**Phenology is not related to recording date**

**Bivariate Fit of Mean(most\_adv) By date\_julian year=2010**





**Linear Fit**

Mean(most\_adv) = 12,518153 - 0,0450455\*date\_julian

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,053516 |
| RSquare Adj | 0,000933 |
| Root Mean Square Error | 0,553745 |
| Mean of Response | 2,964 |
| Observations (or Sum Wgts) | 20 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 0,3120753 | 0,312075 | 1,0177 |
| Error | 18 | 5,5194047 | 0,306634 | **Prob > F** |
| C. Total | 19 | 5,8314800 |  | 0,3264 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | 12,518153 | 9,471298 | 1,32 | 0,2028 |
| date\_julian |  | -0,045046 | 0,044651 | -1,01 | 0,3264 |

**Bivariate Fit of Mean(most\_adv) By date\_julian year=2011**





**Linear Fit**

Mean(most\_adv) = -1,267699 + 0,0219498\*date\_julian

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,053723 |
| RSquare Adj | -0,01387 |
| Root Mean Square Error | 0,546074 |
| Mean of Response | 3,285518 |
| Observations (or Sum Wgts) | 16 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 0,2370129 | 0,237013 | 0,7948 |
| Error | 14 | 4,1747484 | 0,298196 | **Prob > F** |
| C. Total | 15 | 4,4117613 |  | 0,3877 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | -1,267699 | 5,109031 | -0,25 | 0,8076 |
| date\_julian |  | 0,0219498 | 0,02462 | 0,89 | 0,3877 |

Mean flowering phenology does not differ among populations with and without predator, both when considering both years separately, or together

**Oneway Analysis of Mean(most\_adv) By predator year=2010**



**Oneway Anova**

**Summary of Fit**

|  |  |
| --- | --- |
| Rsquare | 0,016303 |
| Adj Rsquare | -0,03835 |
| Root Mean Square Error | 0,564526 |
| Mean of Response | 2,964 |
| Observations (or Sum Wgts) | 20 |

**t Test**

1-0

Assuming equal variances

|  |  |  |  |
| --- | --- | --- | --- |
| Difference | 0,13859 | t Ratio | 0,546182 |
| Std Err Dif | 0,25374 | DF | 18 |
| Upper CL Dif | 0,67166 | Prob > |t| | 0,5916 |
| Lower CL Dif | -0,39449 | Prob > t | 0,2958 |
| Confidence | 0,95 | Prob < t | 0,7042 |
|  |  |  |  |



**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** | **Prob > F** |
| --- | --- | --- | --- | --- | --- |
| predator | 1 | 0,0950699 | 0,095070 | 0,2983 | 0,5916 |
| Error | 18 | 5,7364101 | 0,318689 |  |  |
| C. Total | 19 | 5,8314800 |  |  |  |

**Means for Oneway Anova**

| **Level** | **Number** | **Mean** | **Std Error** | **Lower 95%** | **Upper 95%** |
| --- | --- | --- | --- | --- | --- |
| 0 | 9 | 2,88778 | 0,18818 | 2,4924 | 3,2831 |
| 1 | 11 | 3,02636 | 0,17021 | 2,6688 | 3,3840 |

Std Error uses a pooled estimate of error variance

**Oneway Analysis of Mean(most\_adv) By predator year=2011**



**Oneway Anova**

**Summary of Fit**

|  |  |
| --- | --- |
| Rsquare | 0,026229 |
| Adj Rsquare | -0,04333 |
| Root Mean Square Error | 0,55395 |
| Mean of Response | 3,285518 |
| Observations (or Sum Wgts) | 16 |

**t Test**

1-0

Assuming equal variances

|  |  |  |  |
| --- | --- | --- | --- |
| Difference | -0,18347 | t Ratio | -0,61408 |
| Std Err Dif | 0,29878 | DF | 14 |
| Upper CL Dif | 0,45734 | Prob > |t| | 0,5490 |
| Lower CL Dif | -0,82429 | Prob > t | 0,7255 |
| Confidence | 0,95 | Prob < t | 0,2745 |
|  |  |  |  |



**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** | **Prob > F** |
| --- | --- | --- | --- | --- | --- |
| predator | 1 | 0,1157165 | 0,115717 | 0,3771 | 0,5490 |
| Error | 14 | 4,2960448 | 0,306860 |  |  |
| C. Total | 15 | 4,4117613 |  |  |  |

**Means for Oneway Anova**

| **Level** | **Number** | **Mean** | **Std Error** | **Lower 95%** | **Upper 95%** |
| --- | --- | --- | --- | --- | --- |
| 0 | 5 | 3,41166 | 0,24773 | 2,8803 | 3,9430 |
| 1 | 11 | 3,22818 | 0,16702 | 2,8700 | 3,5864 |

Std Error uses a pooled estimate of error variance

**Oneway Analysis of Mean(most\_adv) By predator**



**Oneway Anova**

**Summary of Fit**

|  |  |
| --- | --- |
| Rsquare | 0,002104 |
| Adj Rsquare | -0,02725 |
| Root Mean Square Error | 0,572369 |
| Mean of Response | 3,106897 |
| Observations (or Sum Wgts) | 36 |

**t Test**

1-0

Assuming equal variances

|  |  |  |  |
| --- | --- | --- | --- |
| Difference | 0,05240 | t Ratio | 0,267757 |
| Std Err Dif | 0,19568 | DF | 34 |
| Upper CL Dif | 0,45007 | Prob > |t| | 0,7905 |
| Lower CL Dif | -0,34528 | Prob > t | 0,3953 |
| Confidence | 0,95 | Prob < t | 0,6047 |
|  |  |  |  |



**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** | **Prob > F** |
| --- | --- | --- | --- | --- | --- |
| predator | 1 | 0,023487 | 0,023487 | 0,0717 | 0,7905 |
| Error | 34 | 11,138631 | 0,327607 |  |  |
| C. Total | 35 | 11,162118 |  |  |  |

**Means for Oneway Anova**

| **Level** | **Number** | **Mean** | **Std Error** | **Lower 95%** | **Upper 95%** |
| --- | --- | --- | --- | --- | --- |
| 0 | 14 | 3,07488 | 0,15297 | 2,7640 | 3,3858 |
| 1 | 22 | 3,12727 | 0,12203 | 2,8793 | 3,3753 |

Std Error uses a pooled estimate of error variance

In populations with the predator, no relation among mean population phenology and attack rates

**Fit Y by X Group**

**Bivariate Fit of Mean(n\_eggs) By Mean(most\_adv)**





**Linear Fit**

Mean(n\_eggs) = 4,5826331 - 0,5947402\*Mean(most\_adv)

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,011767 |
| RSquare Adj | -0,03765 |
| Root Mean Square Error | 2,959815 |
| Mean of Response | 2,722718 |
| Observations (or Sum Wgts) | 22 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 2,08616 | 2,08616 | 0,2381 |
| Error | 20 | 175,21015 | 8,76051 | **Prob > F** |
| C. Total | 21 | 177,29631 |  | 0,6309 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | 4,5826331 | 3,863281 | 1,19 | 0,2494 |
| Mean(most\_adv) |  | -0,59474 | 1,21876 | -0,49 | 0,6309 |

**Bivariate Fit of Mean(attack) By Mean(most\_adv)**





**Linear Fit**

Mean(attack) = 0,0034882 + 0,1243192\*Mean(most\_adv)

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,117425 |
| RSquare Adj | 0,073296 |
| Root Mean Square Error | 0,185082 |
| Mean of Response | 0,392268 |
| Observations (or Sum Wgts) | 22 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 0,09115262 | 0,091153 | 2,6610 |
| Error | 20 | 0,68510945 | 0,034255 | **Prob > F** |
| C. Total | 21 | 0,77626207 |  | 0,1185 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | 0,0034882 | 0,241578 | 0,01 | 0,9886 |
| Mean(most\_adv) |  | 0,1243192 | 0,076211 | 1,63 | 0,1185 |

In populations with the predator, no relation among selection gradient for phenology and mean population phenology

**Bivariate Fit of sel\_grad\_phen By Mean(most\_adv) year=2010**





**Linear Fit**

sel\_grad\_phen = -0,469476 + 0,0935421\*Mean(most\_adv)

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,044096 |
| RSquare Adj | -0,06212 |
| Root Mean Square Error | 0,227071 |
| Mean of Response | -0,18638 |
| Observations (or Sum Wgts) | 11 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 0,02140678 | 0,021407 | 0,4152 |
| Error | 9 | 0,46405065 | 0,051561 | **Prob > F** |
| C. Total | 10 | 0,48545743 |  | 0,5354 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | -0,469476 | 0,444656 | -1,06 | 0,3186 |
| Mean(most\_adv) |  | 0,0935421 | 0,145175 | 0,64 | 0,5354 |

**Bivariate Fit of sel\_grad\_phen By Mean(most\_adv) year=2011**





**Linear Fit**

sel\_grad\_phen = -0,490468 + 0,1220988\*Mean(most\_adv)

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,12746 |
| RSquare Adj | 0,030511 |
| Root Mean Square Error | 0,191302 |
| Mean of Response | -0,09631 |
| Observations (or Sum Wgts) | 11 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 0,04811389 | 0,048114 | 1,3147 |
| Error | 9 | 0,32936965 | 0,036597 | **Prob > F** |
| C. Total | 10 | 0,37748354 |  | 0,2811 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | -0,490468 | 0,348565 | -1,41 | 0,1930 |
| Mean(most\_adv) |  | 0,1220988 | 0,106487 | 1,15 | 0,2811 |

**Bivariate Fit of sel\_grad\_phen By Mean(most\_adv)**





**Linear Fit**

sel\_grad\_phen = -0,52465 + 0,1225678\*Mean(most\_adv)

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,097627 |
| RSquare Adj | 0,052508 |
| Root Mean Square Error | 0,202356 |
| Mean of Response | -0,14135 |
| Observations (or Sum Wgts) | 22 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 0,08860242 | 0,088602 | 2,1638 |
| Error | 20 | 0,81896105 | 0,040948 | **Prob > F** |
| C. Total | 21 | 0,90756346 |  | 0,1569 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | -0,52465 | 0,264124 | -1,99 | 0,0609 |
| Mean(most\_adv) |  | 0,1225678 | 0,083324 | 1,47 | 0,1569 |

Butterfly preference for early-flowering plants does not vary with population phenology

**Bivariate Fit of phen\_neggs By Mean(most\_adv)**





**Linear Fit**

phen\_neggs = 0,5089459 - 0,0989748\*Mean(most\_adv)

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,051729 |
| RSquare Adj | 0,00182 |
| Root Mean Square Error | 0,222722 |
| Mean of Response | 0,195714 |
| Observations (or Sum Wgts) | 21 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 0,05141456 | 0,051415 | 1,0365 |
| Error | 19 | 0,94249972 | 0,049605 | **Prob > F** |
| C. Total | 20 | 0,99391429 |  | 0,3214 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | 0,5089459 | 0,311486 | 1,63 | 0,1187 |
| Mean(most\_adv) |  | -0,098975 | 0,097218 | -1,02 | 0,3214 |

BUT butterfly preference for early-flowering plants is stronger in populations/years that have higher attack rates

(plot coefficient phenology🡪n\_eggs from path models vs proportion of plants attacked per population/year)

 p = 0,0019

Why is the direct effect of phenology on fitness negative in populations with the predator?

This effect is unrelated to mean population phenology (and also to attack rate, not shown)

**Fit Y by X Group**

**Bivariate Fit of phen\_nifr By Mean(most\_adv)**





**Linear Fit**

phen\_nifr = -0,108738 + 0,0305973\*Mean(most\_adv)

**Summary of Fit**

|  |  |
| --- | --- |
| RSquare | 0,029401 |
| RSquare Adj | -0,02168 |
| Root Mean Square Error | 0,092398 |
| Mean of Response | -0,0119 |
| Observations (or Sum Wgts) | 21 |

**Analysis of Variance**

| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Ratio** |
| --- | --- | --- | --- | --- |
| Model | 1 | 0,00491363 | 0,004914 | 0,5755 |
| Error | 19 | 0,16221018 | 0,008537 | **Prob > F** |
| C. Total | 20 | 0,16712381 |  | 0,4574 |

**Parameter Estimates**

| **Term** |  | **Estimate** | **Std Error** | **t Ratio** | **Prob>|t|** |
| --- | --- | --- | --- | --- | --- |
| Intercept |  | -0,108738 | 0,129222 | -0,84 | 0,4105 |
| Mean(most\_adv) |  | 0,0305973 | 0,040331 | 0,76 | 0,4574 |