136 NMBS UniClu m 461 30-Jun-18 0 0 0 0  
## 137 NMBS CrRWhi m 462 30-Jun-18 0 0 0 0  
## 138 NMBS AmeEme m 463 30-Jun-18 0 0 0 0  
## 139 NMBS AmeEme m 464 30-Jun-18 0 0 0 0  
## 140 NMBS CrRWhi m 465 30-Jun-18 0 0 0 0  
## 141 NMBS AmeEme m 466 30-Jun-18 0 0 0 0  
## 142 NMBS ChFCor m 467 30-Jun-18 0 0 0 0  
## 143 NMBS CrRWhi m 468 30-Jun-18 0 0 0 0  
## 144 NMBS CrRWhi m 469 30-Jun-18 0 0 0 0  
## 145 NMBS CalPen m 470 30-Jun-18 0 0 0 0  
## 146 NMBS CrRWhi m 471 30-Jun-18 0 0 0 0  
## 147 NMBS CrRWhi m 472 30-Jun-18 0 0 0 0  
## 148 NMBS CrRWhi m 473 30-Jun-18 0 0 0 0  
## 149 NMBS ComWhi m 517 9-Jul-18 0 0 0 0  
## 150 NMBS AmeEme m 518 9-Jul-18 0 0 0 0  
## 151 NMBS PaiSki f 520 9-Jul-18 0 0 0 0  
## 152 NMBS CrRWhi f 521 9-Jul-18 0 0 0 0  
## 153 NMBS CrRWhi f 522 9-Jul-18 0 0 0 0  
## 154 NMBS ChFCor m 523 9-Jul-18 0 0 0 0  
## 155 NMBS CrRWhi m 524 9-Jul-18 0 0 0 0  
## 156 NMBS BluDas f 525 9-Jul-18 0 0 0 0  
## 157 NMBS CrRWhi m 526 9-Jul-18 0 0 0 0  
## 158 NMBS BluDas m 527 9-Jul-18 0 0 0 0  
## 159 NMBS CrRWhi m 528 9-Jul-18 0 0 0 0  
## 160 NMBS CrRWhi m 529 9-Jul-18 0 0 0 0  
## 161 NMBS CrRWhi m 530 9-Jul-18 0 0 0 0  
## 162 NMBS CrRWhi m 532 9-Jul-18 0 0 0 0  
## 163 NMBS CrRWhi m 533 9-Jul-18 0 0 0 0  
## 164 NMBS CrRWhi m 535 9-Jul-18 0 0 0 0  
## 165 NMBS CrRWhi m 536 9-Jul-18 0 0 0 0  
## 166 NMBS CrRWhi m 539 9-Jul-18 0 0 0 0  
## 167 NMBS CrRWhi m 540 9-Jul-18 0 0 0 0  
## 168 NMBS CrRWhi m 543 9-Jul-18 0 0 0 0  
## 169 NMBS CrRWhi m 544 9-Jul-18 0 0 0 0  
## 170 NMBS CrRWhi m 545 9-Jul-18 0 0 0 0  
## 171 NMBS CrRWhi m 546 9-Jul-18 0 0 0 0  
## 172 NMBS PaiSki m 547 9-Jul-18 0 0 0 0  
## 173 NMBS SpaSki f 548 9-Jul-18 0 0 0 0  
## 174 NMBS CrRWhi m 549 9-Jul-18 0 0 0 0  
## 175 NMBS CrRWhi m 550 9-Jul-18 0 0 0 0  
## 176 NMBS CrRWhi m 551 9-Jul-18 0 0 0 0  
## 177 NMBS CrRWhi m 552 9-Jul-18 0 0 0 0  
## 178 NMBS ChFCor m 553 9-Jul-18 0 0 0 0  
## 179 NMBS CrRWhi m 554 9-Jul-18 0 0 0 0  
## 180 NMBS CrRWhi m 555 9-Jul-18 0 0 0 0  
## 181 NMBS AmeEme m 556 9-Jul-18 0 0 0 0  
## 182 NMBS CrRWhi m 557 9-Jul-18 0 0 0 0  
## 183 NMBS CrRWhi m 558 9-Jul-18 0 0 0 0  
## 184 NMBS CrRWhi m 559 9-Jul-18 0 0 0 0  
## 185 NMBS CalPen m 560 9-Jul-18 0 0 0 0  
## 186 NMBS ComWhi m 561 9-Jul-18 0 0 0 0  
## 187 NMBS ChFCor m 562 9-Jul-18 0 0 0 0  
## 188 NMBS LanClu m 563 9-Jul-18 0 0 0 0  
## 189 NMBS CrRWhi m 585 10-Jul-18 0 0 0 0  
## 190 NMBS CrRWhi m 586 10-Jul-18 0 0 0 0  
## 191 NMBS ComWhi m 587 10-Jul-18 0 0 0 0  
## 192 NMBS SlaSki m 588 10-Jul-18 0 0 0 0  
## 193 NMBS ChFCor m 589 10-Jul-18 0 0 0 0  
## 194 NMBS CrRWhi m 590 10-Jul-18 0 0 0 0  
## 195 NMBS CrRWhi m 591 10-Jul-18 0 0 0 0  
## 196 NMBS AmeEme m 592 10-Jul-18 0 0 0 0  
## 197 NMBS CrRWhi f 593 10-Jul-18 0 0 0 0  
## 198 NMBS CrRWhi m 594 10-Jul-18 0 0 0 0  
## 199 NMBS ComWhi m 612 12-Jul-18 0 0 0 0  
## 200 NMBS CalPen f 613 12-Jul-18 0 0 0 0  
## 201 NMBS CrRWhi m 614 12-Jul-18 0 0 0 0  
## 202 NMBS AmeEme m 615 12-Jul-18 0 0 0 0  
## 203 NMBS CrRWhi m 616 12-Jul-18 0 0 0 0  
## 204 NMBS TwSSki m 617 12-Jul-18 0 0 0 0  
## 205 NMBS ChFCor m 618 12-Jul-18 0 0 0 0  
## 206 NMBS PaiSki m 619 12-Jul-18 0 0 0 0  
## 207 NMBS GrsDar f 620 12-Jul-18 0 0 0 0  
## 208 NMBS CrRWhi m 621 19-Jul-18 0 0 0 0  
## 209 NMBS CrRWhi m 622 19-Jul-18 0 0 0 0  
## 210 NMBS CrRWhi m 623 19-Jul-18 0 0 0 0  
## c5 c6 c7 c8 c9 c10 c11 c12  
## 1 0 0 0 0 0 0 0 0  
## 2 0 0 0 0 0 0 0 0  
## 3 0 0 0 0 0 0 0 0  
## 4 0 0 0 0 0 0 0 0  
## 5 0 0 0 0 0 0 0 0  
## 6 1 0 0 0 0 0 0 0  
## 7 0 0 0 0 0 0 0 0  
## 8 0 0 0 0 0 0 0 0  
## 9 0 0 0 0 0 0 0 0  
## 10 0 0 0 0 0 0 0 0  
## 11 0 0 0 0 0 0 0 0  
## 12 0 0 0 0 0 0 0 0  
## 13 0 0 0 0 0 0 0 0  
## 14 0 0 0 0 0 0 0 0  
## 15 0 0 0 0 0 0 0 0  
## 16 0 0 0 0 0 0 0 0  
## 17 0 0 0 0 0 0 0 0  
## 18 0 0 0 0 0 0 0 0  
## 19 0 0 0 0 0 0 0 0  
## 20 0 0 0 0 0 0 0 0  
## 21 0 0 0 0 0 0 0 0  
## 22 0 0 0 0 0 0 0 0  
## 23 0 0 0 0 0 0 0 0  
## 24 0 0 0 0 0 0 0 0  
## 25 0 0 0 0 0 0 0 0  
## 26 0 0 0 0 0 0 0 0  
## 27 0 0 0 0 0 0 0 0  
## 28 0 0 0 0 0 0 0 0  
## 29 0 0 0 0 0 0 0 0  
## 30 0 0 0 0 0 0 0 0  
## 31 0 0 0 0 0 0 0 0  
## 32 0 0 0 0 0 0 0 0  
## 33 0 0 0 0 0 0 0 0  
## 34 0 0 0 0 0 0 0 0  
## 35 0 0 0 0 0 0 0 0  
## 36 0 0 0 0 0 0 0 0  
## 37 0 0 0 0 0 0 0 0  
## 38 0 0 0 0 0 0 0 0  
## 39 0 0 0 0 0 0 0 0  
## 40 0 0 0 0 0 0 0 0  
## 41 0 0 0 0 0 0 0 0  
## 42 0 0 0 0 0 0 0 0  
## 43 0 0 0 0 0 0 0 0  
## 44 0 0 0 0 0 0 0 0  
## 45 0 0 0 0 0 0 0 0  
## 46 0 0 0 0 0 0 0 0  
## 47 0 0 0 0 0 0 0 0  
## 48 1 0 0 0 0 0 0 0  
## 49 1 1 0 1 1 0 0 0  
## 50 1 0 0 0 0 0 0 0  
## 51 1 1 0 0 0 0 0 0  
## 52 1 0 0 0 0 0 0 0  
## 53 1 0 0 0 0 0 0 0  
## 54 1 0 0 0 0 0 0 0  
## 55 1 0 0 0 0 0 0 0  
## 56 1 0 0 0 0 0 0 0  
## 57 1 0 0 0 0 0 0 0  
## 58 1 0 0 0 0 0 0 0  
## 59 1 0 0 0 0 0 0 0  
## 60 1 0 0 0 0 0 0 0  
## 61 1 0 0 0 0 0 0 0  
## 62 1 0 0 0 0 0 0 0  
## 63 1 0 0 0 0 0 0 0  
## 64 1 1 0 0 0 0 0 0  
## 65 1 0 0 0 0 0 0 0  
## 66 1 0 0 0 0 0 0 0  
## 67 1 0 0 0 0 0 0 0  
## 68 1 0 0 0 0 0 0 0  
## 69 1 0 0 0 0 0 0 0  
## 70 1 0 0 0 0 0 0 0  
## 71 1 0 0 0 0 0 0 0  
## 72 1 0 0 0 0 0 0 0  
## 73 1 0 0 0 0 0 0 0  
## 74 1 1 0 0 0 0 0 0  
## 75 1 0 0 0 0 0 0 0  
## 76 1 0 0 0 0 0 0 0  
## 77 1 0 0 0 0 0 0 0  
## 78 1 0 0 0 0 0 0 0  
## 79 1 0 0 0 0 0 0 0  
## 80 1 0 0 0 0 0 0 0  
## 81 1 0 0 0 0 0 0 0  
## 82 1 1 0 0 0 0 0 0  
## 83 1 0 0 0 0 0 0 0  
## 84 1 0 0 0 0 0 0 0  
## 85 1 0 0 0 0 0 0 0  
## 86 1 0 0 0 0 0 0 0  
## 87 1 0 0 0 0 0 0 0  
## 88 0 1 0 0 0 0 0 0  
## 89 0 1 0 0 0 0 0 0  
## 90 0 1 0 0 0 0 0 0  
## 91 0 1 0 0 0 0 0 0  
## 92 0 1 0 0 0 0 0 0  
## 93 0 1 0 0 0 0 0 0  
## 94 0 1 0 0 0 0 0 0  
## 95 0 1 0 0 0 0 0 0  
## 96 0 1 0 0 0 0 0 0  
## 97 0 1 0 0 0 0 0 0  
## 98 0 1 0 0 0 0 0 0  
## 99 0 1 0 0 0 0 0 0  
## 100 0 1 0 0 0 0 0 0  
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## 105 0 1 0 0 0 0 0 0  
## 106 0 1 0 0 0 0 0 0  
## 107 0 1 0 0 0 0 0 0  
## 108 0 1 0 0 0 0 0 0  
## 109 0 1 0 0 0 0 0 0  
## 110 0 1 0 0 0 0 0 0  
## 111 0 1 0 0 0 0 0 0  
## 112 0 1 0 0 0 0 0 0  
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## 114 0 1 0 0 0 0 0 0  
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## 119 0 1 0 0 0 0 0 0  
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## 121 0 1 0 0 0 0 0 0  
## 122 0 1 0 0 0 0 0 0  
## 123 0 1 0 0 0 0 0 0  
## 124 0 1 0 0 0 0 0 0  
## 125 0 1 0 0 0 1 0 0  
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## 129 0 1 0 0 0 0 0 0  
## 130 0 0 1 0 0 0 0 0  
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## 134 0 0 1 0 0 0 0 0  
## 135 0 0 1 0 0 1 0 0  
## 136 0 0 1 0 0 0 0 0  
## 137 0 0 1 0 0 0 0 0  
## 138 0 0 1 0 0 0 0 0  
## 139 0 0 1 0 0 0 0 0  
## 140 0 0 1 0 0 0 0 0  
## 141 0 0 1 0 0 0 0 0  
## 142 0 0 1 0 0 0 0 0  
## 143 0 0 1 0 0 0 0 0  
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## 145 0 0 1 0 0 0 0 0  
## 146 0 0 1 0 0 0 0 0  
## 147 0 0 1 0 0 0 0 0  
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## 149 0 0 0 1 0 0 0 0  
## 150 0 0 0 1 0 0 0 0  
## 151 0 0 0 1 0 0 0 0  
## 152 0 0 0 1 0 0 0 0  
## 153 0 0 0 1 0 0 0 0  
## 154 0 0 0 1 0 0 0 0  
## 155 0 0 0 1 0 0 0 0  
## 156 0 0 0 1 0 0 0 0  
## 157 0 0 0 1 0 0 0 0  
## 158 0 0 0 1 0 0 0 0  
## 159 0 0 0 1 0 0 0 0  
## 160 0 0 0 1 0 1 0 0  
## 161 0 0 0 1 0 0 0 0  
## 162 0 0 0 1 0 0 0 0  
## 163 0 0 0 1 0 0 0 0  
## 164 0 0 0 1 1 0 0 0  
## 165 0 0 0 1 0 0 0 0  
## 166 0 0 0 1 0 0 0 0  
## 167 0 0 0 1 0 0 0 0  
## 168 0 0 0 1 0 0 0 0  
## 169 0 0 0 1 1 0 0 0  
## 170 0 0 0 1 1 0 0 0  
## 171 0 0 0 1 1 0 0 0  
## 172 0 0 0 1 0 0 0 0  
## 173 0 0 0 1 0 0 0 0  
## 174 0 0 0 1 1 0 0 0  
## 175 0 0 0 1 0 0 0 0  
## 176 0 0 0 1 0 0 0 0  
## 177 0 0 0 1 0 0 0 0  
## 178 0 0 0 1 1 0 0 0  
## 179 0 0 0 1 0 0 0 0  
## 180 0 0 0 1 0 0 0 0  
## 181 0 0 0 1 0 0 0 0  
## 182 0 0 0 1 0 0 0 0  
## 183 0 0 0 1 0 0 0 0  
## 184 0 0 0 1 1 0 0 0  
## 185 0 0 0 1 0 0 0 0  
## 186 0 0 0 1 0 0 0 0  
## 187 0 0 0 1 1 0 0 0  
## 188 0 0 0 1 0 0 0 0  
## 189 0 0 0 0 1 0 0 0  
## 190 0 0 0 0 1 0 0 0  
## 191 0 0 0 0 1 1 0 0  
## 192 0 0 0 0 1 0 0 0  
## 193 0 0 0 0 1 0 0 0  
## 194 0 0 0 0 1 0 0 0  
## 195 0 0 0 0 1 0 0 0  
## 196 0 0 0 0 1 0 0 0  
## 197 0 0 0 0 1 0 0 0  
## 198 0 0 0 0 1 0 0 0  
## 199 0 0 0 0 0 1 0 0  
## 200 0 0 0 0 0 1 0 0  
## 201 0 0 0 0 0 1 0 0  
## 202 0 0 0 0 0 1 0 0  
## 203 0 0 0 0 0 1 1 1  
## 204 0 0 0 0 0 1 0 0  
## 205 0 0 0 0 0 1 0 0  
## 206 0 0 0 0 0 1 0 0  
## 207 0 0 0 0 0 1 0 0  
## 208 0 0 0 0 0 0 1 1  
## 209 0 0 0 0 0 0 1 1  
## 210 0 0 0 0 0 0 1 1

summary(capNMBS)

## location species sex mark.number   
## Length:210 Length:210 Length:210 Min. : 1.0   
## Class :character Class :character Class :character 1st Qu.:267.2   
## Mode :character Mode :character Mode :character Median :377.5   
## Mean :364.7   
## 3rd Qu.:526.8   
## Max. :623.0   
## Date.of.initial.capture c1 c2   
## Length:210 Min. :0.000000 Min. :0.0000   
## Class :character 1st Qu.:0.000000 1st Qu.:0.0000   
## Mode :character Median :0.000000 Median :0.0000   
## Mean :0.004762 Mean :0.1048   
## 3rd Qu.:0.000000 3rd Qu.:0.0000   
## Max. :1.000000 Max. :1.0000   
## c3 c4 c5 c6   
## Min. :0.00000 Min. :0.00000 Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.00000 1st Qu.:0.00000 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :0.00000 Median :0.00000 Median :0.0000 Median :0.0000   
## Mean :0.09048 Mean :0.02857 Mean :0.1952 Mean :0.2238   
## 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:0.0000 3rd Qu.:0.0000   
## Max. :1.00000 Max. :1.00000 Max. :1.0000 Max. :1.0000   
## c7 c8 c9 c10   
## Min. :0.00000 Min. :0.0000 Min. :0.00000 Min. :0.0000   
## 1st Qu.:0.00000 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.0000   
## Median :0.00000 Median :0.0000 Median :0.00000 Median :0.0000   
## Mean :0.09048 Mean :0.1952 Mean :0.09048 Mean :0.0619   
## 3rd Qu.:0.00000 3rd Qu.:0.0000 3rd Qu.:0.00000 3rd Qu.:0.0000   
## Max. :1.00000 Max. :1.0000 Max. :1.00000 Max. :1.0000   
## c11 c12   
## Min. :0.00000 Min. :0.00000   
## 1st Qu.:0.00000 1st Qu.:0.00000   
## Median :0.00000 Median :0.00000   
## Mean :0.01905 Mean :0.01905   
## 3rd Qu.:0.00000 3rd Qu.:0.00000   
## Max. :1.00000 Max. :1.00000

capNMBS <- capNMBS[which(!is.na(capNMBS$c1)), ]  
summary(capNMBS)

## location species sex mark.number   
## Length:210 Length:210 Length:210 Min. : 1.0   
## Class :character Class :character Class :character 1st Qu.:267.2   
## Mode :character Mode :character Mode :character Median :377.5   
## Mean :364.7   
## 3rd Qu.:526.8   
## Max. :623.0   
## Date.of.initial.capture c1 c2   
## Length:210 Min. :0.000000 Min. :0.0000   
## Class :character 1st Qu.:0.000000 1st Qu.:0.0000   
## Mode :character Median :0.000000 Median :0.0000   
## Mean :0.004762 Mean :0.1048   
## 3rd Qu.:0.000000 3rd Qu.:0.0000   
## Max. :1.000000 Max. :1.0000   
## c3 c4 c5 c6   
## Min. :0.00000 Min. :0.00000 Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.00000 1st Qu.:0.00000 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :0.00000 Median :0.00000 Median :0.0000 Median :0.0000   
## Mean :0.09048 Mean :0.02857 Mean :0.1952 Mean :0.2238   
## 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:0.0000 3rd Qu.:0.0000   
## Max. :1.00000 Max. :1.00000 Max. :1.0000 Max. :1.0000   
## c7 c8 c9 c10   
## Min. :0.00000 Min. :0.0000 Min. :0.00000 Min. :0.0000   
## 1st Qu.:0.00000 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.0000   
## Median :0.00000 Median :0.0000 Median :0.00000 Median :0.0000   
## Mean :0.09048 Mean :0.1952 Mean :0.09048 Mean :0.0619   
## 3rd Qu.:0.00000 3rd Qu.:0.0000 3rd Qu.:0.00000 3rd Qu.:0.0000   
## Max. :1.00000 Max. :1.0000 Max. :1.00000 Max. :1.0000   
## c11 c12   
## Min. :0.00000 Min. :0.00000   
## 1st Qu.:0.00000 1st Qu.:0.00000   
## Median :0.00000 Median :0.00000   
## Mean :0.01905 Mean :0.01905   
## 3rd Qu.:0.00000 3rd Qu.:0.00000   
## Max. :1.00000 Max. :1.00000

library(reshape)

##   
## Attaching package: 'reshape'

## The following object is masked from 'package:Matrix':  
##   
## expand

## Format data for MARK  
  
# get data formatted for MARK/RMark  
capNMBS$ch <- paste(capNMBS$c1,  
 capNMBS$c2,  
 capNMBS$c3,  
 capNMBS$c4,  
 capNMBS$c5,  
 capNMBS$c6,  
 capNMBS$c7,  
 capNMBS$c8,  
 capNMBS$c9,  
 capNMBS$c10,  
 capNMBS$c11,  
 capNMBS$c12,  
 " ",  
 ";",  
 sep="")  
  
  
data=data.frame(capNMBS)  
data

## location species sex mark.number Date.of.initial.capture c1 c2 c3 c4  
## 1 NMBS CGrDar m 1 2-May-18 1 0 0 0  
## 2 NMBS BeaBas m 42 25-May-18 0 1 0 0  
## 3 NMBS PaiSki m 43 25-May-18 0 1 0 0  
## 4 NMBS BeaBas m 44 25-May-18 0 1 0 0  
## 5 NMBS PaiSki m 45 25-May-18 0 1 0 0  
## 6 NMBS PaiSki m 46 25-May-18 0 1 0 0  
## 7 NMBS PaiSki m 47 25-May-18 0 1 0 0  
## 8 NMBS CarSad m 48 25-May-18 0 1 0 0  
## 9 NMBS PaiSki m 49 25-May-18 0 1 0 0  
## 10 NMBS PaiSki m 50 25-May-18 0 1 0 0  
## 11 NMBS PaiSki f 51 25-May-18 0 1 0 0  
## 12 NMBS PaiSki m 52 25-May-18 0 1 1 0  
## 13 NMBS PaiSki m 53 25-May-18 0 1 0 0  
## 14 NMBS PaiSki m 54 25-May-18 0 1 0 0  
## 15 NMBS PaiSki m 55 25-May-18 0 1 0 0  
## 16 NMBS PaiSki m 56 25-May-18 0 1 0 0  
## 17 NMBS PaiSki m 57 25-May-18 0 1 0 0  
## 18 NMBS CarSad m 58 25-May-18 0 1 0 0  
## 19 NMBS PaiSki m 59 25-May-18 0 1 0 0  
## 20 NMBS PaiSki m 60 25-May-18 0 1 0 0  
## 21 NMBS BeaBas m 61 25-May-18 0 1 0 0  
## 22 NMBS BeaBas m 62 25-May-18 0 1 0 0  
## 23 NMBS PaiSki m 63 25-May-18 0 1 0 0  
## 24 NMBS ChFCor m 151 29-May-18 0 0 1 0  
## 25 NMBS ChFCor m 152 29-May-18 0 0 1 0  
## 26 NMBS CarSad m 153 29-May-18 0 0 1 0  
## 27 NMBS PaiSki m 154 29-May-18 0 0 1 0  
## 28 NMBS ChFCor m 155 29-May-18 0 0 1 0  
## 29 NMBS PaiSki m 156 29-May-18 0 0 1 0  
## 30 NMBS ComWhi m 157 29-May-18 0 0 1 0  
## 31 NMBS ChFCor m 158 29-May-18 0 0 1 0  
## 32 NMBS AmeEme m 160 29-May-18 0 0 1 0  
## 33 NMBS BeaBas m 161 29-May-18 0 0 1 0  
## 34 NMBS PaiSki m 163 29-May-18 0 0 1 0  
## 35 NMBS PaiSki m 164 29-May-18 0 0 1 0  
## 36 NMBS PaiSki m 165 29-May-18 0 0 1 0  
## 37 NMBS PaiSki m 167 29-May-18 0 0 1 0  
## 38 NMBS PaiSki m 168 29-May-18 0 0 1 0  
## 39 NMBS PaiSki m 169 29-May-18 0 0 1 0  
## 40 NMBS ChFCor m 170 29-May-18 0 0 1 0  
## 41 NMBS ComWhi m 171 29-May-18 0 0 1 0  
## 42 NMBS AmeEme m 253 7-Jun-18 0 0 0 1  
## 43 NMBS BeaBas m 254 7-Jun-18 0 0 0 1  
## 44 NMBS CrRWhi m 255 7-Jun-18 0 0 0 1  
## 45 NMBS AmeEme m 256 7-Jun-18 0 0 0 1  
## 46 NMBS DtTWhi m 257 7-Jun-18 0 0 0 1  
## 47 NMBS CrRWhi m 258 7-Jun-18 0 0 0 1  
## 48 NMBS ChFCor m 262 9-Jun-18 0 0 0 0  
## 49 NMBS CrRWhi m 263 9-Jun-18 0 0 0 0  
## 50 NMBS DeSSpi m 264 9-Jun-18 0 0 0 0  
## 51 NMBS ChFCor m 265 9-Jun-18 0 0 0 0  
## 52 NMBS DeSSpi m 266 9-Jun-18 0 0 0 0  
## 53 NMBS AmeEme m 267 9-Jun-18 0 0 0 0  
## 54 NMBS ChFCor m 268 9-Jun-18 0 0 0 0  
## 55 NMBS AmeEme m 269 9-Jun-18 0 0 0 0  
## 56 NMBS CGrDar m 270 9-Jun-18 0 0 0 0  
## 57 NMBS ChFCor m 271 9-Jun-18 0 0 0 0  
## 58 NMBS AmeEme m 272 9-Jun-18 0 0 0 0  
## 59 NMBS AmeEme m 273 9-Jun-18 0 0 0 0  
## 60 NMBS CrRWhi m 274 9-Jun-18 0 0 0 0  
## 61 NMBS PaiSki m 275 9-Jun-18 0 0 0 0  
## 62 NMBS AmeEme m 276 9-Jun-18 0 0 0 0  
## 63 NMBS CrRWhi m 277 9-Jun-18 0 0 0 0  
## 64 NMBS ChFCor m 278 9-Jun-18 0 0 0 0  
## 65 NMBS CrRWhi m 279 9-Jun-18 0 0 0 0  
## 66 NMBS AmeEme m 280 9-Jun-18 0 0 0 0  
## 67 NMBS PaiSki m 281 9-Jun-18 0 0 0 0  
## 68 NMBS PaiSki m 282 9-Jun-18 0 0 0 0  
## 69 NMBS UniClu m 283 9-Jun-18 0 0 0 0  
## 70 NMBS CarSad f 284 9-Jun-18 0 0 0 0  
## 71 NMBS CarSad m 285 9-Jun-18 0 0 0 0  
## 72 NMBS CrRWhi m 286 9-Jun-18 0 0 0 0  
## 73 NMBS CrRWhi m 289 9-Jun-18 0 0 0 0  
## 74 NMBS HudWhi m 290 9-Jun-18 0 0 0 0  
## 75 NMBS PaiSki m 291 9-Jun-18 0 0 0 0  
## 76 NMBS LanClu m 292 9-Jun-18 0 0 0 0  
## 77 NMBS CrRWhi m 293 9-Jun-18 0 0 0 0  
## 78 NMBS ChFCor m 294 9-Jun-18 0 0 0 0  
## 79 NMBS AmeEme m 295 9-Jun-18 0 0 0 0  
## 80 NMBS AmeEme m 296 9-Jun-18 0 0 0 0  
## 81 NMBS AmeEme m 297 9-Jun-18 0 0 0 0  
## 82 NMBS ChFCor m 298 9-Jun-18 0 0 0 0  
## 83 NMBS AmeEme m 299 9-Jun-18 0 0 0 0  
## 84 NMBS AmeEme f 300 9-Jun-18 0 0 0 0  
## 85 NMBS BluDas m 301 9-Jun-18 0 0 0 0  
## 86 NMBS AmeEme m 302 9-Jun-18 0 0 0 0  
## 87 NMBS ComWhi m 303 9-Jun-18 0 0 0 0  
## 88 NMBS CrRWhi m 357 15-Jun-18 0 0 0 0  
## 89 NMBS ChFCor m 358 15-Jun-18 0 0 0 0  
## 90 NMBS ChFCor m 359 15-Jun-18 0 0 0 0  
## 91 NMBS ChFCor m 360 15-Jun-18 0 0 0 0  
## 92 NMBS CrRWhi m 361 15-Jun-18 0 0 0 0  
## 93 NMBS ChFCor m 362 15-Jun-18 0 0 0 0  
## 94 NMBS CrRWhi m 363 15-Jun-18 0 0 0 0  
## 95 NMBS CrRWhi m 364 15-Jun-18 0 0 0 0  
## 96 NMBS ChFCor m 365 15-Jun-18 0 0 0 0  
## 97 NMBS ComWhi m 366 15-Jun-18 0 0 0 0  
## 98 NMBS ChFCor m 368 15-Jun-18 0 0 0 0  
## 99 NMBS ChFCor m 369 15-Jun-18 0 0 0 0  
## 100 NMBS AmeEme m 370 15-Jun-18 0 0 0 0  
## 101 NMBS ChFCor m 371 15-Jun-18 0 0 0 0  
## 102 NMBS AmeEme m 372 15-Jun-18 0 0 0 0  
## 103 NMBS CrRWhi f 374 15-Jun-18 0 0 0 0  
## 104 NMBS AmeEme m 376 15-Jun-18 0 0 0 0  
## 105 NMBS CrRWhi m 377 15-Jun-18 0 0 0 0  
## 106 NMBS AmeEme m 378 15-Jun-18 0 0 0 0  
## 107 NMBS AmeEme m 379 15-Jun-18 0 0 0 0  
## 108 NMBS AmeEme m 380 15-Jun-18 0 0 0 0  
## 109 NMBS ChFCor m 381 15-Jun-18 0 0 0 0  
## 110 NMBS ChFCor m 382 15-Jun-18 0 0 0 0  
## 111 NMBS CrRWhi m 383 15-Jun-18 0 0 0 0  
## 112 NMBS ChFCor m 384 15-Jun-18 0 0 0 0  
## 113 NMBS ChFCor m 386 15-Jun-18 0 0 0 0  
## 114 NMBS CrRWhi m 387 15-Jun-18 0 0 0 0  
## 115 NMBS ChFCor m 388 15-Jun-18 0 0 0 0  
## 116 NMBS AmeEme m 389 15-Jun-18 0 0 0 0  
## 117 NMBS ChFCor m 390 15-Jun-18 0 0 0 0  
## 118 NMBS ChFCor m 391 15-Jun-18 0 0 0 0  
## 119 NMBS ChFCor m 392 15-Jun-18 0 0 0 0  
## 120 NMBS PaiSki m 393 15-Jun-18 0 0 0 0  
## 121 NMBS DeSSpi m 394 15-Jun-18 0 0 0 0  
## 122 NMBS PaiSki m 395 15-Jun-18 0 0 0 0  
## 123 NMBS AmeEme m 396 15-Jun-18 0 0 0 0  
## 124 NMBS CrRWhi m 397 15-Jun-18 0 0 0 0  
## 125 NMBS CrRWhi m 398 15-Jun-18 0 0 0 0  
## 126 NMBS CrRWhi f 399 15-Jun-18 0 0 0 0  
## 127 NMBS CrRWhi f 401 15-Jun-18 0 0 0 0  
## 128 NMBS CrRWhi m 402 15-Jun-18 0 0 0 0  
## 129 NMBS ChFCor m 403 15-Jun-18 0 0 0 0  
## 130 NMBS ChFCor m 454 30-Jun-18 0 0 0 0  
## 131 NMBS ChFCor m 455 30-Jun-18 0 0 0 0  
## 132 NMBS CrRWhi m 456 30-Jun-18 0 0 0 0  
## 133 NMBS UniClu m 457 30-Jun-18 0 0 0 0  
## 134 NMBS CalPen m 458 30-Jun-18 0 0 0 0  
## 135 NMBS ComWhi m 460 30-Jun-18 0 0 0 0  
## 136 NMBS UniClu m 461 30-Jun-18 0 0 0 0  
## 137 NMBS CrRWhi m 462 30-Jun-18 0 0 0 0  
## 138 NMBS AmeEme m 463 30-Jun-18 0 0 0 0  
## 139 NMBS AmeEme m 464 30-Jun-18 0 0 0 0  
## 140 NMBS CrRWhi m 465 30-Jun-18 0 0 0 0  
## 141 NMBS AmeEme m 466 30-Jun-18 0 0 0 0  
## 142 NMBS ChFCor m 467 30-Jun-18 0 0 0 0  
## 143 NMBS CrRWhi m 468 30-Jun-18 0 0 0 0  
## 144 NMBS CrRWhi m 469 30-Jun-18 0 0 0 0  
## 145 NMBS CalPen m 470 30-Jun-18 0 0 0 0  
## 146 NMBS CrRWhi m 471 30-Jun-18 0 0 0 0  
## 147 NMBS CrRWhi m 472 30-Jun-18 0 0 0 0  
## 148 NMBS CrRWhi m 473 30-Jun-18 0 0 0 0  
## 149 NMBS ComWhi m 517 9-Jul-18 0 0 0 0  
## 150 NMBS AmeEme m 518 9-Jul-18 0 0 0 0  
## 151 NMBS PaiSki f 520 9-Jul-18 0 0 0 0  
## 152 NMBS CrRWhi f 521 9-Jul-18 0 0 0 0  
## 153 NMBS CrRWhi f 522 9-Jul-18 0 0 0 0  
## 154 NMBS ChFCor m 523 9-Jul-18 0 0 0 0  
## 155 NMBS CrRWhi m 524 9-Jul-18 0 0 0 0  
## 156 NMBS BluDas f 525 9-Jul-18 0 0 0 0  
## 157 NMBS CrRWhi m 526 9-Jul-18 0 0 0 0  
## 158 NMBS BluDas m 527 9-Jul-18 0 0 0 0  
## 159 NMBS CrRWhi m 528 9-Jul-18 0 0 0 0  
## 160 NMBS CrRWhi m 529 9-Jul-18 0 0 0 0  
## 161 NMBS CrRWhi m 530 9-Jul-18 0 0 0 0  
## 162 NMBS CrRWhi m 532 9-Jul-18 0 0 0 0  
## 163 NMBS CrRWhi m 533 9-Jul-18 0 0 0 0  
## 164 NMBS CrRWhi m 535 9-Jul-18 0 0 0 0  
## 165 NMBS CrRWhi m 536 9-Jul-18 0 0 0 0  
## 166 NMBS CrRWhi m 539 9-Jul-18 0 0 0 0  
## 167 NMBS CrRWhi m 540 9-Jul-18 0 0 0 0  
## 168 NMBS CrRWhi m 543 9-Jul-18 0 0 0 0  
## 169 NMBS CrRWhi m 544 9-Jul-18 0 0 0 0  
## 170 NMBS CrRWhi m 545 9-Jul-18 0 0 0 0  
## 171 NMBS CrRWhi m 546 9-Jul-18 0 0 0 0  
## 172 NMBS PaiSki m 547 9-Jul-18 0 0 0 0  
## 173 NMBS SpaSki f 548 9-Jul-18 0 0 0 0  
## 174 NMBS CrRWhi m 549 9-Jul-18 0 0 0 0  
## 175 NMBS CrRWhi m 550 9-Jul-18 0 0 0 0  
## 176 NMBS CrRWhi m 551 9-Jul-18 0 0 0 0  
## 177 NMBS CrRWhi m 552 9-Jul-18 0 0 0 0  
## 178 NMBS ChFCor m 553 9-Jul-18 0 0 0 0  
## 179 NMBS CrRWhi m 554 9-Jul-18 0 0 0 0  
## 180 NMBS CrRWhi m 555 9-Jul-18 0 0 0 0  
## 181 NMBS AmeEme m 556 9-Jul-18 0 0 0 0  
## 182 NMBS CrRWhi m 557 9-Jul-18 0 0 0 0  
## 183 NMBS CrRWhi m 558 9-Jul-18 0 0 0 0  
## 184 NMBS CrRWhi m 559 9-Jul-18 0 0 0 0  
## 185 NMBS CalPen m 560 9-Jul-18 0 0 0 0  
## 186 NMBS ComWhi m 561 9-Jul-18 0 0 0 0  
## 187 NMBS ChFCor m 562 9-Jul-18 0 0 0 0  
## 188 NMBS LanClu m 563 9-Jul-18 0 0 0 0  
## 189 NMBS CrRWhi m 585 10-Jul-18 0 0 0 0  
## 190 NMBS CrRWhi m 586 10-Jul-18 0 0 0 0  
## 191 NMBS ComWhi m 587 10-Jul-18 0 0 0 0  
## 192 NMBS SlaSki m 588 10-Jul-18 0 0 0 0  
## 193 NMBS ChFCor m 589 10-Jul-18 0 0 0 0  
## 194 NMBS CrRWhi m 590 10-Jul-18 0 0 0 0  
## 195 NMBS CrRWhi m 591 10-Jul-18 0 0 0 0  
## 196 NMBS AmeEme m 592 10-Jul-18 0 0 0 0  
## 197 NMBS CrRWhi f 593 10-Jul-18 0 0 0 0  
## 198 NMBS CrRWhi m 594 10-Jul-18 0 0 0 0  
## 199 NMBS ComWhi m 612 12-Jul-18 0 0 0 0  
## 200 NMBS CalPen f 613 12-Jul-18 0 0 0 0  
## 201 NMBS CrRWhi m 614 12-Jul-18 0 0 0 0  
## 202 NMBS AmeEme m 615 12-Jul-18 0 0 0 0  
## 203 NMBS CrRWhi m 616 12-Jul-18 0 0 0 0  
## 204 NMBS TwSSki m 617 12-Jul-18 0 0 0 0  
## 205 NMBS ChFCor m 618 12-Jul-18 0 0 0 0  
## 206 NMBS PaiSki m 619 12-Jul-18 0 0 0 0  
## 207 NMBS GrsDar f 620 12-Jul-18 0 0 0 0  
## 208 NMBS CrRWhi m 621 19-Jul-18 0 0 0 0  
## 209 NMBS CrRWhi m 622 19-Jul-18 0 0 0 0  
## 210 NMBS CrRWhi m 623 19-Jul-18 0 0 0 0  
## c5 c6 c7 c8 c9 c10 c11 c12 ch  
## 1 0 0 0 0 0 0 0 0 100000000000 ;  
## 2 0 0 0 0 0 0 0 0 010000000000 ;  
## 3 0 0 0 0 0 0 0 0 010000000000 ;  
## 4 0 0 0 0 0 0 0 0 010000000000 ;  
## 5 0 0 0 0 0 0 0 0 010000000000 ;  
## 6 1 0 0 0 0 0 0 0 010010000000 ;  
## 7 0 0 0 0 0 0 0 0 010000000000 ;  
## 8 0 0 0 0 0 0 0 0 010000000000 ;  
## 9 0 0 0 0 0 0 0 0 010000000000 ;  
## 10 0 0 0 0 0 0 0 0 010000000000 ;  
## 11 0 0 0 0 0 0 0 0 010000000000 ;  
## 12 0 0 0 0 0 0 0 0 011000000000 ;  
## 13 0 0 0 0 0 0 0 0 010000000000 ;  
## 14 0 0 0 0 0 0 0 0 010000000000 ;  
## 15 0 0 0 0 0 0 0 0 010000000000 ;  
## 16 0 0 0 0 0 0 0 0 010000000000 ;  
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## 207 0 0 0 0 0 1 0 0 000000000100 ;  
## 208 0 0 0 0 0 0 1 1 000000000011 ;  
## 209 0 0 0 0 0 0 1 1 000000000011 ;  
## 210 0 0 0 0 0 0 1 1 000000000011 ;

transform=melt(capNMBS, id.vars="mark.number")  
pivot=cast(transform, mark.number ~ value)

## Aggregation requires fun.aggregate: length used as default

pivot[is.na(pivot)]=0  
  
pivot[,2:ncol(pivot)][pivot[,2:ncol(pivot)] != 0] = 1  
lh <- 11;  
  
  
pivot$eh <- apply(pivot[2:lh],1,paste,collapse="") # concatenates encounter columns into eh  
pivot[2:lh] <- NULL # drops individual encounter columns  
# create commented tag  
pivot$mark.number <- paste("/\*", pivot$mark.number, "\*/", sep=" ")  
# sort by descending encounter histories  
pivot <- pivot[order(data$ch,decreasing=TRUE),]  
# tack on the frequency for the individual  
pivot$end <- "1;";  
# write out the input file  
write.table(pivot,file="cjs-pivot.inp",sep=" ",quote=F,col.names=F,row.names=F);  
  
pivot

## mark.number DeSSpi DtTWhi GrsDar HudWhi LanClu PaiSki SlaSki SpaSki  
## 1 /\* 1 \*/ 0 0 0 0 0 0 0 0  
## 12 /\* 52 \*/ 0 0 0 0 0 1 0 0  
## 6 /\* 46 \*/ 0 0 0 0 0 1 0 0  
## 2 /\* 42 \*/ 0 0 0 0 0 0 0 0  
## 3 /\* 43 \*/ 0 0 0 0 0 1 0 0  
## 4 /\* 44 \*/ 0 0 0 0 0 0 0 0  
## 5 /\* 45 \*/ 0 0 0 0 0 1 0 0  
## 7 /\* 47 \*/ 0 0 0 0 0 1 0 0  
## 8 /\* 48 \*/ 0 0 0 0 0 0 0 0  
## 9 /\* 49 \*/ 0 0 0 0 0 1 0 0  
## 10 /\* 50 \*/ 0 0 0 0 0 1 0 0  
## 11 /\* 51 \*/ 0 0 0 0 0 1 0 0  
## 13 /\* 53 \*/ 0 0 0 0 0 1 0 0  
## 14 /\* 54 \*/ 0 0 0 0 0 1 0 0  
## 15 /\* 55 \*/ 0 0 0 0 0 1 0 0  
## 16 /\* 56 \*/ 0 0 0 0 0 1 0 0  
## 17 /\* 57 \*/ 0 0 0 0 0 1 0 0  
## 18 /\* 58 \*/ 0 0 0 0 0 0 0 0  
## 19 /\* 59 \*/ 0 0 0 0 0 1 0 0  
## 20 /\* 60 \*/ 0 0 0 0 0 1 0 0  
## 21 /\* 61 \*/ 0 0 0 0 0 0 0 0  
## 22 /\* 62 \*/ 0 0 0 0 0 0 0 0  
## 23 /\* 63 \*/ 0 0 0 0 0 1 0 0  
## 24 /\* 151 \*/ 0 0 0 0 0 0 0 0  
## 25 /\* 152 \*/ 0 0 0 0 0 0 0 0  
## 26 /\* 153 \*/ 0 0 0 0 0 0 0 0  
## 27 /\* 154 \*/ 0 0 0 0 0 1 0 0  
## 28 /\* 155 \*/ 0 0 0 0 0 0 0 0  
## 29 /\* 156 \*/ 0 0 0 0 0 1 0 0  
## 30 /\* 157 \*/ 0 0 0 0 0 0 0 0  
## 31 /\* 158 \*/ 0 0 0 0 0 0 0 0  
## 32 /\* 160 \*/ 0 0 0 0 0 0 0 0  
## 33 /\* 161 \*/ 0 0 0 0 0 0 0 0  
## 34 /\* 163 \*/ 0 0 0 0 0 1 0 0  
## 35 /\* 164 \*/ 0 0 0 0 0 1 0 0  
## 36 /\* 165 \*/ 0 0 0 0 0 1 0 0  
## 37 /\* 167 \*/ 0 0 0 0 0 1 0 0  
## 38 /\* 168 \*/ 0 0 0 0 0 1 0 0  
## 39 /\* 169 \*/ 0 0 0 0 0 1 0 0  
## 40 /\* 170 \*/ 0 0 0 0 0 0 0 0  
## 41 /\* 171 \*/ 0 0 0 0 0 0 0 0  
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## 43 /\* 254 \*/ 0 0 0 0 0 0 0 0  
## 44 /\* 255 \*/ 0 0 0 0 0 0 0 0  
## 45 /\* 256 \*/ 0 0 0 0 0 0 0 0  
## 46 /\* 257 \*/ 0 1 0 0 0 0 0 0  
## 47 /\* 258 \*/ 0 0 0 0 0 0 0 0  
## 49 /\* 263 \*/ 0 0 0 0 0 0 0 0  
## 51 /\* 265 \*/ 0 0 0 0 0 0 0 0  
## 64 /\* 278 \*/ 0 0 0 0 0 0 0 0  
## 74 /\* 290 \*/ 0 0 0 1 0 0 0 0  
## 82 /\* 298 \*/ 0 0 0 0 0 0 0 0  
## 48 /\* 262 \*/ 0 0 0 0 0 0 0 0  
## 50 /\* 264 \*/ 1 0 0 0 0 0 0 0  
## 52 /\* 266 \*/ 1 0 0 0 0 0 0 0  
## 53 /\* 267 \*/ 0 0 0 0 0 0 0 0  
## 54 /\* 268 \*/ 0 0 0 0 0 0 0 0  
## 55 /\* 269 \*/ 0 0 0 0 0 0 0 0  
## 56 /\* 270 \*/ 0 0 0 0 0 0 0 0  
## 57 /\* 271 \*/ 0 0 0 0 0 0 0 0  
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## 76 /\* 292 \*/ 0 0 0 0 1 0 0 0  
## 77 /\* 293 \*/ 0 0 0 0 0 0 0 0  
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## 79 /\* 295 \*/ 0 0 0 0 0 0 0 0  
## 80 /\* 296 \*/ 0 0 0 0 0 0 0 0  
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## 93 /\* 362 \*/ 0 0 0 0 0 0 0 0  
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## 95 /\* 364 \*/ 0 0 0 0 0 0 0 0  
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## 100 /\* 370 \*/ 0 0 0 0 0 0 0 0  
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## 105 /\* 377 \*/ 0 0 0 0 0 0 0 0  
## 106 /\* 378 \*/ 0 0 0 0 0 0 0 0  
## 107 /\* 379 \*/ 0 0 0 0 0 0 0 0  
## 108 /\* 380 \*/ 0 0 0 0 0 0 0 0  
## 109 /\* 381 \*/ 0 0 0 0 0 0 0 0  
## 110 /\* 382 \*/ 0 0 0 0 0 0 0 0  
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## 115 /\* 388 \*/ 0 0 0 0 0 0 0 0  
## 116 /\* 389 \*/ 0 0 0 0 0 0 0 0  
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## 119 /\* 392 \*/ 0 0 0 0 0 0 0 0  
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## 123 /\* 396 \*/ 0 0 0 0 0 0 0 0  
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## 138 /\* 463 \*/ 0 0 0 0 0 0 0 0  
## 139 /\* 464 \*/ 0 0 0 0 0 0 0 0  
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## 196 /\* 592 \*/ 0 0 0 0 0 0 0 0  
## 197 /\* 593 \*/ 0 0 0 0 0 0 0 0  
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## 200 /\* 613 \*/ 0 0 0 0 0 0 0 0  
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## 202 /\* 615 \*/ 0 0 0 0 0 0 0 0  
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## 206 /\* 619 \*/ 0 0 0 0 0 1 0 0  
## 207 /\* 620 \*/ 0 0 1 0 0 0 0 0  
## 208 /\* 621 \*/ 0 0 0 0 0 0 0 0  
## 209 /\* 622 \*/ 0 0 0 0 0 0 0 0  
## 210 /\* 623 \*/ 0 0 0 0 0 0 0 0  
## TwSSki UniClu f m 10-Jul-18 12-Jul-18 15-Jun-18 19-Jul-18 2-May-18  
## 1 0 0 0 1 0 0 0 0 1  
## 12 0 0 0 1 0 0 0 0 0  
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## 4 0 0 0 1 0 0 0 0 0  
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## 9 0 0 0 1 0 0 0 0 0  
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## 11 0 0 1 0 0 0 0 0 0  
## 13 0 0 0 1 0 0 0 0 0  
## 14 0 0 0 1 0 0 0 0 0  
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## 17 0 0 0 1 0 0 0 0 0  
## 18 0 0 0 1 0 0 0 0 0  
## 19 0 0 0 1 0 0 0 0 0  
## 20 0 0 0 1 0 0 0 0 0  
## 21 0 0 0 1 0 0 0 0 0  
## 22 0 0 0 1 0 0 0 0 0  
## 23 0 0 0 1 0 0 0 0 0  
## 24 0 0 0 1 0 0 0 0 0  
## 25 0 0 0 1 0 0 0 0 0  
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## 34 0 0 0 1 0 0 0 0 0  
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## 47 0 0 0 1 0 0 0 0 0  
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## 189 0 1 1000000001 1;  
## 190 0 1 1000000001 1;  
## 192 0 1 1000000000 1;  
## 193 0 1 1000000100 1;  
## 194 0 1 1000000001 1;  
## 195 0 1 1000000001 1;  
## 196 0 1 1100000000 1;  
## 197 0 1 1000000001 1;  
## 198 0 1 1000000001 1;  
## 203 0 1 1000000001 1;  
## 199 0 1 1000000010 1;  
## 200 0 1 1000100000 1;  
## 201 0 1 1000000001 1;  
## 202 0 1 1100000000 1;  
## 204 0 1 1000000000 1;  
## 205 0 1 1000000100 1;  
## 206 0 1 1000000000 1;  
## 207 0 1 1000000000 1;  
## 208 0 1 1000000001 1;  
## 209 0 1 1000000001 1;  
## 210 0 1 1000000001 1;

## Format data for marked package  
  
marked\_dfNMBS <- capNMBS  
  
marked\_dfNMBS$ch <- paste0(capNMBS$c1,  
 capNMBS$c2,  
 capNMBS$c3,  
 capNMBS$c4,  
 capNMBS$c5,  
 capNMBS$c6,  
 capNMBS$c7,  
 capNMBS$c8,  
 capNMBS$c9,  
 capNMBS$c10,  
 capNMBS$c11,  
 capNMBS$c12)  
   
marked\_dfNMBS$sex.fac <- as.factor(marked\_dfNMBS$sex)  
marked\_dfNMBS$species.fac <- as.factor(marked\_dfNMBS$species)  
  
model1=crm(marked\_dfNMBS,   
 time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9),  
 groups = c("sex.fac"),   
 model.parameters=list(Phi = list(formula = ~sex.fac)))

## Model: CJS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 3 parameters...

##   
 Number of evaluations: 100 -2lnl: 192.3433917  
 Number of evaluations: 200 -2lnl: 192.3171637  
 Number of evaluations: 300 -2lnl: 192.3161159  
 Number of evaluations: 400 -2lnl: 192.3159549  
## Elapsed time in minutes: 0.013

model1

##   
## crm Model Summary  
##   
## Npar : 3  
## -2lnL: 192.316  
## AIC : 198.316  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -6.320903  
## Phi.sex.facm 8.120893  
## p.(Intercept) -1.573726

model=cjs.hessian(model1)  
model1

##   
## crm Model Summary  
##   
## Npar : 3  
## -2lnL: 192.316  
## AIC : 198.316  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -6.320903  
## Phi.sex.facm 8.120893  
## p.(Intercept) -1.573726

model2=crm(marked\_dfNMBS,   
 time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9),  
 groups = c("sex.fac"),   
 model.parameters=list(p = list(formula = ~sex.fac)))

## Model: CJS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 3 parameters...

##   
 Number of evaluations: 100 -2lnl: 192.329639  
 Number of evaluations: 200 -2lnl: 192.3229192  
 Number of evaluations: 300 -2lnl: 192.3206611  
 Number of evaluations: 400 -2lnl: 201.2965662  
## Elapsed time in minutes: 0.0092

model2

##   
## crm Model Summary  
##   
## Npar : 3  
## -2lnL: 192.32  
## AIC : 198.32  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 1.801279  
## p.(Intercept) -8.232980  
## p.sex.facm 6.657377

model=cjs.hessian(model2)  
model2

##   
## crm Model Summary  
##   
## Npar : 3  
## -2lnL: 192.32  
## AIC : 198.32  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 1.801279  
## p.(Intercept) -8.232980  
## p.sex.facm 6.657377

model22=crm(marked\_dfNMBS,   
 time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9),  
 groups = c("sex.fac"),   
 model.parameters=list(Phi = list(formula = ~1), p= list(formula = ~1)))

## Model: CJS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 2 parameters...

##   
 Number of evaluations: 100 -2lnl: 196.7720059  
## Elapsed time in minutes: 0.0073

model22

##   
## crm Model Summary  
##   
## Npar : 2  
## -2lnL: 196.772  
## AIC : 200.772  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 1.812490  
## p.(Intercept) -1.689368

model=cjs.hessian(model22)  
model22

##   
## crm Model Summary  
##   
## Npar : 2  
## -2lnL: 196.772  
## AIC : 200.772  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 1.812490  
## p.(Intercept) -1.689368

model3=crm(marked\_dfNMBS,   
 time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9),  
 groups = c("species.fac"),   
 model.parameters=list(Phi = list(formula = ~species.fac)))

## Model: CJS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 20 parameters...

##   
 Number of evaluations: 100 -2lnl: 217.9371954  
 Number of evaluations: 200 -2lnl: 192.7267169  
 Number of evaluations: 300 -2lnl: 178.7793154  
 Number of evaluations: 400 -2lnl: 176.6206669  
 Number of evaluations: 500 -2lnl: 175.7309936  
 Number of evaluations: 600 -2lnl: 175.5071348  
 Number of evaluations: 700 -2lnl: 175.4466917  
 Number of evaluations: 800 -2lnl: 175.4273071  
 Number of evaluations: 900 -2lnl: 175.4250992  
 Number of evaluations: 1000 -2lnl: 175.4244226  
 Number of evaluations: 1100 -2lnl: 175.4243493  
 Number of evaluations: 1200 -2lnl: 175.4243264  
 Number of evaluations: 1300 -2lnl: 175.6152593  
 Number of evaluations: 1400 -2lnl: 175.4986319  
 Number of evaluations: 1500 -2lnl: 175.4243249  
 Number of evaluations: 1600 -2lnl: 176.9278037  
 Number of evaluations: 1700 -2lnl: 176.3044394  
 Number of evaluations: 1800 -2lnl: 175.4243249  
 Number of evaluations: 1900 -2lnl: 175.6152593  
 Number of evaluations: 2000 -2lnl: 186.7609842  
 Number of evaluations: 2100 -2lnl: 176.0587908  
 Number of evaluations: 2200 -2lnl: 189.8596099  
 Number of evaluations: 2300 -2lnl: 175.6152593  
 Number of evaluations: 2400 -2lnl: 175.4243249  
 Number of evaluations: 2500 -2lnl: 176.3044394  
 Number of evaluations: 2600 -2lnl: 175.4243249  
 Number of evaluations: 2700 -2lnl: 176.0587908  
 Number of evaluations: 2800 -2lnl: 175.4986319  
 Number of evaluations: 2900 -2lnl: 175.4289883  
 Number of evaluations: 3000 -2lnl: 175.424325  
## Elapsed time in minutes: 0.027

model3

##   
## crm Model Summary  
##   
## Npar : 20  
## -2lnL: 175.4243  
## AIC : 215.4243  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -13.1715541  
## Phi.species.facBeaBas -2.5350614  
## Phi.species.facBluDas -8.1159393  
## Phi.species.facCalPen -5.6302659  
## Phi.species.facCarSad -1.4692708  
## Phi.species.facCGrDar -0.8440622  
## Phi.species.facChFCor 14.6237040  
## Phi.species.facComWhi 15.2747957  
## Phi.species.facCrRWhi 15.3034368  
## Phi.species.facDeSSpi -1.2190652  
## Phi.species.facDtTWhi -3.0091770  
## Phi.species.facGrsDar -0.1735393  
## Phi.species.facHudWhi 15.8259874  
## Phi.species.facLanClu -5.8391568  
## Phi.species.facPaiSki 14.5971273  
## Phi.species.facSlaSki -3.0762132  
## Phi.species.facSpaSki -6.0867326  
## Phi.species.facTwSSki -0.1735393  
## Phi.species.facUniClu -0.8616403  
## p.(Intercept) -1.3383755

model=cjs.hessian(model3)

##   
 Number of evaluations: 100 -2lnl: 176.89511  
 Number of evaluations: 200 -2lnl: 175.4243249  
 Number of evaluations: 300 -2lnl: 185.785636  
 Number of evaluations: 400 -2lnl: 178.036794  
 Number of evaluations: 500 -2lnl: 185.785636  
 Number of evaluations: 600 -2lnl: 175.4243249  
 Number of evaluations: 700 -2lnl: 176.89511  
 Number of evaluations: 800 -2lnl: 175.4243249  
 Number of evaluations: 900 -2lnl: 188.8291883  
 Number of evaluations: 1000 -2lnl: 176.2965565  
 Number of evaluations: 1100 -2lnl: 176.89511  
 Number of evaluations: 1200 -2lnl: 175.4243249  
 Number of evaluations: 1300 -2lnl: 185.785636  
 Number of evaluations: 1400 -2lnl: 175.4243249  
 Number of evaluations: 1500 -2lnl: 188.8291883  
 Number of evaluations: 1600 -2lnl: 178.2510245

model3

##   
## crm Model Summary  
##   
## Npar : 20  
## -2lnL: 175.4243  
## AIC : 215.4243  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -13.1715541  
## Phi.species.facBeaBas -2.5350614  
## Phi.species.facBluDas -8.1159393  
## Phi.species.facCalPen -5.6302659  
## Phi.species.facCarSad -1.4692708  
## Phi.species.facCGrDar -0.8440622  
## Phi.species.facChFCor 14.6237040  
## Phi.species.facComWhi 15.2747957  
## Phi.species.facCrRWhi 15.3034368  
## Phi.species.facDeSSpi -1.2190652  
## Phi.species.facDtTWhi -3.0091770  
## Phi.species.facGrsDar -0.1735393  
## Phi.species.facHudWhi 15.8259874  
## Phi.species.facLanClu -5.8391568  
## Phi.species.facPaiSki 14.5971273  
## Phi.species.facSlaSki -3.0762132  
## Phi.species.facSpaSki -6.0867326  
## Phi.species.facTwSSki -0.1735393  
## Phi.species.facUniClu -0.8616403  
## p.(Intercept) -1.3383755

model4=crm(marked\_dfNMBS,   
 time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9),  
 groups = c("species.fac"),   
 model.parameters=list(p = list(formula = ~species.fac)))

## Model: CJS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 20 parameters...

##   
 Number of evaluations: 100 -2lnl: 281.9366603  
 Number of evaluations: 200 -2lnl: 192.9015891  
 Number of evaluations: 300 -2lnl: 176.120842  
 Number of evaluations: 400 -2lnl: 174.1293633  
 Number of evaluations: 500 -2lnl: 172.762817  
 Number of evaluations: 600 -2lnl: 172.5934569  
 Number of evaluations: 700 -2lnl: 172.5446124  
 Number of evaluations: 800 -2lnl: 172.5297951  
 Number of evaluations: 900 -2lnl: 172.528141  
 Number of evaluations: 1000 -2lnl: 172.5276498  
 Number of evaluations: 1100 -2lnl: 172.5275966  
 Number of evaluations: 1200 -2lnl: 172.527581  
 Number of evaluations: 1300 -2lnl: 172.527581  
 Number of evaluations: 1400 -2lnl: 173.1941873  
 Number of evaluations: 1500 -2lnl: 172.527581  
 Number of evaluations: 1600 -2lnl: 173.3445673  
 Number of evaluations: 1700 -2lnl: 178.2203464  
 Number of evaluations: 1800 -2lnl: 172.90921  
 Number of evaluations: 1900 -2lnl: 182.475881  
 Number of evaluations: 2000 -2lnl: 173.1941873  
 Number of evaluations: 2100 -2lnl: 182.475881  
 Number of evaluations: 2200 -2lnl: 172.527581  
 Number of evaluations: 2300 -2lnl: 173.249858  
 Number of evaluations: 2400 -2lnl: 172.90921  
 Number of evaluations: 2500 -2lnl: 172.527581  
 Number of evaluations: 2600 -2lnl: 173.1941873  
 Number of evaluations: 2700 -2lnl: 172.527581  
 Number of evaluations: 2800 -2lnl: 172.5766525  
 Number of evaluations: 2900 -2lnl: 172.5276057  
 Number of evaluations: 3000 -2lnl: 172.5275816  
## Elapsed time in minutes: 0.0292

model4

##   
## crm Model Summary  
##   
## Npar : 20  
## -2lnL: 172.5276  
## AIC : 212.5276  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 1.896998  
## p.(Intercept) -16.779127  
## p.species.facBeaBas -6.457406  
## p.species.facBluDas -5.756508  
## p.species.facCalPen -5.917180  
## p.species.facCarSad -5.624891  
## p.species.facCGrDar -2.097095  
## p.species.facChFCor 16.033678  
## p.species.facComWhi 15.414756  
## p.species.facCrRWhi 15.478310  
## p.species.facDeSSpi -3.481311  
## p.species.facDtTWhi -3.109074  
## p.species.facGrsDar -1.379320  
## p.species.facHudWhi 46.199189  
## p.species.facLanClu -4.627117  
## p.species.facPaiSki 14.197232  
## p.species.facSlaSki -2.801671  
## p.species.facSpaSki -3.957656  
## p.species.facTwSSki -1.379320  
## p.species.facUniClu -4.581280

model=cjs.hessian(model4)

##   
 Number of evaluations: 100 -2lnl: 172.527581  
 Number of evaluations: 200 -2lnl: 175.1405102  
 Number of evaluations: 300 -2lnl: 172.527581  
 Number of evaluations: 400 -2lnl: 175.7006863  
 Number of evaluations: 500 -2lnl: 192.7219033  
 Number of evaluations: 600 -2lnl: 174.0229662  
 Number of evaluations: 700 -2lnl: 207.7538147  
 Number of evaluations: 800 -2lnl: 175.1405102  
 Number of evaluations: 900 -2lnl: 207.7538147  
 Number of evaluations: 1000 -2lnl: 172.527581  
 Number of evaluations: 1100 -2lnl: 174.9823489  
 Number of evaluations: 1200 -2lnl: 174.0229662  
 Number of evaluations: 1300 -2lnl: 172.527581  
 Number of evaluations: 1400 -2lnl: 175.1405102  
 Number of evaluations: 1500 -2lnl: 172.527581  
 Number of evaluations: 1600 -2lnl: 172.7191316

model4

##   
## crm Model Summary  
##   
## Npar : 20  
## -2lnL: 172.5276  
## AIC : 212.5276  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 1.896998  
## p.(Intercept) -16.779127  
## p.species.facBeaBas -6.457406  
## p.species.facBluDas -5.756508  
## p.species.facCalPen -5.917180  
## p.species.facCarSad -5.624891  
## p.species.facCGrDar -2.097095  
## p.species.facChFCor 16.033678  
## p.species.facComWhi 15.414756  
## p.species.facCrRWhi 15.478310  
## p.species.facDeSSpi -3.481311  
## p.species.facDtTWhi -3.109074  
## p.species.facGrsDar -1.379320  
## p.species.facHudWhi 46.199189  
## p.species.facLanClu -4.627117  
## p.species.facPaiSki 14.197232  
## p.species.facSlaSki -2.801671  
## p.species.facSpaSki -3.957656  
## p.species.facTwSSki -1.379320  
## p.species.facUniClu -4.581280

model23=crm(marked\_dfNMBS,   
 time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9),  
 groups = c("species.fac"),   
 model.parameters=list(p = list(formula = ~1), Phi = list(formular = ~1)))

## Model: CJS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 2 parameters...

##   
 Number of evaluations: 100 -2lnl: 196.7720059  
## Elapsed time in minutes: 0.0072

model23

##   
## crm Model Summary  
##   
## Npar : 2  
## -2lnL: 196.772  
## AIC : 200.772  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 1.812490  
## p.(Intercept) -1.689368

model=cjs.hessian(model23)  
model23

##   
## crm Model Summary  
##   
## Npar : 2  
## -2lnL: 196.772  
## AIC : 200.772  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 1.812490  
## p.(Intercept) -1.689368

CJS: AIC : 184.6449, Phi.(Intercept) -0.4564347, p.(Intercept) -1.5498460

looking at sex and species. phi= apparent survival estimate. p=capture probability (percents) N=population estimate

str(marked\_dfNMBS)

## 'data.frame': 210 obs. of 20 variables:  
## $ location : chr "NMBS" "NMBS" "NMBS" "NMBS" ...  
## $ species : chr "CGrDar" "BeaBas" "PaiSki" "BeaBas" ...  
## $ sex : chr "m" "m" "m" "m" ...  
## $ mark.number : int 1 42 43 44 45 46 47 48 49 50 ...  
## $ Date.of.initial.capture: chr "2-May-18" "25-May-18" "25-May-18" "25-May-18" ...  
## $ c1 : int 1 0 0 0 0 0 0 0 0 0 ...  
## $ c2 : int 0 1 1 1 1 1 1 1 1 1 ...  
## $ c3 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c4 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c5 : int 0 0 0 0 0 1 0 0 0 0 ...  
## $ c6 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c7 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c8 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c9 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c10 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c11 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c12 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ ch : chr "100000000000" "010000000000" "010000000000" "010000000000" ...  
## $ sex.fac : Factor w/ 2 levels "f","m": 2 2 2 2 2 2 2 2 2 2 ...  
## $ species.fac : Factor w/ 19 levels "AmeEme","BeaBas",..: 6 2 15 2 15 15 15 5 15 15 ...

marked\_dfNMBS$sex.fac <- as.factor(marked\_dfNMBS$sex)  
marked\_dfNMBS$species.fac <- as.factor(marked\_dfNMBS$species)  
#modNMBS <- crm(marked\_dfNMBS,   
 #model="JS",   
 #groups = c("sex.fac"),   
 #model.parameters=list(Phi = list(formula = ~sex.fac),   
 #p = list(formula = ~1)))  
  
modNMBS1 <- crm(marked\_dfNMBS,   
 model="JS",   
 groups = c("sex.fac"),   
 model.parameters=list(N = list(formula = ~sex.fac)))

## Model: JS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization 5 parameters  
##   
 Number of evaluations: 100 -2lnl: -446.4674462  
 Number of evaluations: 200 -2lnl: -447.9753212  
 Number of evaluations: 300 -2lnl: -495.5579569  
 Number of evaluations: 400 -2lnl: -504.0039271  
 Number of evaluations: 500 -2lnl: -503.8782343  
 Number of evaluations: 600 -2lnl: -504.0187128  
## Elapsed time in minutes: 0.0275

modNMBS1$results$beta #found online but not sure how to use it

## $Phi  
## (Intercept)   
## -0.8001854   
##   
## $p  
## (Intercept)   
## -0.9118063   
##   
## $pent  
## (Intercept)   
## 2.625479   
##   
## $N  
## (Intercept) sex.facm   
## 3.200334 2.657914

modNMBS1

##   
## crm Model Summary  
##   
## Npar : 5  
## -2lnL: 417.0116  
## AIC : 427.0116  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -0.8001854  
## p.(Intercept) -0.9118063  
## pent.(Intercept) 2.6254790  
## N.(Intercept) 3.2003340  
## N.sex.facm 2.6579140

cjs.hessian(modNMBS1)

##   
 Number of evaluations: 100 -2lnl: 202.6866707

##   
## crm Model Summary  
##   
## Npar : 5  
## -2lnL: 417.0116  
## AIC : 427.0116  
##   
## Beta  
## Estimate se lcl ucl  
## Phi.(Intercept) -0.8001854 3.077367e-01 -1.403349e+00 -1.970215e-01  
## p.(Intercept) -0.9118063 4.474404e-01 -1.788790e+00 -3.482316e-02  
## pent.(Intercept) 2.6254790 1.000000e+05 -1.959974e+05 1.960026e+05  
## N.(Intercept) 3.2003340 1.000000e+05 -1.959968e+05 1.960032e+05  
## N.sex.facm 2.6579140 1.000000e+05 -1.959973e+05 1.960027e+05

str(modNMBS1)

## List of 5  
## $ model : chr "JS"  
## $ data :List of 12  
## ..$ data :'data.frame': 234 obs. of 18 variables:  
## .. ..$ ch : chr [1:234] "0,0,0,0,1,0,0,0,0,0,0,0" "0,0,1,0,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" ...  
## .. ..$ freq : num [1:234] 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ group : Factor w/ 2 levels "1","2": 1 2 2 2 2 2 2 2 2 2 ...  
## .. ..$ mark.number: num [1:234] 300 160 253 256 267 269 272 273 276 280 ...  
## .. ..$ c1 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c2 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c3 : num [1:234] 0 1 0 0 0 0 0 0 0 0 ...  
## .. ..$ c4 : num [1:234] 0 0 1 1 0 0 0 0 0 0 ...  
## .. ..$ c5 : num [1:234] 1 0 0 0 1 1 1 1 1 1 ...  
## .. ..$ c6 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c7 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c8 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c9 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c10 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c11 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c12 : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ sex.fac : Factor w/ 2 levels "f","m": 1 2 2 2 2 2 2 2 2 2 ...  
## .. ..$ id : Factor w/ 234 levels "1","2","3","4",..: 1 2 3 4 5 6 7 8 9 10 ...  
## ..$ model : chr "JS"  
## ..$ mixtures : NULL  
## ..$ freq :'data.frame': 210 obs. of 2 variables:  
## .. ..$ sex.facf: num [1:210] 1 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ sex.facm: num [1:210] 0 1 1 1 1 1 1 1 1 1 ...  
## ..$ nocc : num 12  
## ..$ nocc.secondary : NULL  
## ..$ time.intervals : num [1:11] 1 1 1 1 1 1 1 1 1 1 ...  
## ..$ begin.time : num 1  
## ..$ initial.ages : NULL  
## ..$ group.covariates:'data.frame': 2 obs. of 1 variable:  
## .. ..$ sex.fac: Factor w/ 2 levels "f","m": 1 2  
## ..$ start : num [1:210, 1:2] NA NA NA NA NA NA NA NA NA NA ...  
## .. ..- attr(\*, "dimnames")=List of 2  
## .. .. ..$ : chr [1:210] "0,0,0,0,1,0,0,0,0,0,0,0" "0,0,1,0,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" ...  
## .. .. ..$ : NULL  
## ..$ ehmat : num [1:210, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## $ model.parameters :List of 4  
## ..$ Phi :List of 14  
## .. ..$ begin : num 0  
## .. ..$ num : num -1  
## .. ..$ default : num 1  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "logit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000001ab13950>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi TRUE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ p :List of 14  
## .. ..$ begin : num 0  
## .. ..$ num : num 0  
## .. ..$ default : num 0  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "logit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000001ab13950>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ pent:List of 16  
## .. ..$ begin : num 1  
## .. ..$ num : num -1  
## .. ..$ default : num 0  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "mlogit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000001ab13950>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ include : chr "time"  
## .. ..$ mlogit : chr "id"  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ N :List of 13  
## .. ..$ formula :Class 'formula' language ~sex.fac  
## .. .. .. ..- attr(\*, ".Environment")=<environment: R\_GlobalEnv>   
## .. ..$ begin : num 0  
## .. ..$ num : num(0)   
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "log"  
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## $ design.parameters: list()  
## $ results :List of 9  
## ..$ beta :List of 4  
## .. ..$ Phi : Named num -0.8  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ p : Named num -0.912  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ pent: Named num 2.63  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ N : Named num [1:2] 3.2 2.66  
## .. .. ..- attr(\*, "names")= chr [1:2] "(Intercept)" "sex.facm"  
## ..$ neg2lnl : num 417  
## ..$ AIC : num 427  
## ..$ convergence : num 0  
## ..$ optim.details:List of 13  
## .. ..$ p1 : num -0.8  
## .. ..$ p2 : num -0.912  
## .. ..$ p3 : num 2.63  
## .. ..$ p4 : num 3.2  
## .. ..$ p5 : num 2.66  
## .. ..$ value : num -252  
## .. ..$ fevals : num 78  
## .. ..$ gevals : num 38  
## .. ..$ niter : num NA  
## .. ..$ convcode: num 0  
## .. ..$ kkt1 : logi TRUE  
## .. ..$ kkt2 : logi TRUE  
## .. ..$ xtime : num 0.8  
## .. ..- attr(\*, "details")=List of 5  
## .. .. ..$ method : chr "BFGS"  
## .. .. ..$ ngatend: num [1:5] -1.69e-05 6.46e-05 -2.59e-06 -3.26e-06 4.48e-05  
## .. .. ..$ nhatend: num [1:5, 1:5] 38.348 50.446 0.284 36.148 33.78 ...  
## .. .. ..$ hev : num [1:5] 406.218 30.512 6.223 2.3 0.973  
## .. .. ..$ message: chr "none"  
## .. ..- attr(\*, "maximize")= logi FALSE  
## .. ..- attr(\*, "npar")= int 5  
## ..$ model\_data :List of 9  
## .. ..$ Phi.dm : num [1:2574, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:2574] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ p.dm : num [1:2808, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:2808] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ pent.dm : num [1:2574, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:2574] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ N.dm : num [1:2, 1:2] 1 1 0 1  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:2] "1" "2"  
## .. .. .. ..$ : chr [1:2] "(Intercept)" "sex.facm"  
## .. ..$ imat :List of 11  
## .. .. ..$ nocc : int 12  
## .. .. ..$ freq : num [1:234] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..$ first: num [1:234] 5 3 4 4 5 5 5 5 5 5 ...  
## .. .. ..$ last : num [1:234] 5 3 4 4 5 5 5 5 5 5 ...  
## .. .. ..$ loc : num [1:234] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ chmat: num [1:234, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ FtoL : num [1:234, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ Fplus: num [1:234, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ Lplus: num [1:234, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ L : num [1:234, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ First: num [1:234, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ Phi.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ p.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ pent.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ time.intervals: num [1:234, 1:11] 1 1 1 1 1 1 1 1 1 1 ...  
## ..$ ns : num [1:2(1d)] 14 196  
## .. ..- attr(\*, "dimnames")=List of 1  
## .. .. ..$ : chr [1:2] "1" "2"  
## ..$ options :List of 7  
## .. ..$ scale :List of 4  
## .. .. ..$ Phi : Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ p : Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ pent: Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ N : Named num [1:2] 1 1  
## .. .. .. ..- attr(\*, "names")= chr [1:2] "(Intercept)" "sex.facm"  
## .. ..$ accumulate: logi FALSE  
## .. ..$ initial :List of 4  
## .. .. ..$ Phi : Named num -1.77  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ p : Named num -1.1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ pent: Named num 0  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ N : Named num [1:2] 0 0  
## .. .. .. ..- attr(\*, "names")= chr [1:2] "(Intercept)" "sex.facm"  
## .. ..$ method : chr "BFGS"  
## .. ..$ chunk\_size: num 1e+07  
## .. ..$ itnmax : num 5000  
## .. ..$ control : list()  
## ..$ reals :List of 4  
## .. ..$ Phi :'data.frame': 1 obs. of 2 variables:  
## .. .. ..$ occ : int 1  
## .. .. ..$ estimate: num 0.31  
## .. ..$ p :'data.frame': 1 obs. of 2 variables:  
## .. .. ..$ occ : int 1  
## .. .. ..$ estimate: num 0.287  
## .. ..$ pent:'data.frame': 11 obs. of 3 variables:  
## .. .. ..$ time : Factor w/ 11 levels "2","3","4","5",..: 1 2 3 4 5 6 7 8 9 10 ...  
## .. .. ..$ occ : int [1:11] 2 3 4 5 6 7 8 9 10 11 ...  
## .. .. ..$ estimate: num [1:11] 0.0903 0.0903 0.0903 0.0903 0.0903 ...  
## .. ..$ N :'data.frame': 2 obs. of 2 variables:  
## .. .. ..$ sex.fac : Factor w/ 2 levels "f","m": 1 2  
## .. .. ..$ estimate: num [1:2] 24.5 350.1  
## ..- attr(\*, "class")= chr [1:3] "crm" "mle" "js"  
## - attr(\*, "class")= chr [1:3] "crm" "mle" "js"

# get values on real scale and not logit or log scales  
modNMBS1$results$reals

## $Phi  
## occ estimate  
## 1 1 0.3099859  
##   
## $p  
## occ estimate  
## 1 1 0.2866303  
##   
## $pent  
## time occ estimate  
## 1 2 2 0.09031461  
## 2 3 3 0.09031461  
## 3 4 4 0.09031461  
## 4 5 5 0.09031461  
## 5 6 6 0.09031461  
## 6 7 7 0.09031461  
## 7 8 8 0.09031461  
## 8 9 9 0.09031461  
## 9 10 10 0.09031461  
## 10 11 11 0.09031461  
## 11 12 12 0.09031461  
##   
## $N  
## sex.fac estimate  
## 1 f 24.54073  
## 2 m 350.11023

#modNMBS <- crm(marked\_dfNMBS,   
 # model="JS",   
 # groups = c("species.fac"),   
 # model.parameters=list(Phi = list(formula = ~species.fac), #should have for one or the other, not both  
 # p = list(formula = ~species.fac)))  
  
modNMBS2 <- crm(marked\_dfNMBS,   
 model="JS",   
 groups = c("species.fac"),   
 model.parameters=list(N = list(formula = ~species.fac)))

## Model: JS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization 22 parameters  
##   
 Number of evaluations: 100 -2lnl: 344.8173268  
 Number of evaluations: 200 -2lnl: 294.801433  
 Number of evaluations: 300 -2lnl: 272.8674901  
 Number of evaluations: 400 -2lnl: 263.8736948  
 Number of evaluations: 500 -2lnl: 258.0142685  
 Number of evaluations: 600 -2lnl: 254.8813286  
 Number of evaluations: 700 -2lnl: 252.7607098  
 Number of evaluations: 800 -2lnl: 251.3456744  
 Number of evaluations: 900 -2lnl: 251.0201377  
 Number of evaluations: 1000 -2lnl: 249.9851481  
 Number of evaluations: 1100 -2lnl: 249.3476148  
 Number of evaluations: 1200 -2lnl: 249.2540455  
 Number of evaluations: 1300 -2lnl: 249.1576647  
 Number of evaluations: 1400 -2lnl: 249.0737334  
 Number of evaluations: 1500 -2lnl: 249.0448788  
 Number of evaluations: 1600 -2lnl: 249.0303951  
 Number of evaluations: 1700 -2lnl: 249.0291478  
 Number of evaluations: 1800 -2lnl: 249.0285777  
 Number of evaluations: 1900 -2lnl: 249.0277551  
 Number of evaluations: 2000 -2lnl: 249.0276568  
 Number of evaluations: 2100 -2lnl: 249.2326447  
 Number of evaluations: 2200 -2lnl: 249.0275732  
 Number of evaluations: 2300 -2lnl: 255.8018233  
 Number of evaluations: 2400 -2lnl: 249.0442128  
 Number of evaluations: 2500 -2lnl: 249.2631405  
 Number of evaluations: 2600 -2lnl: 249.0297809  
 Number of evaluations: 2700 -2lnl: 249.0731793  
 Number of evaluations: 2800 -2lnl: 249.067177  
 Number of evaluations: 2900 -2lnl: 249.2326643  
 Number of evaluations: 3000 -2lnl: 249.0647619  
 Number of evaluations: 3100 -2lnl: 249.0276018  
 Number of evaluations: 3200 -2lnl: 249.0364649  
 Number of evaluations: 3300 -2lnl: 249.0509222  
 Number of evaluations: 3400 -2lnl: 249.0295162  
 Number of evaluations: 3500 -2lnl: 249.2326643  
 Number of evaluations: 3600 -2lnl: 249.0275754  
 Number of evaluations: 3700 -2lnl: 249.045636  
 Number of evaluations: 3800 -2lnl: 249.0404525  
 Number of evaluations: 3900 -2lnl: 249.0276018  
 Number of evaluations: 4000 -2lnl: 249.031725  
 Number of evaluations: 4100 -2lnl: 249.0615626  
 Number of evaluations: 4200 -2lnl: 249.027571  
## Elapsed time in minutes: 0.2927

modNMBS2$results$beta

## $Phi  
## (Intercept)   
## -1.357645   
##   
## $p  
## (Intercept)   
## 0.5425053   
##   
## $pent  
## (Intercept)   
## 2.856326   
##   
## $N  
## (Intercept) species.facBeaBas species.facBluDas species.facCalPen   
## 2.61686644 -1.77538727 -2.74034204 -2.30631041   
## species.facCarSad species.facCGrDar species.facChFCor species.facComWhi   
## -2.00574279 -3.55095157 0.21657184 -1.29672316   
## species.facCrRWhi species.facDeSSpi species.facDtTWhi species.facGrsDar   
## 0.82354284 -2.74034204 -13.43536273 -13.43536273   
## species.facHudWhi species.facLanClu species.facPaiSki species.facSlaSki   
## -13.43536273 -3.55095157 0.09857027 -13.43536274   
## species.facSpaSki species.facTwSSki species.facUniClu   
## -13.43536274 -13.43536274 -2.74034204

modNMBS2

##   
## crm Model Summary  
##   
## Npar : 22  
## -2lnL: 751.8998  
## AIC : 795.8998  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -1.35764528  
## p.(Intercept) 0.54250526  
## pent.(Intercept) 2.85632633  
## N.(Intercept) 2.61686644  
## N.species.facBeaBas -1.77538727  
## N.species.facBluDas -2.74034204  
## N.species.facCalPen -2.30631041  
## N.species.facCarSad -2.00574279  
## N.species.facCGrDar -3.55095157  
## N.species.facChFCor 0.21657184  
## N.species.facComWhi -1.29672316  
## N.species.facCrRWhi 0.82354284  
## N.species.facDeSSpi -2.74034204  
## N.species.facDtTWhi -13.43536273  
## N.species.facGrsDar -13.43536273  
## N.species.facHudWhi -13.43536273  
## N.species.facLanClu -3.55095157  
## N.species.facPaiSki 0.09857027  
## N.species.facSlaSki -13.43536274  
## N.species.facSpaSki -13.43536274  
## N.species.facTwSSki -13.43536274  
## N.species.facUniClu -2.74034204

modNMBS2$results$reals

## $Phi  
## occ estimate  
## 1 1 0.2046233  
##   
## $p  
## occ estimate  
## 1 1 0.632395  
##   
## $pent  
## time occ estimate  
## 1 2 2 0.09043652  
## 2 3 3 0.09043652  
## 3 4 4 0.09043652  
## 4 5 5 0.09043652  
## 5 6 6 0.09043652  
## 6 7 7 0.09043652  
## 7 8 8 0.09043652  
## 8 9 9 0.09043652  
## 9 10 10 0.09043652  
## 10 11 11 0.09043652  
## 11 12 12 0.09043652  
##   
## $N  
## species.fac estimate  
## 1 AmeEme 1.369275e+01  
## 2 BeaBas 2.319796e+00  
## 3 BluDas 8.838432e-01  
## 4 CalPen 1.364183e+00  
## 5 CarSad 1.842501e+00  
## 6 CGrDar 3.929452e-01  
## 7 ChFCor 1.700382e+01  
## 8 ComWhi 3.743958e+00  
## 9 CrRWhi 3.119972e+01  
## 10 DeSSpi 8.838432e-01  
## 11 DtTWhi 2.002566e-05  
## 12 GrsDar 2.002566e-05  
## 13 HudWhi 2.002566e-05  
## 14 LanClu 3.929452e-01  
## 15 PaiSki 1.511121e+01  
## 16 SlaSki 2.002566e-05  
## 17 SpaSki 2.002566e-05  
## 18 TwSSki 2.002566e-05  
## 19 UniClu 8.838432e-01

cjs.hessian(modNMBS2)

##   
 Number of evaluations: 100 -2lnl: 214.9826221  
 Number of evaluations: 200 -2lnl: 214.80062  
 Number of evaluations: 300 -2lnl: 215.2667466  
 Number of evaluations: 400 -2lnl: 214.9826221  
 Number of evaluations: 500 -2lnl: 214.9826221  
 Number of evaluations: 600 -2lnl: 214.9826221  
 Number of evaluations: 700 -2lnl: 214.9826221  
 Number of evaluations: 800 -2lnl: 214.9826221  
 Number of evaluations: 900 -2lnl: 214.9826221  
 Number of evaluations: 1000 -2lnl: 214.9826221  
 Number of evaluations: 1100 -2lnl: 214.9826221  
 Number of evaluations: 1200 -2lnl: 214.9826221  
 Number of evaluations: 1300 -2lnl: 214.9826221  
 Number of evaluations: 1400 -2lnl: 214.9826221  
 Number of evaluations: 1500 -2lnl: 214.9826221  
 Number of evaluations: 1600 -2lnl: 214.9826221  
 Number of evaluations: 1700 -2lnl: 215.2667466  
 Number of evaluations: 1800 -2lnl: 214.9826221  
 Number of evaluations: 1900 -2lnl: 214.9826221  
 Number of evaluations: 2000 -2lnl: 214.9826221

##   
## crm Model Summary  
##   
## Npar : 22  
## -2lnL: 751.8998  
## AIC : 795.8998  
##   
## Beta  
## Estimate se lcl ucl  
## Phi.(Intercept) -1.35764528 2.783785e-01 -1.903267e+00 -8.120234e-01  
## p.(Intercept) 0.54250526 7.018932e-01 -8.332054e-01 1.918216e+00  
## pent.(Intercept) 2.85632633 1.000000e+05 -1.959971e+05 1.960029e+05  
## N.(Intercept) 2.61686644 1.000000e+05 -1.959974e+05 1.960026e+05  
## N.species.facBeaBas -1.77538727 1.000000e+05 -1.960018e+05 1.959982e+05  
## N.species.facBluDas -2.74034204 1.000000e+05 -1.960027e+05 1.959973e+05  
## N.species.facCalPen -2.30631041 1.000000e+05 -1.960023e+05 1.959977e+05  
## N.species.facCarSad -2.00574279 1.000000e+05 -1.960020e+05 1.959980e+05  
## N.species.facCGrDar -3.55095157 1.000000e+05 -1.960036e+05 1.959964e+05  
## N.species.facChFCor 0.21657184 1.000000e+05 -1.959998e+05 1.960002e+05  
## N.species.facComWhi -1.29672316 1.000000e+05 -1.960013e+05 1.959987e+05  
## N.species.facCrRWhi 0.82354284 1.000000e+05 -1.959992e+05 1.960008e+05  
## N.species.facDeSSpi -2.74034204 1.000000e+05 -1.960027e+05 1.959973e+05  
## N.species.facDtTWhi -13.43536273 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facGrsDar -13.43536273 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facHudWhi -13.43536273 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facLanClu -3.55095157 1.000000e+05 -1.960036e+05 1.959964e+05  
## N.species.facPaiSki 0.09857027 1.000000e+05 -1.959999e+05 1.960001e+05  
## N.species.facSlaSki -13.43536274 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facSpaSki -13.43536274 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facTwSSki -13.43536274 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facUniClu -2.74034204 1.000000e+05 -1.960027e+05 1.959973e+05

str(modNMBS2)

## List of 5  
## $ model : chr "JS"  
## $ data :List of 12  
## ..$ data :'data.frame': 438 obs. of 18 variables:  
## .. ..$ ch : chr [1:438] "0,0,0,0,1,0,0,0,0,0,0,0" "0,0,1,0,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" ...  
## .. ..$ freq : num [1:438] 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ group : Factor w/ 19 levels "1","2","3","4",..: 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ mark.number: num [1:438] 300 160 253 256 267 269 272 273 276 280 ...  
## .. ..$ c1 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c2 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c3 : num [1:438] 0 1 0 0 0 0 0 0 0 0 ...  
## .. ..$ c4 : num [1:438] 0 0 1 1 0 0 0 0 0 0 ...  
## .. ..$ c5 : num [1:438] 1 0 0 0 1 1 1 1 1 1 ...  
## .. ..$ c6 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c7 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c8 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c9 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c10 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c11 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c12 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.fac: Factor w/ 19 levels "AmeEme","BeaBas",..: 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ id : Factor w/ 438 levels "1","2","3","4",..: 1 2 3 4 5 6 7 8 9 10 ...  
## ..$ model : chr "JS"  
## ..$ mixtures : NULL  
## ..$ freq :'data.frame': 210 obs. of 19 variables:  
## .. ..$ species.facAmeEme: num [1:210] 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ species.facBeaBas: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facBluDas: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facCalPen: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facCarSad: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facCGrDar: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facChFCor: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facComWhi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facCrRWhi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facDeSSpi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facDtTWhi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facGrsDar: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facHudWhi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facLanClu: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facPaiSki: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facSlaSki: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facSpaSki: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facTwSSki: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facUniClu: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## ..$ nocc : num 12  
## ..$ nocc.secondary : NULL  
## ..$ time.intervals : num [1:11] 1 1 1 1 1 1 1 1 1 1 ...  
## ..$ begin.time : num 1  
## ..$ initial.ages : NULL  
## ..$ group.covariates:'data.frame': 19 obs. of 1 variable:  
## .. ..$ species.fac: Factor w/ 19 levels "AmeEme","BeaBas",..: 1 2 3 4 5 6 7 8 9 10 ...  
## ..$ start : num [1:210, 1:2] NA NA NA NA NA NA NA NA NA NA ...  
## .. ..- attr(\*, "dimnames")=List of 2  
## .. .. ..$ : chr [1:210] "0,0,0,0,1,0,0,0,0,0,0,0" "0,0,1,0,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" ...  
## .. .. ..$ : NULL  
## ..$ ehmat : num [1:210, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## $ model.parameters :List of 4  
## ..$ Phi :List of 14  
## .. ..$ begin : num 0  
## .. ..$ num : num -1  
## .. ..$ default : num 1  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "logit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x0000000023ee26e0>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi TRUE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ p :List of 14  
## .. ..$ begin : num 0  
## .. ..$ num : num 0  
## .. ..$ default : num 0  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "logit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x0000000023ee26e0>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ pent:List of 16  
## .. ..$ begin : num 1  
## .. ..$ num : num -1  
## .. ..$ default : num 0  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "mlogit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x0000000023ee26e0>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ include : chr "time"  
## .. ..$ mlogit : chr "id"  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ N :List of 13  
## .. ..$ formula :Class 'formula' language ~species.fac  
## .. .. .. ..- attr(\*, ".Environment")=<environment: R\_GlobalEnv>   
## .. ..$ begin : num 0  
## .. ..$ num : num(0)   
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "log"  
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## $ design.parameters: list()  
## $ results :List of 9  
## ..$ beta :List of 4  
## .. ..$ Phi : Named num -1.36  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ p : Named num 0.543  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ pent: Named num 2.86  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ N : Named num [1:19] 2.62 -1.78 -2.74 -2.31 -2.01 ...  
## .. .. ..- attr(\*, "names")= chr [1:19] "(Intercept)" "species.facBeaBas" "species.facBluDas" "species.facCalPen" ...  
## ..$ neg2lnl : num 752  
## ..$ AIC : num 796  
## ..$ convergence : num 0  
## ..$ optim.details:List of 30  
## .. ..$ p1 : num -1.36  
## .. ..$ p2 : num 0.543  
## .. ..$ p3 : num 2.86  
## .. ..$ p4 : num 2.62  
## .. ..$ p5 : num -1.78  
## .. ..$ p6 : num -2.74  
## .. ..$ p7 : num -2.31  
## .. ..$ p8 : num -2.01  
## .. ..$ p9 : num -3.55  
## .. ..$ p10 : num 0.217  
## .. ..$ p11 : num -1.3  
## .. ..$ p12 : num 0.824  
## .. ..$ p13 : num -2.74  
## .. ..$ p14 : num -13.4  
## .. ..$ p15 : num -13.4  
## .. ..$ p16 : num -13.4  
## .. ..$ p17 : num -3.55  
## .. ..$ p18 : num 0.0986  
## .. ..$ p19 : num -13.4  
## .. ..$ p20 : num -13.4  
## .. ..$ p21 : num -13.4  
## .. ..$ p22 : num -2.74  
## .. ..$ value : num 125  
## .. ..$ fevals : num 64  
## .. ..$ gevals : num 46  
## .. ..$ niter : num NA  
## .. ..$ convcode: num 0  
## .. ..$ kkt1 : logi TRUE  
## .. ..$ kkt2 : logi FALSE  
## .. ..$ xtime : num 8.07  
## .. ..- attr(\*, "details")=List of 5  
## .. .. ..$ method : chr "BFGS"  
## .. .. ..$ ngatend: num [1:22] 0.002599 -0.000568 0.001427 -0.000972 -0.000084 ...  
## .. .. ..$ nhatend: num [1:22, 1:22] 31.8391 20.8141 0.0763 11.0578 0.2859 ...  
## .. .. ..$ hev : num [1:22] 141.4 28.5 16.2 10.5 4.5 ...  
## .. .. ..$ message: chr "none"  
## .. ..- attr(\*, "maximize")= logi FALSE  
## .. ..- attr(\*, "npar")= int 22  
## ..$ model\_data :List of 9  
## .. ..$ Phi.dm : num [1:4818, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:4818] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ p.dm : num [1:5256, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:5256] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ pent.dm : num [1:4818, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:4818] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ N.dm : num [1:19, 1:19] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:19] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr [1:19] "(Intercept)" "species.facBeaBas" "species.facBluDas" "species.facCalPen" ...  
## .. ..$ imat :List of 11  
## .. .. ..$ nocc : int 12  
## .. .. ..$ freq : num [1:438] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..$ first: num [1:438] 5 3 4 4 5 5 5 5 5 5 ...  
## .. .. ..$ last : num [1:438] 5 3 4 4 5 5 5 5 5 5 ...  
## .. .. ..$ loc : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ chmat: num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ FtoL : num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ Fplus: num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ Lplus: num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ L : num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ First: num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ Phi.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ p.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ pent.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ time.intervals: num [1:438, 1:11] 1 1 1 1 1 1 1 1 1 1 ...  
## ..$ ns : num [1:19(1d)] 30 6 3 4 5 2 37 9 67 3 ...  
## .. ..- attr(\*, "dimnames")=List of 1  
## .. .. ..$ : chr [1:19] "1" "2" "3" "4" ...  
## ..$ options :List of 7  
## .. ..$ scale :List of 4  
## .. .. ..$ Phi : Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ p : Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ pent: Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ N : Named num [1:19] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. .. ..- attr(\*, "names")= chr [1:19] "(Intercept)" "species.facBeaBas" "species.facBluDas" "species.facCalPen" ...  
## .. ..$ accumulate: logi FALSE  
## .. ..$ initial :List of 4  
## .. .. ..$ Phi : Named num -1.77  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ p : Named num -1.1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ pent: Named num 0  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ N : Named num [1:19] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. .. ..- attr(\*, "names")= chr [1:19] "(Intercept)" "species.facBeaBas" "species.facBluDas" "species.facCalPen" ...  
## .. ..$ method : chr "BFGS"  
## .. ..$ chunk\_size: num 1e+07  
## .. ..$ itnmax : num 5000  
## .. ..$ control : list()  
## ..$ reals :List of 4  
## .. ..$ Phi :'data.frame': 1 obs. of 2 variables:  
## .. .. ..$ occ : int 1  
## .. .. ..$ estimate: num 0.205  
## .. ..$ p :'data.frame': 1 obs. of 2 variables:  
## .. .. ..$ occ : int 1  
## .. .. ..$ estimate: num 0.632  
## .. ..$ pent:'data.frame': 11 obs. of 3 variables:  
## .. .. ..$ time : Factor w/ 11 levels "2","3","4","5",..: 1 2 3 4 5 6 7 8 9 10 ...  
## .. .. ..$ occ : int [1:11] 2 3 4 5 6 7 8 9 10 11 ...  
## .. .. ..$ estimate: num [1:11] 0.0904 0.0904 0.0904 0.0904 0.0904 ...  
## .. ..$ N :'data.frame': 19 obs. of 2 variables:  
## .. .. ..$ species.fac: Factor w/ 19 levels "AmeEme","BeaBas",..: 1 2 3 4 5 6 7 8 9 10 ...  
## .. .. ..$ estimate : num [1:19] 13.693 2.32 0.884 1.364 1.843 ...  
## ..- attr(\*, "class")= chr [1:3] "crm" "mle" "js"  
## - attr(\*, "class")= chr [1:3] "crm" "mle" "js"

# get values on real scale and not logit or log scales  
modNMBS2$results$reals

## $Phi  
## occ estimate  
## 1 1 0.2046233  
##   
## $p  
## occ estimate  
## 1 1 0.632395  
##   
## $pent  
## time occ estimate  
## 1 2 2 0.09043652  
## 2 3 3 0.09043652  
## 3 4 4 0.09043652  
## 4 5 5 0.09043652  
## 5 6 6 0.09043652  
## 6 7 7 0.09043652  
## 7 8 8 0.09043652  
## 8 9 9 0.09043652  
## 9 10 10 0.09043652  
## 10 11 11 0.09043652  
## 11 12 12 0.09043652  
##   
## $N  
## species.fac estimate  
## 1 AmeEme 1.369275e+01  
## 2 BeaBas 2.319796e+00  
## 3 BluDas 8.838432e-01  
## 4 CalPen 1.364183e+00  
## 5 CarSad 1.842501e+00  
## 6 CGrDar 3.929452e-01  
## 7 ChFCor 1.700382e+01  
## 8 ComWhi 3.743958e+00  
## 9 CrRWhi 3.119972e+01  
## 10 DeSSpi 8.838432e-01  
## 11 DtTWhi 2.002566e-05  
## 12 GrsDar 2.002566e-05  
## 13 HudWhi 2.002566e-05  
## 14 LanClu 3.929452e-01  
## 15 PaiSki 1.511121e+01  
## 16 SlaSki 2.002566e-05  
## 17 SpaSki 2.002566e-05  
## 18 TwSSki 2.002566e-05  
## 19 UniClu 8.838432e-01

modNMBS3 <- crm(marked\_dfNMBS,   
 model="JS",   
 groups = c("species.fac"),   
 model.parameters=list(N = list(formula = ~species.fac)))

## Model: JS

## Processing data...

## 210 capture histories collapsed into 210

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization 22 parameters  
##   
 Number of evaluations: 100 -2lnl: 344.8173268  
 Number of evaluations: 200 -2lnl: 294.801433  
 Number of evaluations: 300 -2lnl: 272.8674901  
 Number of evaluations: 400 -2lnl: 263.8736948  
 Number of evaluations: 500 -2lnl: 258.0142685  
 Number of evaluations: 600 -2lnl: 254.8813286  
 Number of evaluations: 700 -2lnl: 252.7607098  
 Number of evaluations: 800 -2lnl: 251.3456744  
 Number of evaluations: 900 -2lnl: 251.0201377  
 Number of evaluations: 1000 -2lnl: 249.9851481  
 Number of evaluations: 1100 -2lnl: 249.3476148  
 Number of evaluations: 1200 -2lnl: 249.2540455  
 Number of evaluations: 1300 -2lnl: 249.1576647  
 Number of evaluations: 1400 -2lnl: 249.0737334  
 Number of evaluations: 1500 -2lnl: 249.0448788  
 Number of evaluations: 1600 -2lnl: 249.0303951  
 Number of evaluations: 1700 -2lnl: 249.0291478  
 Number of evaluations: 1800 -2lnl: 249.0285777  
 Number of evaluations: 1900 -2lnl: 249.0277551  
 Number of evaluations: 2000 -2lnl: 249.0276568  
 Number of evaluations: 2100 -2lnl: 249.2326447  
 Number of evaluations: 2200 -2lnl: 249.0275732  
 Number of evaluations: 2300 -2lnl: 255.8018233  
 Number of evaluations: 2400 -2lnl: 249.0442128  
 Number of evaluations: 2500 -2lnl: 249.2631405  
 Number of evaluations: 2600 -2lnl: 249.0297809  
 Number of evaluations: 2700 -2lnl: 249.0731793  
 Number of evaluations: 2800 -2lnl: 249.067177  
 Number of evaluations: 2900 -2lnl: 249.2326643  
 Number of evaluations: 3000 -2lnl: 249.0647619  
 Number of evaluations: 3100 -2lnl: 249.0276018  
 Number of evaluations: 3200 -2lnl: 249.0364649  
 Number of evaluations: 3300 -2lnl: 249.0509222  
 Number of evaluations: 3400 -2lnl: 249.0295162  
 Number of evaluations: 3500 -2lnl: 249.2326643  
 Number of evaluations: 3600 -2lnl: 249.0275754  
 Number of evaluations: 3700 -2lnl: 249.045636  
 Number of evaluations: 3800 -2lnl: 249.0404525  
 Number of evaluations: 3900 -2lnl: 249.0276018  
 Number of evaluations: 4000 -2lnl: 249.031725  
 Number of evaluations: 4100 -2lnl: 249.0615626  
 Number of evaluations: 4200 -2lnl: 249.027571  
## Elapsed time in minutes: 0.294

modNMBS3$results$beta

## $Phi  
## (Intercept)   
## -1.357645   
##   
## $p  
## (Intercept)   
## 0.5425053   
##   
## $pent  
## (Intercept)   
## 2.856326   
##   
## $N  
## (Intercept) species.facBeaBas species.facBluDas species.facCalPen   
## 2.61686644 -1.77538727 -2.74034204 -2.30631041   
## species.facCarSad species.facCGrDar species.facChFCor species.facComWhi   
## -2.00574279 -3.55095157 0.21657184 -1.29672316   
## species.facCrRWhi species.facDeSSpi species.facDtTWhi species.facGrsDar   
## 0.82354284 -2.74034204 -13.43536273 -13.43536273   
## species.facHudWhi species.facLanClu species.facPaiSki species.facSlaSki   
## -13.43536273 -3.55095157 0.09857027 -13.43536274   
## species.facSpaSki species.facTwSSki species.facUniClu   
## -13.43536274 -13.43536274 -2.74034204

modNMBS3

##   
## crm Model Summary  
##   
## Npar : 22  
## -2lnL: 751.8998  
## AIC : 795.8998  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -1.35764528  
## p.(Intercept) 0.54250526  
## pent.(Intercept) 2.85632633  
## N.(Intercept) 2.61686644  
## N.species.facBeaBas -1.77538727  
## N.species.facBluDas -2.74034204  
## N.species.facCalPen -2.30631041  
## N.species.facCarSad -2.00574279  
## N.species.facCGrDar -3.55095157  
## N.species.facChFCor 0.21657184  
## N.species.facComWhi -1.29672316  
## N.species.facCrRWhi 0.82354284  
## N.species.facDeSSpi -2.74034204  
## N.species.facDtTWhi -13.43536273  
## N.species.facGrsDar -13.43536273  
## N.species.facHudWhi -13.43536273  
## N.species.facLanClu -3.55095157  
## N.species.facPaiSki 0.09857027  
## N.species.facSlaSki -13.43536274  
## N.species.facSpaSki -13.43536274  
## N.species.facTwSSki -13.43536274  
## N.species.facUniClu -2.74034204

modNMBS3$results$reals

## $Phi  
## occ estimate  
## 1 1 0.2046233  
##   
## $p  
## occ estimate  
## 1 1 0.632395  
##   
## $pent  
## time occ estimate  
## 1 2 2 0.09043652  
## 2 3 3 0.09043652  
## 3 4 4 0.09043652  
## 4 5 5 0.09043652  
## 5 6 6 0.09043652  
## 6 7 7 0.09043652  
## 7 8 8 0.09043652  
## 8 9 9 0.09043652  
## 9 10 10 0.09043652  
## 10 11 11 0.09043652  
## 11 12 12 0.09043652  
##   
## $N  
## species.fac estimate  
## 1 AmeEme 1.369275e+01  
## 2 BeaBas 2.319796e+00  
## 3 BluDas 8.838432e-01  
## 4 CalPen 1.364183e+00  
## 5 CarSad 1.842501e+00  
## 6 CGrDar 3.929452e-01  
## 7 ChFCor 1.700382e+01  
## 8 ComWhi 3.743958e+00  
## 9 CrRWhi 3.119972e+01  
## 10 DeSSpi 8.838432e-01  
## 11 DtTWhi 2.002566e-05  
## 12 GrsDar 2.002566e-05  
## 13 HudWhi 2.002566e-05  
## 14 LanClu 3.929452e-01  
## 15 PaiSki 1.511121e+01  
## 16 SlaSki 2.002566e-05  
## 17 SpaSki 2.002566e-05  
## 18 TwSSki 2.002566e-05  
## 19 UniClu 8.838432e-01

cjs.hessian(modNMBS3)

##   
 Number of evaluations: 100 -2lnl: 214.9826221  
 Number of evaluations: 200 -2lnl: 214.80062  
 Number of evaluations: 300 -2lnl: 215.2667466  
 Number of evaluations: 400 -2lnl: 214.9826221  
 Number of evaluations: 500 -2lnl: 214.9826221  
 Number of evaluations: 600 -2lnl: 214.9826221  
 Number of evaluations: 700 -2lnl: 214.9826221  
 Number of evaluations: 800 -2lnl: 214.9826221  
 Number of evaluations: 900 -2lnl: 214.9826221  
 Number of evaluations: 1000 -2lnl: 214.9826221  
 Number of evaluations: 1100 -2lnl: 214.9826221  
 Number of evaluations: 1200 -2lnl: 214.9826221  
 Number of evaluations: 1300 -2lnl: 214.9826221  
 Number of evaluations: 1400 -2lnl: 214.9826221  
 Number of evaluations: 1500 -2lnl: 214.9826221  
 Number of evaluations: 1600 -2lnl: 214.9826221  
 Number of evaluations: 1700 -2lnl: 215.2667466  
 Number of evaluations: 1800 -2lnl: 214.9826221  
 Number of evaluations: 1900 -2lnl: 214.9826221  
 Number of evaluations: 2000 -2lnl: 214.9826221

##   
## crm Model Summary  
##   
## Npar : 22  
## -2lnL: 751.8998  
## AIC : 795.8998  
##   
## Beta  
## Estimate se lcl ucl  
## Phi.(Intercept) -1.35764528 2.783785e-01 -1.903267e+00 -8.120234e-01  
## p.(Intercept) 0.54250526 7.018932e-01 -8.332054e-01 1.918216e+00  
## pent.(Intercept) 2.85632633 1.000000e+05 -1.959971e+05 1.960029e+05  
## N.(Intercept) 2.61686644 1.000000e+05 -1.959974e+05 1.960026e+05  
## N.species.facBeaBas -1.77538727 1.000000e+05 -1.960018e+05 1.959982e+05  
## N.species.facBluDas -2.74034204 1.000000e+05 -1.960027e+05 1.959973e+05  
## N.species.facCalPen -2.30631041 1.000000e+05 -1.960023e+05 1.959977e+05  
## N.species.facCarSad -2.00574279 1.000000e+05 -1.960020e+05 1.959980e+05  
## N.species.facCGrDar -3.55095157 1.000000e+05 -1.960036e+05 1.959964e+05  
## N.species.facChFCor 0.21657184 1.000000e+05 -1.959998e+05 1.960002e+05  
## N.species.facComWhi -1.29672316 1.000000e+05 -1.960013e+05 1.959987e+05  
## N.species.facCrRWhi 0.82354284 1.000000e+05 -1.959992e+05 1.960008e+05  
## N.species.facDeSSpi -2.74034204 1.000000e+05 -1.960027e+05 1.959973e+05  
## N.species.facDtTWhi -13.43536273 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facGrsDar -13.43536273 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facHudWhi -13.43536273 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facLanClu -3.55095157 1.000000e+05 -1.960036e+05 1.959964e+05  
## N.species.facPaiSki 0.09857027 1.000000e+05 -1.959999e+05 1.960001e+05  
## N.species.facSlaSki -13.43536274 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facSpaSki -13.43536274 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facTwSSki -13.43536274 1.000000e+05 -1.960134e+05 1.959866e+05  
## N.species.facUniClu -2.74034204 1.000000e+05 -1.960027e+05 1.959973e+05

str(modNMBS3)

## List of 5  
## $ model : chr "JS"  
## $ data :List of 12  
## ..$ data :'data.frame': 438 obs. of 18 variables:  
## .. ..$ ch : chr [1:438] "0,0,0,0,1,0,0,0,0,0,0,0" "0,0,1,0,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" ...  
## .. ..$ freq : num [1:438] 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ group : Factor w/ 19 levels "1","2","3","4",..: 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ mark.number: num [1:438] 300 160 253 256 267 269 272 273 276 280 ...  
## .. ..$ c1 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c2 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c3 : num [1:438] 0 1 0 0 0 0 0 0 0 0 ...  
## .. ..$ c4 : num [1:438] 0 0 1 1 0 0 0 0 0 0 ...  
## .. ..$ c5 : num [1:438] 1 0 0 0 1 1 1 1 1 1 ...  
## .. ..$ c6 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c7 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c8 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c9 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c10 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c11 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c12 : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.fac: Factor w/ 19 levels "AmeEme","BeaBas",..: 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ id : Factor w/ 438 levels "1","2","3","4",..: 1 2 3 4 5 6 7 8 9 10 ...  
## ..$ model : chr "JS"  
## ..$ mixtures : NULL  
## ..$ freq :'data.frame': 210 obs. of 19 variables:  
## .. ..$ species.facAmeEme: num [1:210] 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ species.facBeaBas: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facBluDas: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facCalPen: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facCarSad: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facCGrDar: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facChFCor: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facComWhi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facCrRWhi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facDeSSpi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facDtTWhi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facGrsDar: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facHudWhi: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facLanClu: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facPaiSki: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facSlaSki: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facSpaSki: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facTwSSki: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ species.facUniClu: num [1:210] 0 0 0 0 0 0 0 0 0 0 ...  
## ..$ nocc : num 12  
## ..$ nocc.secondary : NULL  
## ..$ time.intervals : num [1:11] 1 1 1 1 1 1 1 1 1 1 ...  
## ..$ begin.time : num 1  
## ..$ initial.ages : NULL  
## ..$ group.covariates:'data.frame': 19 obs. of 1 variable:  
## .. ..$ species.fac: Factor w/ 19 levels "AmeEme","BeaBas",..: 1 2 3 4 5 6 7 8 9 10 ...  
## ..$ start : num [1:210, 1:2] NA NA NA NA NA NA NA NA NA NA ...  
## .. ..- attr(\*, "dimnames")=List of 2  
## .. .. ..$ : chr [1:210] "0,0,0,0,1,0,0,0,0,0,0,0" "0,0,1,0,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" "0,0,0,1,0,0,0,0,0,0,0,0" ...  
## .. .. ..$ : NULL  
## ..$ ehmat : num [1:210, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## $ model.parameters :List of 4  
## ..$ Phi :List of 14  
## .. ..$ begin : num 0  
## .. ..$ num : num -1  
## .. ..$ default : num 1  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "logit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000002253a4f8>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi TRUE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ p :List of 14  
## .. ..$ begin : num 0  
## .. ..$ num : num 0  
## .. ..$ default : num 0  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "logit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000002253a4f8>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ pent:List of 16  
## .. ..$ begin : num 1  
## .. ..$ num : num -1  
## .. ..$ default : num 0  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "mlogit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000002253a4f8>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ include : chr "time"  
## .. ..$ mlogit : chr "id"  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ N :List of 13  
## .. ..$ formula :Class 'formula' language ~species.fac  
## .. .. .. ..- attr(\*, ".Environment")=<environment: R\_GlobalEnv>   
## .. ..$ begin : num 0  
## .. ..$ num : num(0)   
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "log"  
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## $ design.parameters: list()  
## $ results :List of 9  
## ..$ beta :List of 4  
## .. ..$ Phi : Named num -1.36  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ p : Named num 0.543  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ pent: Named num 2.86  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ N : Named num [1:19] 2.62 -1.78 -2.74 -2.31 -2.01 ...  
## .. .. ..- attr(\*, "names")= chr [1:19] "(Intercept)" "species.facBeaBas" "species.facBluDas" "species.facCalPen" ...  
## ..$ neg2lnl : num 752  
## ..$ AIC : num 796  
## ..$ convergence : num 0  
## ..$ optim.details:List of 30  
## .. ..$ p1 : num -1.36  
## .. ..$ p2 : num 0.543  
## .. ..$ p3 : num 2.86  
## .. ..$ p4 : num 2.62  
## .. ..$ p5 : num -1.78  
## .. ..$ p6 : num -2.74  
## .. ..$ p7 : num -2.31  
## .. ..$ p8 : num -2.01  
## .. ..$ p9 : num -3.55  
## .. ..$ p10 : num 0.217  
## .. ..$ p11 : num -1.3  
## .. ..$ p12 : num 0.824  
## .. ..$ p13 : num -2.74  
## .. ..$ p14 : num -13.4  
## .. ..$ p15 : num -13.4  
## .. ..$ p16 : num -13.4  
## .. ..$ p17 : num -3.55  
## .. ..$ p18 : num 0.0986  
## .. ..$ p19 : num -13.4  
## .. ..$ p20 : num -13.4  
## .. ..$ p21 : num -13.4  
## .. ..$ p22 : num -2.74  
## .. ..$ value : num 125  
## .. ..$ fevals : num 64  
## .. ..$ gevals : num 46  
## .. ..$ niter : num NA  
## .. ..$ convcode: num 0  
## .. ..$ kkt1 : logi TRUE  
## .. ..$ kkt2 : logi FALSE  
## .. ..$ xtime : num 8.11  
## .. ..- attr(\*, "details")=List of 5  
## .. .. ..$ method : chr "BFGS"  
## .. .. ..$ ngatend: num [1:22] 0.002599 -0.000568 0.001427 -0.000972 -0.000084 ...  
## .. .. ..$ nhatend: num [1:22, 1:22] 31.8391 20.8141 0.0763 11.0578 0.2859 ...  
## .. .. ..$ hev : num [1:22] 141.4 28.5 16.2 10.5 4.5 ...  
## .. .. ..$ message: chr "none"  
## .. ..- attr(\*, "maximize")= logi FALSE  
## .. ..- attr(\*, "npar")= int 22  
## ..$ model\_data :List of 9  
## .. ..$ Phi.dm : num [1:4818, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:4818] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ p.dm : num [1:5256, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:5256] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ pent.dm : num [1:4818, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:4818] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ N.dm : num [1:19, 1:19] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:19] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr [1:19] "(Intercept)" "species.facBeaBas" "species.facBluDas" "species.facCalPen" ...  
## .. ..$ imat :List of 11  
## .. .. ..$ nocc : int 12  
## .. .. ..$ freq : num [1:438] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..$ first: num [1:438] 5 3 4 4 5 5 5 5 5 5 ...  
## .. .. ..$ last : num [1:438] 5 3 4 4 5 5 5 5 5 5 ...  
## .. .. ..$ loc : num [1:438] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ chmat: num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ FtoL : num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ Fplus: num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ Lplus: num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ L : num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ First: num [1:438, 1:12] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ Phi.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ p.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ pent.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ time.intervals: num [1:438, 1:11] 1 1 1 1 1 1 1 1 1 1 ...  
## ..$ ns : num [1:19(1d)] 30 6 3 4 5 2 37 9 67 3 ...  
## .. ..- attr(\*, "dimnames")=List of 1  
## .. .. ..$ : chr [1:19] "1" "2" "3" "4" ...  
## ..$ options :List of 7  
## .. ..$ scale :List of 4  
## .. .. ..$ Phi : Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ p : Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ pent: Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ N : Named num [1:19] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. .. ..- attr(\*, "names")= chr [1:19] "(Intercept)" "species.facBeaBas" "species.facBluDas" "species.facCalPen" ...  
## .. ..$ accumulate: logi FALSE  
## .. ..$ initial :List of 4  
## .. .. ..$ Phi : Named num -1.77  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ p : Named num -1.1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ pent: Named num 0  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ N : Named num [1:19] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. .. ..- attr(\*, "names")= chr [1:19] "(Intercept)" "species.facBeaBas" "species.facBluDas" "species.facCalPen" ...  
## .. ..$ method : chr "BFGS"  
## .. ..$ chunk\_size: num 1e+07  
## .. ..$ itnmax : num 5000  
## .. ..$ control : list()  
## ..$ reals :List of 4  
## .. ..$ Phi :'data.frame': 1 obs. of 2 variables:  
## .. .. ..$ occ : int 1  
## .. .. ..$ estimate: num 0.205  
## .. ..$ p :'data.frame': 1 obs. of 2 variables:  
## .. .. ..$ occ : int 1  
## .. .. ..$ estimate: num 0.632  
## .. ..$ pent:'data.frame': 11 obs. of 3 variables:  
## .. .. ..$ time : Factor w/ 11 levels "2","3","4","5",..: 1 2 3 4 5 6 7 8 9 10 ...  
## .. .. ..$ occ : int [1:11] 2 3 4 5 6 7 8 9 10 11 ...  
## .. .. ..$ estimate: num [1:11] 0.0904 0.0904 0.0904 0.0904 0.0904 ...  
## .. ..$ N :'data.frame': 19 obs. of 2 variables:  
## .. .. ..$ species.fac: Factor w/ 19 levels "AmeEme","BeaBas",..: 1 2 3 4 5 6 7 8 9 10 ...  
## .. .. ..$ estimate : num [1:19] 13.693 2.32 0.884 1.364 1.843 ...  
## ..- attr(\*, "class")= chr [1:3] "crm" "mle" "js"  
## - attr(\*, "class")= chr [1:3] "crm" "mle" "js"

# get values on real scale and not logit or log scales  
modNMBS3$results$reals

## $Phi  
## occ estimate  
## 1 1 0.2046233  
##   
## $p  
## occ estimate  
## 1 1 0.632395  
##   
## $pent  
## time occ estimate  
## 1 2 2 0.09043652  
## 2 3 3 0.09043652  
## 3 4 4 0.09043652  
## 4 5 5 0.09043652  
## 5 6 6 0.09043652  
## 6 7 7 0.09043652  
## 7 8 8 0.09043652  
## 8 9 9 0.09043652  
## 9 10 10 0.09043652  
## 10 11 11 0.09043652  
## 11 12 12 0.09043652  
##   
## $N  
## species.fac estimate  
## 1 AmeEme 1.369275e+01  
## 2 BeaBas 2.319796e+00  
## 3 BluDas 8.838432e-01  
## 4 CalPen 1.364183e+00  
## 5 CarSad 1.842501e+00  
## 6 CGrDar 3.929452e-01  
## 7 ChFCor 1.700382e+01  
## 8 ComWhi 3.743958e+00  
## 9 CrRWhi 3.119972e+01  
## 10 DeSSpi 8.838432e-01  
## 11 DtTWhi 2.002566e-05  
## 12 GrsDar 2.002566e-05  
## 13 HudWhi 2.002566e-05  
## 14 LanClu 3.929452e-01  
## 15 PaiSki 1.511121e+01  
## 16 SlaSki 2.002566e-05  
## 17 SpaSki 2.002566e-05  
## 18 TwSSki 2.002566e-05  
## 19 UniClu 8.838432e-01

#NMBS.table <- collect.models(type = "Jolly")  
  
#This is supposed to get all the models into a nice table so I can compare AIC values but it isn't working (because it only works with RMark)  
  
#####This is my reminder to find a way to make a table of my models AIC values#########

# Run with RMark (need to download Program MARK in order for this to work). This is looking at NMBS only

#MarkPath='C:/Program Files (x86)/MARK'  
  
#data(marked\_dfCNMBS)  
#p.sex = list(formula=~marked\_dfNMBS$sex.fac)  
#Phi.ct= list(formula=~1)  
#p.ct = list(formula=~1)  
#Phi.sex = list(formula=~marked\_dfNMBS$sex.fac)  
  
#mod5=mark(marked\_dfNMBS, model = "CJS", model.parameters=list(p=p.ct, Phi=Phi.ct), output=FALSE, time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9))$results$beta  
  
#mod6=mark(marked\_dfNMBS, model = "CJS", model.parameters=list(p=p.sex, Phi=Phi.ct), output=FALSE, time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9))$results$beta  
  
#mark(marked\_dfNMBS, model.parameters=list(p=list(formula=~species.fac)),output=FALSE, time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9))$results$beta  
  
#mark(marked\_dfNMBS, model = "Jolly", model.parameters=list(p=list(formula=~1)),output=FALSE,time.intervals = c(23, 4, 9, 2, 4, 15, 9, 1, 2, 7, 9), options="SIMANNEAL")$results$beta  
#This Jolly code doesn't run properly.

#### okay now for CT

capCT <- read.csv("capturehistoryCT.csv", stringsAsFactors = F)  
str(capCT)

## 'data.frame': 60 obs. of 14 variables:  
## $ location : chr "CT" "CT" "CT" "CT" ...  
## $ species : chr "HudWhi" "HudWhi" "HudWhi" "HudWhi" ...  
## $ sex : chr "m" "m" "m" "m" ...  
## $ mark.number : int 88 89 90 91 92 93 94 95 96 97 ...  
## $ Date.of.initial.capture: chr "28-May-18" "28-May-18" "28-May-18" "28-May-18" ...  
## $ c1 : int 1 1 1 1 1 1 1 1 1 1 ...  
## $ c2 : int 0 1 0 0 0 1 0 0 0 0 ...  
## $ c3 : int 0 1 0 0 1 1 0 1 0 0 ...  
## $ c4 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c5 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c6 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c7 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c8 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c9 : int 0 0 0 0 0 0 0 0 0 0 ...

print(capCT)

## location species sex mark.number Date.of.initial.capture c1 c2 c3 c4 c5  
## 1 CT HudWhi m 88 28-May-18 1 0 0 0 0  
## 2 CT HudWhi m 89 28-May-18 1 1 1 0 0  
## 3 CT HudWhi m 90 28-May-18 1 0 0 0 0  
## 4 CT HudWhi m 91 28-May-18 1 0 0 0 0  
## 5 CT HudWhi m 92 28-May-18 1 0 1 0 0  
## 6 CT HudWhi m 93 28-May-18 1 1 1 0 0  
## 7 CT HudWhi m 94 28-May-18 1 0 0 0 0  
## 8 CT HudWhi m 95 28-May-18 1 0 1 0 0  
## 9 CT HudWhi m 96 28-May-18 1 0 0 0 0  
## 10 CT HudWhi m 97 28-May-18 1 0 0 0 0  
## 11 CT HudWhi m 98 28-May-18 1 0 0 0 0  
## 12 CT HudWhi m 99 28-May-18 1 0 1 1 0  
## 13 CT HudWhi m 100 28-May-18 1 0 0 0 0  
## 14 CT HudWhi m 101 28-May-18 1 0 1 0 0  
## 15 CT HudWhi m 102 28-May-18 1 0 1 0 0  
## 16 CT HudWhi m 103 28-May-18 1 0 1 0 0  
## 17 CT HudWhi m 104 28-May-18 1 0 0 0 0  
## 18 CT HudWhi m 105 28-May-18 1 0 0 0 0  
## 19 CT HudWhi f 106 28-May-18 1 0 0 0 0  
## 20 CT HudWhi m 107 28-May-18 1 0 0 0 0  
## 21 CT HudWhi m 108 28-May-18 1 0 0 0 0  
## 22 CT HudWhi m 109 28-May-18 1 0 0 0 0  
## 23 CT HudWhi m 110 28-May-18 1 0 0 0 0  
## 24 CT HudWhi m 111 28-May-18 1 0 0 0 0  
## 25 CT AmeEme m 112 28-May-18 1 0 0 0 0  
## 26 CT BeaBas m 113 28-May-18 1 0 0 0 0  
## 27 CT HudWhi m 114 28-May-18 1 0 0 0 0  
## 28 CT HudWhi m 115 28-May-18 1 0 1 0 1  
## 29 CT DtTWhi m 116 28-May-18 1 0 0 0 0  
## 30 CT HudWhi m 117 28-May-18 1 0 0 0 0  
## 31 CT HudWhi m 118 28-May-18 1 0 0 0 0  
## 32 CT HudWhi m 119 28-May-18 1 0 0 0 0  
## 33 CT ChFCor m 191 4-Jun-18 0 1 1 0 0  
## 34 CT HudWhi m 192 4-Jun-18 0 1 0 0 0  
## 35 CT ChFCor m 304 12-Jun-18 0 0 1 1 0  
## 36 CT HudWhi f 305 12-Jun-18 0 0 1 0 0  
## 37 CT HudWhi f 306 12-Jun-18 0 0 1 0 0  
## 38 CT DtTWhi m 307 12-Jun-18 0 0 1 0 0  
## 39 CT HudWhi m 308 12-Jun-18 0 0 1 0 0  
## 40 CT HudWhi m 309 12-Jun-18 0 0 1 0 0  
## 41 CT SpaSki m 310 12-Jun-18 0 0 1 0 0  
## 42 CT DtTWhi m 311 12-Jun-18 0 0 1 0 0  
## 43 CT ComWhi m 312 12-Jun-18 0 0 1 0 0  
## 44 CT DtTWhi f 428 18-Jun-18 0 0 0 1 0  
## 45 CT DtTWhi m 430 18-Jun-18 0 0 0 1 0  
## 46 CT DtTWhi m 431 18-Jun-18 0 0 0 1 0  
## 47 CT HudWhi f 432 18-Jun-18 0 0 0 1 0  
## 48 CT HudWhi m 433 18-Jun-18 0 0 0 1 0  
## 49 CT DtTWhi m 434 18-Jun-18 0 0 0 1 0  
## 50 CT HudWhi m 435 18-Jun-18 0 0 0 1 0  
## 51 CT DtTWhi m 436 18-Jun-18 0 0 0 1 0  
## 52 CT HudWhi f 437 18-Jun-18 0 0 0 1 0  
## 53 CT HudWhi m 438 18-Jun-18 0 0 0 1 0  
## 54 CT TwSSki m 439 18-Jun-18 0 0 0 1 0  
## 55 CT TwSSki m 442 29-Jun-18 0 0 0 0 0  
## 56 CT HudWhi f 444 29-Jun-18 0 0 0 0 0  
## 57 CT HudWhi m 446 29-Jun-18 0 0 0 0 0  
## 58 CT HudWhi m 514 8-Jul-18 0 0 0 0 0  
## 59 CT HudWhi m 515 8-Jul-18 0 0 0 0 0  
## 60 CT EasPon m 516 8-Jul-18 0 0 0 0 0  
## c6 c7 c8 c9  
## 1 0 0 0 0  
## 2 0 0 0 0  
## 3 0 0 0 0  
## 4 0 0 0 0  
## 5 0 0 0 0  
## 6 0 0 0 0  
## 7 0 0 0 0  
## 8 0 0 0 0  
## 9 0 0 0 0  
## 10 0 0 0 0  
## 11 0 0 0 0  
## 12 0 0 0 0  
## 13 0 0 0 0  
## 14 0 0 0 0  
## 15 0 0 0 0  
## 16 0 0 0 0  
## 17 0 0 0 0  
## 18 0 0 0 0  
## 19 0 0 0 0  
## 20 0 0 0 0  
## 21 0 0 0 0  
## 22 0 0 0 0  
## 23 0 0 0 0  
## 24 0 0 0 0  
## 25 0 0 0 0  
## 26 0 0 0 0  
## 27 0 0 0 0  
## 28 0 0 0 0  
## 29 0 0 0 0  
## 30 0 0 0 0  
## 31 0 0 0 0  
## 32 0 0 0 0  
## 33 0 0 0 0  
## 34 0 0 0 0  
## 35 0 0 0 0  
## 36 0 0 0 0  
## 37 0 0 0 0  
## 38 0 0 0 0  
## 39 0 0 0 0  
## 40 0 0 0 0  
## 41 0 0 0 0  
## 42 0 0 0 0  
## 43 0 0 0 0  
## 44 0 0 0 0  
## 45 0 0 0 0  
## 46 0 0 0 0  
## 47 0 0 0 0  
## 48 0 0 0 0  
## 49 0 0 0 0  
## 50 0 0 0 0  
## 51 0 0 0 0  
## 52 0 0 0 0  
## 53 0 0 0 0  
## 54 0 0 0 0  
## 55 1 0 0 0  
## 56 1 0 0 0  
## 57 1 0 0 0  
## 58 0 1 0 0  
## 59 0 1 0 0  
## 60 0 1 0 0

summary(capCT)

## location species sex mark.number   
## Length:60 Length:60 Length:60 Min. : 88.0   
## Class :character Class :character Class :character 1st Qu.:102.8   
## Mode :character Mode :character Mode :character Median :117.5   
## Mean :235.3   
## 3rd Qu.:430.2   
## Max. :516.0   
## Date.of.initial.capture c1 c2   
## Length:60 Min. :0.0000 Min. :0.00000   
## Class :character 1st Qu.:0.0000 1st Qu.:0.00000   
## Mode :character Median :1.0000 Median :0.00000   
## Mean :0.5333 Mean :0.06667   
## 3rd Qu.:1.0000 3rd Qu.:0.00000   
## Max. :1.0000 Max. :1.00000   
## c3 c4 c5 c6   
## Min. :0.0000 Min. :0.0000 Min. :0.00000 Min. :0.00   
## 1st Qu.:0.0000 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.00   
## Median :0.0000 Median :0.0000 Median :0.00000 Median :0.00   
## Mean :0.3167 Mean :0.2167 Mean :0.01667 Mean :0.05   
## 3rd Qu.:1.0000 3rd Qu.:0.0000 3rd Qu.:0.00000 3rd Qu.:0.00   
## Max. :1.0000 Max. :1.0000 Max. :1.00000 Max. :1.00   
## c7 c8 c9   
## Min. :0.00 Min. :0 Min. :0   
## 1st Qu.:0.00 1st Qu.:0 1st Qu.:0   
## Median :0.00 Median :0 Median :0   
## Mean :0.05 Mean :0 Mean :0   
## 3rd Qu.:0.00 3rd Qu.:0 3rd Qu.:0   
## Max. :1.00 Max. :0 Max. :0

capCT <- capCT[which(!is.na(capCT$c1)), ]  
summary(capCT)

## location species sex mark.number   
## Length:60 Length:60 Length:60 Min. : 88.0   
## Class :character Class :character Class :character 1st Qu.:102.8   
## Mode :character Mode :character Mode :character Median :117.5   
## Mean :235.3   
## 3rd Qu.:430.2   
## Max. :516.0   
## Date.of.initial.capture c1 c2   
## Length:60 Min. :0.0000 Min. :0.00000   
## Class :character 1st Qu.:0.0000 1st Qu.:0.00000   
## Mode :character Median :1.0000 Median :0.00000   
## Mean :0.5333 Mean :0.06667   
## 3rd Qu.:1.0000 3rd Qu.:0.00000   
## Max. :1.0000 Max. :1.00000   
## c3 c4 c5 c6   
## Min. :0.0000 Min. :0.0000 Min. :0.00000 Min. :0.00   
## 1st Qu.:0.0000 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.00   
## Median :0.0000 Median :0.0000 Median :0.00000 Median :0.00   
## Mean :0.3167 Mean :0.2167 Mean :0.01667 Mean :0.05   
## 3rd Qu.:1.0000 3rd Qu.:0.0000 3rd Qu.:0.00000 3rd Qu.:0.00   
## Max. :1.0000 Max. :1.0000 Max. :1.00000 Max. :1.00   
## c7 c8 c9   
## Min. :0.00 Min. :0 Min. :0   
## 1st Qu.:0.00 1st Qu.:0 1st Qu.:0   
## Median :0.00 Median :0 Median :0   
## Mean :0.05 Mean :0 Mean :0   
## 3rd Qu.:0.00 3rd Qu.:0 3rd Qu.:0   
## Max. :1.00 Max. :0 Max. :0

library(reshape)  
## Format data for MARK  
  
# get data formatted for MARK/RMark  
capCT$ch <- paste(capCT$c1,  
 capCT$c2,  
 capCT$c3,  
 capCT$c4,  
 capCT$c5,  
 capCT$c6,  
 capCT$c7,  
 capCT$c8,  
 capCT$c9,  
 " ",  
 ";",  
 sep="")  
  
  
data=data.frame(capCT)  
data

## location species sex mark.number Date.of.initial.capture c1 c2 c3 c4 c5  
## 1 CT HudWhi m 88 28-May-18 1 0 0 0 0  
## 2 CT HudWhi m 89 28-May-18 1 1 1 0 0  
## 3 CT HudWhi m 90 28-May-18 1 0 0 0 0  
## 4 CT HudWhi m 91 28-May-18 1 0 0 0 0  
## 5 CT HudWhi m 92 28-May-18 1 0 1 0 0  
## 6 CT HudWhi m 93 28-May-18 1 1 1 0 0  
## 7 CT HudWhi m 94 28-May-18 1 0 0 0 0  
## 8 CT HudWhi m 95 28-May-18 1 0 1 0 0  
## 9 CT HudWhi m 96 28-May-18 1 0 0 0 0  
## 10 CT HudWhi m 97 28-May-18 1 0 0 0 0  
## 11 CT HudWhi m 98 28-May-18 1 0 0 0 0  
## 12 CT HudWhi m 99 28-May-18 1 0 1 1 0  
## 13 CT HudWhi m 100 28-May-18 1 0 0 0 0  
## 14 CT HudWhi m 101 28-May-18 1 0 1 0 0  
## 15 CT HudWhi m 102 28-May-18 1 0 1 0 0  
## 16 CT HudWhi m 103 28-May-18 1 0 1 0 0  
## 17 CT HudWhi m 104 28-May-18 1 0 0 0 0  
## 18 CT HudWhi m 105 28-May-18 1 0 0 0 0  
## 19 CT HudWhi f 106 28-May-18 1 0 0 0 0  
## 20 CT HudWhi m 107 28-May-18 1 0 0 0 0  
## 21 CT HudWhi m 108 28-May-18 1 0 0 0 0  
## 22 CT HudWhi m 109 28-May-18 1 0 0 0 0  
## 23 CT HudWhi m 110 28-May-18 1 0 0 0 0  
## 24 CT HudWhi m 111 28-May-18 1 0 0 0 0  
## 25 CT AmeEme m 112 28-May-18 1 0 0 0 0  
## 26 CT BeaBas m 113 28-May-18 1 0 0 0 0  
## 27 CT HudWhi m 114 28-May-18 1 0 0 0 0  
## 28 CT HudWhi m 115 28-May-18 1 0 1 0 1  
## 29 CT DtTWhi m 116 28-May-18 1 0 0 0 0  
## 30 CT HudWhi m 117 28-May-18 1 0 0 0 0  
## 31 CT HudWhi m 118 28-May-18 1 0 0 0 0  
## 32 CT HudWhi m 119 28-May-18 1 0 0 0 0  
## 33 CT ChFCor m 191 4-Jun-18 0 1 1 0 0  
## 34 CT HudWhi m 192 4-Jun-18 0 1 0 0 0  
## 35 CT ChFCor m 304 12-Jun-18 0 0 1 1 0  
## 36 CT HudWhi f 305 12-Jun-18 0 0 1 0 0  
## 37 CT HudWhi f 306 12-Jun-18 0 0 1 0 0  
## 38 CT DtTWhi m 307 12-Jun-18 0 0 1 0 0  
## 39 CT HudWhi m 308 12-Jun-18 0 0 1 0 0  
## 40 CT HudWhi m 309 12-Jun-18 0 0 1 0 0  
## 41 CT SpaSki m 310 12-Jun-18 0 0 1 0 0  
## 42 CT DtTWhi m 311 12-Jun-18 0 0 1 0 0  
## 43 CT ComWhi m 312 12-Jun-18 0 0 1 0 0  
## 44 CT DtTWhi f 428 18-Jun-18 0 0 0 1 0  
## 45 CT DtTWhi m 430 18-Jun-18 0 0 0 1 0  
## 46 CT DtTWhi m 431 18-Jun-18 0 0 0 1 0  
## 47 CT HudWhi f 432 18-Jun-18 0 0 0 1 0  
## 48 CT HudWhi m 433 18-Jun-18 0 0 0 1 0  
## 49 CT DtTWhi m 434 18-Jun-18 0 0 0 1 0  
## 50 CT HudWhi m 435 18-Jun-18 0 0 0 1 0  
## 51 CT DtTWhi m 436 18-Jun-18 0 0 0 1 0  
## 52 CT HudWhi f 437 18-Jun-18 0 0 0 1 0  
## 53 CT HudWhi m 438 18-Jun-18 0 0 0 1 0  
## 54 CT TwSSki m 439 18-Jun-18 0 0 0 1 0  
## 55 CT TwSSki m 442 29-Jun-18 0 0 0 0 0  
## 56 CT HudWhi f 444 29-Jun-18 0 0 0 0 0  
## 57 CT HudWhi m 446 29-Jun-18 0 0 0 0 0  
## 58 CT HudWhi m 514 8-Jul-18 0 0 0 0 0  
## 59 CT HudWhi m 515 8-Jul-18 0 0 0 0 0  
## 60 CT EasPon m 516 8-Jul-18 0 0 0 0 0  
## c6 c7 c8 c9 ch  
## 1 0 0 0 0 100000000 ;  
## 2 0 0 0 0 111000000 ;  
## 3 0 0 0 0 100000000 ;  
## 4 0 0 0 0 100000000 ;  
## 5 0 0 0 0 101000000 ;  
## 6 0 0 0 0 111000000 ;  
## 7 0 0 0 0 100000000 ;  
## 8 0 0 0 0 101000000 ;  
## 9 0 0 0 0 100000000 ;  
## 10 0 0 0 0 100000000 ;  
## 11 0 0 0 0 100000000 ;  
## 12 0 0 0 0 101100000 ;  
## 13 0 0 0 0 100000000 ;  
## 14 0 0 0 0 101000000 ;  
## 15 0 0 0 0 101000000 ;  
## 16 0 0 0 0 101000000 ;  
## 17 0 0 0 0 100000000 ;  
## 18 0 0 0 0 100000000 ;  
## 19 0 0 0 0 100000000 ;  
## 20 0 0 0 0 100000000 ;  
## 21 0 0 0 0 100000000 ;  
## 22 0 0 0 0 100000000 ;  
## 23 0 0 0 0 100000000 ;  
## 24 0 0 0 0 100000000 ;  
## 25 0 0 0 0 100000000 ;  
## 26 0 0 0 0 100000000 ;  
## 27 0 0 0 0 100000000 ;  
## 28 0 0 0 0 101010000 ;  
## 29 0 0 0 0 100000000 ;  
## 30 0 0 0 0 100000000 ;  
## 31 0 0 0 0 100000000 ;  
## 32 0 0 0 0 100000000 ;  
## 33 0 0 0 0 011000000 ;  
## 34 0 0 0 0 010000000 ;  
## 35 0 0 0 0 001100000 ;  
## 36 0 0 0 0 001000000 ;  
## 37 0 0 0 0 001000000 ;  
## 38 0 0 0 0 001000000 ;  
## 39 0 0 0 0 001000000 ;  
## 40 0 0 0 0 001000000 ;  
## 41 0 0 0 0 001000000 ;  
## 42 0 0 0 0 001000000 ;  
## 43 0 0 0 0 001000000 ;  
## 44 0 0 0 0 000100000 ;  
## 45 0 0 0 0 000100000 ;  
## 46 0 0 0 0 000100000 ;  
## 47 0 0 0 0 000100000 ;  
## 48 0 0 0 0 000100000 ;  
## 49 0 0 0 0 000100000 ;  
## 50 0 0 0 0 000100000 ;  
## 51 0 0 0 0 000100000 ;  
## 52 0 0 0 0 000100000 ;  
## 53 0 0 0 0 000100000 ;  
## 54 0 0 0 0 000100000 ;  
## 55 1 0 0 0 000001000 ;  
## 56 1 0 0 0 000001000 ;  
## 57 1 0 0 0 000001000 ;  
## 58 0 1 0 0 000000100 ;  
## 59 0 1 0 0 000000100 ;  
## 60 0 1 0 0 000000100 ;

transform=melt(capCT, id.vars="mark.number")  
pivot=cast(transform, mark.number ~ value)

## Aggregation requires fun.aggregate: length used as default

pivot[is.na(pivot)]=0  
  
pivot[,2:ncol(pivot)][pivot[,2:ncol(pivot)] != 0] = 1  
lh <- 11;  
  
  
pivot$eh <- apply(pivot[2:lh],1,paste,collapse="") # concatenates encounter columns into eh  
pivot[2:lh] <- NULL # drops individual encounter columns  
# create commented tag  
pivot$mark.number <- paste("/\*", pivot$mark.number, "\*/", sep=" ")  
# sort by descending encounter histories  
pivot <- pivot[order(data$ch,decreasing=TRUE),]  
# tack on the frequency for the individual  
pivot$end <- "1;";  
# write out the input file  
write.table(pivot,file="cjs-pivot.inp",sep=" ",quote=F,col.names=F,row.names=F);  
  
pivot

## mark.number f m 12-Jun-18 18-Jun-18 28-May-18 29-Jun-18 4-Jun-18  
## 2 /\* 89 \*/ 0 1 0 0 1 0 0  
## 6 /\* 93 \*/ 0 1 0 0 1 0 0  
## 12 /\* 99 \*/ 0 1 0 0 1 0 0  
## 28 /\* 115 \*/ 0 1 0 0 1 0 0  
## 5 /\* 92 \*/ 0 1 0 0 1 0 0  
## 8 /\* 95 \*/ 0 1 0 0 1 0 0  
## 14 /\* 101 \*/ 0 1 0 0 1 0 0  
## 15 /\* 102 \*/ 0 1 0 0 1 0 0  
## 16 /\* 103 \*/ 0 1 0 0 1 0 0  
## 1 /\* 88 \*/ 0 1 0 0 1 0 0  
## 3 /\* 90 \*/ 0 1 0 0 1 0 0  
## 4 /\* 91 \*/ 0 1 0 0 1 0 0  
## 7 /\* 94 \*/ 0 1 0 0 1 0 0  
## 9 /\* 96 \*/ 0 1 0 0 1 0 0  
## 10 /\* 97 \*/ 0 1 0 0 1 0 0  
## 11 /\* 98 \*/ 0 1 0 0 1 0 0  
## 13 /\* 100 \*/ 0 1 0 0 1 0 0  
## 17 /\* 104 \*/ 0 1 0 0 1 0 0  
## 18 /\* 105 \*/ 0 1 0 0 1 0 0  
## 19 /\* 106 \*/ 1 0 0 0 1 0 0  
## 20 /\* 107 \*/ 0 1 0 0 1 0 0  
## 21 /\* 108 \*/ 0 1 0 0 1 0 0  
## 22 /\* 109 \*/ 0 1 0 0 1 0 0  
## 23 /\* 110 \*/ 0 1 0 0 1 0 0  
## 24 /\* 111 \*/ 0 1 0 0 1 0 0  
## 25 /\* 112 \*/ 0 1 0 0 1 0 0  
## 26 /\* 113 \*/ 0 1 0 0 1 0 0  
## 27 /\* 114 \*/ 0 1 0 0 1 0 0  
## 29 /\* 116 \*/ 0 1 0 0 1 0 0  
## 30 /\* 117 \*/ 0 1 0 0 1 0 0  
## 31 /\* 118 \*/ 0 1 0 0 1 0 0  
## 32 /\* 119 \*/ 0 1 0 0 1 0 0  
## 33 /\* 191 \*/ 0 1 0 0 0 0 1  
## 34 /\* 192 \*/ 0 1 0 0 0 0 1  
## 35 /\* 304 \*/ 0 1 1 0 0 0 0  
## 36 /\* 305 \*/ 1 0 1 0 0 0 0  
## 37 /\* 306 \*/ 1 0 1 0 0 0 0  
## 38 /\* 307 \*/ 0 1 1 0 0 0 0  
## 39 /\* 308 \*/ 0 1 1 0 0 0 0  
## 40 /\* 309 \*/ 0 1 1 0 0 0 0  
## 41 /\* 310 \*/ 0 1 1 0 0 0 0  
## 42 /\* 311 \*/ 0 1 1 0 0 0 0  
## 43 /\* 312 \*/ 0 1 1 0 0 0 0  
## 44 /\* 428 \*/ 1 0 0 1 0 0 0  
## 45 /\* 430 \*/ 0 1 0 1 0 0 0  
## 46 /\* 431 \*/ 0 1 0 1 0 0 0  
## 47 /\* 432 \*/ 1 0 0 1 0 0 0  
## 48 /\* 433 \*/ 0 1 0 1 0 0 0  
## 49 /\* 434 \*/ 0 1 0 1 0 0 0  
## 50 /\* 435 \*/ 0 1 0 1 0 0 0  
## 51 /\* 436 \*/ 0 1 0 1 0 0 0  
## 52 /\* 437 \*/ 1 0 0 1 0 0 0  
## 53 /\* 438 \*/ 0 1 0 1 0 0 0  
## 54 /\* 439 \*/ 0 1 0 1 0 0 0  
## 55 /\* 442 \*/ 0 1 0 0 0 1 0  
## 56 /\* 444 \*/ 1 0 0 0 0 1 0  
## 57 /\* 446 \*/ 0 1 0 0 0 1 0  
## 58 /\* 514 \*/ 0 1 0 0 0 0 0  
## 59 /\* 515 \*/ 0 1 0 0 0 0 0  
## 60 /\* 516 \*/ 0 1 0 0 0 0 0  
## 8-Jul-18 000000100 ; 000001000 ; 000100000 ; 001000000 ; 001100000 ;  
## 2 0 0 0 0 0 0  
## 6 0 0 0 0 0 0  
## 12 0 0 0 0 0 0  
## 28 0 0 0 0 0 0  
## 5 0 0 0 0 0 0  
## 8 0 0 0 0 0 0  
## 14 0 0 0 0 0 0  
## 15 0 0 0 0 0 0  
## 16 0 0 0 0 0 0  
## 1 0 0 0 0 0 0  
## 3 0 0 0 0 0 0  
## 4 0 0 0 0 0 0  
## 7 0 0 0 0 0 0  
## 9 0 0 0 0 0 0  
## 10 0 0 0 0 0 0  
## 11 0 0 0 0 0 0  
## 13 0 0 0 0 0 0  
## 17 0 0 0 0 0 0  
## 18 0 0 0 0 0 0  
## 19 0 0 0 0 0 0  
## 20 0 0 0 0 0 0  
## 21 0 0 0 0 0 0  
## 22 0 0 0 0 0 0  
## 23 0 0 0 0 0 0  
## 24 0 0 0 0 0 0  
## 25 0 0 0 0 0 0  
## 26 0 0 0 0 0 0  
## 27 0 0 0 0 0 0  
## 29 0 0 0 0 0 0  
## 30 0 0 0 0 0 0  
## 31 0 0 0 0 0 0  
## 32 0 0 0 0 0 0  
## 33 0 0 0 0 0 0  
## 34 0 0 0 0 0 0  
## 35 0 0 0 0 0 1  
## 36 0 0 0 0 1 0  
## 37 0 0 0 0 1 0  
## 38 0 0 0 0 1 0  
## 39 0 0 0 0 1 0  
## 40 0 0 0 0 1 0  
## 41 0 0 0 0 1 0  
## 42 0 0 0 0 1 0  
## 43 0 0 0 0 1 0  
## 44 0 0 0 1 0 0  
## 45 0 0 0 1 0 0  
## 46 0 0 0 1 0 0  
## 47 0 0 0 1 0 0  
## 48 0 0 0 1 0 0  
## 49 0 0 0 1 0 0  
## 50 0 0 0 1 0 0  
## 51 0 0 0 1 0 0  
## 52 0 0 0 1 0 0  
## 53 0 0 0 1 0 0  
## 54 0 0 0 1 0 0  
## 55 0 0 1 0 0 0  
## 56 0 0 1 0 0 0  
## 57 0 0 1 0 0 0  
## 58 1 1 0 0 0 0  
## 59 1 1 0 0 0 0  
## 60 1 1 0 0 0 0  
## 010000000 ; 011000000 ; 100000000 ; 101000000 ; 101010000 ; 101100000 ;  
## 2 0 0 0 0 0 0  
## 6 0 0 0 0 0 0  
## 12 0 0 0 0 0 1  
## 28 0 0 0 0 1 0  
## 5 0 0 0 1 0 0  
## 8 0 0 0 1 0 0  
## 14 0 0 0 1 0 0  
## 15 0 0 0 1 0 0  
## 16 0 0 0 1 0 0  
## 1 0 0 1 0 0 0  
## 3 0 0 1 0 0 0  
## 4 0 0 1 0 0 0  
## 7 0 0 1 0 0 0  
## 9 0 0 1 0 0 0  
## 10 0 0 1 0 0 0  
## 11 0 0 1 0 0 0  
## 13 0 0 1 0 0 0  
## 17 0 0 1 0 0 0  
## 18 0 0 1 0 0 0  
## 19 0 0 1 0 0 0  
## 20 0 0 1 0 0 0  
## 21 0 0 1 0 0 0  
## 22 0 0 1 0 0 0  
## 23 0 0 1 0 0 0  
## 24 0 0 1 0 0 0  
## 25 0 0 1 0 0 0  
## 26 0 0 1 0 0 0  
## 27 0 0 1 0 0 0  
## 29 0 0 1 0 0 0  
## 30 0 0 1 0 0 0  
## 31 0 0 1 0 0 0  
## 32 0 0 1 0 0 0  
## 33 0 1 0 0 0 0  
## 34 1 0 0 0 0 0  
## 35 0 0 0 0 0 0  
## 36 0 0 0 0 0 0  
## 37 0 0 0 0 0 0  
## 38 0 0 0 0 0 0  
## 39 0 0 0 0 0 0  
## 40 0 0 0 0 0 0  
## 41 0 0 0 0 0 0  
## 42 0 0 0 0 0 0  
## 43 0 0 0 0 0 0  
## 44 0 0 0 0 0 0  
## 45 0 0 0 0 0 0  
## 46 0 0 0 0 0 0  
## 47 0 0 0 0 0 0  
## 48 0 0 0 0 0 0  
## 49 0 0 0 0 0 0  
## 50 0 0 0 0 0 0  
## 51 0 0 0 0 0 0  
## 52 0 0 0 0 0 0  
## 53 0 0 0 0 0 0  
## 54 0 0 0 0 0 0  
## 55 0 0 0 0 0 0  
## 56 0 0 0 0 0 0  
## 57 0 0 0 0 0 0  
## 58 0 0 0 0 0 0  
## 59 0 0 0 0 0 0  
## 60 0 0 0 0 0 0  
## 111000000 ; NA eh end  
## 2 1 1 1000000100 1;  
## 6 1 1 1000000100 1;  
## 12 0 1 1000000100 1;  
## 28 0 1 1000000100 1;  
## 5 0 1 1000000100 1;  
## 8 0 1 1000000100 1;  
## 14 0 1 1000000100 1;  
## 15 0 1 1000000100 1;  
## 16 0 1 1000000100 1;  
## 1 0 1 1000000100 1;  
## 3 0 1 1000000100 1;  
## 4 0 1 1000000100 1;  
## 7 0 1 1000000100 1;  
## 9 0 1 1000000100 1;  
## 10 0 1 1000000100 1;  
## 11 0 1 1000000100 1;  
## 13 0 1 1000000100 1;  
## 17 0 1 1000000100 1;  
## 18 0 1 1000000100 1;  
## 19 0 1 1000000100 1;  
## 20 0 1 1000000100 1;  
## 21 0 1 1000000100 1;  
## 22 0 1 1000000100 1;  
## 23 0 1 1000000100 1;  
## 24 0 1 1000000100 1;  
## 25 0 1 1100000000 1;  
## 26 0 1 1010000000 1;  
## 27 0 1 1000000100 1;  
## 29 0 1 1000010000 1;  
## 30 0 1 1000000100 1;  
## 31 0 1 1000000100 1;  
## 32 0 1 1000000100 1;  
## 33 0 1 1001000000 1;  
## 34 0 1 1000000100 1;  
## 35 0 1 1001000000 1;  
## 36 0 1 1000000100 1;  
## 37 0 1 1000000100 1;  
## 38 0 1 1000010000 1;  
## 39 0 1 1000000100 1;  
## 40 0 1 1000000100 1;  
## 41 0 1 1000000010 1;  
## 42 0 1 1000010000 1;  
## 43 0 1 1000100000 1;  
## 44 0 1 1000010000 1;  
## 45 0 1 1000010000 1;  
## 46 0 1 1000010000 1;  
## 47 0 1 1000000100 1;  
## 48 0 1 1000000100 1;  
## 49 0 1 1000010000 1;  
## 50 0 1 1000000100 1;  
## 51 0 1 1000010000 1;  
## 52 0 1 1000000100 1;  
## 53 0 1 1000000100 1;  
## 54 0 1 1000000001 1;  
## 55 0 1 1000000001 1;  
## 56 0 1 1000000100 1;  
## 57 0 1 1000000100 1;  
## 58 0 1 1000000100 1;  
## 59 0 1 1000000100 1;  
## 60 0 1 1000001000 1;

## Format data for marked package  
  
marked\_dfCT <- capCT  
  
marked\_dfCT$ch <- paste0(capCT$c1,  
 capCT$c2,  
 capCT$c3,  
 capCT$c4,  
 capCT$c5,  
 capCT$c6,  
 capCT$c7,  
 capCT$c8,  
 capCT$c9)  
   
#model=crm(marked\_dfCT, time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7))  
#model  
#model=cjs.hessian(model)  
#model  
  
marked\_dfCT$sex.fac <- as.factor(marked\_dfCT$sex)  
marked\_dfCT$species.fac <- as.factor(marked\_dfCT$species)  
  
model5=crm(marked\_dfCT,   
 time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7),  
 groups = c("sex.fac"),   
 model.parameters=list(Phi = list(formula = ~sex.fac)))

## Model: CJS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 3 parameters...

##   
 Number of evaluations: 100 -2lnl: 104.9304721  
## Elapsed time in minutes: 0.0052

model5

##   
## crm Model Summary  
##   
## Npar : 3  
## -2lnL: 104.9283  
## AIC : 110.9283  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -0.7808749  
## Phi.sex.facm 3.1165210  
## p.(Intercept) -1.1037320

model=cjs.hessian(model5)  
model5

##   
## crm Model Summary  
##   
## Npar : 3  
## -2lnL: 104.9283  
## AIC : 110.9283  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -0.7808749  
## Phi.sex.facm 3.1165210  
## p.(Intercept) -1.1037320

model6=crm(marked\_dfCT,   
 time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7),  
 groups = c("sex.fac"),   
 model.parameters=list(p = list(formula = ~sex.fac)))

## Model: CJS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 3 parameters...

##   
 Number of evaluations: 100 -2lnl: 105.0507929  
 Number of evaluations: 200 -2lnl: 104.9398376  
 Number of evaluations: 300 -2lnl: 105.2550005  
## Elapsed time in minutes: 0.0047

model6

##   
## crm Model Summary  
##   
## Npar : 3  
## -2lnL: 104.9289  
## AIC : 110.9289  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.336037  
## p.(Intercept) -8.927561  
## p.sex.facm 7.824116

model=cjs.hessian(model6)  
model6

##   
## crm Model Summary  
##   
## Npar : 3  
## -2lnL: 104.9289  
## AIC : 110.9289  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.336037  
## p.(Intercept) -8.927561  
## p.sex.facm 7.824116

model25=crm(marked\_dfCT,   
 time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7),  
 groups = c("sex.fac"),   
 model.parameters=list(p = list(formula = ~1), Phi = list(formula = ~1)))

## Model: CJS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 2 parameters...

##   
 Number of evaluations: 100 -2lnl: 108.4209191  
## Elapsed time in minutes: 0.0043

model25

##   
## crm Model Summary  
##   
## Npar : 2  
## -2lnL: 108.3922  
## AIC : 112.3922  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.297656  
## p.(Intercept) -1.208799

model=cjs.hessian(model25)  
model25

##   
## crm Model Summary  
##   
## Npar : 2  
## -2lnL: 108.3922  
## AIC : 112.3922  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.297656  
## p.(Intercept) -1.208799

model7=crm(marked\_dfCT,   
 time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7),  
 groups = c("species.fac"),   
 model.parameters=list(Phi = list(formula = ~species.fac)))

## Model: CJS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 10 parameters...

##   
 Number of evaluations: 100 -2lnl: 100.3405012  
 Number of evaluations: 200 -2lnl: 100.0713929  
 Number of evaluations: 300 -2lnl: 100.0587944  
 Number of evaluations: 400 -2lnl: 100.0581182  
 Number of evaluations: 500 -2lnl: 100.0581006  
 Number of evaluations: 600 -2lnl: 100.0613514  
 Number of evaluations: 700 -2lnl: 100.8707661  
 Number of evaluations: 800 -2lnl: 100.0613514  
 Number of evaluations: 900 -2lnl: 100.0730036  
## Elapsed time in minutes: 0.0083

model7

##   
## crm Model Summary  
##   
## Npar : 10  
## -2lnL: 100.0581  
## AIC : 120.0581  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -1.6442434  
## Phi.species.facBeaBas -0.8362388  
## Phi.species.facChFCor 4.4233088  
## Phi.species.facComWhi -1.1243467  
## Phi.species.facDtTWhi -1.6505496  
## Phi.species.facEasPon -2.8840727  
## Phi.species.facHudWhi 3.9950213  
## Phi.species.facSpaSki -1.1243467  
## Phi.species.facTwSSki -0.9005112  
## p.(Intercept) -0.9336532

model=cjs.hessian(model7)

##   
 Number of evaluations: 100 -2lnl: 100.2981676  
 Number of evaluations: 200 -2lnl: 100.0581004  
 Number of evaluations: 300 -2lnl: 103.6445731  
 Number of evaluations: 400 -2lnl: 100.0618461

model7

##   
## crm Model Summary  
##   
## Npar : 10  
## -2lnL: 100.0581  
## AIC : 120.0581  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -1.6442434  
## Phi.species.facBeaBas -0.8362388  
## Phi.species.facChFCor 4.4233088  
## Phi.species.facComWhi -1.1243467  
## Phi.species.facDtTWhi -1.6505496  
## Phi.species.facEasPon -2.8840727  
## Phi.species.facHudWhi 3.9950213  
## Phi.species.facSpaSki -1.1243467  
## Phi.species.facTwSSki -0.9005112  
## p.(Intercept) -0.9336532

model8=crm(marked\_dfCT,   
 time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7),  
 groups = c("species.fac"),   
 model.parameters=list(p = list(formula = ~species.fac)))

## Model: CJS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 10 parameters...

##   
 Number of evaluations: 100 -2lnl: 108.9827901  
 Number of evaluations: 200 -2lnl: 97.28222377  
 Number of evaluations: 300 -2lnl: 97.07029751  
 Number of evaluations: 400 -2lnl: 97.04083654  
 Number of evaluations: 500 -2lnl: 97.038438  
 Number of evaluations: 600 -2lnl: 97.03597426  
 Number of evaluations: 700 -2lnl: 97.038438  
 Number of evaluations: 800 -2lnl: 97.03561673  
 Number of evaluations: 900 -2lnl: 104.9036842  
## Elapsed time in minutes: 0.006

model8

##   
## crm Model Summary  
##   
## Npar : 10  
## -2lnL: 97.03562  
## AIC : 117.0356  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.412989  
## p.(Intercept) -23.407175  
## p.species.facBeaBas -7.991328  
## p.species.facChFCor 31.274834  
## p.species.facComWhi -8.577491  
## p.species.facDtTWhi -12.616370  
## p.species.facEasPon -8.984701  
## p.species.facHudWhi 22.267679  
## p.species.facSpaSki -8.577491  
## p.species.facTwSSki -10.043149

model=cjs.hessian(model8)

##   
 Number of evaluations: 100 -2lnl: 127.2102247  
 Number of evaluations: 200 -2lnl: 97.03561673  
 Number of evaluations: 300 -2lnl: 124.7604408  
 Number of evaluations: 400 -2lnl: 97.03650273

model8

##   
## crm Model Summary  
##   
## Npar : 10  
## -2lnL: 97.03562  
## AIC : 117.0356  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.412989  
## p.(Intercept) -23.407175  
## p.species.facBeaBas -7.991328  
## p.species.facChFCor 31.274834  
## p.species.facComWhi -8.577491  
## p.species.facDtTWhi -12.616370  
## p.species.facEasPon -8.984701  
## p.species.facHudWhi 22.267679  
## p.species.facSpaSki -8.577491  
## p.species.facTwSSki -10.043149

model26=crm(marked\_dfCT,   
 time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7),  
 groups = c("species.fac"),   
 model.parameters=list(p = list(formula = ~1), Phi= list(formula = ~1)))

## Model: CJS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization for 2 parameters...

##   
 Number of evaluations: 100 -2lnl: 108.4209191  
## Elapsed time in minutes: 0.0042

model26

##   
## crm Model Summary  
##   
## Npar : 2  
## -2lnL: 108.3922  
## AIC : 112.3922  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.297656  
## p.(Intercept) -1.208799

model=cjs.hessian(model26)  
model26

##   
## crm Model Summary  
##   
## Npar : 2  
## -2lnL: 108.3922  
## AIC : 112.3922  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.297656  
## p.(Intercept) -1.208799

looking at sex and species. phi= apparent survival estimate. p=capture probability (percents) N=population estimate

str(marked\_dfCT)

## 'data.frame': 60 obs. of 17 variables:  
## $ location : chr "CT" "CT" "CT" "CT" ...  
## $ species : chr "HudWhi" "HudWhi" "HudWhi" "HudWhi" ...  
## $ sex : chr "m" "m" "m" "m" ...  
## $ mark.number : int 88 89 90 91 92 93 94 95 96 97 ...  
## $ Date.of.initial.capture: chr "28-May-18" "28-May-18" "28-May-18" "28-May-18" ...  
## $ c1 : int 1 1 1 1 1 1 1 1 1 1 ...  
## $ c2 : int 0 1 0 0 0 1 0 0 0 0 ...  
## $ c3 : int 0 1 0 0 1 1 0 1 0 0 ...  
## $ c4 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c5 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c6 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c7 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c8 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ c9 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ ch : chr "100000000" "111000000" "100000000" "100000000" ...  
## $ sex.fac : Factor w/ 2 levels "f","m": 2 2 2 2 2 2 2 2 2 2 ...  
## $ species.fac : Factor w/ 9 levels "AmeEme","BeaBas",..: 7 7 7 7 7 7 7 7 7 7 ...

marked\_dfCT$sex.fac <- as.factor(marked\_dfCT$sex)  
marked\_dfCT$species.fac <- as.factor(marked\_dfCT$species)  
#modCT <- crm(marked\_dfCT,   
 #model="JS",   
 #groups = c("sex.fac"),   
 #model.parameters=list(Phi = list(formula = ~sex.fac),   
 #p = list(formula = ~1)))  
  
modCT1 <- crm(marked\_dfCT,   
 model="JS",   
 groups = c("sex.fac"),   
 model.parameters=list(N = list(formula = ~sex.fac)))

## Model: JS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization 5 parameters  
##   
 Number of evaluations: 100 -2lnl: -14.97871633  
 Number of evaluations: 200 -2lnl: -25.10227818  
 Number of evaluations: 300 -2lnl: -24.54552798  
 Number of evaluations: 400 -2lnl: -25.11504604  
## Elapsed time in minutes: 0.0105

modCT1$results$beta

## $Phi  
## (Intercept)   
## 0.3446208   
##   
## $p  
## (Intercept)   
## -1.459268   
##   
## $pent  
## (Intercept)   
## -3.75058   
##   
## $N  
## (Intercept) sex.facm   
## 2.514471 2.059296

modCT1

##   
## crm Model Summary  
##   
## Npar : 5  
## -2lnL: 180.6548  
## AIC : 190.6548  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 0.3446208  
## p.(Intercept) -1.4592676  
## pent.(Intercept) -3.7505799  
## N.(Intercept) 2.5144714  
## N.sex.facm 2.0592960

cjs.hessian(modCT1)

##   
 Number of evaluations: 100 -2lnl: 105.8233991

##   
## crm Model Summary  
##   
## Npar : 5  
## -2lnL: 180.6548  
## AIC : 190.6548  
##   
## Beta  
## Estimate se lcl ucl  
## Phi.(Intercept) 0.3446208 4.278895e-01 -4.940426e-01 1.183284e+00  
## p.(Intercept) -1.4592676 5.363218e-01 -2.510458e+00 -4.080769e-01  
## pent.(Intercept) -3.7505799 1.000000e+05 -1.960038e+05 1.959962e+05  
## N.(Intercept) 2.5144714 1.000000e+05 -1.959975e+05 1.960025e+05  
## N.sex.facm 2.0592960 1.000000e+05 -1.959979e+05 1.960021e+05

str(modCT1)

## List of 5  
## $ model : chr "JS"  
## $ data :List of 12  
## ..$ data :'data.frame': 78 obs. of 15 variables:  
## .. ..$ ch : chr [1:78] "1,0,0,0,0,0,0,0,0" "1,0,0,0,0,0,0,0,0" "0,1,1,0,0,0,0,0,0" "0,0,1,1,0,0,0,0,0" ...  
## .. ..$ freq : num [1:78] 1 1 1 1 1 1 1 1 1 1 ...  
## .. ..$ group : Factor w/ 2 levels "1","2": 2 2 2 2 2 1 2 2 2 2 ...  
## .. ..$ mark.number: num [1:78] 112 113 191 304 312 428 116 307 311 430 ...  
## .. ..$ c1 : num [1:78] 1 1 0 0 0 0 1 0 0 0 ...  
## .. ..$ c2 : num [1:78] 0 0 1 0 0 0 0 0 0 0 ...  
## .. ..$ c3 : num [1:78] 0 0 1 1 1 0 0 1 1 0 ...  
## .. ..$ c4 : num [1:78] 0 0 0 1 0 1 0 0 0 1 ...  
## .. ..$ c5 : num [1:78] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c6 : num [1:78] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c7 : num [1:78] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c8 : num [1:78] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ c9 : num [1:78] 0 0 0 0 0 0 0 0 0 0 ...  
## .. ..$ sex.fac : Factor w/ 2 levels "f","m": 2 2 2 2 2 1 2 2 2 2 ...  
## .. ..$ id : Factor w/ 78 levels "1","2","3","4",..: 1 2 3 4 5 6 7 8 9 10 ...  
## ..$ model : chr "JS"  
## ..$ mixtures : NULL  
## ..$ freq :'data.frame': 60 obs. of 2 variables:  
## .. ..$ sex.facf: num [1:60] 0 0 0 0 0 1 0 0 0 0 ...  
## .. ..$ sex.facm: num [1:60] 1 1 1 1 1 0 1 1 1 1 ...  
## ..$ nocc : num 9  
## ..$ nocc.secondary : NULL  
## ..$ time.intervals : num [1:8] 1 1 1 1 1 1 1 1  
## ..$ begin.time : num 1  
## ..$ initial.ages : NULL  
## ..$ group.covariates:'data.frame': 2 obs. of 1 variable:  
## .. ..$ sex.fac: Factor w/ 2 levels "f","m": 1 2  
## ..$ start : num [1:60, 1:2] NA NA NA NA NA NA NA NA NA NA ...  
## .. ..- attr(\*, "dimnames")=List of 2  
## .. .. ..$ : chr [1:60] "1,0,0,0,0,0,0,0,0" "1,0,0,0,0,0,0,0,0" "0,1,1,0,0,0,0,0,0" "0,0,1,1,0,0,0,0,0" ...  
## .. .. ..$ : NULL  
## ..$ ehmat : num [1:60, 1:9] 1 1 0 0 0 0 1 0 0 0 ...  
## $ model.parameters :List of 4  
## ..$ Phi :List of 14  
## .. ..$ begin : num 0  
## .. ..$ num : num -1  
## .. ..$ default : num 1  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "logit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000001bb55ad0>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi TRUE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ p :List of 14  
## .. ..$ begin : num 0  
## .. ..$ num : num 0  
## .. ..$ default : num 0  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "logit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000001bb55ad0>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ pent:List of 16  
## .. ..$ begin : num 1  
## .. ..$ num : num -1  
## .. ..$ default : num 0  
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "mlogit"  
## .. ..$ formula :Class 'formula' language ~1  
## .. .. .. ..- attr(\*, ".Environment")=<environment: 0x000000001bb55ad0>   
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ include : chr "time"  
## .. ..$ mlogit : chr "id"  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## ..$ N :List of 13  
## .. ..$ formula :Class 'formula' language ~sex.fac  
## .. .. .. ..- attr(\*, ".Environment")=<environment: R\_GlobalEnv>   
## .. ..$ begin : num 0  
## .. ..$ num : num(0)   
## .. ..$ type : chr "Square"  
## .. ..$ link : chr "log"  
## .. ..$ bystratum : logi FALSE  
## .. ..$ tostrata : logi FALSE  
## .. ..$ cjs : logi FALSE  
## .. ..$ whichlevel : num 0  
## .. ..$ interval : logi FALSE  
## .. ..$ nointercept: logi FALSE  
## .. ..$ obs : logi FALSE  
## .. ..$ firstonly : chr "FALSE"  
## $ design.parameters: list()  
## $ results :List of 9  
## ..$ beta :List of 4  
## .. ..$ Phi : Named num 0.345  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ p : Named num -1.46  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ pent: Named num -3.75  
## .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. ..$ N : Named num [1:2] 2.51 2.06  
## .. .. ..- attr(\*, "names")= chr [1:2] "(Intercept)" "sex.facm"  
## ..$ neg2lnl : num 181  
## ..$ AIC : num 191  
## ..$ convergence : num 0  
## ..$ optim.details:List of 13  
## .. ..$ p1 : num 0.345  
## .. ..$ p2 : num -1.46  
## .. ..$ p3 : num -3.75  
## .. ..$ p4 : num 2.51  
## .. ..$ p5 : num 2.06  
## .. ..$ value : num -12.6  
## .. ..$ fevals : num 49  
## .. ..$ gevals : num 22  
## .. ..$ niter : num NA  
## .. ..$ convcode: num 0  
## .. ..$ kkt1 : logi TRUE  
## .. ..$ kkt2 : logi TRUE  
## .. ..$ xtime : num 0.2  
## .. ..- attr(\*, "details")=List of 5  
## .. .. ..$ method : chr "BFGS"  
## .. .. ..$ ngatend: num [1:5] 1.21e-06 -2.68e-05 4.69e-06 -2.56e-06 -1.34e-05  
## .. .. ..$ nhatend: num [1:5, 1:5] 33.51 25.94 4.04 21.22 18.82 ...  
## .. .. ..$ hev : num [1:5] 127.97 19.508 7.862 1.842 0.796  
## .. .. ..$ message: chr "none"  
## .. ..- attr(\*, "maximize")= logi FALSE  
## .. ..- attr(\*, "npar")= int 5  
## ..$ model\_data :List of 9  
## .. ..$ Phi.dm : num [1:624, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:624] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ p.dm : num [1:702, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:702] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ pent.dm : num [1:624, 1] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:624] "1" "2" "3" "4" ...  
## .. .. .. ..$ : chr "(Intercept)"  
## .. ..$ N.dm : num [1:2, 1:2] 1 1 0 1  
## .. .. ..- attr(\*, "dimnames")=List of 2  
## .. .. .. ..$ : chr [1:2] "1" "2"  
## .. .. .. ..$ : chr [1:2] "(Intercept)" "sex.facm"  
## .. ..$ imat :List of 11  
## .. .. ..$ nocc : int 9  
## .. .. ..$ freq : num [1:78] 1 1 1 1 1 1 1 1 1 1 ...  
## .. .. ..$ first: num [1:78] 1 1 2 3 3 4 1 3 3 4 ...  
## .. .. ..$ last : num [1:78] 1 1 3 4 3 4 1 3 3 4 ...  
## .. .. ..$ loc : num [1:78] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ chmat: num [1:78, 1:9] 1 1 0 0 0 0 1 0 0 0 ...  
## .. .. ..$ FtoL : num [1:78, 1:9] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ Fplus: num [1:78, 1:9] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ Lplus: num [1:78, 1:9] 0 0 0 0 0 0 0 0 0 0 ...  
## .. .. ..$ L : num [1:78, 1:9] 1 1 0 0 0 0 1 0 0 0 ...  
## .. .. ..$ First: num [1:78, 1:9] 1 1 0 0 0 0 1 0 0 0 ...  
## .. ..$ Phi.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ p.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ pent.fixed : num [1, 1:3] -1 -1 0  
## .. ..$ time.intervals: num [1:78, 1:8] 1 1 1 1 1 1 1 1 1 1 ...  
## ..$ ns : num [1:2(1d)] 7 53  
## .. ..- attr(\*, "dimnames")=List of 1  
## .. .. ..$ : chr [1:2] "1" "2"  
## ..$ options :List of 7  
## .. ..$ scale :List of 4  
## .. .. ..$ Phi : Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ p : Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ pent: Named num 1  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ N : Named num [1:2] 1 1  
## .. .. .. ..- attr(\*, "names")= chr [1:2] "(Intercept)" "sex.facm"  
## .. ..$ accumulate: logi FALSE  
## .. ..$ initial :List of 4  
## .. .. ..$ Phi : Named num -0.959  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ p : Named num -0.693  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ pent: Named num 0  
## .. .. .. ..- attr(\*, "names")= chr "(Intercept)"  
## .. .. ..$ N : Named num [1:2] 0 0  
## .. .. .. ..- attr(\*, "names")= chr [1:2] "(Intercept)" "sex.facm"  
## .. ..$ method : chr "BFGS"  
## .. ..$ chunk\_size: num 1e+07  
## .. ..$ itnmax : num 5000  
## .. ..$ control : list()  
## ..$ reals :List of 4  
## .. ..$ Phi :'data.frame': 1 obs. of 2 variables:  
## .. .. ..$ occ : int 1  
## .. .. ..$ estimate: num 0.585  
## .. ..$ p :'data.frame': 1 obs. of 2 variables:  
## .. .. ..$ occ : int 1  
## .. .. ..$ estimate: num 0.189  
## .. ..$ pent:'data.frame': 8 obs. of 3 variables:  
## .. .. ..$ time : Factor w/ 8 levels "2","3","4","5",..: 1 2 3 4 5 6 7 8  
## .. .. ..$ occ : int [1:8] 2 3 4 5 6 7 8 9  
## .. .. ..$ estimate: num [1:8] 0.0198 0.0198 0.0198 0.0198 0.0198 ...  
## .. ..$ N :'data.frame': 2 obs. of 2 variables:  
## .. .. ..$ sex.fac : Factor w/ 2 levels "f","m": 1 2  
## .. .. ..$ estimate: num [1:2] 12.4 96.9  
## ..- attr(\*, "class")= chr [1:3] "crm" "mle" "js"  
## - attr(\*, "class")= chr [1:3] "crm" "mle" "js"

# get values on real scale and not logit or log scales  
modCT1$results$reals

## $Phi  
## occ estimate  
## 1 1 0.5853125  
##   
## $p  
## occ estimate  
## 1 1 0.1885794  
##   
## $pent  
## time occ estimate  
## 1 2 2 0.01978406  
## 2 3 3 0.01978406  
## 3 4 4 0.01978406  
## 4 5 5 0.01978406  
## 5 6 6 0.01978406  
## 6 7 7 0.01978406  
## 7 8 8 0.01978406  
## 8 9 9 0.01978406  
##   
## $N  
## sex.fac estimate  
## 1 f 12.36007  
## 2 m 96.90851

#modCT <- crm(marked\_dfCT,   
 #model="JS",   
 #groups = c("species.fac"),   
 #model.parameters=list(Phi = list(formula = ~species.fac),   
 #p = list(formula = ~species.fac)))  
  
modCT2 <- crm(marked\_dfCT,   
 model="JS",   
 groups = c("species.fac"),   
 model.parameters=list(N = list(formula = ~species.fac)))

## Model: JS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization 12 parameters  
##   
 Number of evaluations: 100 -2lnl: 81.87295719  
 Number of evaluations: 200 -2lnl: 64.84692447  
 Number of evaluations: 300 -2lnl: 59.19528056  
 Number of evaluations: 400 -2lnl: 57.83927584  
 Number of evaluations: 500 -2lnl: 57.42119644  
 Number of evaluations: 600 -2lnl: 57.35911981  
 Number of evaluations: 700 -2lnl: 57.33257862  
 Number of evaluations: 800 -2lnl: 57.33135011  
 Number of evaluations: 900 -2lnl: 57.33063715  
 Number of evaluations: 1000 -2lnl: 57.33049392  
 Number of evaluations: 1100 -2lnl: 57.55539631  
 Number of evaluations: 1200 -2lnl: 57.33824701  
 Number of evaluations: 1300 -2lnl: 57.40275481  
 Number of evaluations: 1400 -2lnl: 57.45672058  
 Number of evaluations: 1500 -2lnl: 57.33238461  
 Number of evaluations: 1600 -2lnl: 57.33492613  
 Number of evaluations: 1700 -2lnl: 57.33049392  
## Elapsed time in minutes: 0.0447

modCT2$results$beta

## $Phi  
## (Intercept)   
## 0.2814497   
##   
## $p  
## (Intercept)   
## -1.237478   
##   
## $pent  
## (Intercept)   
## -3.522731   
##   
## $N  
## (Intercept) species.facBeaBas species.facChFCor species.facComWhi   
## -1.017781e-02 1.656493e-05 9.429850e-01 1.656493e-05   
## species.facDtTWhi species.facEasPon species.facHudWhi species.facSpaSki   
## 2.473795e+00 1.656492e-05 4.190046e+00 1.656489e-05   
## species.facTwSSki   
## 9.429850e-01

modCT2

##   
## crm Model Summary  
##   
## Npar : 12  
## -2lnL: 229.5095  
## AIC : 253.5095  
##   
## Beta  
## Estimate  
## Phi.(Intercept) 2.814497e-01  
## p.(Intercept) -1.237478e+00  
## pent.(Intercept) -3.522731e+00  
## N.(Intercept) -1.017781e-02  
## N.species.facBeaBas 1.656493e-05  
## N.species.facChFCor 9.429850e-01  
## N.species.facComWhi 1.656493e-05  
## N.species.facDtTWhi 2.473795e+00  
## N.species.facEasPon 1.656492e-05  
## N.species.facHudWhi 4.190046e+00  
## N.species.facSpaSki 1.656489e-05  
## N.species.facTwSSki 9.429850e-01

modCT2$results$reals

## $Phi  
## occ estimate  
## 1 1 0.5699016  
##   
## $p  
## occ estimate  
## 1 1 0.2248754  
##   
## $pent  
## time occ estimate  
## 1 2 2 0.02387956  
## 2 3 3 0.02387956  
## 3 4 4 0.02387956  
## 4 5 5 0.02387956  
## 5 6 6 0.02387956  
## 6 7 7 0.02387956  
## 7 8 8 0.02387956  
## 8 9 9 0.02387956  
##   
## $N  
## species.fac estimate  
## 1 AmeEme 0.9898738  
## 2 BeaBas 0.9898902  
## 3 ChFCor 2.5416339  
## 4 ComWhi 0.9898902  
## 5 DtTWhi 11.7472280  
## 6 EasPon 0.9898902  
## 7 HudWhi 65.3572683  
## 8 SpaSki 0.9898902  
## 9 TwSSki 2.5416339

modCT3 <- crm(marked\_dfCT,   
 model="JS",   
 groups = c("species.fac"),   
 model.parameters=list(N = list(formula = ~1)))

## Model: JS

## Processing data...

## 60 capture histories collapsed into 60

## Creating design data...

## Fitting model

## Computing initial parameter estimates

## Starting optimization 4 parameters  
##   
 Number of evaluations: 100 -2lnl: 75.64854404  
 Number of evaluations: 200 -2lnl: 75.44120057  
 Number of evaluations: 300 -2lnl: 75.43733798  
## Elapsed time in minutes: 0.0147

modCT3$results$beta

## $Phi  
## (Intercept)   
## -0.7467428   
##   
## $p  
## (Intercept)   
## 1.720028   
##   
## $pent  
## (Intercept)   
## -2.269756   
##   
## $N  
## (Intercept)   
## -9.446471

modCT3

##   
## crm Model Summary  
##   
## Npar : 4  
## -2lnL: 247.6131  
## AIC : 255.6131  
##   
## Beta  
## Estimate  
## Phi.(Intercept) -0.7467428  
## p.(Intercept) 1.7200276  
## pent.(Intercept) -2.2697560  
## N.(Intercept) -9.4464714

modCT3$results$reals

## $Phi  
## occ estimate  
## 1 1 0.3215314  
##   
## $p  
## occ estimate  
## 1 1 0.8481324  
##   
## $pent  
## time occ estimate  
## 1 2 2 0.05657056  
## 2 3 3 0.05657056  
## 3 4 4 0.05657056  
## 4 5 5 0.05657056  
## 5 6 6 0.05657056  
## 6 7 7 0.05657056  
## 7 8 8 0.05657056  
## 8 9 9 0.05657056  
##   
## $N  
## estimate  
## 1 7.896772e-05

# Run with RMark (need to download Program MARK in order for this to work). This is looking at CT only

#MarkPath='C:/Program Files (x86)/MARK'  
  
#data(marked\_dfCT)  
#p.sex = list(formula=~marked\_dfCT$sex.fac)  
#Phi.ct= list(formula=~1)  
#p.ct = list(formula=~1)  
#Phi.sex = list(formula=~marked\_dfCT$sex.fac)  
  
#mod1=mark(marked\_dfCT, model = "CJS", model.parameters=list(p=p.ct, Phi=Phi.ct), time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7), output=FALSE)$results$beta  
#mod2=mark(marked\_dfCT, model = "CJS", model.parameters=list(p=p.sex, Phi=Phi.ct), time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7), output=FALSE)$results$beta  
#mod3=mark(marked\_dfCT, model = "CJS", model.parameters=list(p=p.ct, Phi=Phi.sex), time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7), output=FALSE)$results$beta  
#mod4=mark(marked\_dfCT, model = "CJS", model.parameters=list(p=p.sex, Phi=Phi.sex), time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7), output=FALSE)$results$beta  
  
#mod2=mark(marked\_dfCT, model = "Jolly", model.parameters=list(N=list(formula=~1)), time.intervals = c(7, 8, 6, 7, 4, 9, 3, 7), output=FALSE, options="SIMANNEAL")$results$beta  
  
#THIS RUNS REALLY SLOW. I read in the package doc that Jolly often doesn't run at all, which is why there is the options part in this code. Without it, it won't run at all. With it, it runs, but takes forever and doesn't ever fully converge   
#####  
  
#mark(marked\_dfCT, model.parameters=list(Phi=sex.fac),output=FALSE)$results$beta

#??Rmark  
  
#CT.table <- collect.models(type = "CJS")

CJS and JS could not be run for any other mark/recap site because there were not enough recaptures and I’m not even going to waste my time right now.