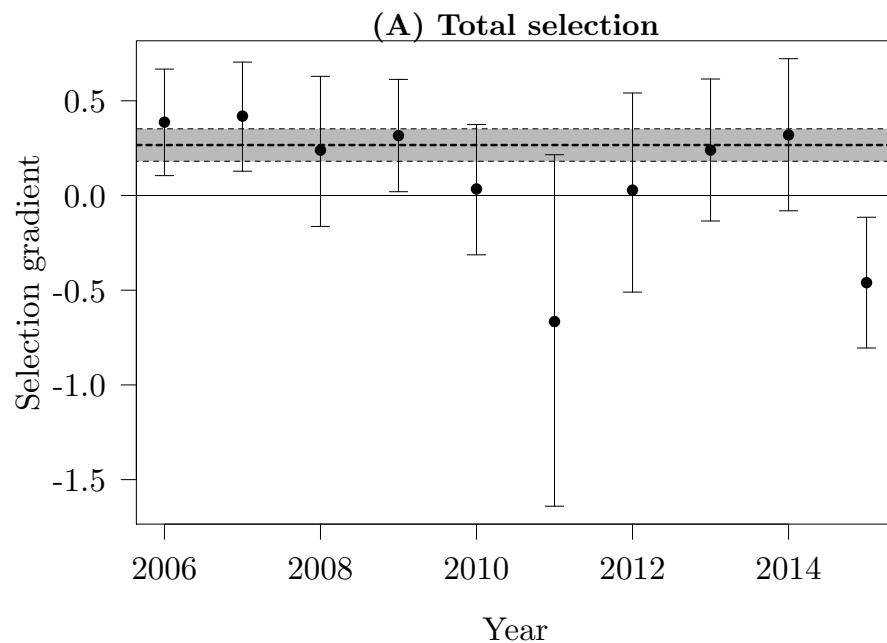


```

setPar()
plot(SelByYear, x=2006:2015, ylim=c(min( CIselByYear), max( CIselByYear)), xlab="Year", ylab="Selection gradient")
abline(h=0)
arrows(x0 = 2006:2015,x1 = 2006:2015,code = 3, y0 = CIselByYear[1,],
       y1 = CIselByYear[2,], angle = 90,length = 0.1)
m0all <- glm(Fitness ~ 1 + StMass + Sex +Age , data=YearPheno, family=poisson)
abline(h=coefficients(m0all)[2], lty=2, lwd=5)
sm0all <- summary(m0all)
lowm0all <- coefficients(m0all)[2]+1.96*sm0all$coefficients[2,2]
highm0all <- coefficients(m0all)[2]-1.96*sm0all$coefficients[2,2]
polygon(x=c(2005,2016,2016,2005),y=c(lowm0all,lowm0all, highm0all, highm0all),
       fillOddEven = TRUE, col=rgb(0.1,0.1,0.1,0.3), lty=2)

```



```

#points(x=2006:2015,y=unlist(coefficients(mmRnoCorfitness)$Year["StMass"]), pch=17)

```

```

setPar()
plot(SelByYearRho, x=2006:2015, ylim=c(min( CIselByYearRho), max( CIselByYearRho)), xlab="Year", ylab="Selection gradient")
abline(h=0)
sd(SelByYearRho)

## [1] 0.3521055

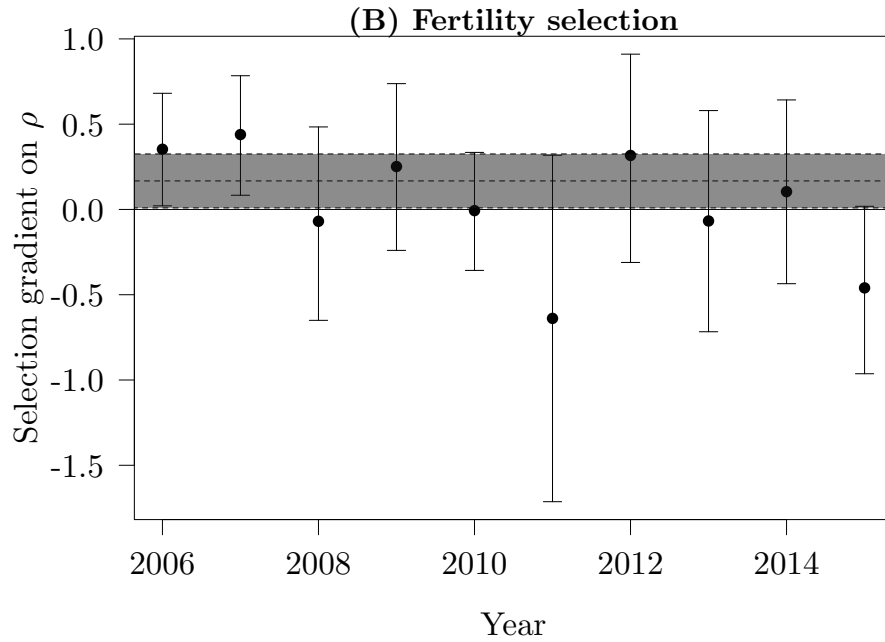
arrows(x0 = 2006:2015,x1 = 2006:2015,code = 3, y0 = CIselByYearRho[1,],
       y1 = CIselByYearRho[2,], angle = 90,length = 0.1)

```

```

y1 = CISelByYearRho[2,], angle = 90,length = 0.1)
m0allRho <- glm(Rho ~ 1 + StMass + Sex , data=YearPheno[YearPheno$Age=="A",], family=quasipo
abline(h=coefficients(m0allRho)[2], lty=2)
sm0allRho <- summary(m0allRho)
lowm0allRho <- coefficients(m0allRho)[2]+1.96*sm0allRho$coefficients[2,2]
highm0allRho <- coefficients(m0allRho)[2]-1.96*sm0allRho$coefficients[2,2]
polygon(x=c(2005,2016,2016,2005),y=c(lowm0allRho,lowm0allRho, highm0allRho, highm0allRho),
       fillOddEven = TRUE, col=rgb(0.1,0.1,0.1,0.5), lty=2)

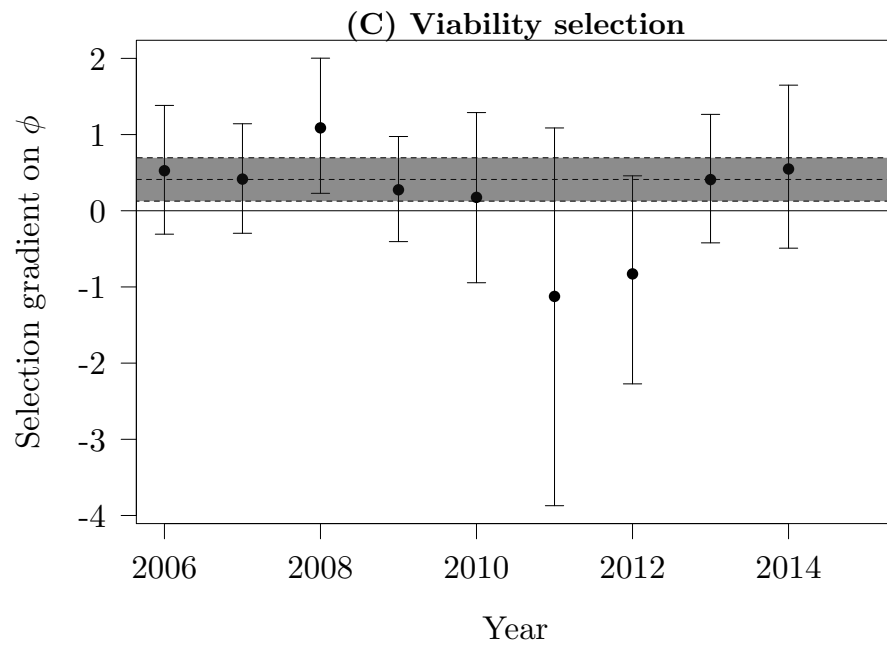
```



```

setPar()
plot(SelByYearPhi, x=2006:2015, ylim=c(min( CISelByYearPhi, na.rm=TRUE), max( CISelByYearPhi
abline(h=0)
arrows(x0 = 2006:2015,x1 = 2006:2015,code = 3, y0 = CISelByYearPhi[1,],
       y1 = CISelByYearPhi[2,], angle = 90,length = 0.1)
m0allphi <- glm(Phi ~ 1 + StMass + Sex +Age , data=YearPheno[YearPheno$Year<2015,], family=b
abline(h=coefficients(m0allphi)[2], lty=2)
sm0allphi <- summary(m0allphi)
lowm0allphi <- coefficients(m0allphi)[2]+1.96*sm0allphi$coefficients[2,2]
highm0allphi <- coefficients(m0allphi)[2]-1.96*sm0allphi$coefficients[2,2]
polygon(x=c(2005,2016,2016,2005),y=c(lowm0allphi,lowm0allphi, highm0allphi, highm0allphi),
       fillOddEven = TRUE, col=rgb(0.1,0.1,0.1,0.5), lty=2 )

```



Correlation fertility viability

```
cor.test(YearPheno$Phi, YearPheno$Rho)

##
##  Pearson's product-moment correlation
##
## data:  YearPheno$Phi and YearPheno$Rho
## t = -1.9473, df = 1292, p-value = 0.05171
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.1082724891  0.0003989614
## sample estimates:
##           cor
## -0.05409695
```

```
sd(SelByYear)

## [1] 0.3689205

coefficients(m0all)[2]

##      StMass
## 0.2663751

mean(SeSelByYear)
```

```
## [1] 0.2129145

sm0all

##
## Call:
## glm(formula = Fitness ~ 1 + StMass + Sex + Age, family = poisson,
##      data = YearPheno)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -3.0411  -1.0989  -0.9829   0.8946   4.6194
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.80415     0.05341  15.055 < 2e-16 ***
## StMass       0.26638     0.04373   6.091 1.12e-09 ***
## SexMale     -0.06913     0.04788  -1.444  0.149
## AgeJ       -1.15530     0.09571 -12.070 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for poisson family taken to be 1)
##
##      Null deviance: 3572.2  on 1267  degrees of freedom
## Residual deviance: 2440.6  on 1264  degrees of freedom
##      (26 observations deleted due to missingness)
## AIC: 4220.8
##
## Number of Fisher Scoring iterations: 6

sm0allRho

##
## Call:
## glm(formula = Rho ~ 1 + StMass + Sex, family = quasipoisson,
##      data = YearPheno[YearPheno$Age == "A", ])
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -2.8900  -1.4039  -0.2919   0.7730   4.5874
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.68281     0.09383   7.277 1.26e-12 ***
## StMass       0.16722     0.08068   2.073  0.03868 *
```

```

## SexMale      0.24668    0.08763    2.815    0.00506 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for quasipoisson family taken to be 2.352076)
##
##      Null deviance: 1337.4  on 524  degrees of freedom
## Residual deviance: 1295.7  on 522  degrees of freedom
## (5 observations deleted due to missingness)
## AIC: NA
##
## Number of Fisher Scoring iterations: 5

sm0allphi

##
## Call:
## glm(formula = Phi ~ 1 + StMass + Sex + Age, family = binomial,
##      data = YearPheno[YearPheno$Year < 2015, ])
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.2431  -0.7023  -0.5990  -0.3750   2.3352
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -1.8261     0.2011  -9.080  < 2e-16 ***
## StMass        0.4107     0.1453   2.827   0.0047 **
## SexMale      -1.0712     0.1534  -6.983  2.90e-12 ***
## AgeJ         1.7408     0.2995   5.812  6.16e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 1256.4  on 1150  degrees of freedom
## Residual deviance: 1165.5  on 1147  degrees of freedom
## (26 observations deleted due to missingness)
## AIC: 1173.5
##
## Number of Fisher Scoring iterations: 4

sd(SelByYearPhi,na.rm=T)

## [1] 0.6993909

mean(SeSelByYearPhi,na.rm=T)

```

```
## [1] 0.5589321

sd(SelByYearRho)

## [1] 0.3521055

mean(SeSelByYearRho)

## [1] 0.2741972
```

Test of fluctuation of selection on fitness.

```
summary(mmRnoCorfitness)

## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: poisson ( log )
## Formula: Fitness ~ 1 + StMass + Sex + Age + (1 | Year) + (0 + StMass |
## Year)
## Data: YearPheno[!is.na(YearPheno$StMass), ]
##
##      AIC      BIC    logLik deviance df.resid
## 3984.6   4015.5 -1986.3   3972.6     1262
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.3621 -0.8015 -0.6154  0.9164  5.0348
##
## Random effects:
##  Groups Name      Variance Std.Dev.
##  Year   (Intercept) 0.1762   0.4198
##  Year.1 StMass      0.0143   0.1196
## Number of obs: 1268, groups: Year, 10
##
## Fixed effects:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.79743    0.14423   5.529 3.22e-08 ***
## StMass       0.19656    0.06118   3.213 0.00132 **
## SexMale     -0.08054    0.04868  -1.655 0.09802 .
## AgeJ        -1.32185    0.09794 -13.496 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##      (Intr) StMass SexMal
## StMass -0.243
```

```

## SexMale -0.040 -0.208
## AgeJ      -0.281  0.601 -0.265

logLik(mmRnoCorfitness)

## 'log Lik.' -1986.296 (df=6)

logLik(mmRIfitness)

## 'log Lik.' -1990.887 (df=5)

anova(mmRIfitness,mmRnoCorfitness)

## Data: YearPheno[!is.na(YearPheno$StMass), ]
## Models:
## mmRIfitness: Fitness ~ 1 + StMass + Sex + Age + (1 | Year)
## mmRnoCorfitness: Fitness ~ 1 + StMass + Sex + Age + (1 | Year) + (0 + StMass |
## mmRnoCorfitness:      Year)
##           Df      AIC      BIC logLik deviance Chisq Chi Df Pr(>Chisq)
## mmRIfitness      5 3991.8 4017.5 -1990.9   3981.8
## mmRnoCorfitness  6 3984.6 4015.5 -1986.3   3972.6 9.1803      1 0.002446
##
## mmRIfitness
## mmRnoCorfitness **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

CImmRnoCorfitness

##           2.5 %      97.5 %
## .sig01      0.27187274 0.72057971
## .sig02      0.05109243 0.23887427
## (Intercept) 0.48613245 1.10267909
## StMass      0.06449753 0.31535917
## SexMale     -0.17634476 0.01487124
## AgeJ        -1.51480609 -1.13006779

sqrt(VarCorr(mmRnoCorfitness)[[2]][1])/summary(mmRnoCorfitness)$coef[2,1]

## Error in eval(expr, envir, enclos): impossible de trouver la fonction
"VarCorr"

```

Test of fluctuation of selection on fecundity.

```

summary(mmRnoCorrho)

## Generalized linear mixed model fit by maximum likelihood (Laplace

```

```

## Approximation) [glmerMod]
## Family: poisson ( log )
## Formula: Rho ~ 1 + StMass + Sex + (1 | Year) + (0 + StMass | Year)
## Data: YearPheno[YearPheno$Age == "A", ]
##
## AIC BIC logLik deviance df.resid
## 2312.0 2333.3 -1151.0 2302.0 520
##
## Scaled residuals:
## Min 1Q Median 3Q Max
## -2.3908 -1.0720 -0.2378 0.7582 4.8141
##
## Random effects:
## Groups Name Variance Std.Dev.
## Year (Intercept) 0.06270 0.2504
## Year.1 StMass 0.06419 0.2534
## Number of obs: 525, groups: Year, 10
##
## Fixed effects:
## Estimate Std. Error z value Pr(>|z|)
## (Intercept) 0.71994 0.10393 6.927 4.30e-12 ***
## StMass 0.03754 0.10160 0.370 0.712
## SexMale 0.25667 0.05869 4.373 1.23e-05 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
## (Intr) StMass
## StMass -0.322
## SexMale -0.063 -0.194

logLik(mmRnoCorrho)

## 'log Lik.' -1151.002 (df=5)

logLik(mmRIrho)

## 'log Lik.' -1156.07 (df=4)

anova(mmRIphi,mmRnoCorphi)

## Data: YearPheno
## Models:
## mmRIphi: Phi ~ 1 + StMass + Sex + Age + (1 | Year) + (0 + StMass | Year)
## mmRnoCorphi: Phi ~ 1 + StMass + Sex + Age + (1 | Year) + (0 + StMass | Year)
## Df AIC BIC logLik deviance Chisq Chi Df Pr(>Chisq)
## mmRIphi 6 1196 1226.8 -591.98 1184
## mmRnoCorphi 6 1196 1226.8 -591.98 1184 0 0 1

```



```

CImmRnoCorrho

##              2.5 %    97.5 %
## .sig01      0.09057098 0.4971633
## .sig02      0.11372335 0.4875975
## (Intercept) 0.48372092 0.9315651
## StMass      -0.19374906 0.2399896
## SexMale      0.14121125 0.3718907

sqrt(VarCorr(mmRnoCorrho)[[2]][1])/summary(mmRnoCorrho)$coef[2,1]

## Error in eval(expr, envir, enclos): impossible de trouver la fonction
"VarCorr"

```

Test of fluctuation of selection on viability.

```

summary(mmRnoCorphi)

## Generalized linear mixed model fit by maximum likelihood (Laplace
## Approximation) [glmerMod]
## Family: binomial ( logit )
## Formula: Phi ~ 1 + StMass + Sex + Age + (1 | Year) + (0 + StMass | Year)
## Data: YearPheno
##
##      AIC      BIC    logLik deviance df.resid
##  1196.0   1226.8   -592.0   1184.0     1262
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.2413 -0.5313 -0.3806 -0.1307  4.3171
##
## Random effects:
## Groups Name      Variance Std.Dev.
## Year (Intercept) 0.8027   0.8959
## Year.1 StMass     0.0000   0.0000
## Number of obs: 1268, groups: Year, 10
##
## Fixed effects:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.1036     0.3540  -5.942 2.81e-09 ***
## StMass       0.4142     0.1481   2.797 0.00516 **
## SexMale      -1.0968     0.1556  -7.047 1.83e-12 ***
## AgeJ         1.7073     0.3066   5.569 2.55e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##

```

```
## Correlation of Fixed Effects:
##          (Intr) StMass SexMal
## StMass  -0.416
## SexMale -0.040 -0.149
## AgeJ    -0.501  0.848 -0.206

anova(mmRIphi,mmRnoCorphi)

## Data: YearPheno
## Models:
## mmRIphi: Phi ~ 1 + StMass + Sex + Age + (1 | Year) + (0 + StMass | Year)
## mmRnoCorphi: Phi ~ 1 + StMass + Sex + Age + (1 | Year) + (0 + StMass | Year)
##          Df  AIC    BIC logLik deviance Chisq Chi Df Pr(>Chisq)
## mmRIphi      6 1196 1226.8 -591.98      1184
## mmRnoCorphi  6 1196 1226.8 -591.98      1184      0      0      1

CImmRnoCorphi

## Error in eval(expr, envir, enclos): objet 'CImmRnoCorphi' introuvable
```

```
szgr <- 2
szax <- 1.3
marr <- c(4, 4, 1, 1) + 0.1
par(las=1,mar=marr, cex=szgr, cex.lab=szax , cex.axis=szax, lwd=2 , las=1)

bbv <- boxplot(bvpairwise,ylab="Change in breeding values (g)", xlab="Year", range = 1,cex=1)
bbv$stats

##          [,1]      [,2]      [,3]      [,4]      [,5]
## [1,] -0.39224727 -0.65714962 -0.50221466 -0.49603438 -0.5134840868
## [2,] -0.17729042 -0.41320927 -0.25308444 -0.22964742 -0.1759667587
## [3,] -0.07363437 -0.28595989 -0.12321288 -0.10290919  0.0003913384
## [4,]  0.04172930 -0.16534692 -0.00372188  0.03905851  0.1665550481
## [5,]  0.25430471  0.08043945  0.24540363  0.30630488  0.5031657817
##          [,6]      [,7]      [,8]      [,9]
## [1,] -0.69391746 -0.65902266 -0.55279675 -0.26306933
## [2,] -0.25143849 -0.32766184 -0.17110007  0.07084517
## [3,] -0.03407662 -0.14976231  0.01359224  0.22736977
## [4,]  0.19413170  0.01882124  0.21150820  0.40477645
## [5,]  0.63459378  0.35733537  0.58948734  0.73784216

bbv$group

## [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [36] 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
## [71] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3
```


##	Mean	:-0.01507	Mean	:0.7452531
##	3rd Qu.:	0.32006	3rd Qu.:	1.4556310
##	Max.	: 0.65519	Max.	:2.3864365