Effects of climatic predictors identified in the model of Table 2B on trait means, trait variances, mean fitness and unstandardized trait-absolute fitness relationships (I used linear mixed models including individual as a random effect, and I standardized climatic variables by subtracting the mean and dividing by the standard deviation, i.e. the “scale” function):

> model1<-lmer(FFD~scale(min\_4)+scale(precipitation\_3)+scale(precipitation\_4)+

+ n\_fl+(1|id),data = data\_sel) #Trait means

> data\_sel$FFD\_ind\_mean<-with(data\_sel,abs(FFD-FFD\_mean))

> model2<-lmer(FFD\_ind\_mean~scale(min\_4)+scale(precipitation\_3)+

+ scale(precipitation\_4)+n\_fl+(1|id),data = data\_sel) #Trait variances> model3<- lmer(n\_intact\_seeds~scale(min\_4)+scale(precipitation\_3)+

+ scale(precipitation\_4)+n\_fl+(1|id),data=data\_sel) #Mean fitness

> model4<- lmer(n\_intact\_seeds~n\_fl+FFD+

+ scale(min\_4):FFD+scale(precipitation\_3):FFD+

+ scale(precipitation\_4):FFD+n\_fl+(1|id),

+ data=data\_sel) # Unstd trait – absolute fitness relationships

> summary(model1)

Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']

Formula: FFD ~ scale(min\_4) + scale(precipitation\_3) + scale(precipitation\_4) +

n\_fl + (1 | id)

Data: data\_sel

REML criterion at convergence: 15338.9

Scaled residuals:

Min 1Q Median 3Q Max

-2.5260 -0.6513 -0.0911 0.5377 3.9205

Random effects:

Groups Name Variance Std.Dev.

id (Intercept) 4.974 2.230

Residual 29.764 5.456

Number of obs: 2411, groups: id, 834

Fixed effects:

Estimate Std. Error df t value Pr(>|t|)

(Intercept) 6.107e+01 1.681e-01 1.127e+03 363.269 <2e-16 \*\*\*

scale(min\_4) -3.120e+00 1.288e-01 2.234e+03 -24.223 <2e-16 \*\*\*

scale(precipitation\_3) 2.310e-01 1.268e-01 2.129e+03 1.822 0.0685 .

scale(precipitation\_4) -1.519e+00 1.191e-01 2.375e+03 -12.752 <2e-16 \*\*\*

n\_fl -1.435e-01 7.128e-03 2.378e+03 -20.128 <2e-16 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:

(Intr) scl(m\_4) sc(\_3) scl(p\_4)

scale(mn\_4) 0.039

scl(prcp\_3) 0.024 -0.425

scl(prcp\_4) 0.041 0.177 -0.083

n\_fl -0.510 0.002 -0.042 0.004

> summary(model2)

Linear mixed model fit by REML. t-tests use Satterthwaite's method [

lmerModLmerTest]

Formula:

FFD\_ind\_mean ~ scale(min\_4) + scale(precipitation\_3) + scale(precipitation\_4) +

n\_fl + (1 | id)

Data: data\_sel

REML criterion at convergence: 12031.2

Scaled residuals:

Min 1Q Median 3Q Max

-1.5310 -0.7663 -0.1377 0.4533 6.3256

Random effects:

Groups Name Variance Std.Dev.

id (Intercept) 0.2051 0.4529

Residual 8.3388 2.8877

Number of obs: 2411, groups: id, 834

Fixed effects:

Estimate Std. Error df t value Pr(>|t|)

(Intercept) 3.548e+00 7.682e-02 1.158e+03 46.192 < 2e-16 \*\*\*

scale(min\_4) 3.274e-01 6.611e-02 2.341e+03 4.952 7.88e-07 \*\*\*

scale(precipitation\_3) 1.645e-01 6.553e-02 2.277e+03 2.510 0.0122 \*

scale(precipitation\_4) -2.714e-01 6.024e-02 2.405e+03 -4.505 6.97e-06 \*\*\*

n\_fl 4.351e-03 3.457e-03 1.543e+03 1.259 0.2084

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:

(Intr) scl(m\_4) sc(\_3) scl(p\_4)

scale(mn\_4) 0.018

scl(prcp\_3) 0.022 -0.426

scl(prcp\_4) 0.018 0.158 -0.090

n\_fl -0.588 -0.015 -0.036 -0.013

> summary(model3)

Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']

Formula:

n\_intact\_seeds ~ scale(min\_4) + scale(precipitation\_3) + scale(precipitation\_4) +

n\_fl + (1 | id)

Data: data\_sel

REML criterion at convergence: 17092

Scaled residuals:

Min 1Q Median 3Q Max

-6.5037 -0.4709 -0.2974 0.2629 9.7443

Random effects:

Groups Name Variance Std.Dev.

id (Intercept) 3.276 1.810

Residual 66.922 8.181

Number of obs: 2411, groups: id, 834

Fixed effects:

Estimate Std. Error df t value Pr(>|t|)

(Intercept) 2.30175 0.22455 1409.52111 10.251 < 2e-16 \*\*\*

scale(min\_4) -0.04781 0.18857 2349.58956 -0.254 0.7999

scale(precipitation\_3) 0.42257 0.18663 2298.38449 2.264 0.0237 \*

scale(precipitation\_4) -0.67210 0.17237 2404.09136 -3.899 9.91e-05 \*\*\*

n\_fl 0.20677 0.01003 1979.20008 20.620 < 2e-16 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:

(Intr) scl(m\_4) sc(\_3) scl(p\_4)

scale(mn\_4) 0.023

scl(prcp\_3) 0.023 -0.426

scl(prcp\_4) 0.024 0.162 -0.088

n\_fl -0.572 -0.011 -0.038 -0.009

> summary(model4)

Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']

Formula: n\_intact\_seeds ~ n\_fl + FFD + scale(min\_4):FFD + scale(precipitation\_3):FFD +

scale(precipitation\_4):FFD + n\_fl + (1 | id)

Data: data\_sel

REML criterion at convergence: 17079.6

Scaled residuals:

Min 1Q Median 3Q Max

-6.0270 -0.4888 -0.2409 0.2601 9.6003

Random effects:

Groups Name Variance Std.Dev.

id (Intercept) 3.814 1.953

Residual 65.287 8.080

Number of obs: 2411, groups: id, 834

Fixed effects:

Estimate Std. Error df t value Pr(>|t|)

(Intercept) 1.318e+01 1.773e+00 2.345e+03 7.433 1.48e-13 \*\*\*

n\_fl 1.807e-01 1.086e-02 2.148e+03 16.636 < 2e-16 \*\*\*

FFD -1.793e-01 2.893e-02 2.370e+03 -6.200 6.64e-10 \*\*\*

FFD:scale(min\_4) -1.145e-02 3.561e-03 2.346e+03 -3.215 0.00132 \*\*

FFD:scale(precipitation\_3) 7.772e-03 3.221e-03 2.301e+03 2.413 0.01590 \*

FFD:scale(precipitation\_4) -1.796e-02 2.893e-03 2.396e+03 -6.210 6.24e-10 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:

(Intr) n\_fl FFD FFD:scl(m\_4) FFD:(\_3

n\_fl -0.458

FFD -0.992 0.396

FFD:scl(m\_4) -0.427 0.172 0.436

FFD:scl(\_3) 0.059 -0.053 -0.057 -0.428

FFD:scl(p\_4) -0.252 0.104 0.259 0.224 -0.154

> r.squaredGLMM(model1)

R2m R2c

[1,] 0.332417 0.4280073

> r.squaredGLMM(model2)

R2m R2c

[1,] 0.03183762 0.05508003

> r.squaredGLMM(model3)

R2m R2c

[1,] 0.1651542 0.2041141

> r.squaredGLMM(model4)

R2m R2c

[1,] 0.1801707 0.2254258

Relative importance of these four components for among-year variation in selection gradients:

> models\_fit\_FFD\_nfl<-data.frame(data\_sel %>% group\_by(year) %>%

+ do(model = lm(n\_intact\_seeds~FFD+n\_fl, data = .)) %>% tidy(model))

> coefs\_abs\_fit<-spread(subset(models\_fit\_FFD\_nfl,!term=="(Intercept)")[1:3],term,estimate)

> names(coefs\_abs\_fit)<-c("year","coef\_FFD","coef\_n\_fl")

> new\_data<-merge(merge(data\_sel\_agg[c(1,146:147,156)],

+ as.data.frame(data\_sel%>%

+ group\_by(year)%>%

+ summarise(mean\_abs\_fitness=mean(n\_intact\_seeds)))),coefs\_abs\_fit)

>

> model5<-lm(selgradFFD~FFD\_mean,data=new\_data) #Trait means

> model6<-lm(selgradFFD~FFD\_var,data=new\_data) #Trait variance

> model7<-lm(selgradFFD~mean\_abs\_fitness,data=new\_data) #Mean fitness

> model8<-lm(selgradFFD~coef\_FFD+coef\_n\_fl,data=new\_data) #Unstandardized trait-absolute fitness relationships

> summary(model5)

Call:

lm(formula = selgradFFD ~ FFD\_mean, data = new\_data)

Residuals:

Min 1Q Median 3Q Max

-0.49768 -0.13404 -0.00418 0.17676 0.36292

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.2920121 0.4719747 -0.619 0.543

FFD\_mean 0.0002288 0.0080965 0.028 0.978

Residual standard error: 0.2186 on 20 degrees of freedom

Multiple R-squared: 3.994e-05, Adjusted R-squared: -0.04996

F-statistic: 0.0007989 on 1 and 20 DF, p-value: 0.9777

> summary(model6)

Call:

lm(formula = selgradFFD ~ FFD\_var, data = new\_data)

Residuals:

Min 1Q Median 3Q Max

-0.53056 -0.11233 -0.00961 0.18329 0.30453

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.322115 0.106721 -3.018 0.00679 \*\*

FFD\_var 0.001857 0.004115 0.451 0.65663

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2175 on 20 degrees of freedom

Multiple R-squared: 0.01008, Adjusted R-squared: -0.03942

F-statistic: 0.2037 on 1 and 20 DF, p-value: 0.6566

> summary(model7)

Call:

lm(formula = selgradFFD ~ mean\_abs\_fitness, data = new\_data)

Residuals:

Min 1Q Median 3Q Max

-0.47506 -0.10969 -0.00785 0.12028 0.33595

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.35891 0.06895 -5.206 4.29e-05 \*\*\*

mean\_abs\_fitness 0.01600 0.01057 1.514 0.146

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2071 on 20 degrees of freedom

Multiple R-squared: 0.1028, Adjusted R-squared: 0.05795

F-statistic: 2.292 on 1 and 20 DF, p-value: 0.1457

> summary(model8)

Call:

lm(formula = selgradFFD ~ coef\_FFD + coef\_n\_fl, data = new\_data)

Residuals:

Min 1Q Median 3Q Max

-0.19361 -0.10192 -0.03572 0.10132 0.27802

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.2078 0.0549 -3.786 0.001250 \*\*

coef\_FFD 0.7714 0.1737 4.440 0.000281 \*\*\*

coef\_n\_fl 0.6217 0.1621 3.834 0.001119 \*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.1405 on 19 degrees of freedom

Multiple R-squared: 0.6078, Adjusted R-squared: 0.5665

F-statistic: 14.72 on 2 and 19 DF, p-value: 0.0001376