Analyses data common garden 2015-16

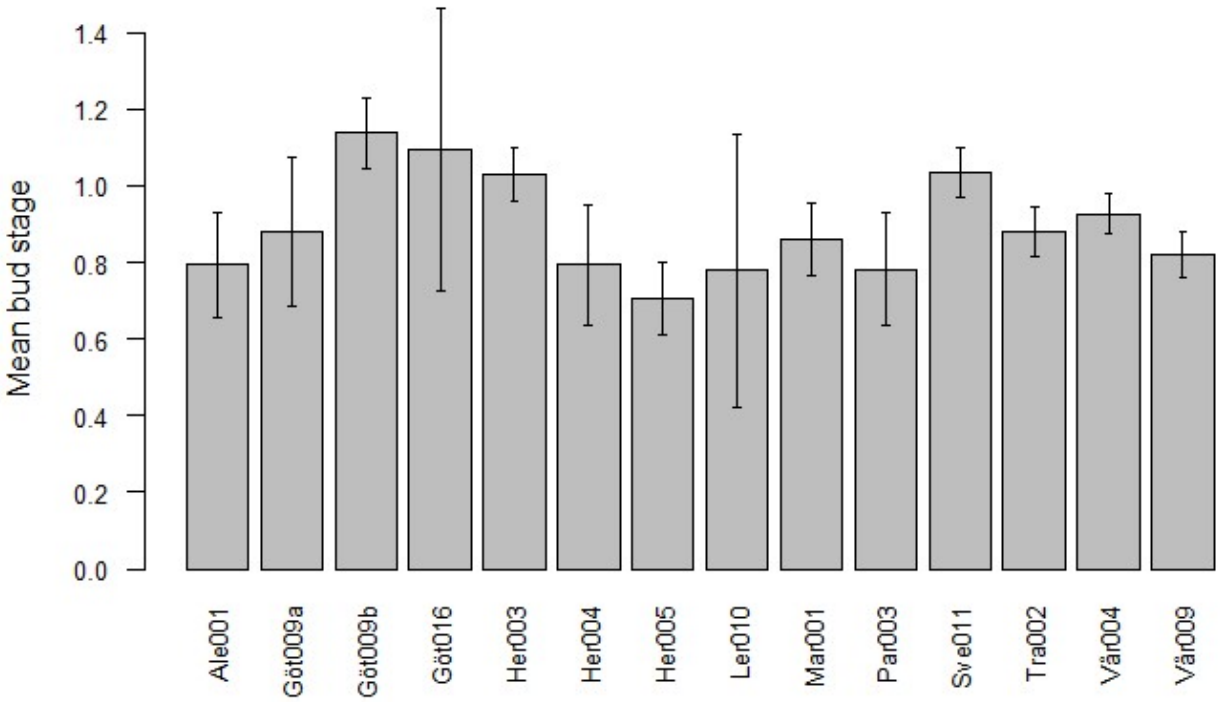
Code

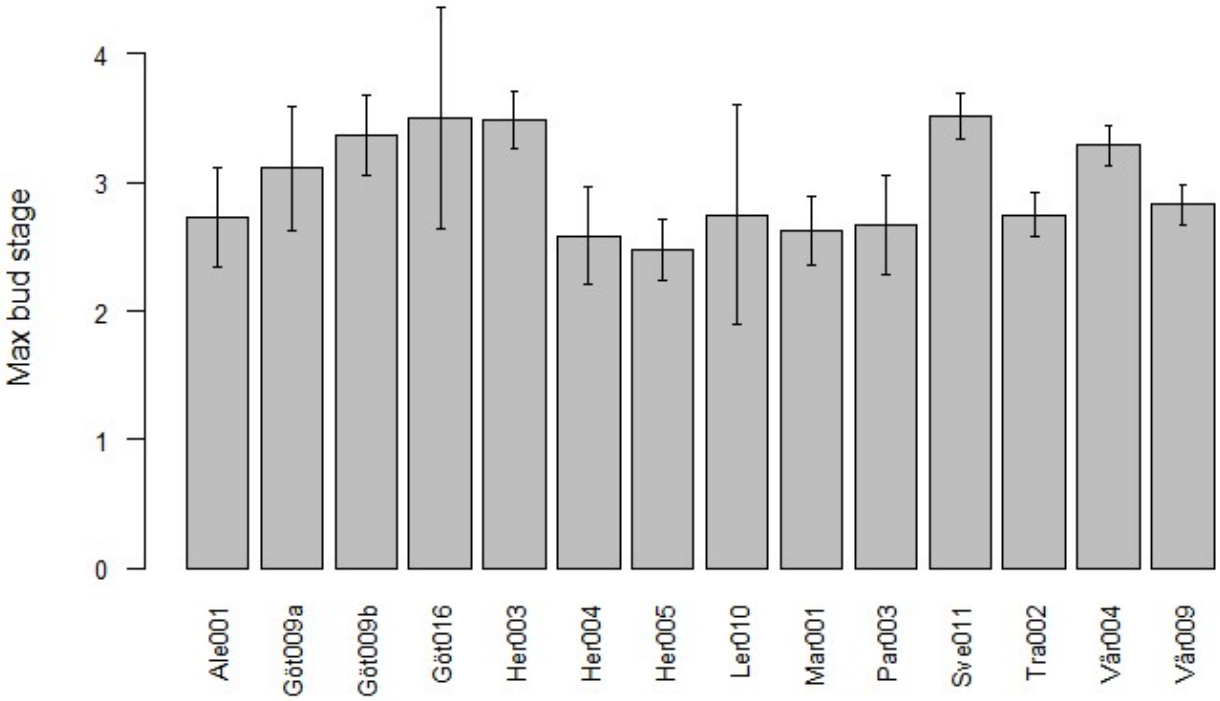
Used populations where there were at least 4 flowering plants (similar results with at least 10)

2015

	pop <fctr>	pred <fctr>
1	Ale001	1
13	Göt009a	1
22	Göt009b	1
33	Göt016	1
37	Her003	1
70	Her004	1
82	Her005	1
105	Ler010	1
109	Mar001	0
117	Par003	1

1-10 of 14 rows Previous **1** 2 Next





Using mean bud stage

Hide

```
m4<-lm(log(phen_index)~pop,data=data2015_4)
Anova(m4)
```

```
Anova Table (Type II tests)

Response: log(phen_index)
          Sum Sq  Df F value Pr(>F)
pop        4.091  13  1.4735 0.1252
Residuals 72.616 340
```

No differences among populations

Hide

```
m5<-lm(log(phen_index)~pop+ori_new,data=data2015_4)
Anova(m5)
```

```
Anova Table (Type II tests)

Response: log(phen_index)
          Sum Sq  Df F value   Pr(>F)
pop        2.262  13  0.9828 0.469434
ori_new   36.499 136  1.5159 0.003557 **
Residuals 36.117 204
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Differences among origins within populations

Hide

```
anova(m4,m5)
```

```
Analysis of Variance Table

Model 1: log(phen_index) ~ pop
Model 2: log(phen_index) ~ pop + ori_new
  Res.Df    RSS  Df Sum of Sq      F   Pr(>F)
1    340 72.616
2    204 36.117 136    36.499 1.5159 0.003557 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Model with origin is better

Hide

```
m6<-lme(log(phen_index) ~ pop, data = data2015_4, random = ~ 1|ori_new)
Anova(m6)
```

```
Analysis of Deviance Table (Type II tests)

Response: log(phen_index)
     Chisq Df Pr(>Chisq)
pop 13.072 13     0.4423
```

No differences among populations after accounting for origin

Using max bud stage

Hide

```
m10<-lm(most_adv~pop,data=data2015_4)
Anova(m10)
```

```
Anova Table (Type II tests)

Response: most_adv
          Sum Sq  Df F value  Pr(>F)
pop        44.80  13  2.1255 0.01247 *
Residuals 551.29 340
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Differences among populations

Hide

```
m11<-lm(most_adv~pop+ori_new,data=data2015_4)
Anova(m11)
```

```
Anova Table (Type II tests)

Response: most_adv
           Sum Sq  Df F value  Pr(>F)
pop        17.438  13  0.9276 0.52537
ori_new   256.273 136  1.3030 0.04353 *
Residuals 295.015 204
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

When including origin, differences among populations disappear

Hide

```
anova(m10,m11)
```

```
Analysis of Variance Table

Model 1: most_adv ~ pop
Model 2: most_adv ~ pop + ori_new
  Res.Df    RSS  Df Sum of Sq     F  Pr(>F)
1    340 551.29
2    204 295.02 136    256.27 1.303 0.04353 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Model with origin is better

Hide

```
m12<-lme(most_adv ~ pop, data = data2015_4, random = ~ 1|ori_new)
Anova(m12)
```

```
Analysis of Deviance Table (Type II tests)

Response: most_adv
     Chisq Df Pr(>Chisq)
pop 18.447 13     0.1413
```

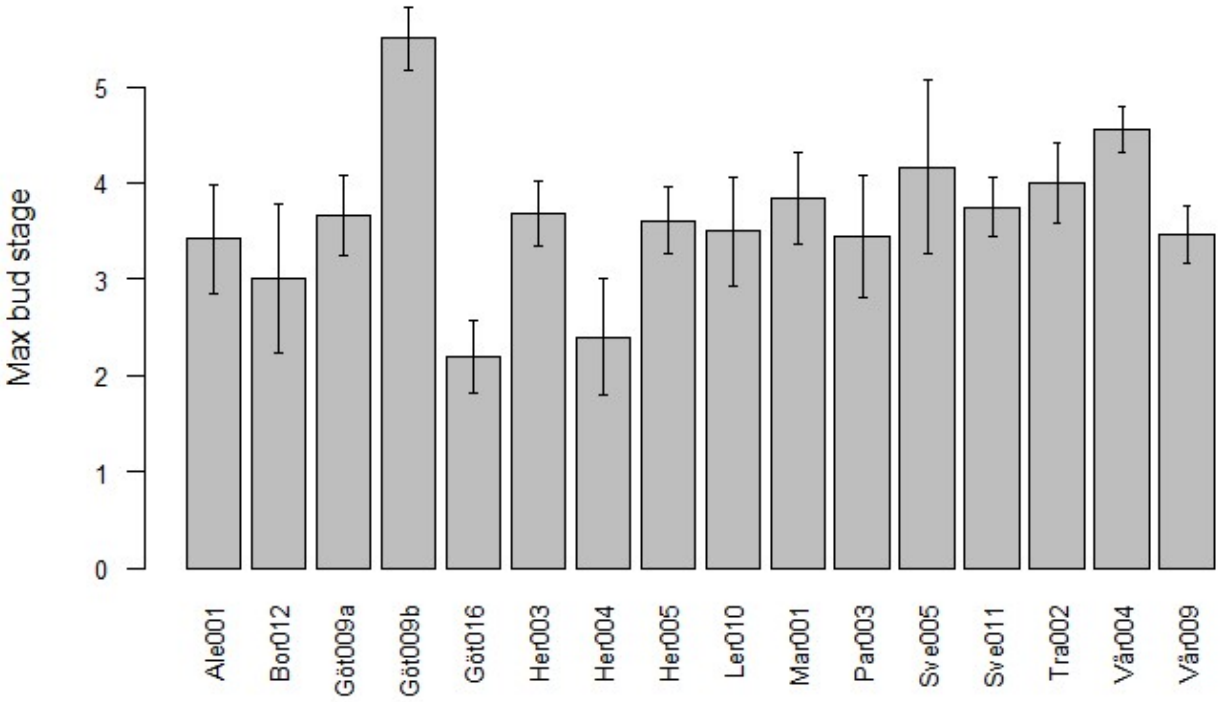
No effect of population after accounting for origin

2016

	pop <fctr>	**pred** <fctr>
1	Ale001	1
14	Bor012	0
19	Göt009a	1
31	Göt009b	1
40	Göt016	1

	pop <fctr>	pred <fctr>
45	Her003	1
70	Her004	1
75	Her005	1
100	Ler010	1
106	Mar001	0

1-10 of 16 rows Previous **1** 2 Next



Max bud stage

Hide

```
m20<-lm(stage0808~pop,data=data2016s_4)
Anova(m20)
```

```
Anova Table (Type II tests)

Response: stage0808
          Sum Sq  Df F value  Pr(>F)
pop        84.39  15  2.0635 0.01261 *
Residuals 607.97 223
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Differences among populations

Hide

```
m21<-lm(stage0808~pop+ori_new,data=data2016s_4)
Anova(m21)
```

```
Anova Table (Type II tests)

Response: stage0808
          Sum Sq  Df F value  Pr(>F)
pop        36.92  15  1.1578 0.31610
ori_new   380.52 116  1.5432 0.01174 *
Residuals 227.45 107
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

When including origin, differences among populations disappear

Hide

```
anova(m20,m21)
```

```
Analysis of Variance Table

Model 1: stage0808 ~ pop
Model 2: stage0808 ~ pop + ori_new
  Res.Df    RSS  Df Sum of Sq      F  Pr(>F)
1    223 607.97
2    107 227.45 116    380.52 1.5432 0.01174 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Model with origin is better

Hide

```
m22<-lme(stage0808 ~ pop, data = data2016s_4, random = ~ 1|ori_new)
Anova(m22)
```

```
Analysis of Deviance Table (Type II tests)

Response: stage0808
     Chisq Df Pr(>Chisq)
pop 24.697 15    0.05416 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

(Almost) no effect of population after accounting for origin

Hide

```
summary(m22)
```

```
Linear mixed-effects model fit by REML
 Data: data2016s_4
       AIC      BIC    logLik
  921.4924 982.8215 -442.7462

Random effects:
 Formula: ~1 | ori_new
        (Intercept) Residual
StdDev:   0.8363741 1.446992

Fixed effects: stage0808 ~ pop
                Value Std.Error  DF   t-value p-value
(Intercept)  3.564258 0.5985385 116  5.954935  0.0000
popBor012   -0.647710 1.0279954 116 -0.630071  0.5299
popGöt009a  -0.031329 0.8292031 116 -0.037782  0.9699
popGöt009b   1.909389 0.8519480 116  2.241203  0.0269
popGöt016   -1.259755 1.0994631 116 -1.145791  0.2542
popHer003    0.051297 0.7173924 116  0.071504  0.9431
popHer004   -1.231033 1.0116794 116 -1.216821  0.2261
popHer005    0.085854 0.7179676 116  0.119579  0.9050
popLer010    0.007276 0.9257981 116  0.007859  0.9937
popMar001    0.269076 0.9076342 116  0.296458  0.7674
popPar003    0.102729 0.8519804 116  0.120577  0.9042
popSve005    0.602409 0.9076342 116  0.663713  0.5082
popSve011    0.117503 0.6883183 116  0.170710  0.8647
popTra002    0.380102 1.0650283 116  0.356894  0.7218
popVår004    1.087904 0.6707868 116  1.621832  0.1076
popVår009   -0.082050 0.6872631 116 -0.119386  0.9052
 Correlation:
```

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used with non-ASCII chars
```

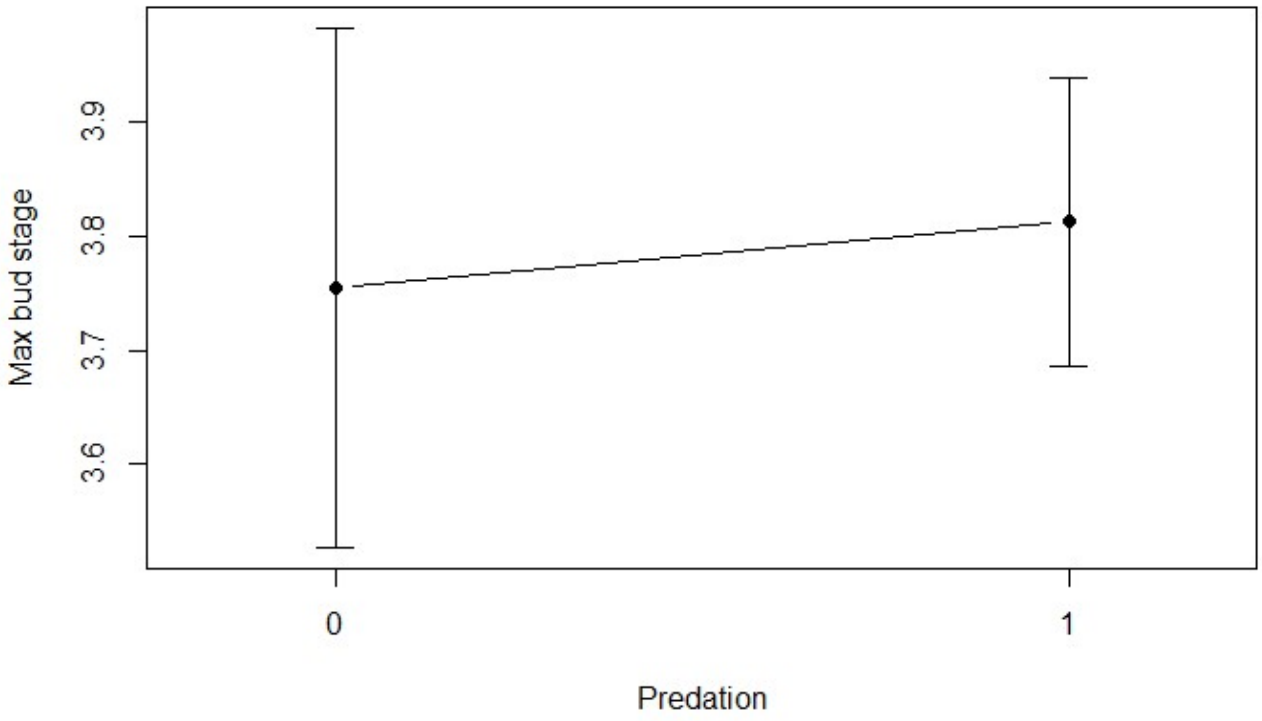
```
           (Intr) ppB012 popGt009 ppGt009b ppG016 ppH003 ppH004 ppH005 ppL010 ppM00
1 ppP003 ppS005 ppS011
popBor012  -0.582
popGöt009a -0.722  0.420
popGöt009b -0.703  0.409  0.507
popGöt016  -0.544  0.317  0.393    0.382
popHer003  -0.834  0.486  0.602    0.586    0.454
popHer004  -0.592  0.344  0.427    0.416    0.322  0.494
popHer005  -0.834  0.485  0.602    0.586    0.454  0.696  0.493
popLer010  -0.647  0.376  0.467    0.454    0.352  0.539  0.382  0.539
popMar001  -0.659  0.384  0.476    0.463    0.359  0.550  0.390  0.550  0.426
popPar003  -0.703  0.409  0.507    0.494    0.382  0.586  0.416  0.586  0.454  0.46
3
popSve005  -0.659  0.384  0.476    0.463    0.359  0.550  0.390  0.550  0.426  0.43
5  0.463
popSve011  -0.870  0.506  0.628    0.611    0.473  0.726  0.514  0.725  0.562  0.57
3  0.611  0.573
popTra002  -0.562  0.327  0.406    0.395    0.306  0.469  0.332  0.469  0.363  0.37
1  0.395  0.371  0.489
popVår004  -0.892  0.520  0.644    0.627    0.486  0.744  0.528  0.744  0.577  0.58
8  0.627  0.588  0.776
popVår009  -0.871  0.507  0.629    0.612    0.474  0.727  0.515  0.726  0.563  0.57
4  0.612  0.574  0.757
           ppT002 ppV004
popBor012
popGöt009a
popGöt009b
popGöt016
popHer003
popHer004
popHer005
popLer010
popMar001
popPar003
popSve005
popSve011
popTra002
popVår004   0.501
popVår009   0.489  0.777

Standardized Within-Group Residuals:
        Min          Q1         Med          Q3         Max
-2.16443076 -0.69671756  0.04322993  0.69583259  1.98675679

Number of Observations: 239
Number of Groups: 132
```

Hide

```
with(data2016s_4, lineplot.CI(pred,stage0808,xlab="Predation",ylab="Max bud stage")
)
```



Hide

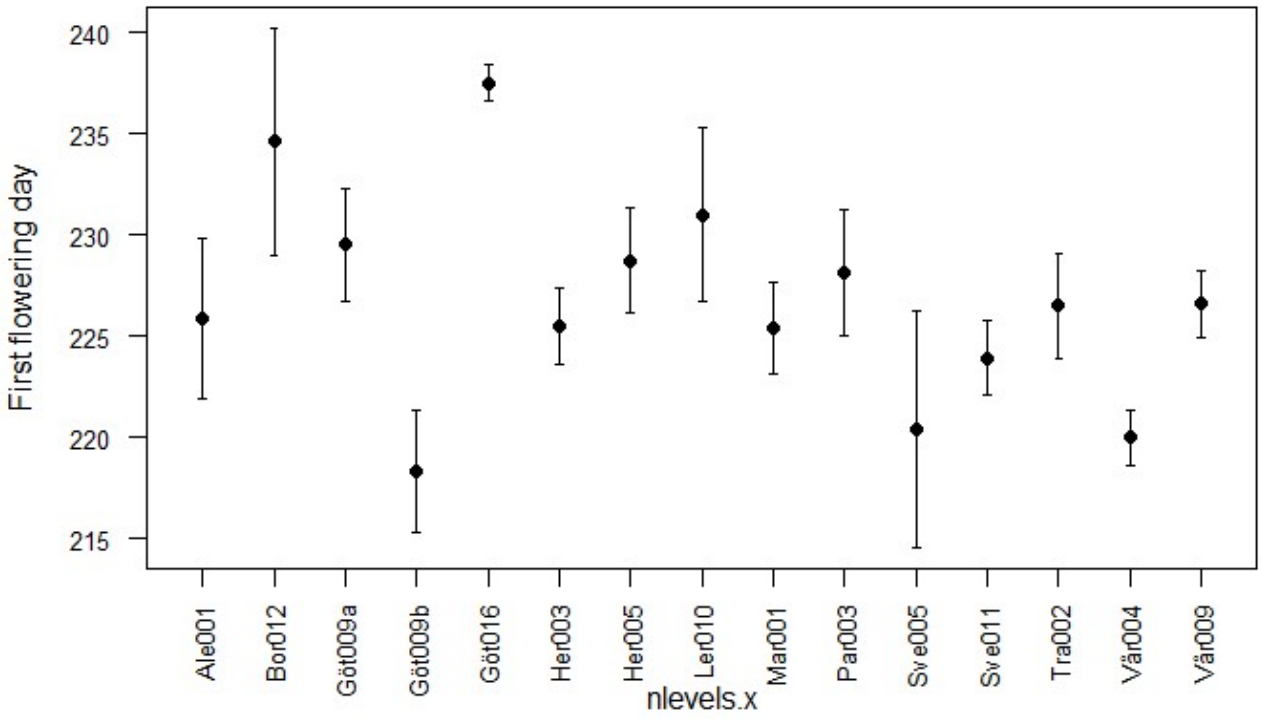
```
m24<-lme(stage0808 ~ pred, data = data2016s_4, random = ~ 1|pop/ori_new)
Anova(m24)
```

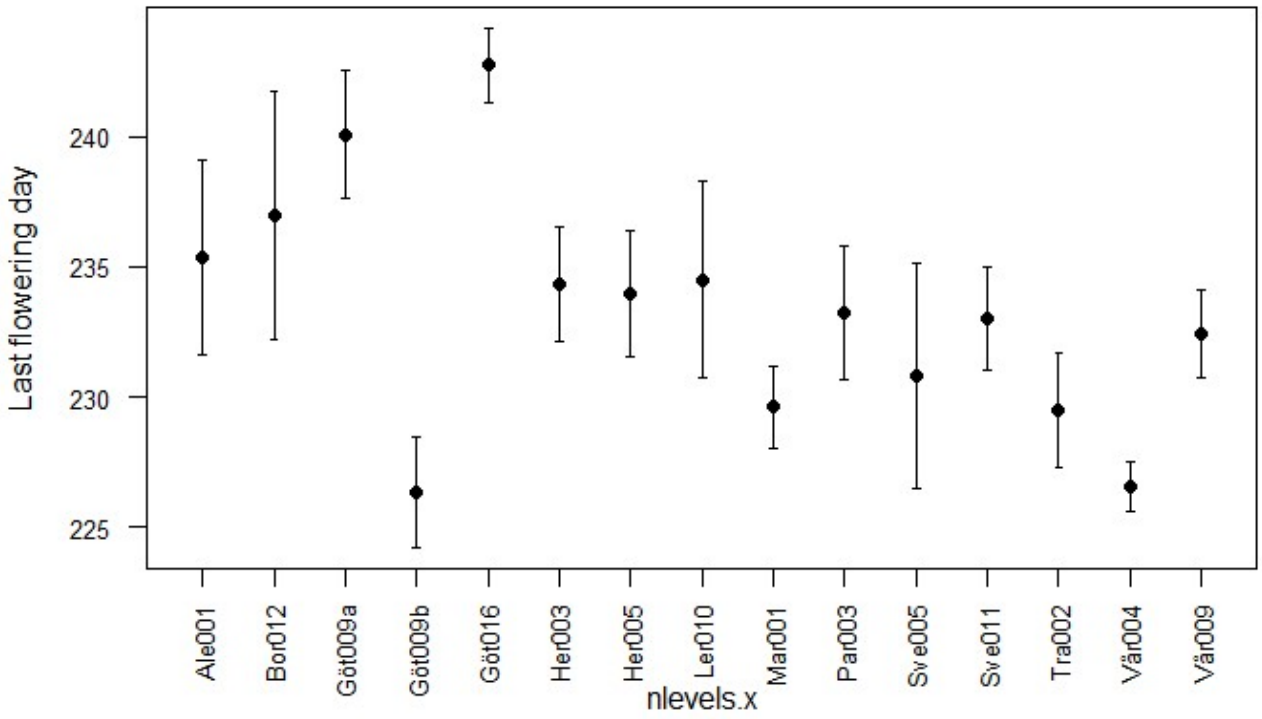
```
Analysis of Deviance Table (Type II tests)

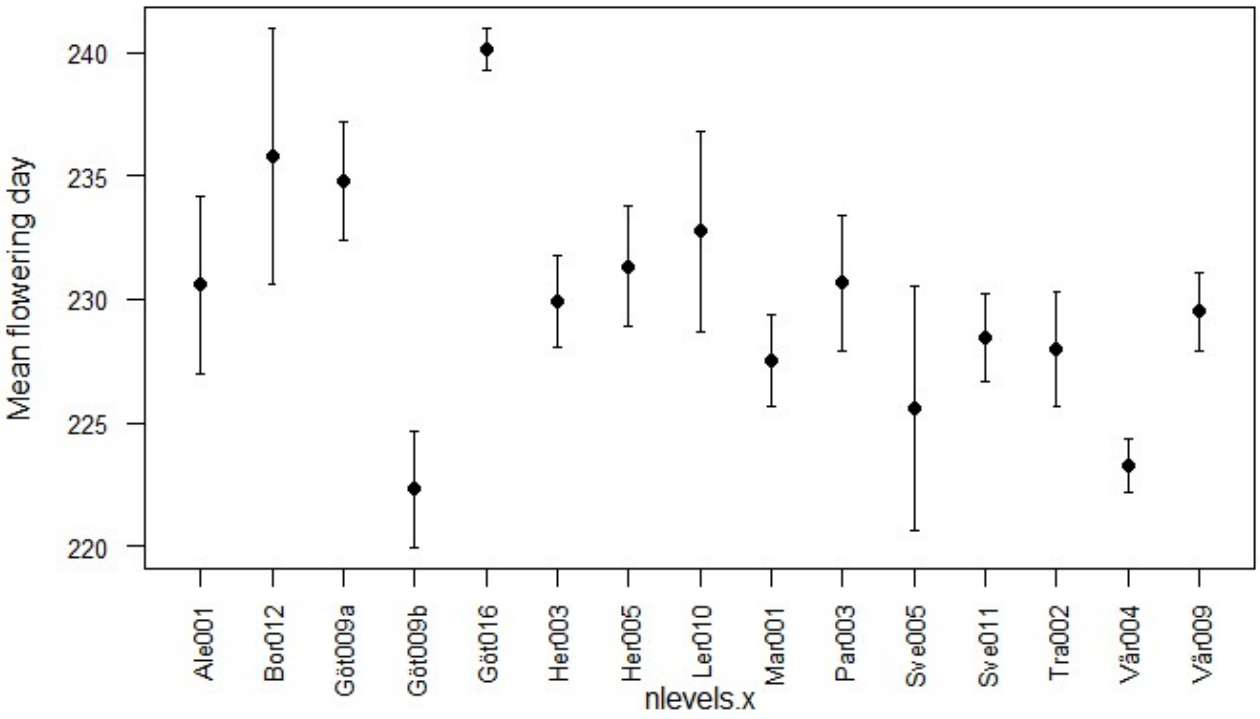
Response: stage0808
      Chisq Df Pr(>Chisq)
pred 0.0149  1     0.9029
```

No effect of predation

2016 - first, last and mean flowering day


First flowering day
240
235
230
225
220
215
Ale001
Bor012
Göt009a
Göt009b
Göt016
Her003
Her005
Ler010
Mar001
Par003
Sve005
Sve011
Tra002
Vär004
Vär009
nlevels.x


Last flowering day
240
235
230
225
Ale001
Bor012
Göt009a
Göt009b
Göt016
Her003
Her005
Ler010
Mar001
Par003
Sve005
Sve011
Tra002
Vär004
Vär009
nlevels.x



First flowering day

Hide

```
m28<-lm(first_j~pop,data=data2016l_calc_4)
Anova(m28)
```

```
Anova Table (Type II tests)

Response: first_j
           Sum Sq  Df F value    Pr(>F)
pop        3613.6  14  2.7613 0.0009214 ***
Residuals 18508.5 198
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Differences among populations

Hide

```
m29<-lm(first_j~pop+ori_new,data=data2016l_calc_4)
Anova(m29)
```

```
Anova Table (Type II tests)

Response: first_j
           Sum Sq  Df F value Pr(>F)
pop        1192.6  14  0.9896 0.4706
ori_new   10847.5 109  1.1561 0.2397
Residuals  7661.0  89
```

Hide

```
anova(m28,m29)
```

```
Analysis of Variance Table

Model 1: first_j ~ pop
Model 2: first_j ~ pop + ori_new
  Res.Df   RSS  Df Sum of Sq      F Pr(>F)
1    198 18509
2     89  7661 109     10848 1.1561 0.2397
```

Model with only population is better

Hide

```
m30<-lme(first_j ~ pop, data = data2016l_calc_4, random = ~ 1|ori_new)
Anova(m30)
```

```
Analysis of Deviance Table (Type II tests)

Response: first_j
     Chisq Df Pr(>Chisq)
pop 35.521 14    0.00123 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Effect of population after accounting for origin

Hide

```
summary(m30)
```

```
Linear mixed-effects model fit by REML
 Data: data2016l_calc_4
       AIC      BIC    logLik
  1528.297 1584.198 -747.1487

Random effects:
 Formula: ~1 | ori_new
        (Intercept) Residual
StdDev:      2.8368 9.276072

Fixed effects: first_j ~ pop
                Value Std.Error  DF  t-value p-value
(Intercept) 225.37563  3.489921 109 64.57901  0.0000
popBor012     9.05786  5.727638 109  1.58143  0.1167
popGöt009a    4.47001  4.604456 109  0.97080  0.3338
popGöt009b   -6.89380  4.777094 109 -1.44309  0.1519
popGöt016    12.06285  6.212633 109  1.94166  0.0548
popHer003     0.04018  4.171772 109  0.00963  0.9923
popHer005     3.49811  4.139320 109  0.84509  0.3999
popLer010     5.43557  5.318333 109  1.02204  0.3090
popMar001     0.02437  5.567597 109  0.00438  0.9965
popPar003     2.33265  4.834818 109  0.48247  0.6304
popSve005    -4.97563  5.567597 109 -0.89368  0.3735
popSve011    -1.42632  3.979737 109 -0.35839  0.7207
popTra002     1.20639  6.055366 109  0.19923  0.8425
popVår004    -5.59215  3.848028 109 -1.45325  0.1490
popVår009     1.61434  3.948282 109  0.40887  0.6834
 Correlation:
```

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used with non-ASCII chars
```

```
           (Intr) ppB012 popGt009 ppGt009b ppG016 ppH003 ppH005 ppL010 ppM001 ppP00
3 ppS005 ppS011 ppT002
popBor012  -0.609
popGöt009a -0.758  0.462
popGöt009b -0.731  0.445  0.554
popGöt016  -0.562  0.342  0.426    0.410
popHer003  -0.837  0.510  0.634    0.611    0.470
popHer005  -0.843  0.514  0.639    0.616    0.474  0.705
popLer010  -0.656  0.400  0.497    0.479    0.369  0.549  0.553
popMar001  -0.627  0.382  0.475    0.458    0.352  0.524  0.528  0.411
popPar003  -0.722  0.440  0.547    0.527    0.405  0.604  0.609  0.474  0.452
popSve005  -0.627  0.382  0.475    0.458    0.352  0.524  0.528  0.411  0.393  0.45
2
popSve011  -0.877  0.534  0.665    0.641    0.493  0.734  0.739  0.575  0.550  0.63
3  0.550
popTra002  -0.576  0.351  0.437    0.421    0.324  0.482  0.486  0.378  0.361  0.41
6  0.361  0.505
popVår004  -0.907  0.553  0.687    0.663    0.509  0.759  0.765  0.595  0.568  0.65
5  0.568  0.795  0.523
popVår009  -0.884  0.539  0.670    0.646    0.497  0.739  0.745  0.580  0.554  0.63
8  0.554  0.775  0.509
           ppV004
popBor012
popGöt009a
popGöt009b
popGöt016
popHer003
popHer005
popLer010
popMar001
popPar003
popSve005
popSve011
popTra002
popVår004
popVår009   0.802

Standardized Within-Group Residuals:
        Min          Q1         Med          Q3         Max
-2.05782043 -0.74980439 -0.02631564  0.81001785  2.10009284

Number of Observations: 213
Number of Groups: 124
```

Similar results with last and mean flowering day

Hide

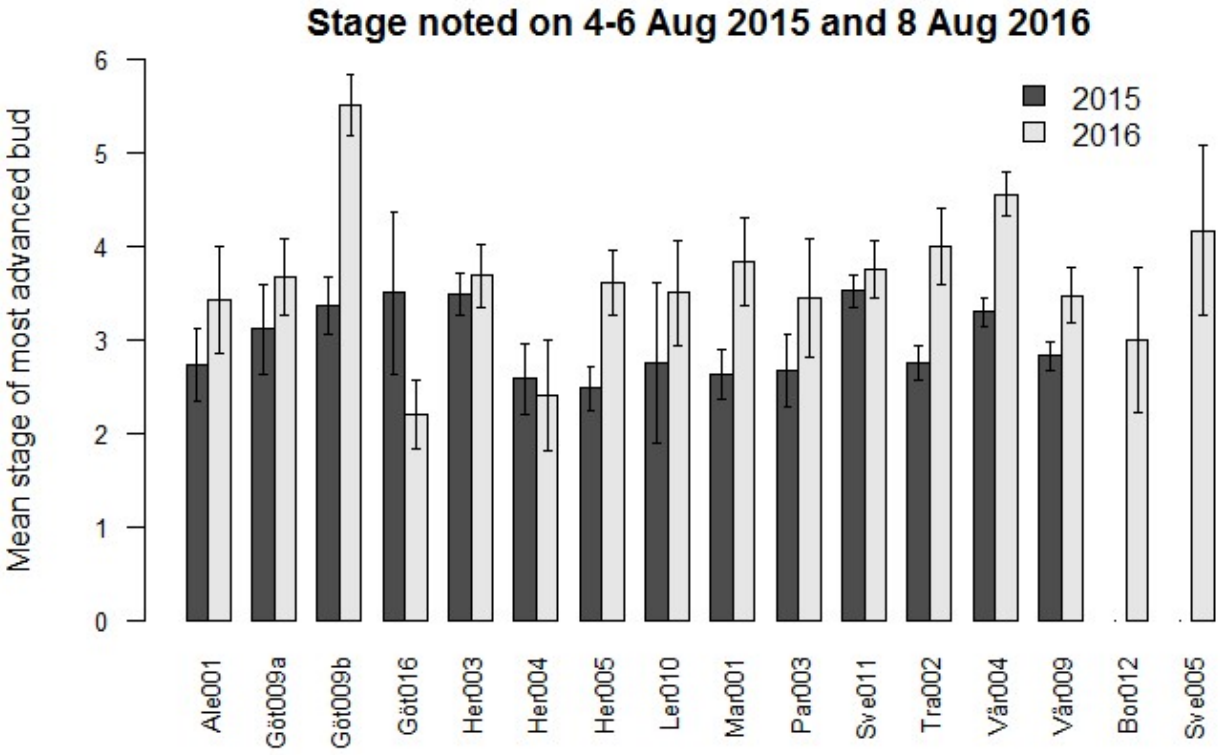
```
m44<-lme(first_j ~ pred, data = data2016l_calc_4, random = ~ 1|pop/ori_new)
Anova(m44)
```

```
Analysis of Deviance Table (Type II tests)

Response: first_j
     Chisq Df Pr(>Chisq)
pred 0.048  1     0.8266
```

No effect of predation

Differences among years in population mean phenology



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```
m49<-lm(phen~year*pop,data=subset(d1516,!pop=="Bor012"&!pop=="Sve005"))
Anova(m49)
```

```
Anova Table (Type II tests)

Response: phen
           Sum Sq  Df F value    Pr(>F)
year        74.37   1 36.7083 2.536e-09 ***
pop         82.82  13  3.1445 0.0001473 ***
year:pop    42.35  13  1.6079 0.0786487 .
Residuals 1122.43 554
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Hide

```
summary(m49)
```

```
Call:
lm(formula = phen ~ year * pop, data = subset(d1516, !pop ==
    "Bor012" & !pop == "Sve005"))

Residuals:
    Min      1Q  Median      3Q     Max
-3.5556 -0.8281  0.1719  1.2500  2.5833

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)
(Intercept)          2.72727    0.42917   6.355 4.36e-10 ***
year2016             0.68939    0.59416   1.160   0.2464
popGöt009a           0.38384    0.63977   0.600   0.5488
popGöt009b           0.63636    0.60694   1.048   0.2949
popGöt016            0.77273    0.83108   0.930   0.3529
popHer003            0.75758    0.49556   1.529   0.1269
popHer004           -0.14394    0.59416  -0.242   0.8087
popHer005           -0.24901    0.52180  -0.477   0.6334
popLer010            0.02273    0.83108   0.027   0.9782
popMar001           -0.10227    0.66139  -0.155   0.8772
popPar003           -0.06061    0.56503  -0.107   0.9146
popSve011            0.79273    0.47403   1.672   0.0950 .
popTra002            0.02273    0.50650   0.045   0.9642
popVår004            0.56541    0.45705   1.237   0.2166
popVår009            0.10085    0.46459   0.217   0.8282
year2016:popGöt009a -0.13384    0.86428  -0.155   0.8770
year2016:popGöt009b  1.44697    0.88908   1.627   0.1042
year2016:popGöt016  -1.98939    1.12461  -1.769   0.0774 .
year2016:popHer003  -0.49424    0.70389  -0.702   0.4829
year2016:popHer004  -0.87273    0.96284  -0.906   0.3651
year2016:popHer005   0.44104    0.72746   0.606   0.5446
year2016:popLer010   0.06061    1.09417   0.055   0.9558
year2016:popMar001   0.51894    0.97157   0.534   0.5935
year2016:popPar003   0.08838    0.84452   0.105   0.9167
year2016:popSve011  -0.45939    0.67591  -0.680   0.4970
year2016:popTra002   0.56061    0.96535   0.581   0.5617
year2016:popVår004   0.57348    0.65020   0.882   0.3782
year2016:popVår009  -0.04530    0.66405  -0.068   0.9456
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.423 on 554 degrees of freedom
Multiple R-squared:  0.1511,    Adjusted R-squared:  0.1097
F-statistic: 3.652 on 27 and 554 DF,  p-value: 3.837e-09
```