

Report: Testing hybrid vigor in the lab in response to *Eimeria*

Alice

27 August 2018

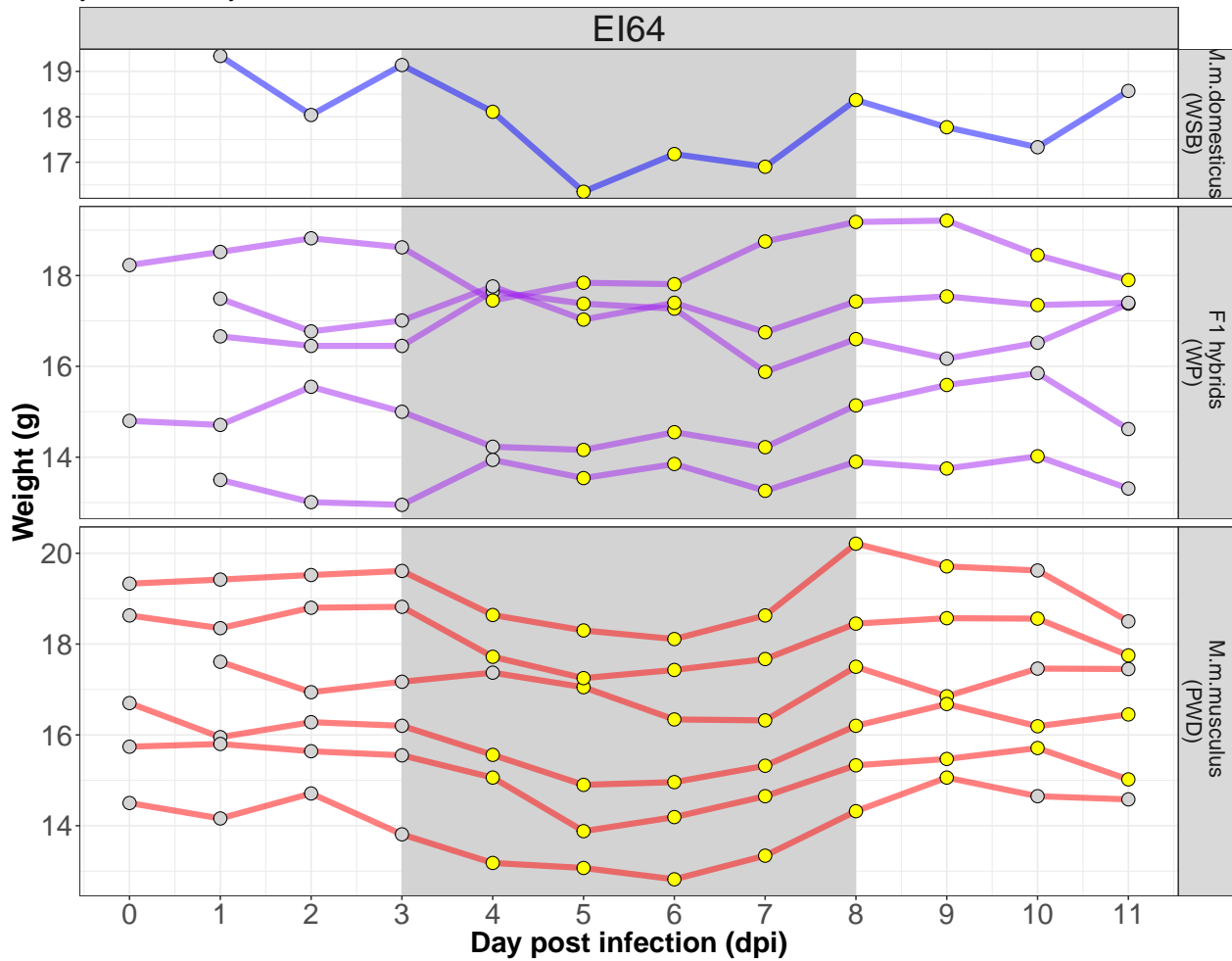
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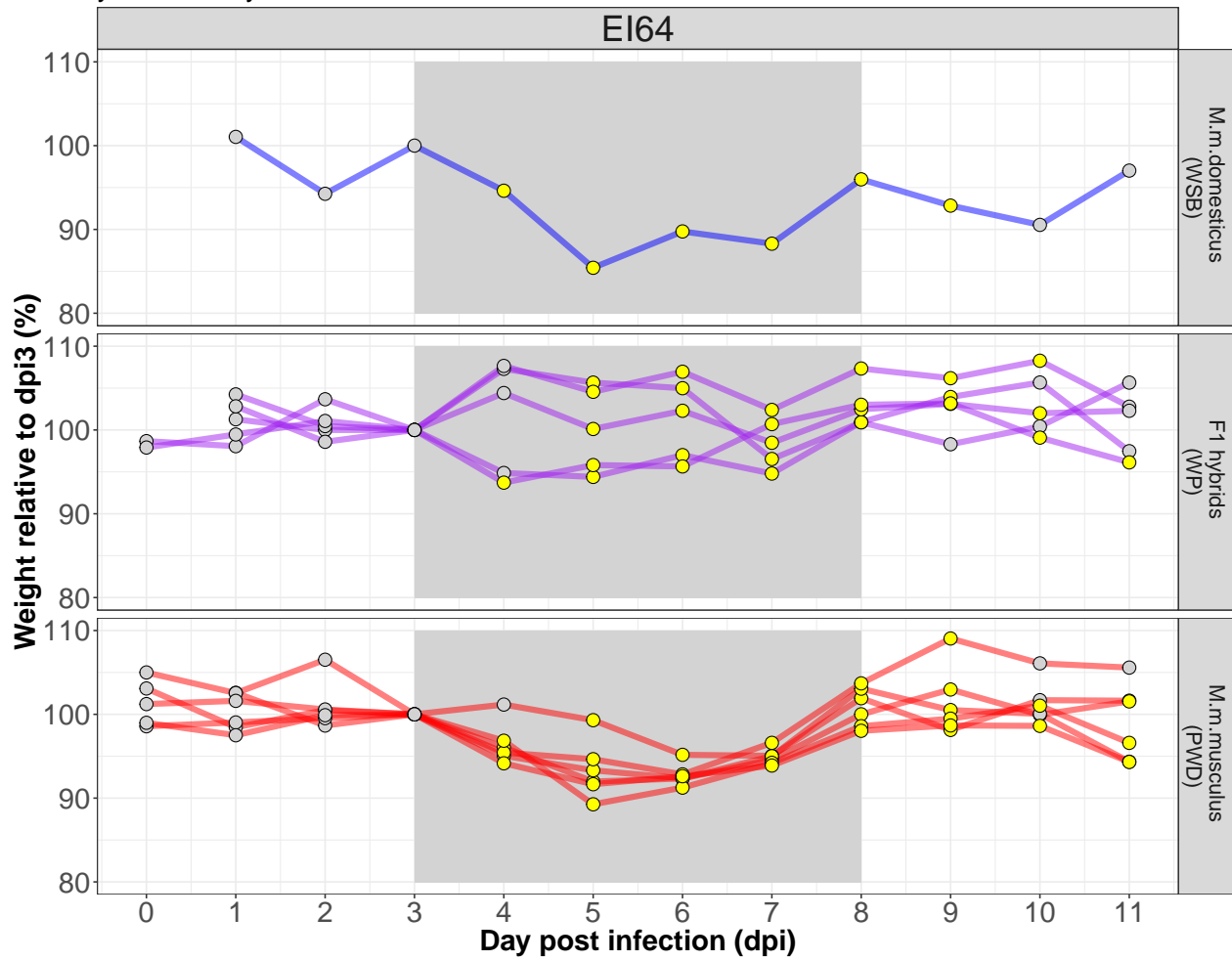
Expe_001, March 2017, Francisca's experiment. infection with E64 and Eflab

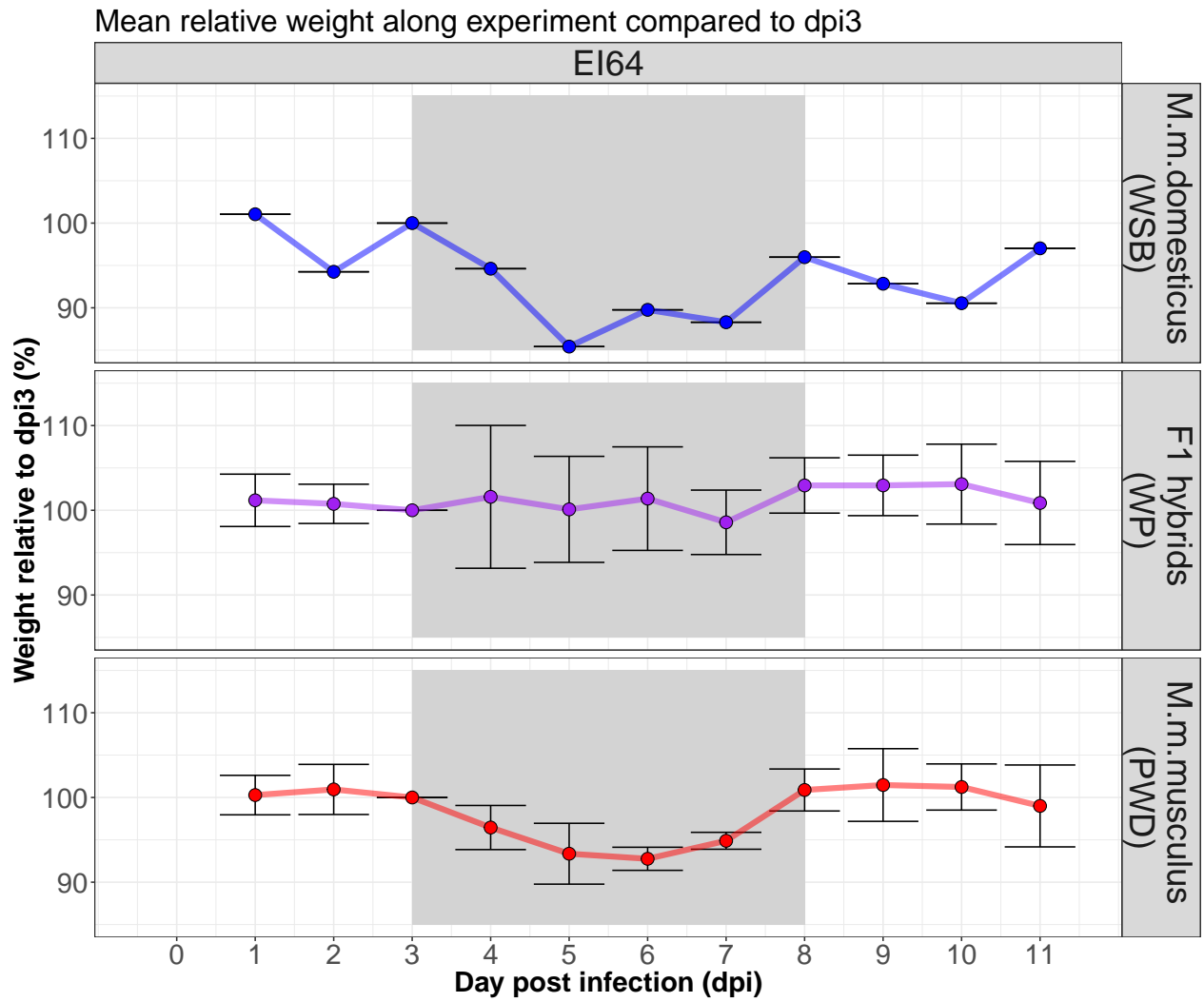
1. Weight loss

Weight along experiment per individual
yellow : oocysts detected in feces

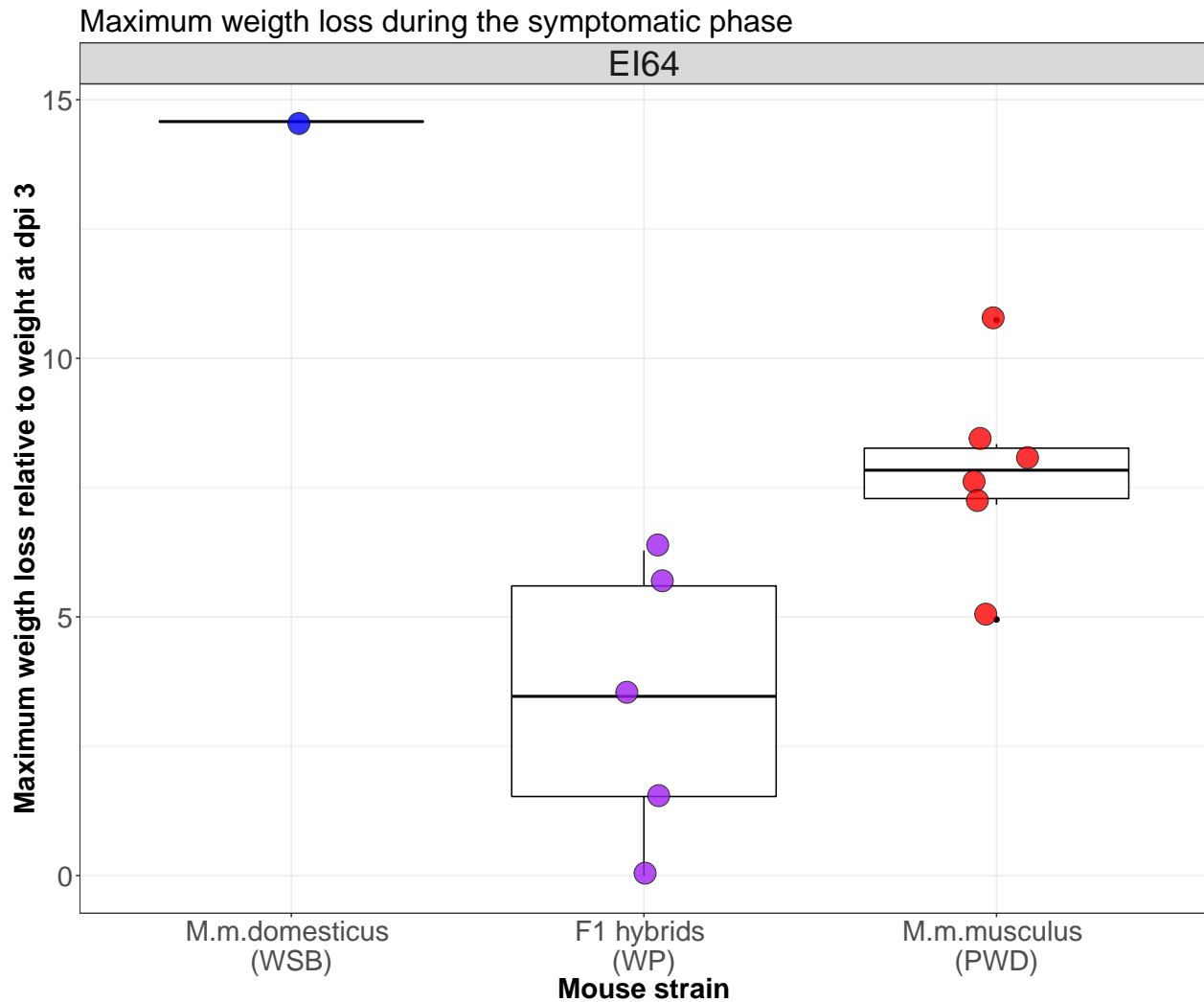


Relative weight along experiment compared to dpi3
 yellow : oocysts detected in feces





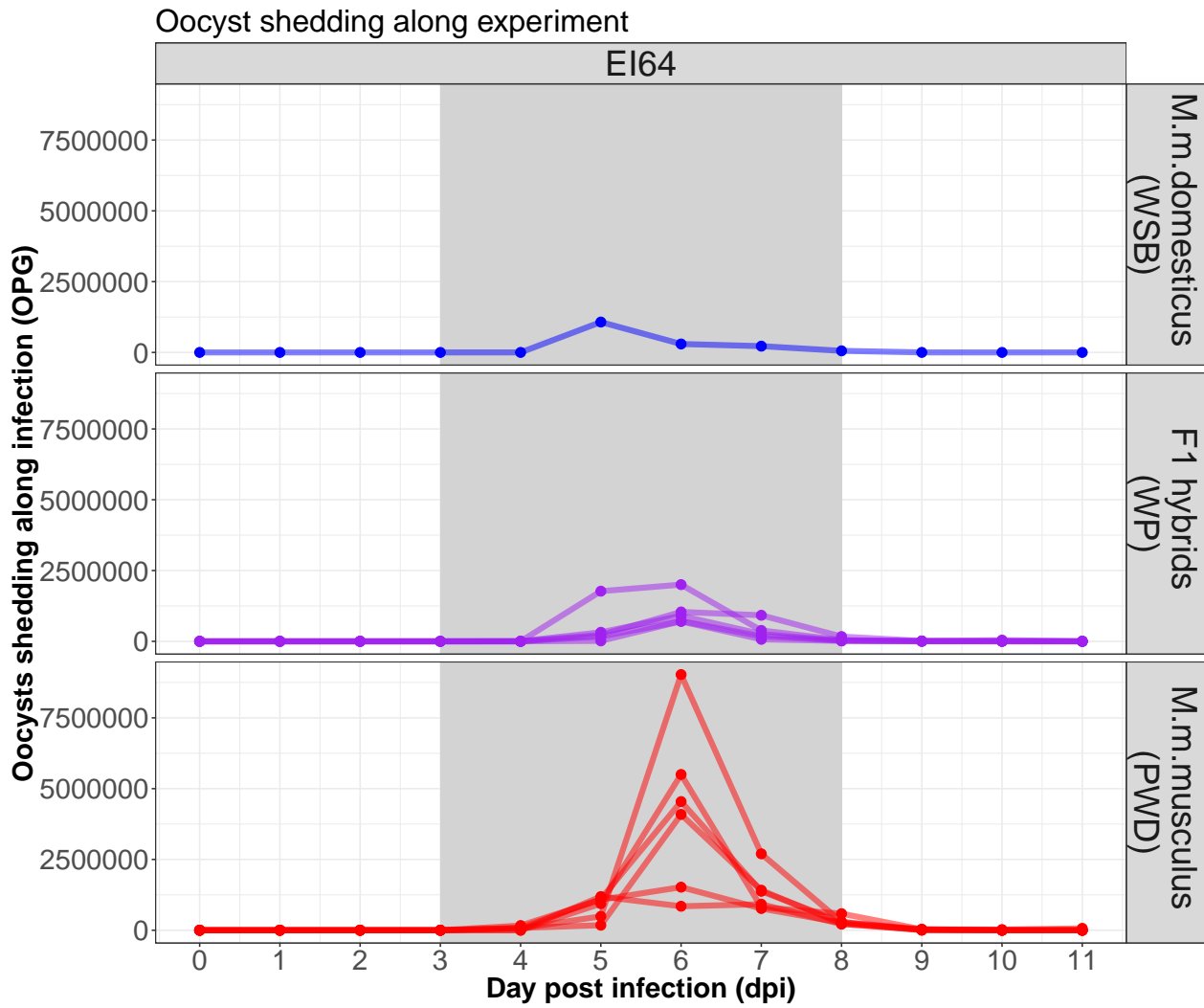
For statistical analysis, we compare the maximum relative weight loss between the different groups. We limit our analysis to the period : dpi3 to dpi8 (symptomatic period for E64 strain).



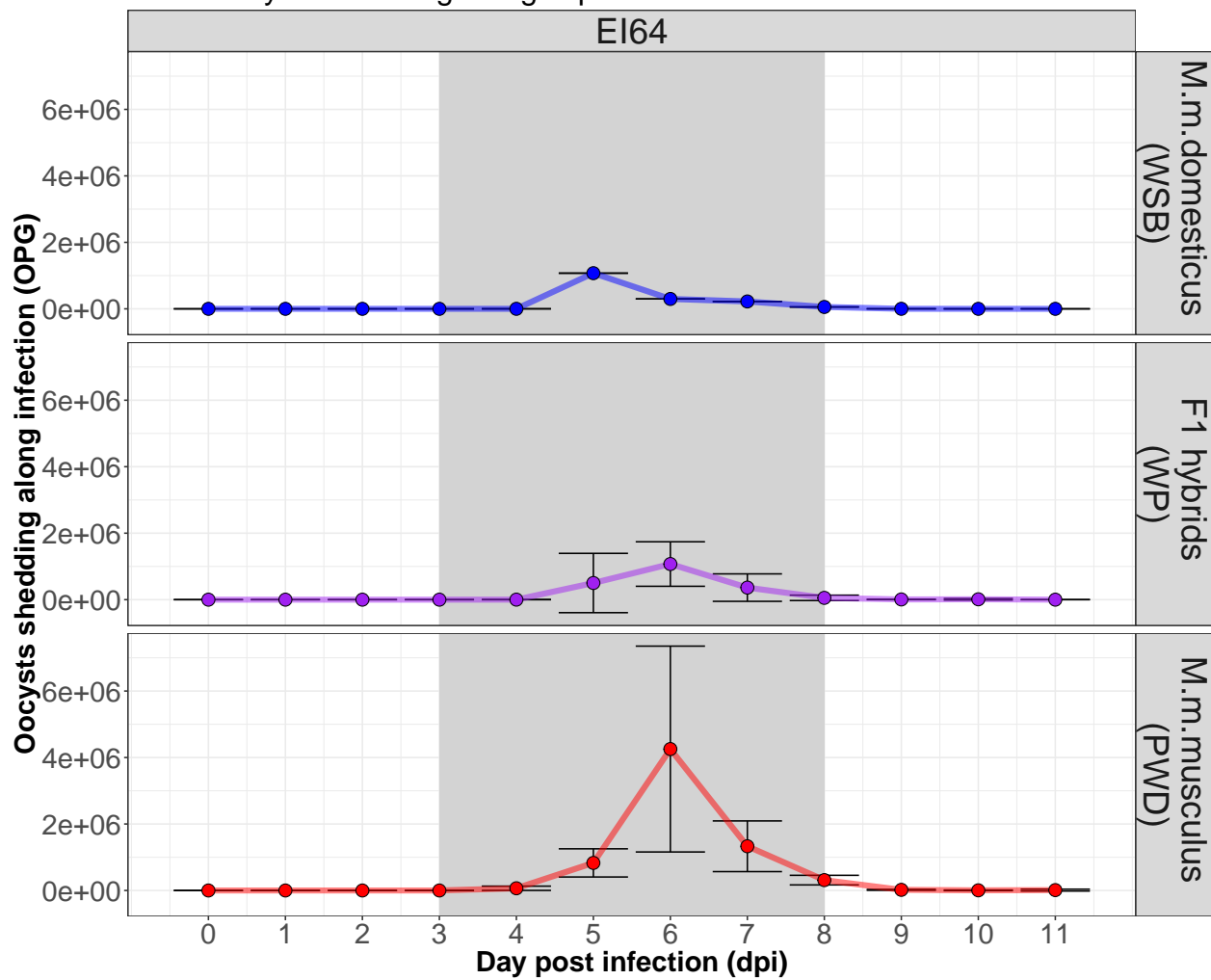
```
##
## Call:
## lm(formula = relativeWeight ~ Mouse_strain, data = max.loss_001)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.9271 -0.9534 -0.0448  0.9445  3.3754
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)       96.625     1.008   95.836 7.44e-15
## Mouse_strainM.m.domesticus \n(WSB)  -11.201     2.470  -4.536 0.00141
## Mouse_strainM.m.musculus \n(PWD)    -4.437     1.365  -3.250 0.00999
##
## (Intercept)          ***
## Mouse_strainM.m.domesticus \n(WSB) **
## Mouse_strainM.m.musculus \n(PWD)  **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.254 on 9 degrees of freedom
```

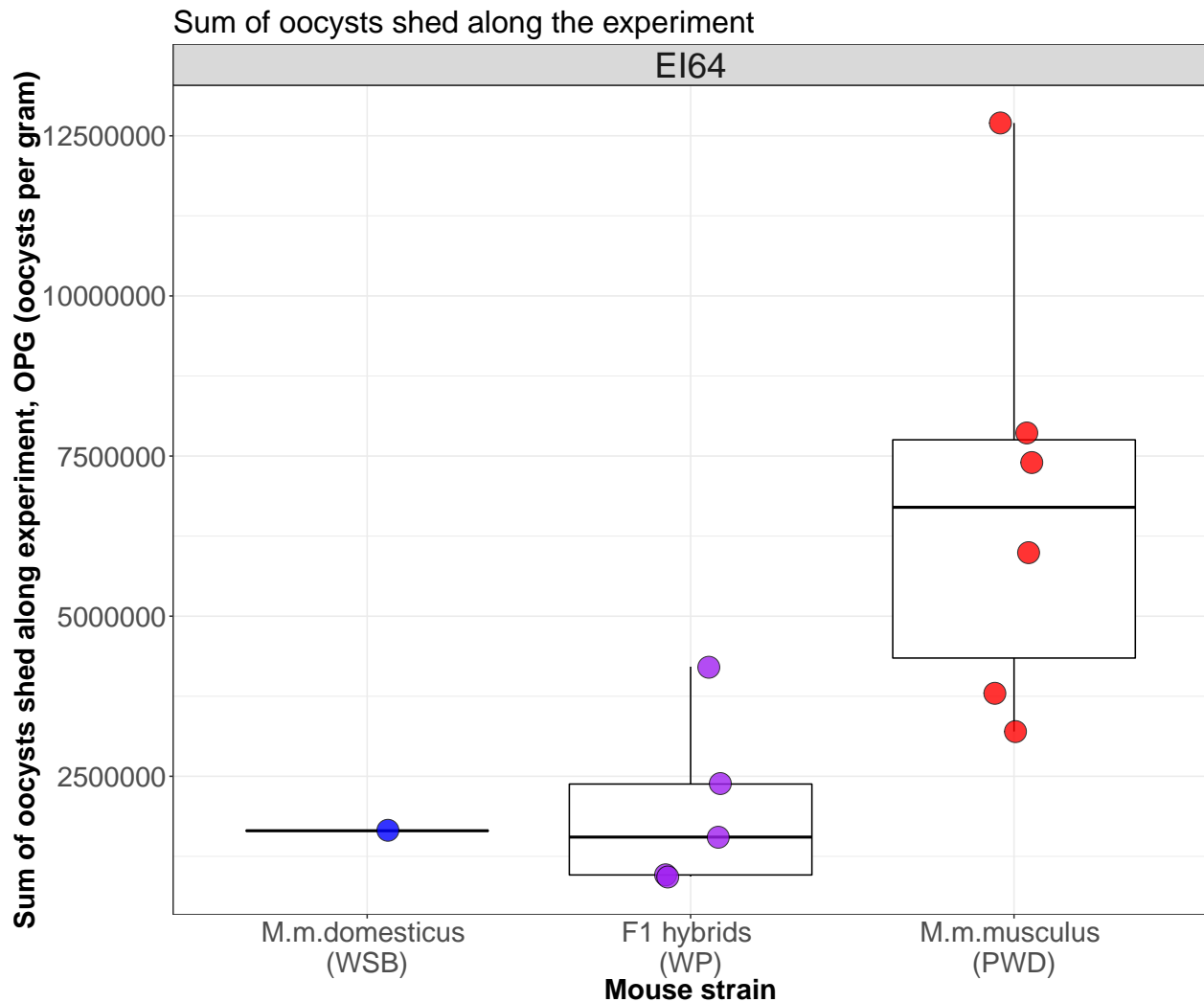
Multiple R-squared: 0.7311, Adjusted R-squared: 0.6714
F-statistic: 12.24 on 2 and 9 DF, p-value: 0.002711

2. Parasite shedding



Mean oocysts shedding along experiment





```
##
## Call:
## lm(formula = sum.oo ~ Mouse_strain, data = sum.oocysts_001)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3628205 -1053694  -228126   693597  5872235
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2007347    1214692   1.653   0.1328
## Mouse_strainM.m.domesticus \n(WSB)  -357449    2975376  -0.120   0.9070
## Mouse_strainM.m.musculus \n(PWD)   4820216    1644701   2.931   0.0167 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2716000 on 9 degrees of freedom
## Multiple R-squared:  0.5187, Adjusted R-squared:  0.4117
## F-statistic: 4.849 on 2 and 9 DF, p-value: 0.03724
```


3. Comparison host/parasite proxy

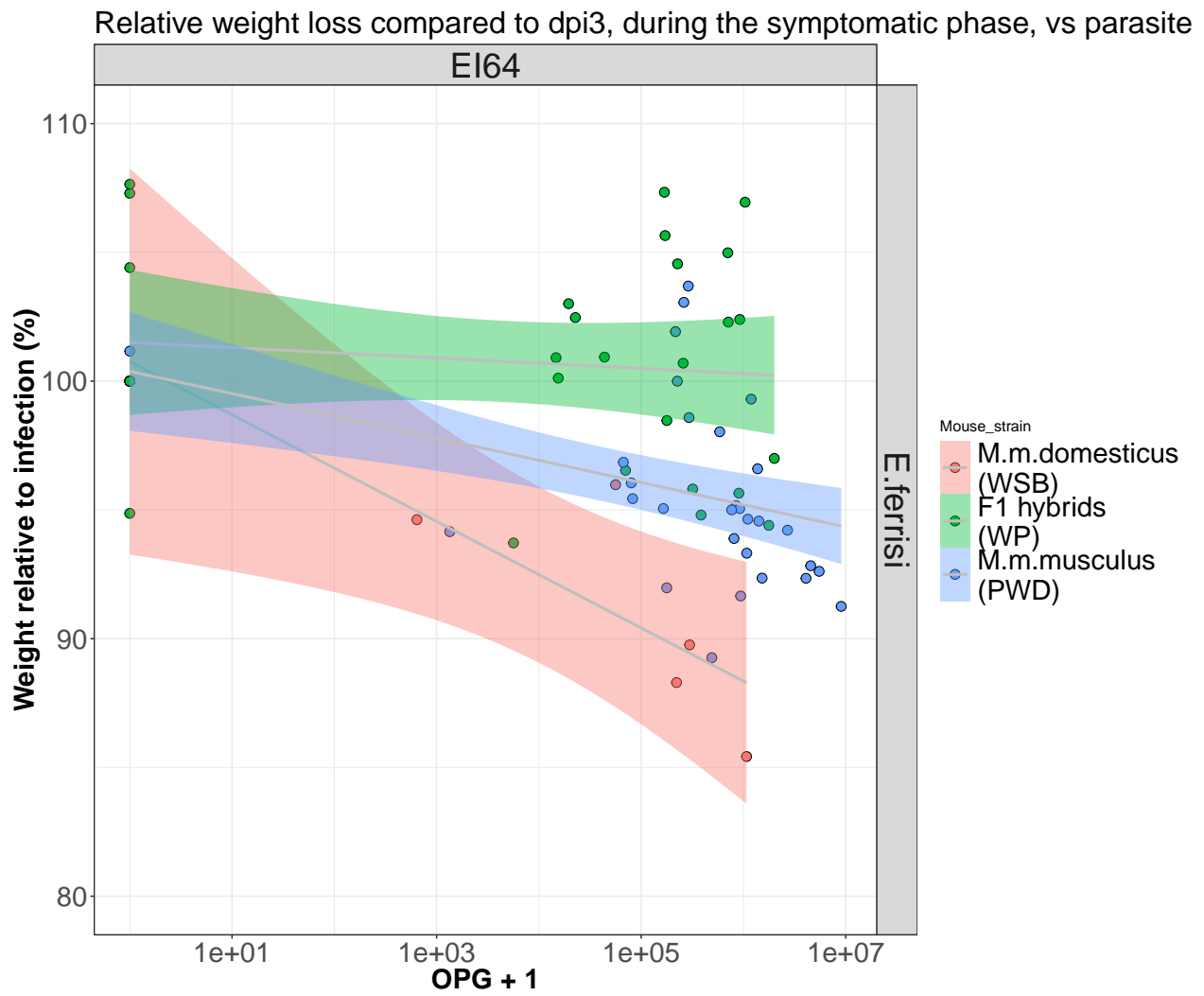
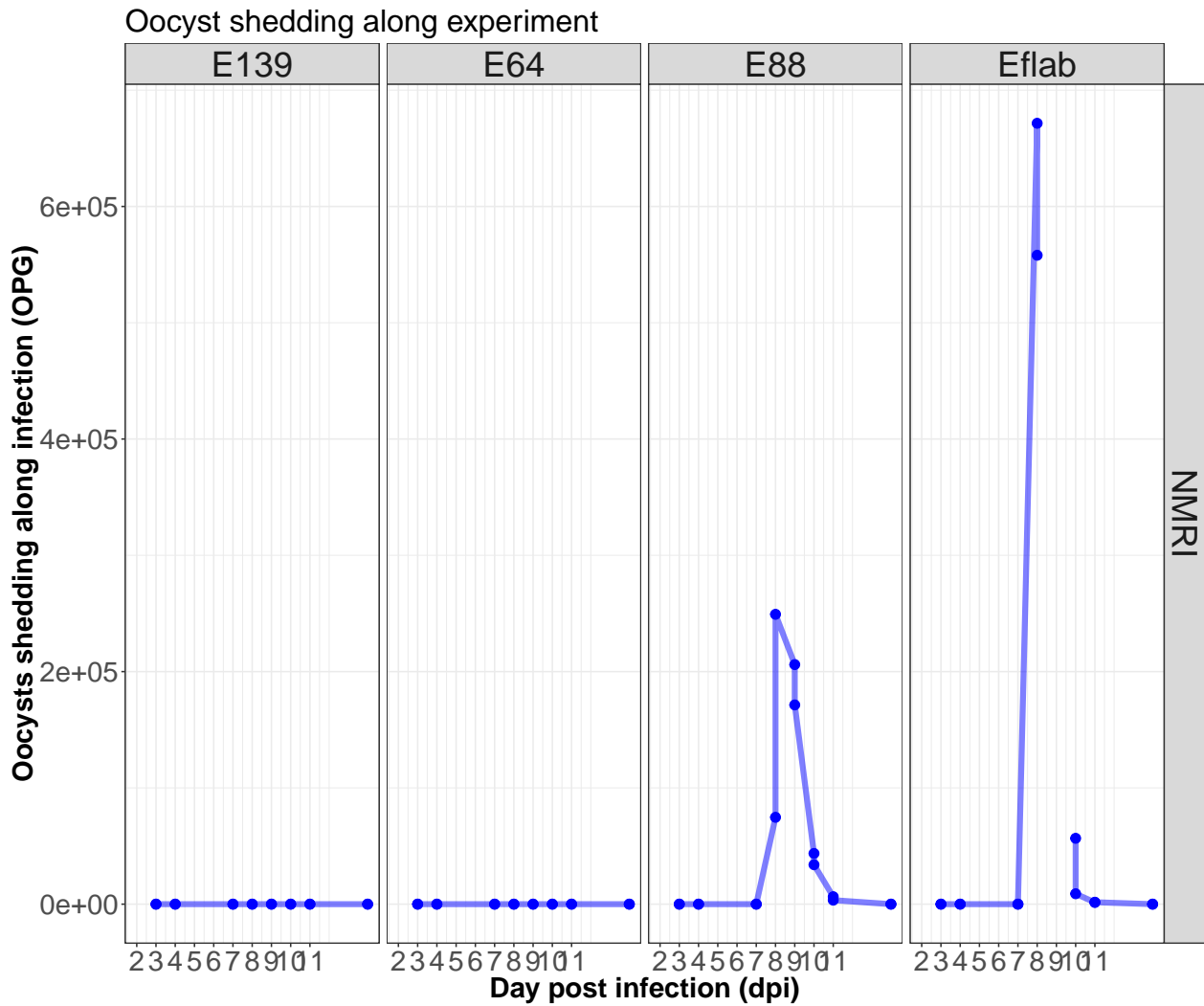


Figure 1: Weight as a function of OPG

Pass001: Nov 2017, passaging 4 isolates (some missing data)

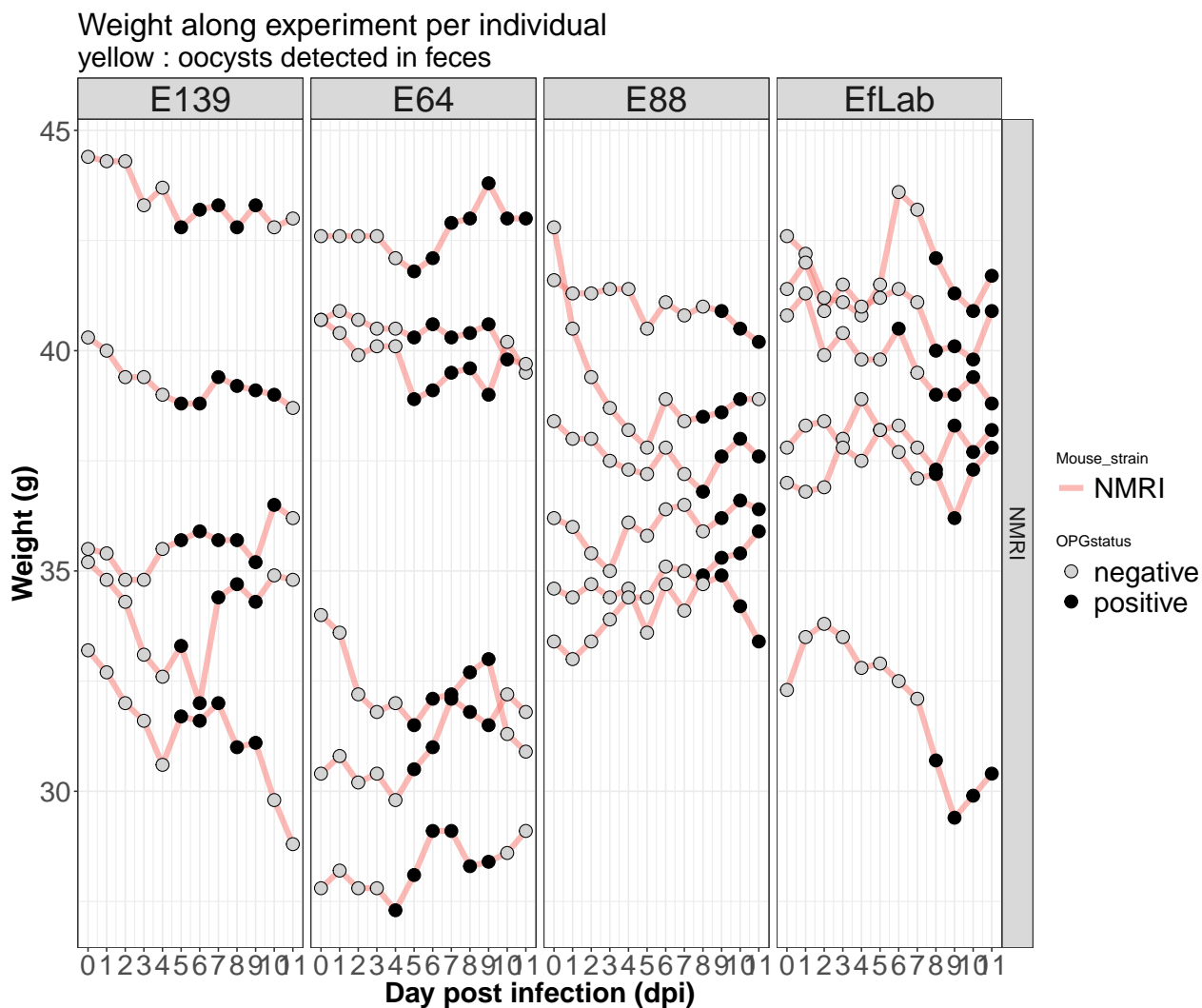
(Eflab, E88, E139, E64) in NMRI. 2 mice per cage. Only OPG recorded

Parasite shedding

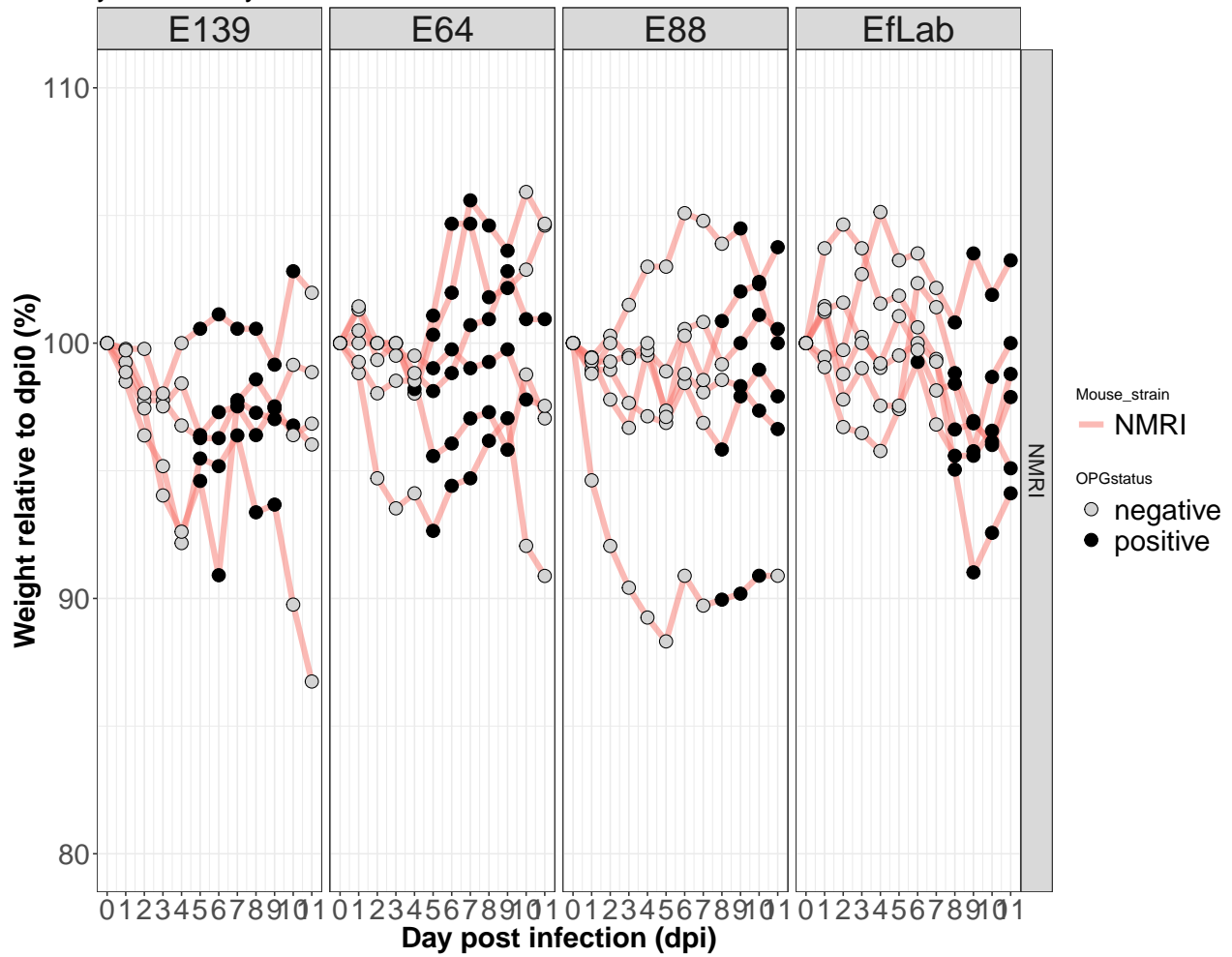


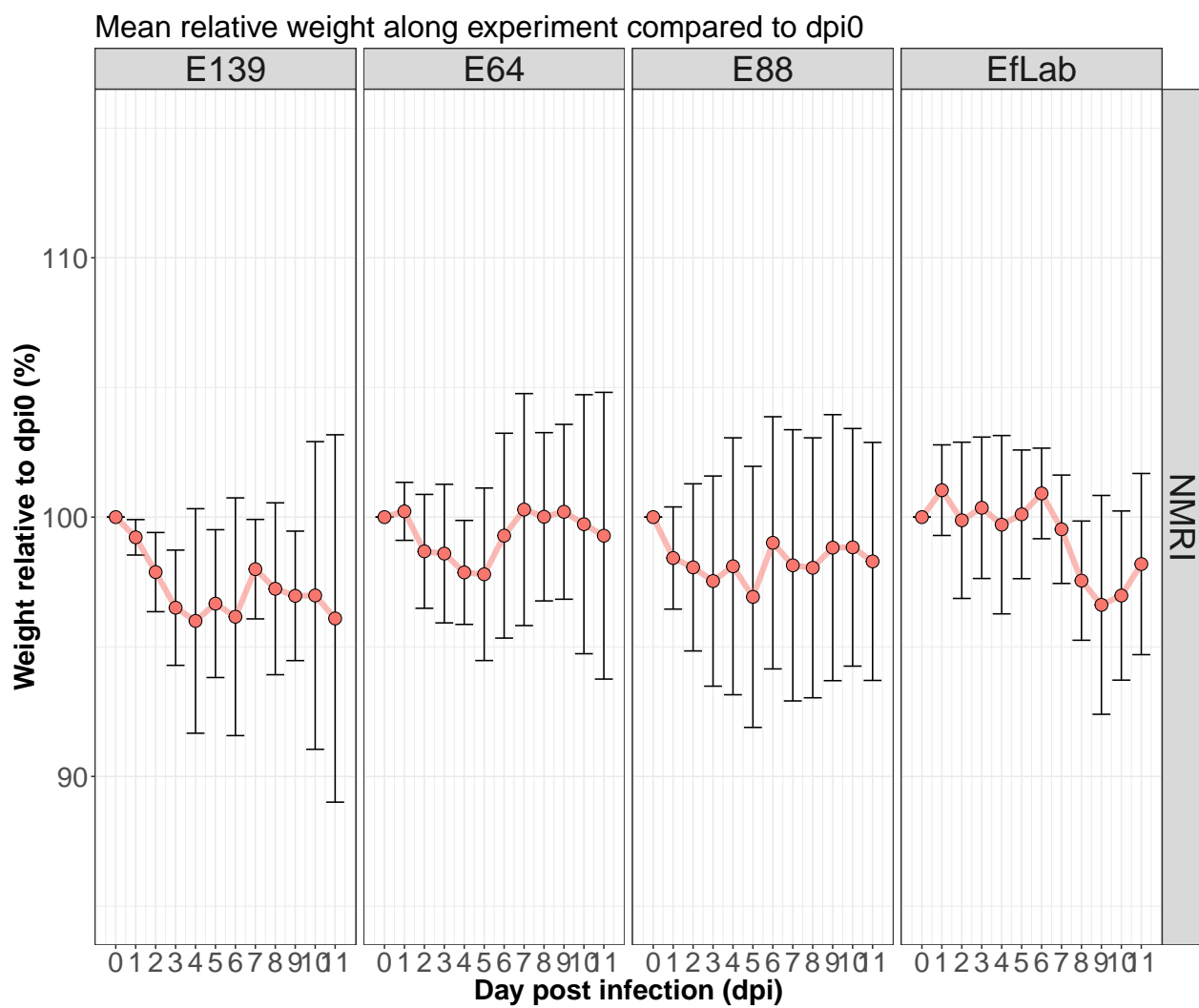
Expe_002: March 2018, NMRI mice infected with 4 *Eimeria* strains (Eflab, E88, E139, E64)

1. Weight loss

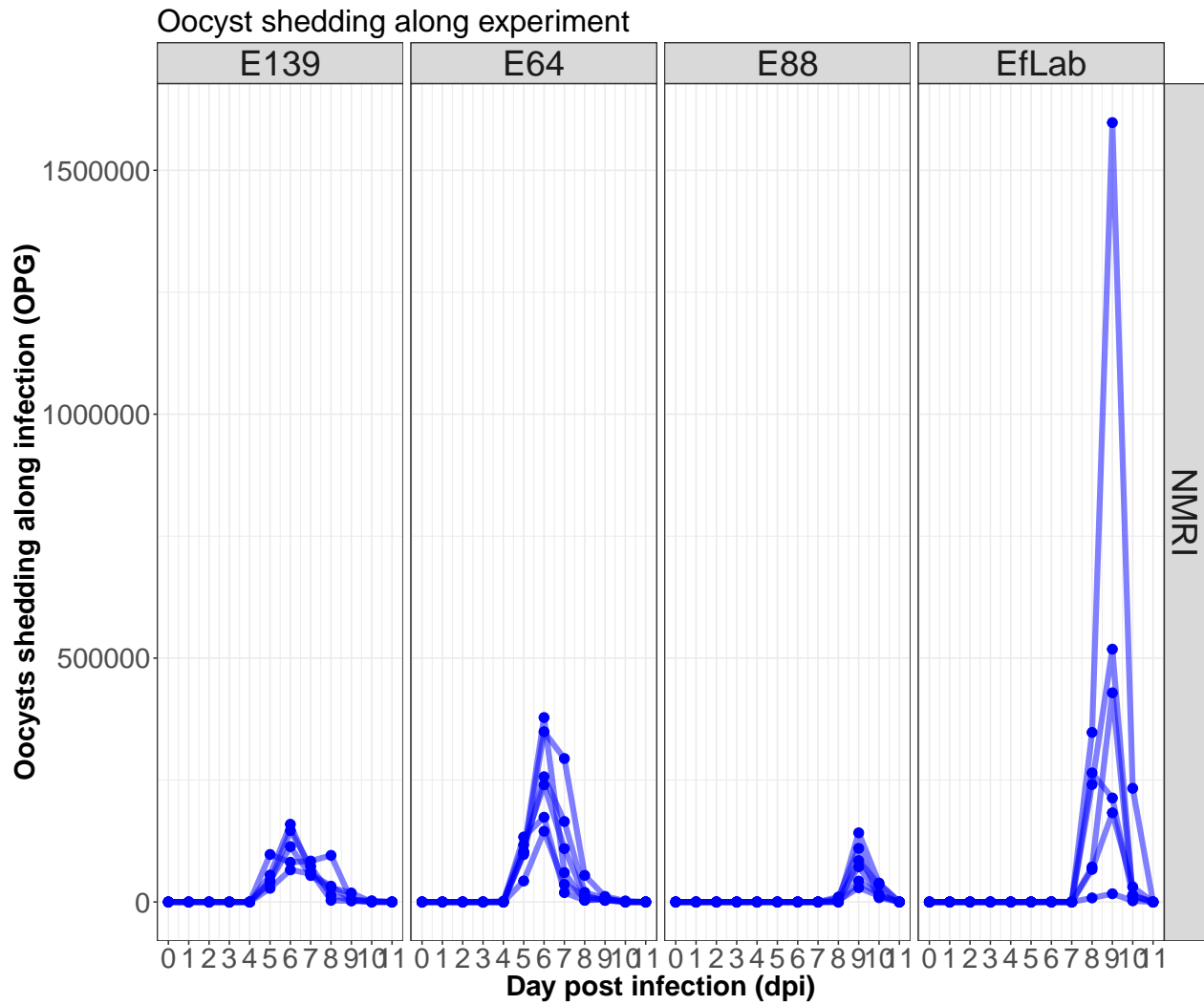


Relative weight along experiment compared to dpi0
 yellow : oocysts detected in feces

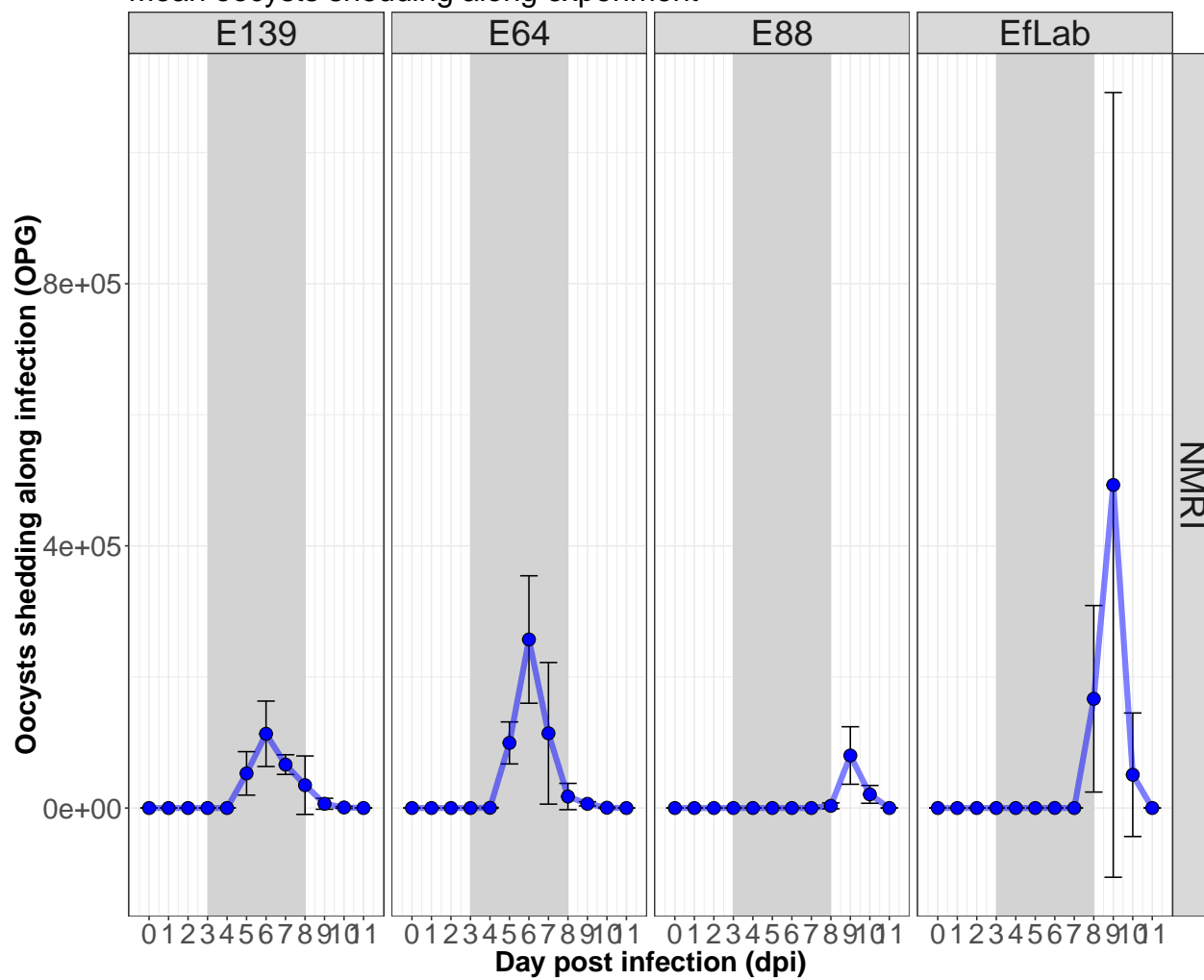




2. Parasite shedding



Mean oocysts shedding along experiment



3. Comparison host/parasite proxy

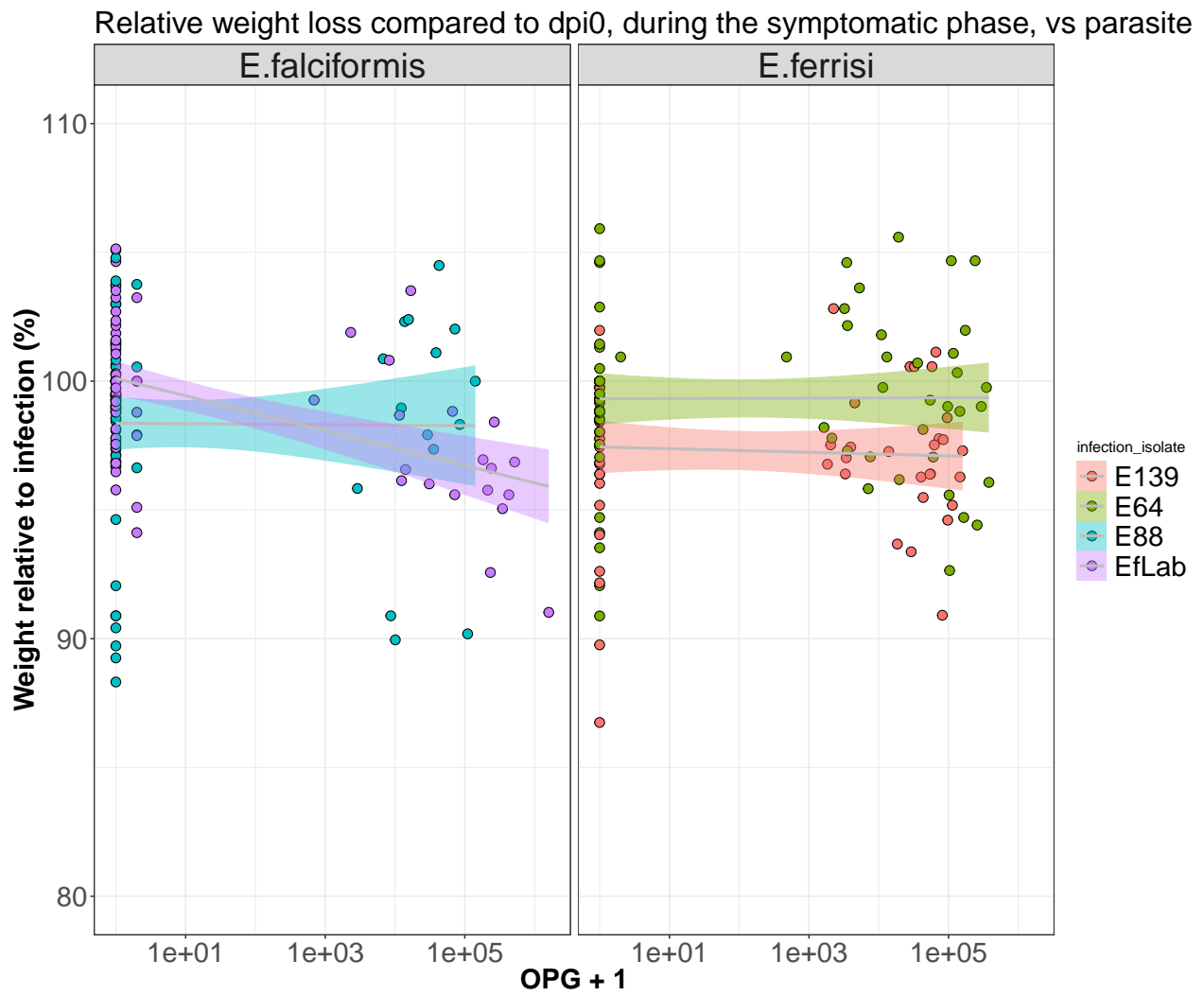
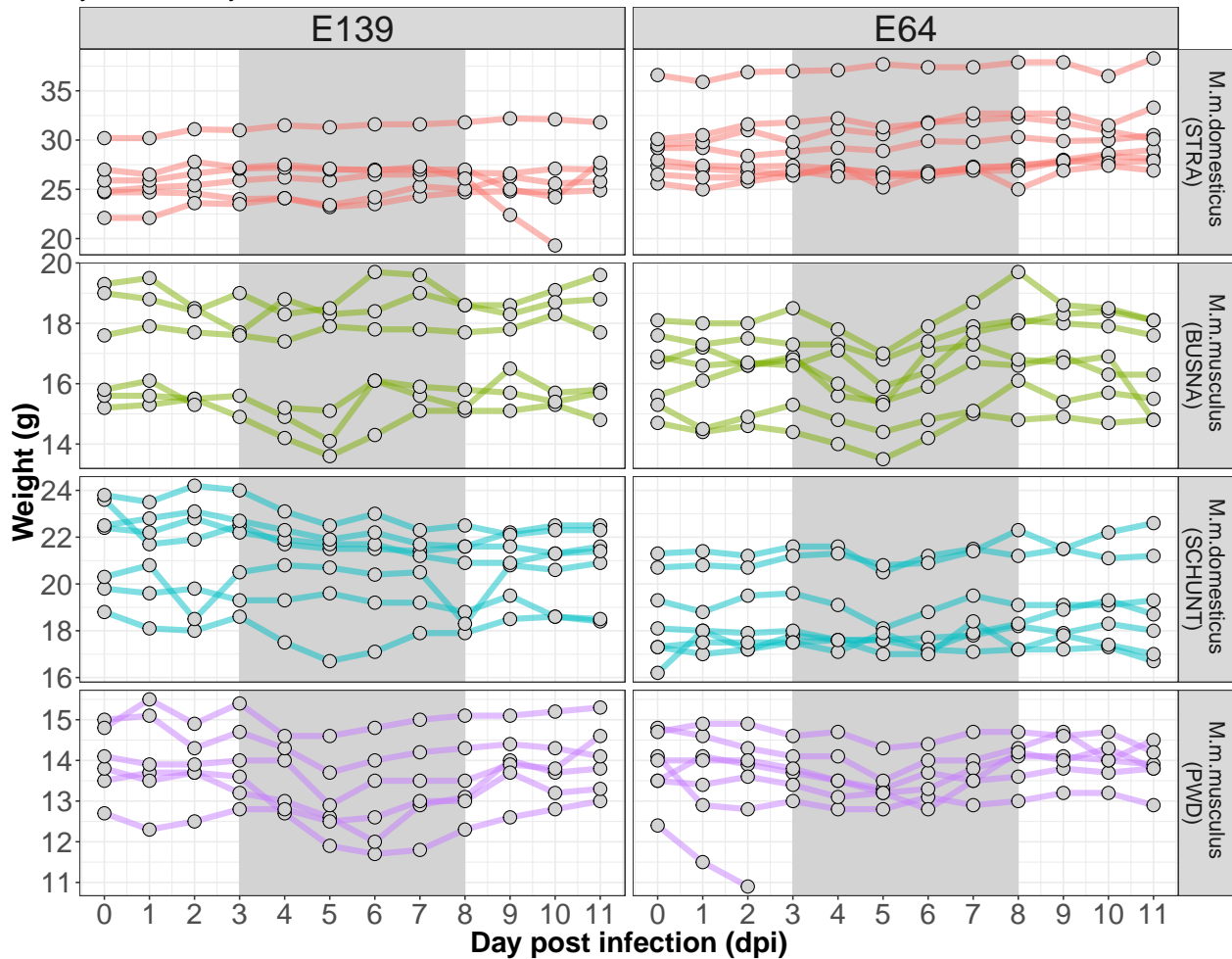


Figure 2: Weight as a function of OPG

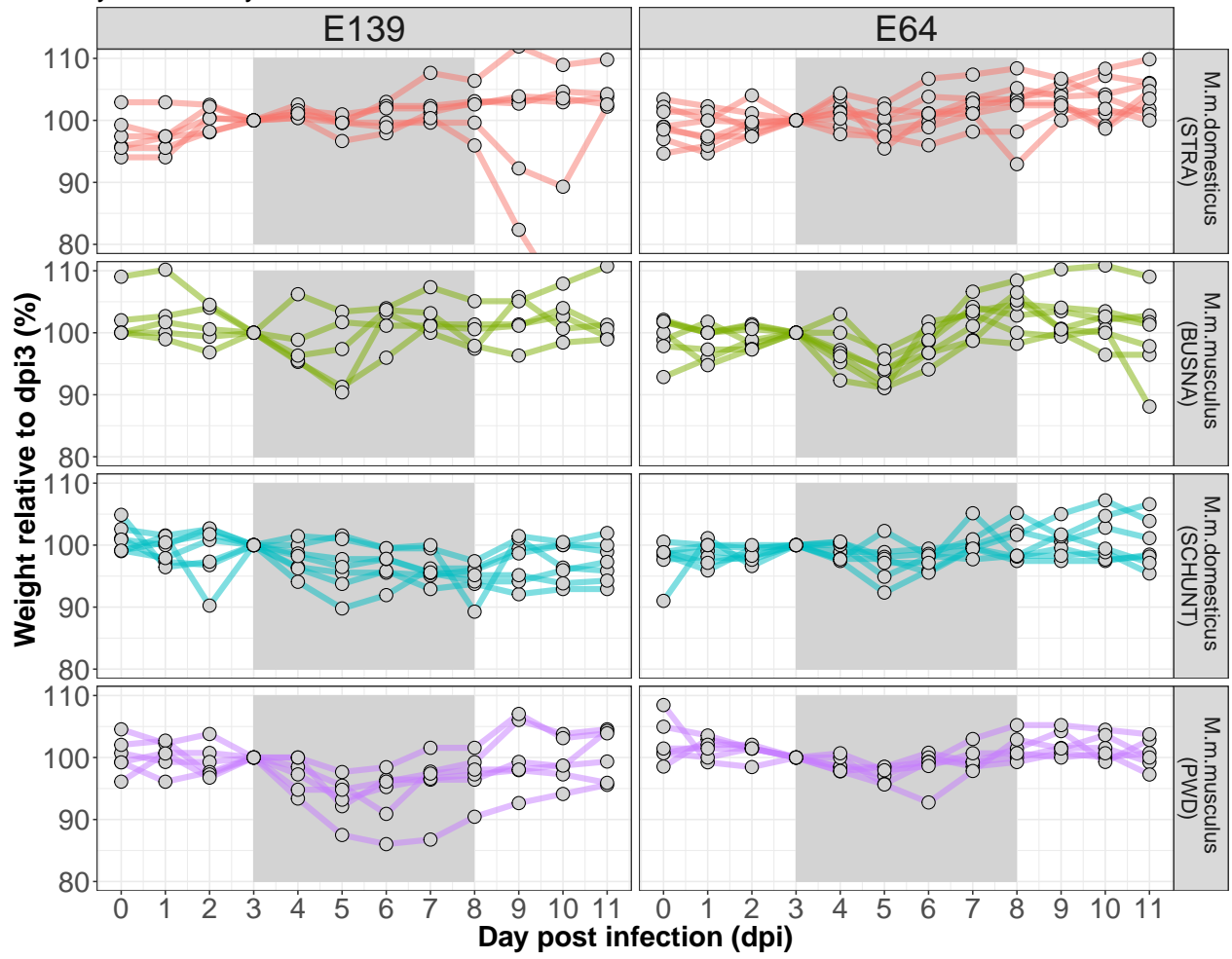
Expe_003 & Expe_004, April-May 2018, first batch Parental strains (F0) BUSNA, STRA, SCHUNT, PWD, infection with Eferrisi (E64 and E139) [2 batches]

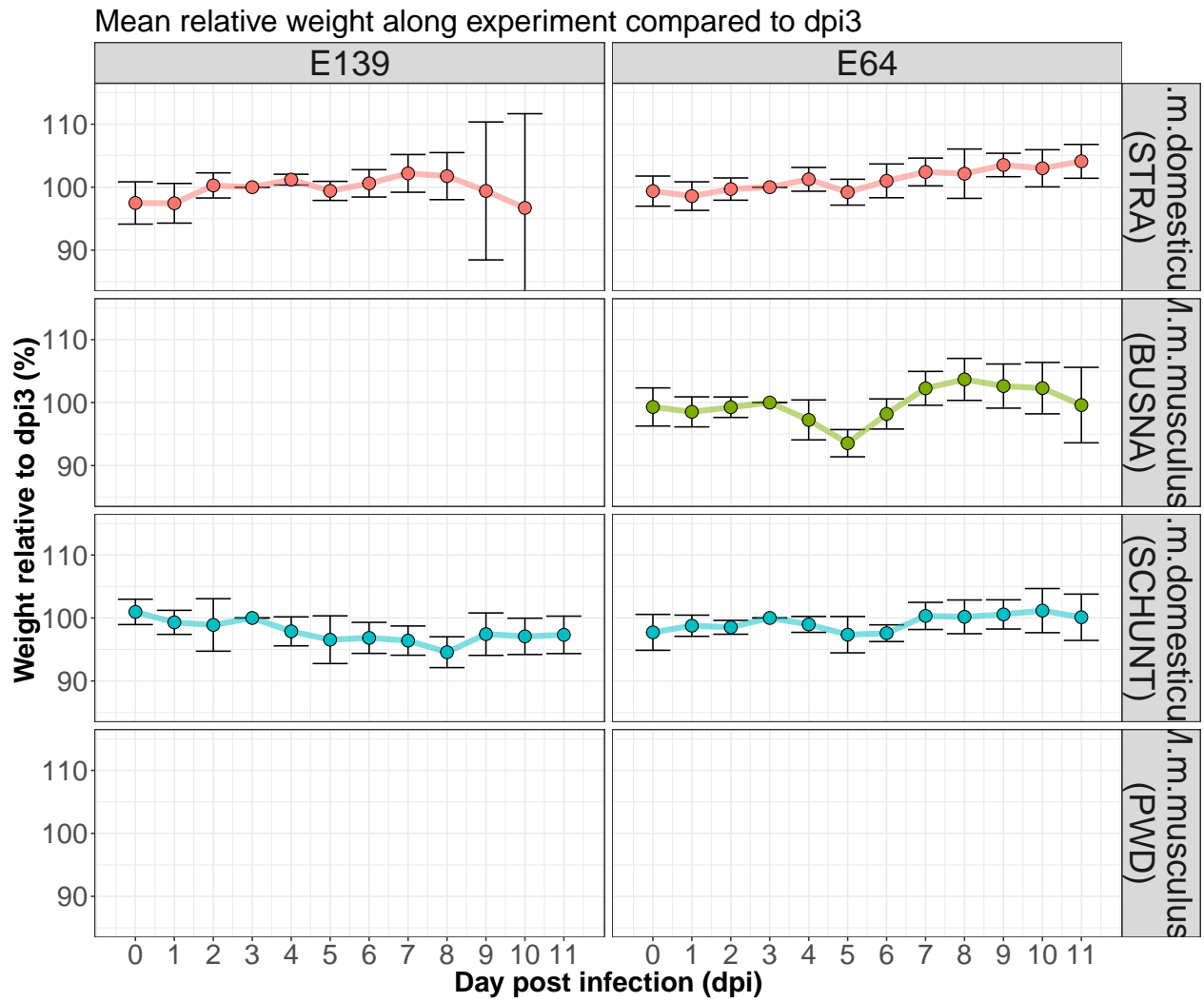
1. Weight loss

Weight along experiment per individual
yellow : oocysts detected in feces



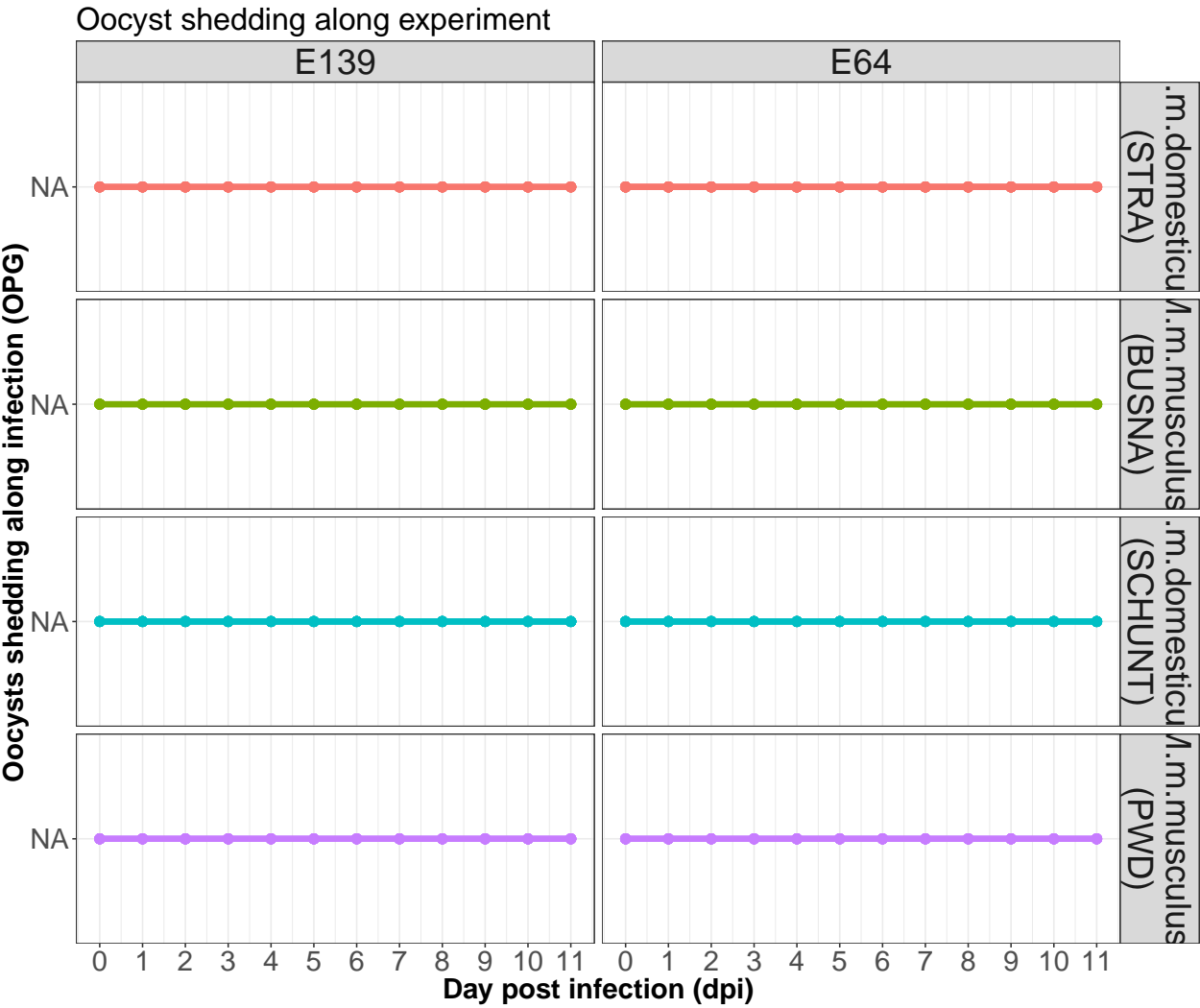
Relative weight along experiment compared to dpi3
 yellow : oocysts detected in feces



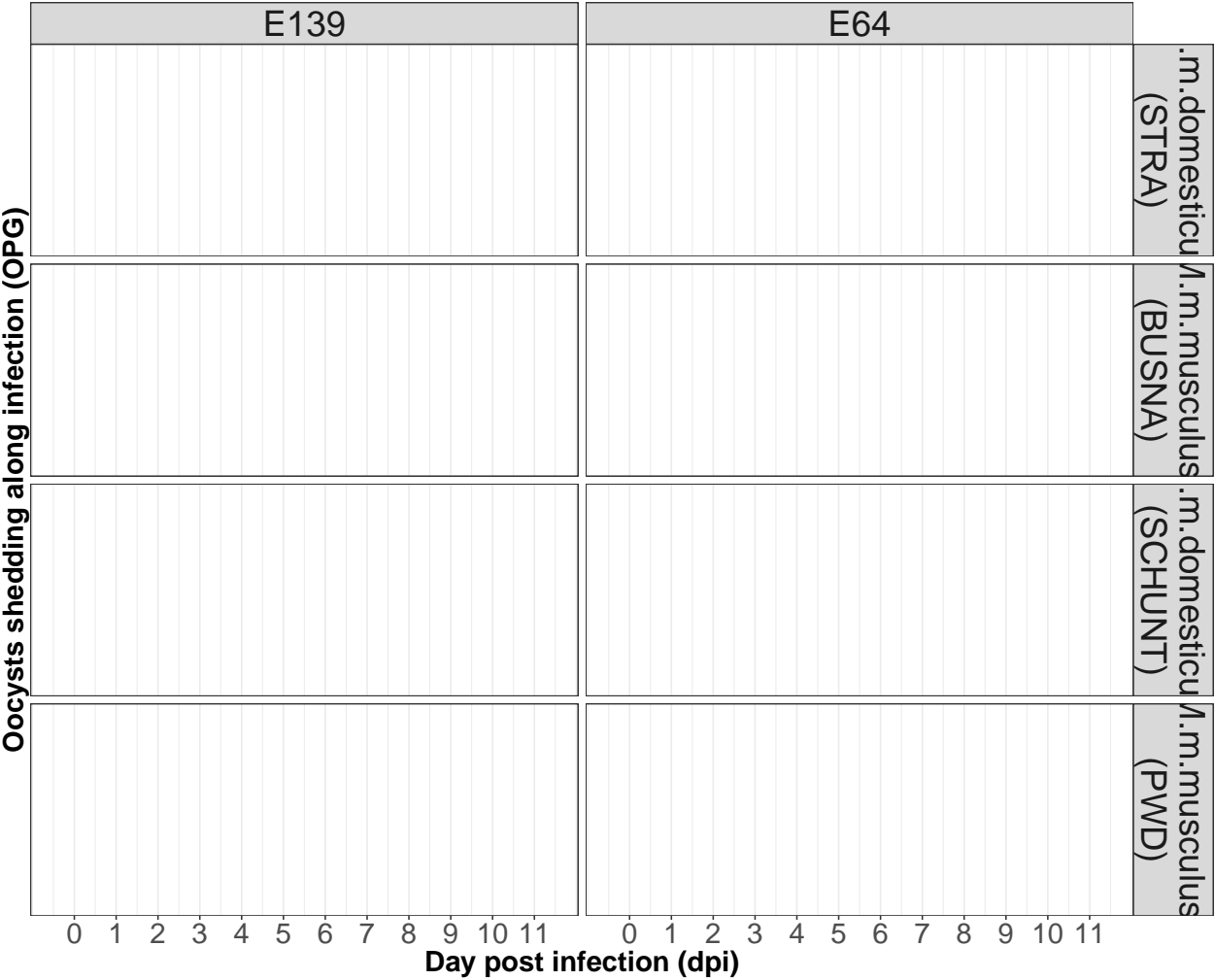


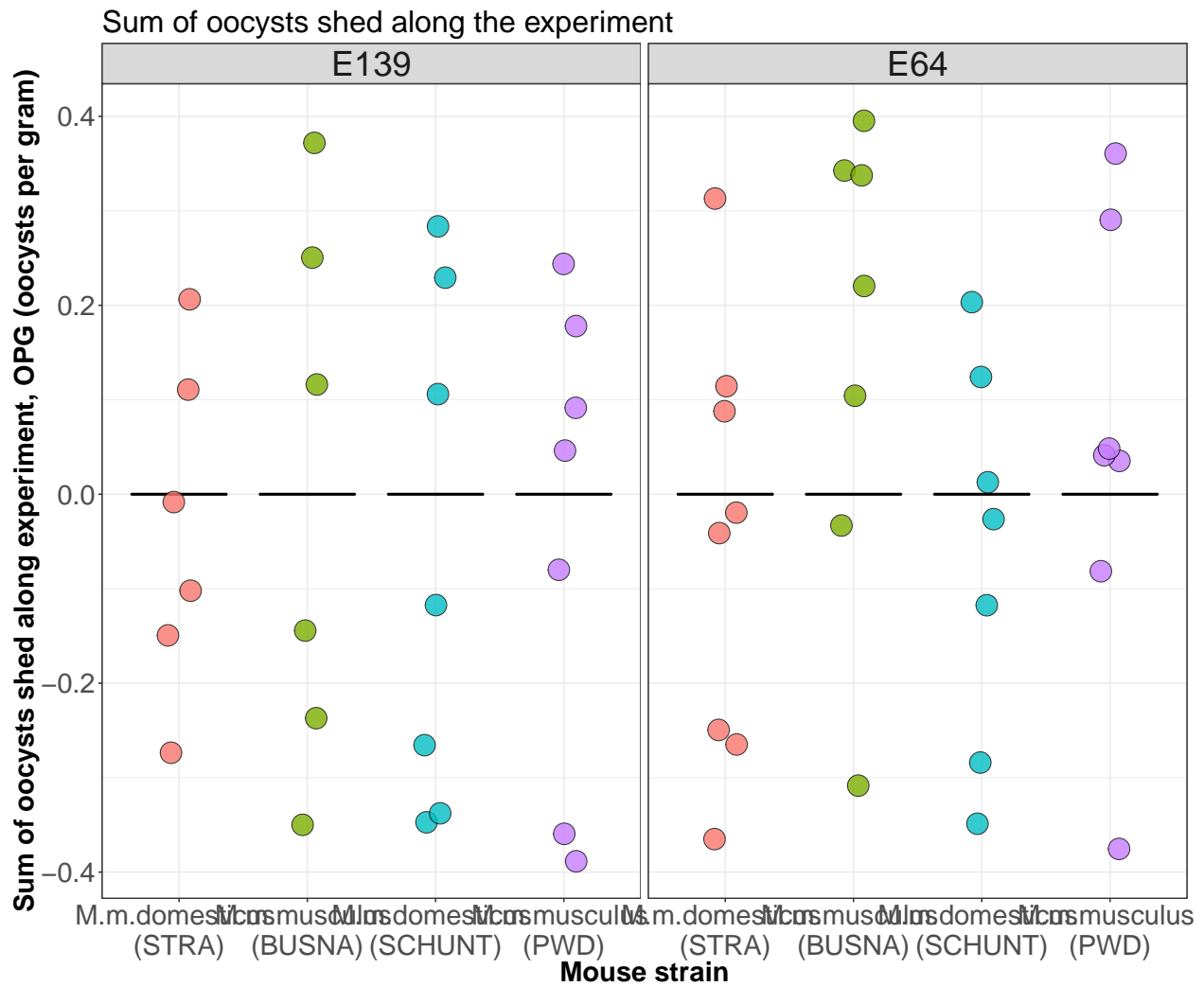
For statistical analysis, we compare the maximum relative weight loss between the different groups. We limit our analysis to the period : dpi3 to dpi8 (symptomatic period for E64 strain).

2. Parasite shedding



Mean oocysts shedding along experiment





```
##
## Call:
## lm(formula = sum.oo ~ Mouse_strain, data = sum.oocysts_003_4)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
##       0        0         0        0        0
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)           0          0      NA     NA
## Mouse_strainM.m.musculus \n(BUSNA)           0          0      NA     NA
## Mouse_strainM.m.domesticus \n(SCHUNT)           0          0      NA     NA
## Mouse_strainM.m.musculus \n(PWD)           0          0      NA     NA
##
## Residual standard error: 0 on 51 degrees of freedom
## Multiple R-squared:  NaN, Adjusted R-squared:  NaN
## F-statistic:  NaN on 3 and 51 DF, p-value: NA
```

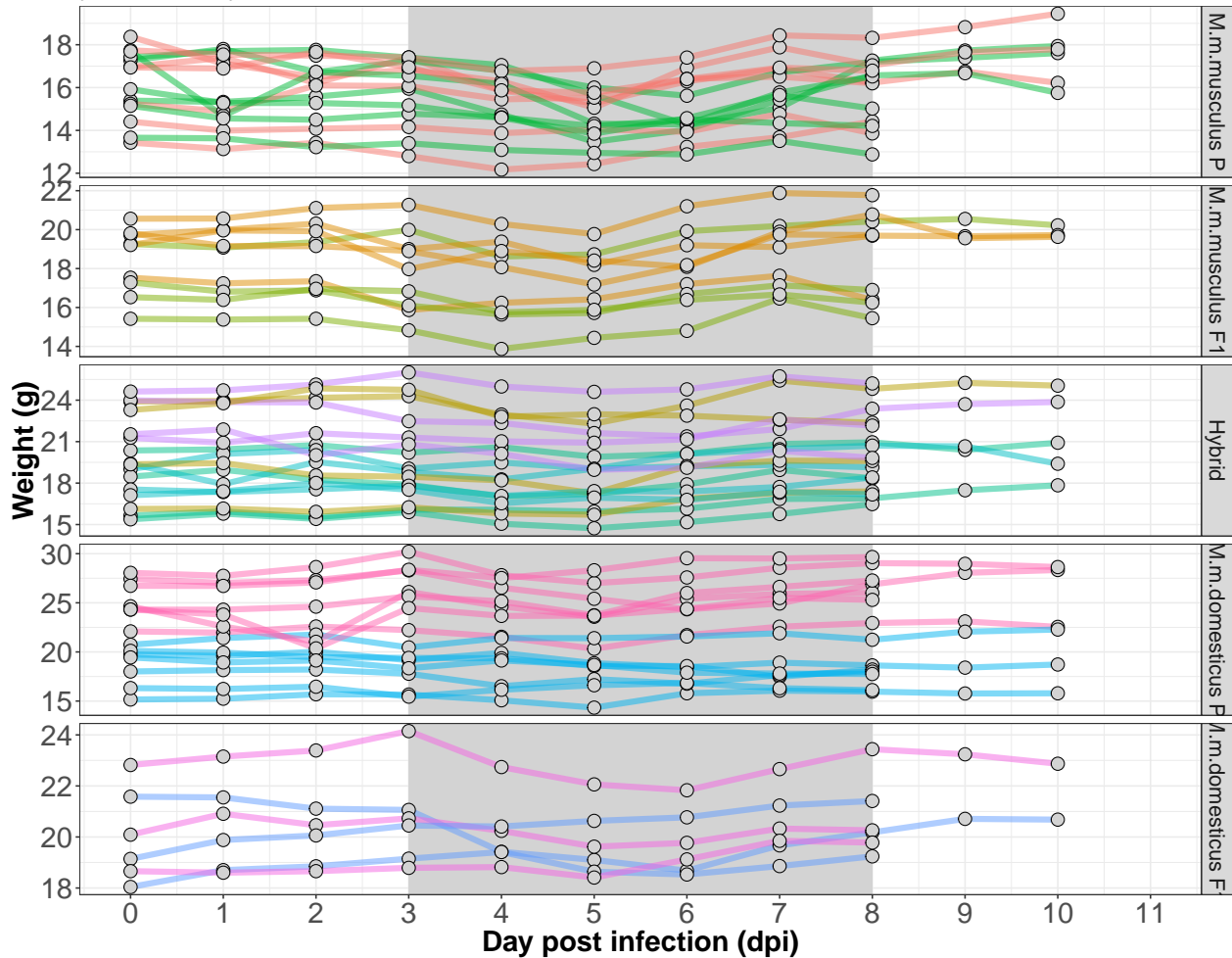
Expe_005, July 2018, FULL experiment (parents, intra specific and inter species hybrids) BUSNA, STRA, SCHUNT, PWD, infection with *E. ferrisi* and *E. falciformis* (E64 and E88)

1. Weight loss

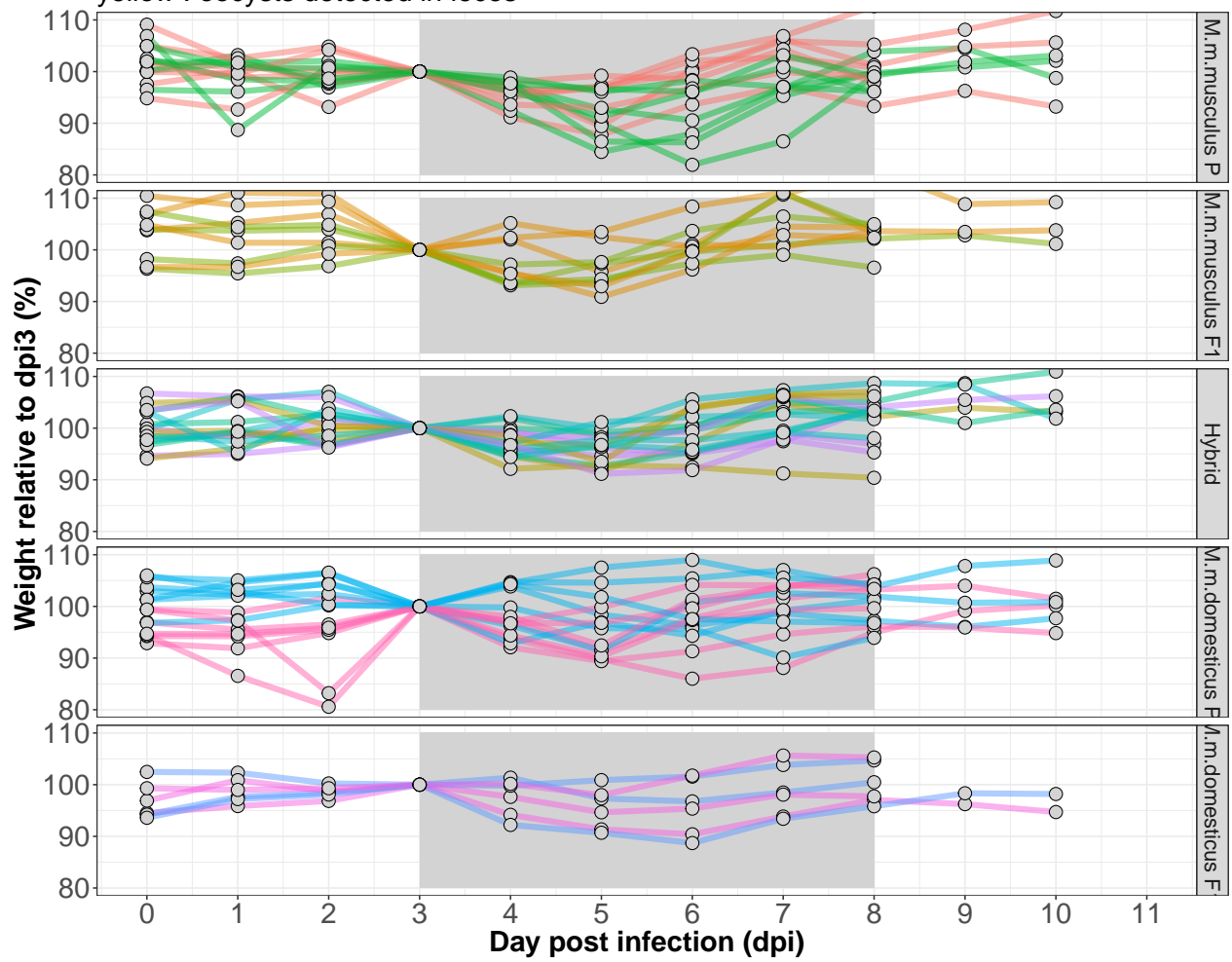
Eimeria ferrisi

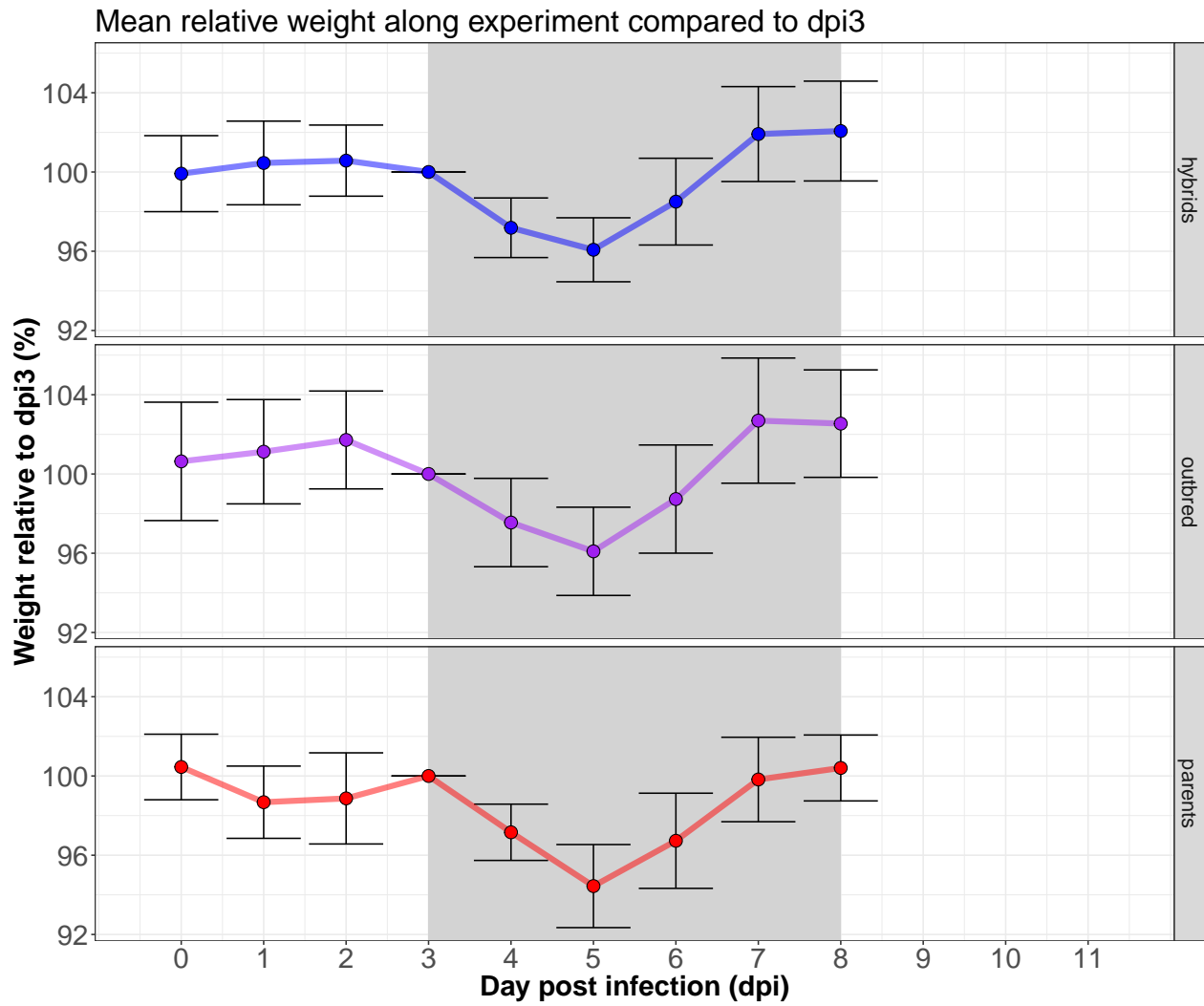
Weight along experiment per individual (E64)

yellow : oocysts detected in feces

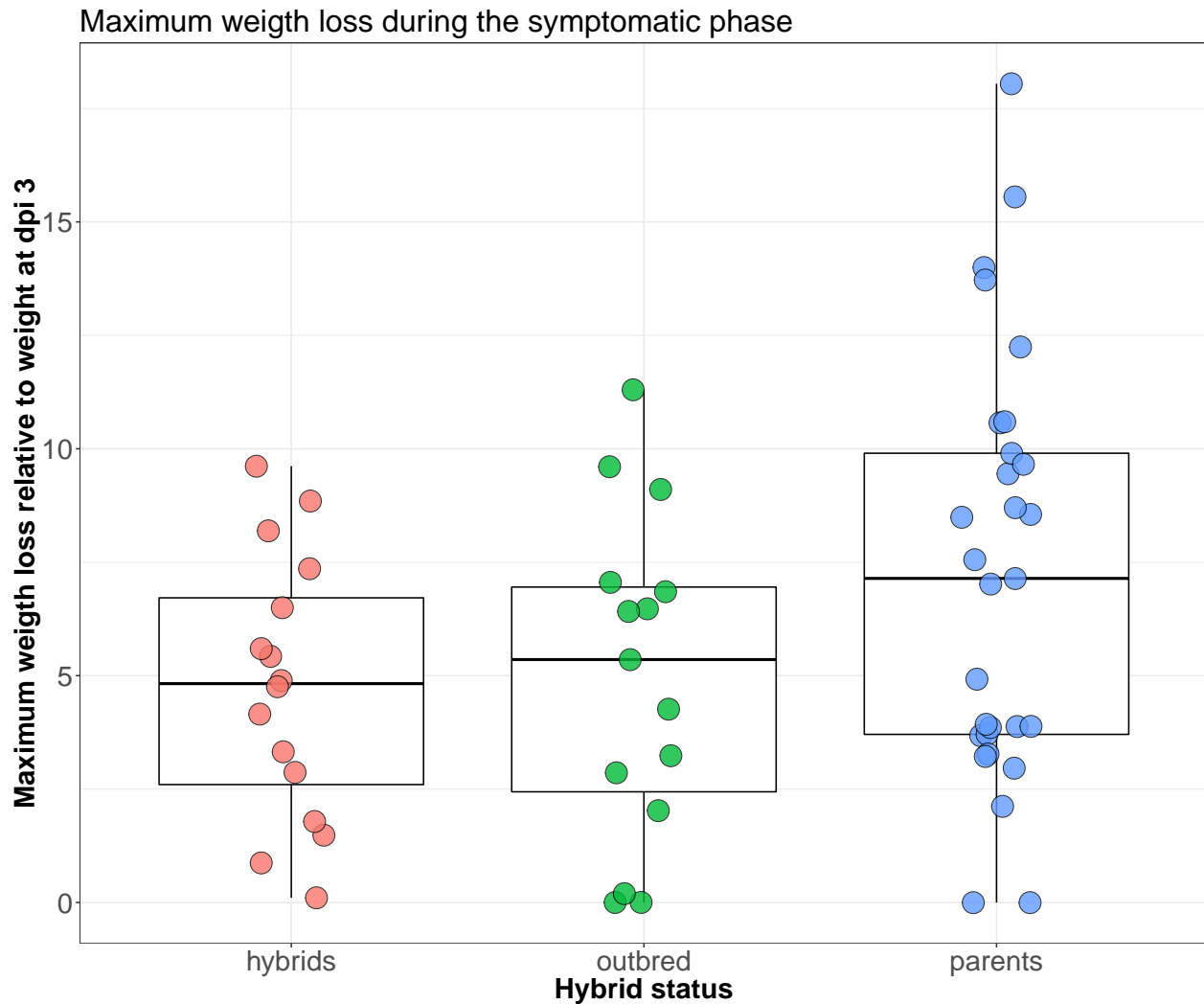


Relative weight along experiment compared to dpi3 (E64)
 yellow : oocysts detected in feces





For statistical analysis, we compare the maximum relative weight loss between the different groups. We limit our analysis to the period : dpi3 to dpi8 (symptomatic period for E64 strain).



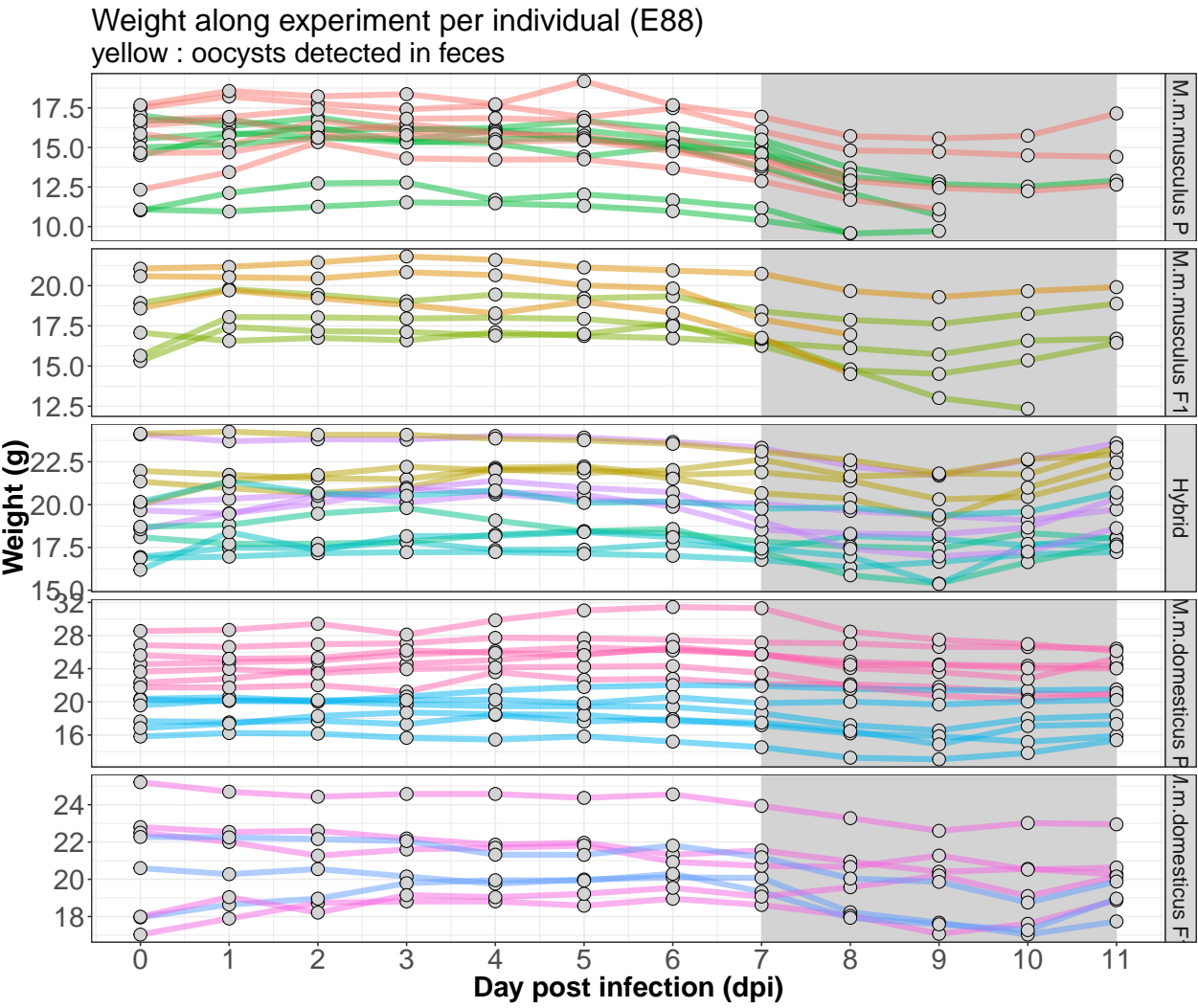
```
##
## Call:
## lm(formula = relativeWeight ~ HybridStatus, data = max.loss_005_E64)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.784  -2.451  -0.088   3.381   7.262
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    95.2644     0.9968  95.569  <2e-16 ***
## HybridStatusoutbred -0.2467     1.4330  -0.172   0.8639
## HybridStatusparents -2.5264     1.2417  -2.035   0.0466 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.987 on 57 degrees of freedom
## Multiple R-squared:  0.08785,    Adjusted R-squared:  0.05585
## F-statistic: 2.745 on 2 and 57 DF,  p-value: 0.07275
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
```

```

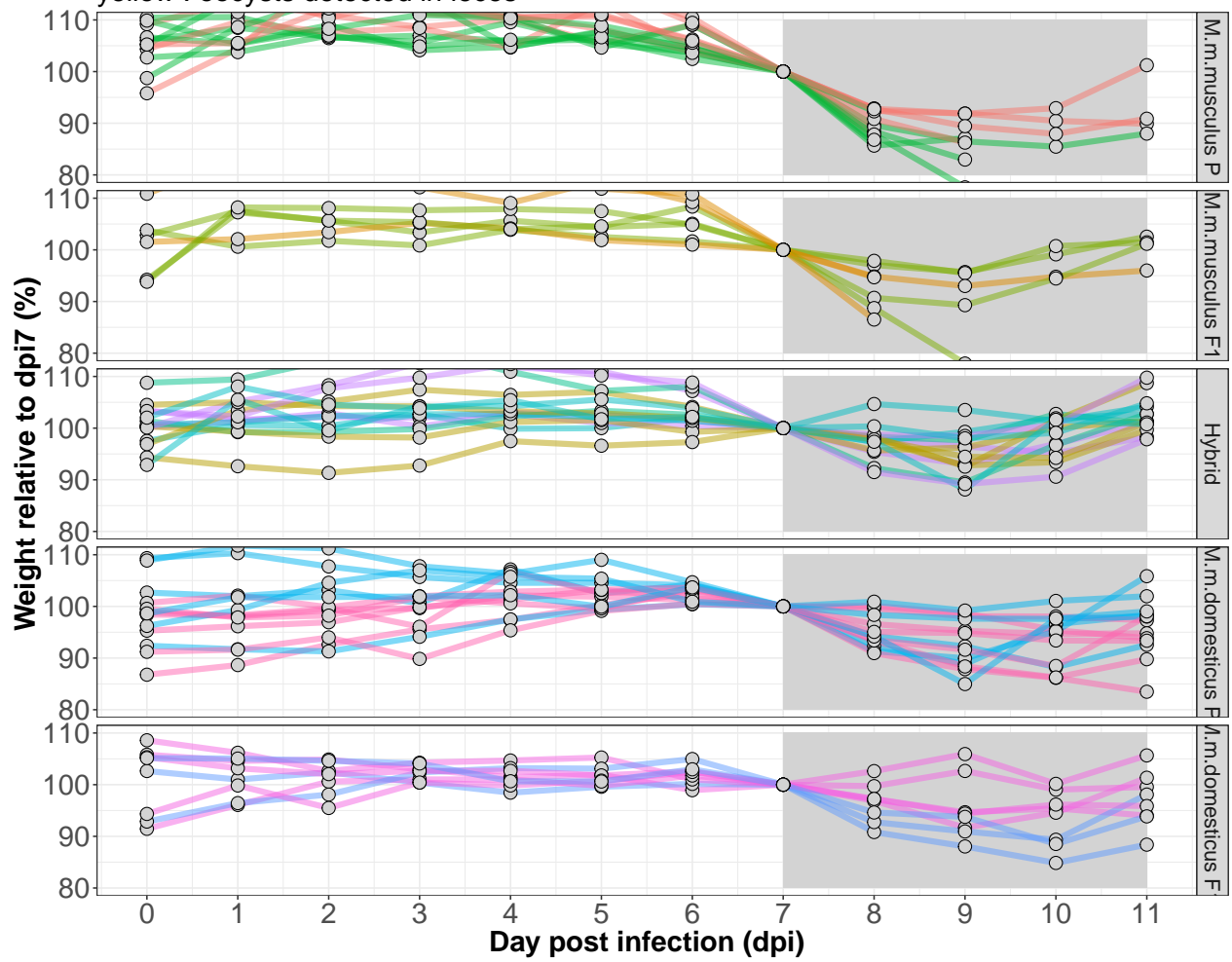
## lmerModLmerTest]
## Formula: relativeWeight ~ HybridStatus + 1 | Mouse_strain
## Data: max.loss_005_E64
##
## REML criterion at convergence: 334.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.47724 -0.64423 -0.01634  0.87861  1.39148
##
## Random effects:
## Groups      Name                Variance Std.Dev. Corr
## Mouse_strain (Intercept)          7.172e-13 8.469e-07
##              HybridStatusoutbred 1.260e-12 1.123e-06 -1.00
##              HybridStatusparents 5.504e+00 2.346e+00 -0.64  0.64
## Residual                        1.465e+01 3.827e+00
## Number of obs: 60, groups:  Mouse_strain, 12
##
## Fixed effects:
##              Estimate Std. Error      df t value Pr(>|t|)
## (Intercept)  94.6748      0.6145 43.4606   154.1   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## convergence code: 0
## unable to evaluate scaled gradient
## Model failed to converge: degenerate Hessian with 1 negative eigenvalues

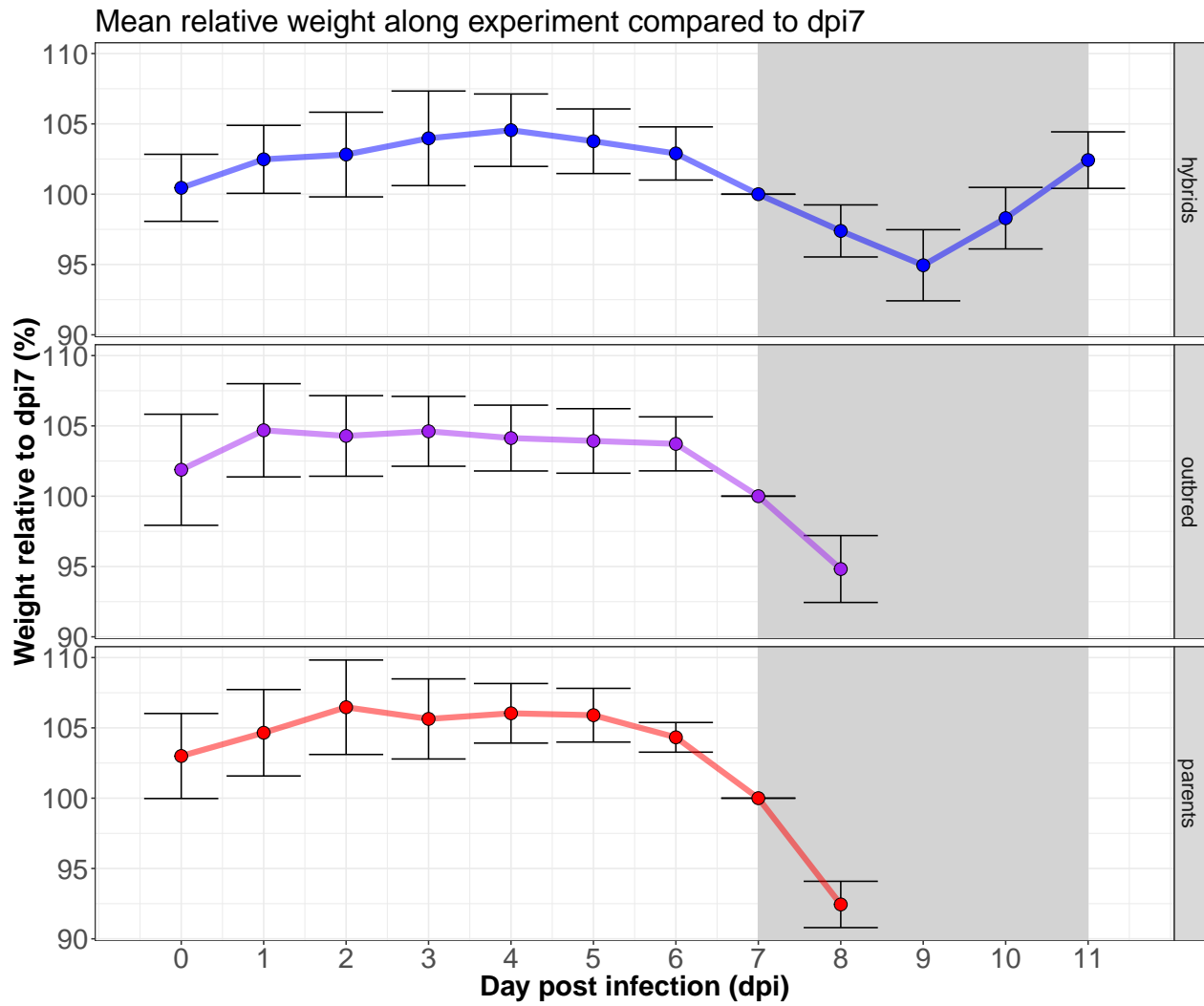
```

Eimeria falciformis

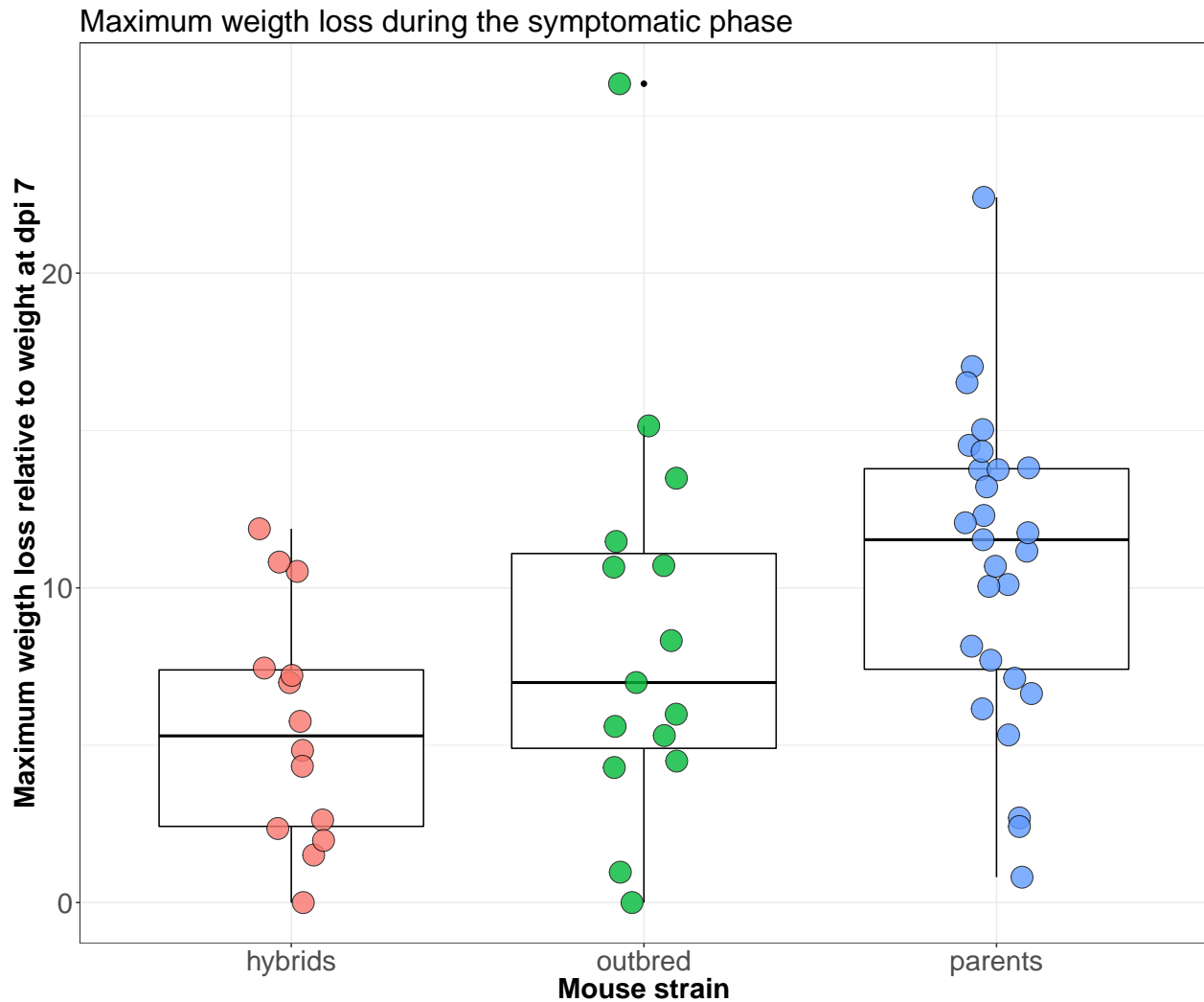


Relative weight along experiment compared to dpi7 (E88)
 yellow : oocysts detected in feces





For statistical analysis, we compare the maximum relative weight loss between the different groups. We limit our analysis to the period : dpi7 to dpi11 (symptomatic period for E88 strain).



```
##
## Call:
## lm(formula = relativeWeight ~ HybridStatus, data = max.loss_005_E88)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -17.3894  -2.9743  -0.0367   3.3960   9.9730
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      94.410      1.369  68.976 < 2e-16 ***
## HybridStatusoutbred  -3.040      1.903  -1.597  0.11617
## HybridStatusparents  -5.189      1.687  -3.077  0.00331 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.121 on 53 degrees of freedom
## Multiple R-squared:  0.1524, Adjusted R-squared:  0.1204
## F-statistic: 4.763 on 2 and 53 DF,  p-value: 0.01252
## [1] "Along all experiment:"
```