

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

Alice

31 August 2018

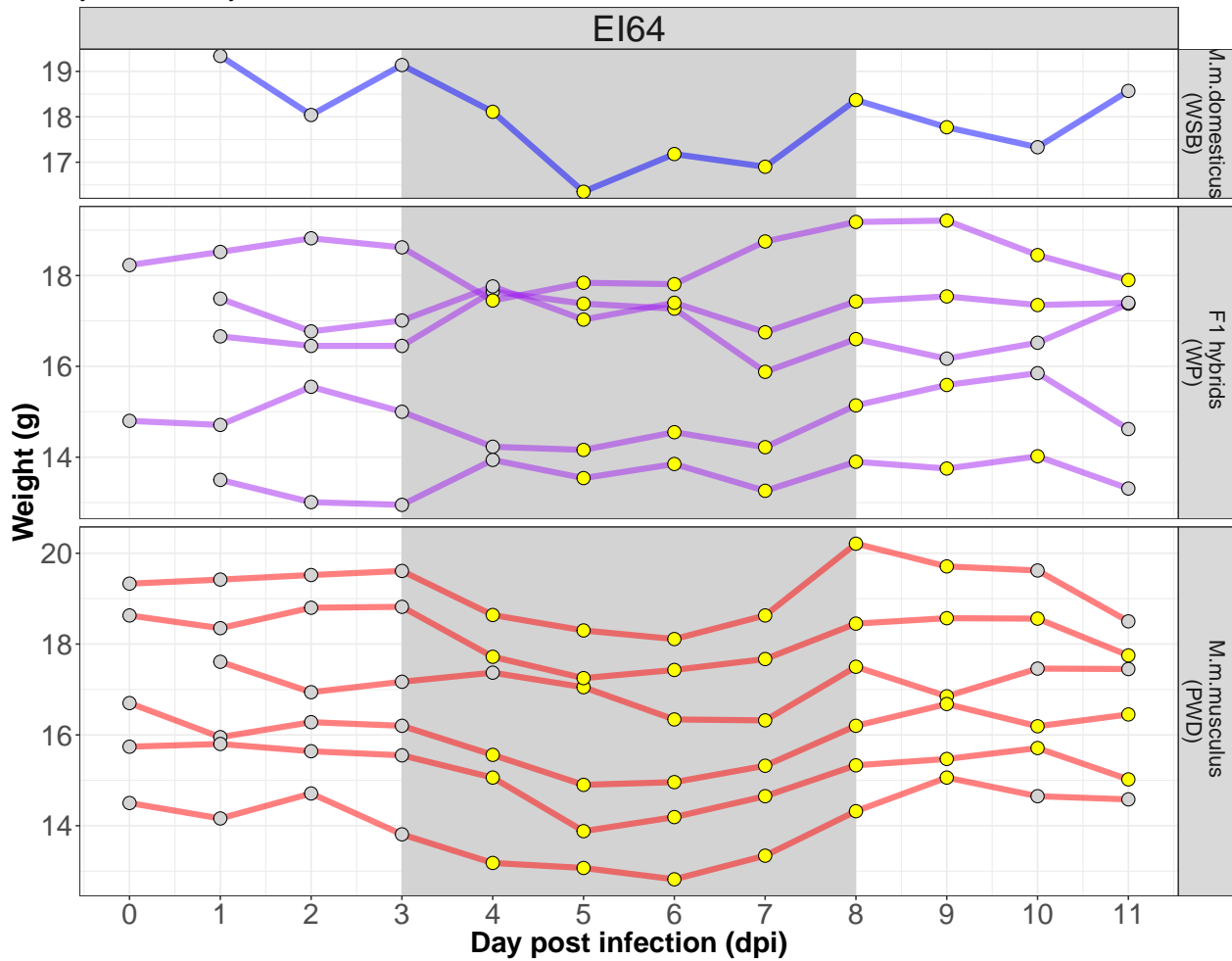
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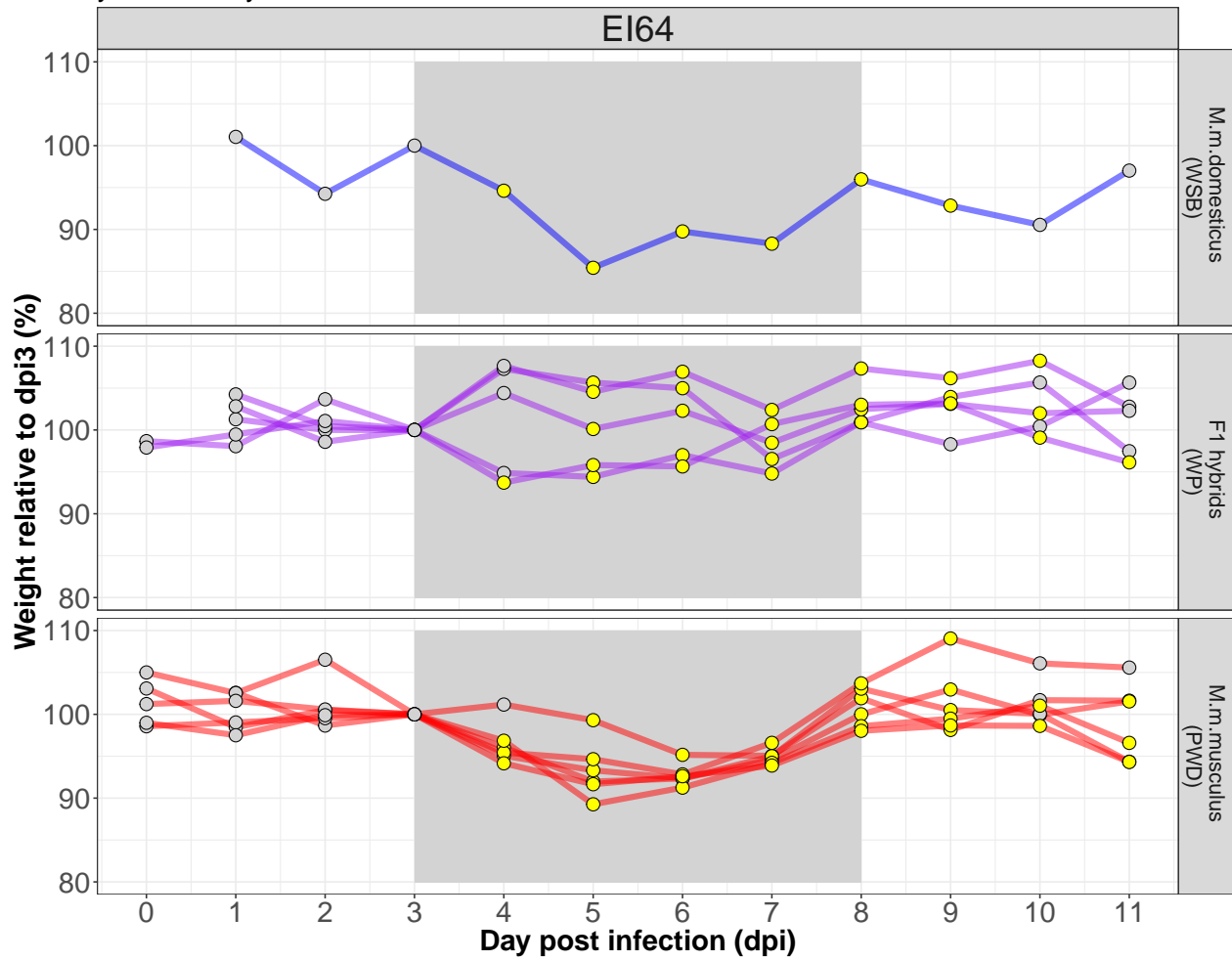
Expe_001, March 2017, Francisca's experiment. infection with E64 and Eflab

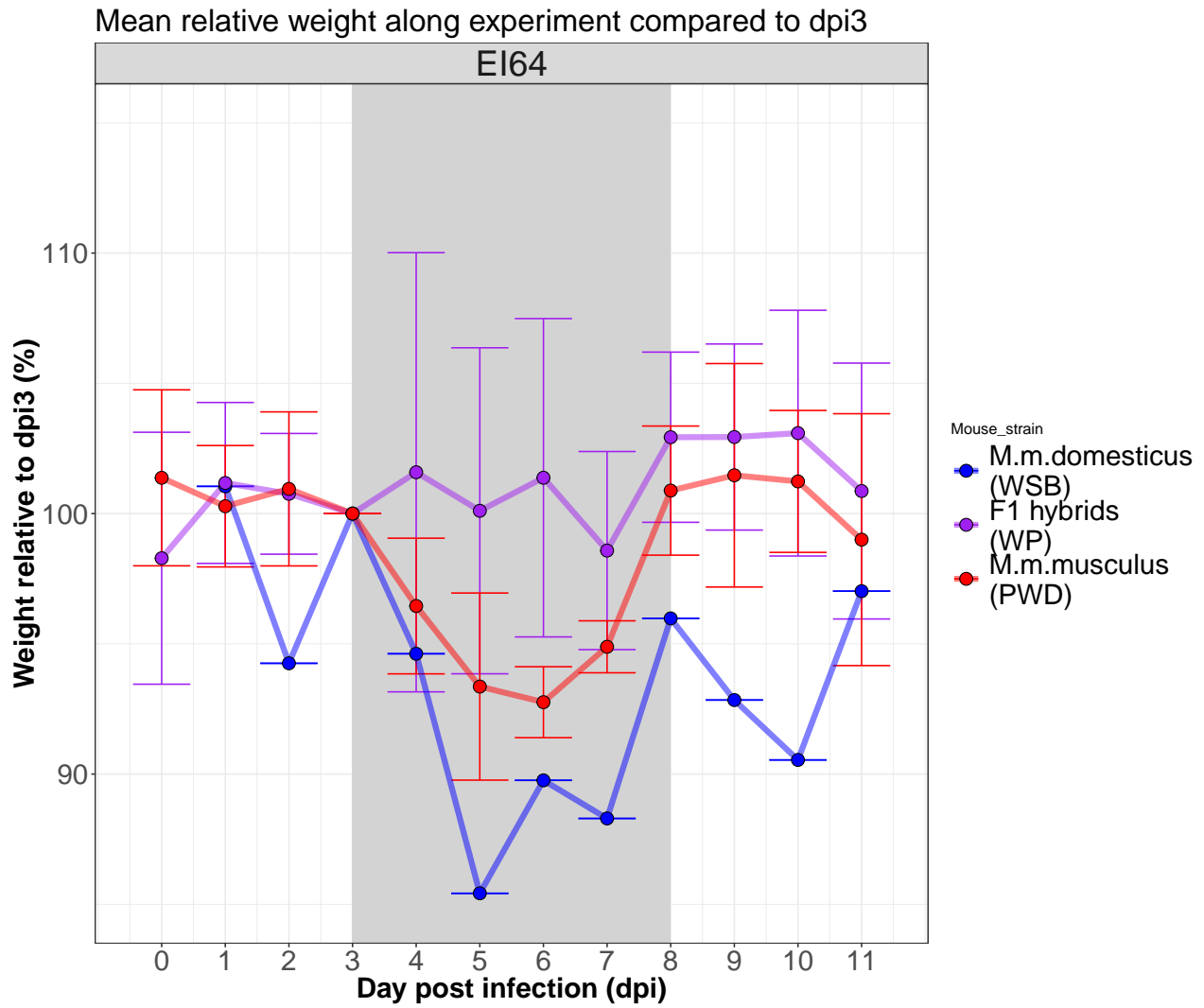
1. Weight loss

Weight along experiment per individual
yellow : oocysts detected in feces

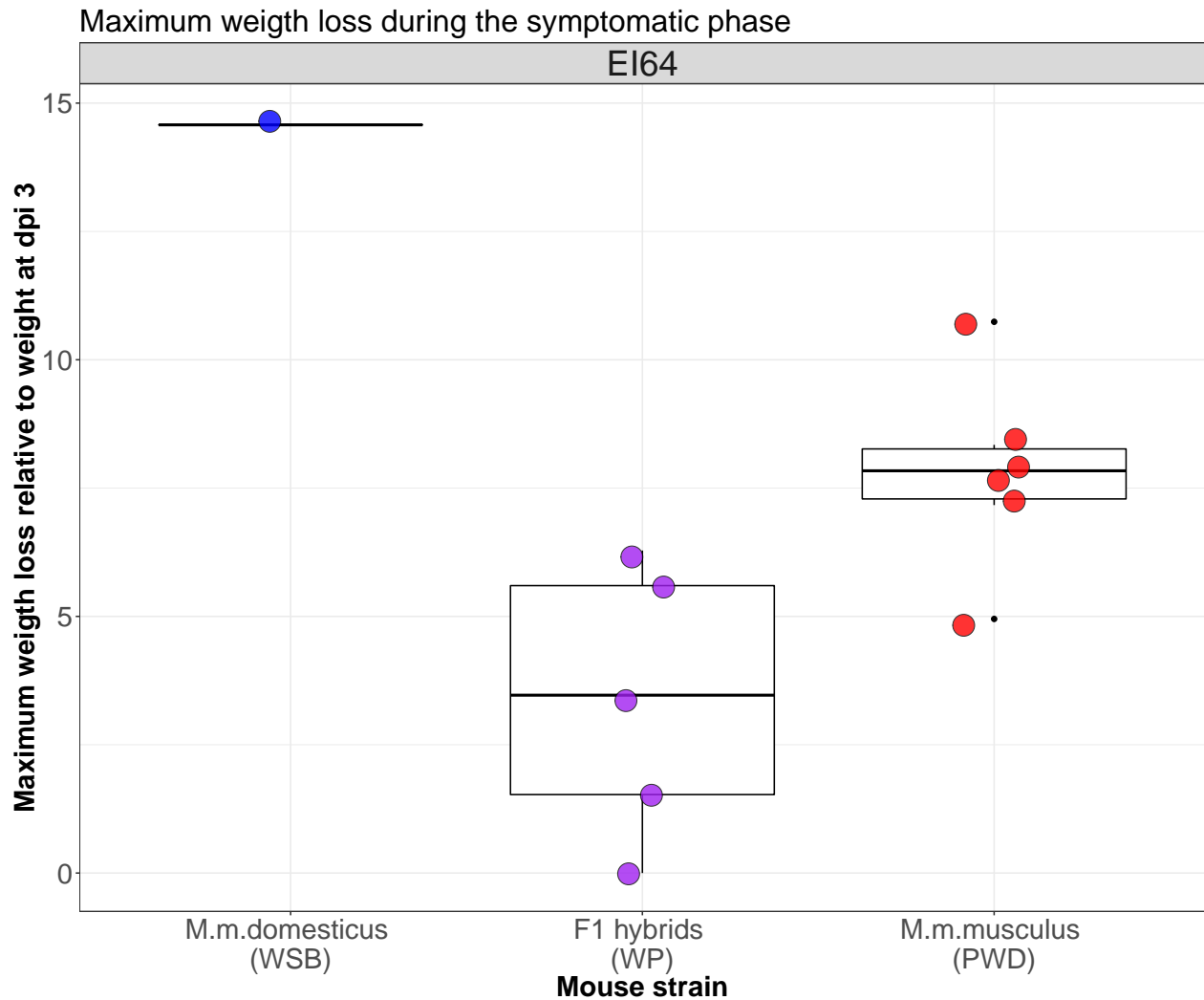


Relative weight along experiment compared to dpi3
 yellow : oocysts detected in feces



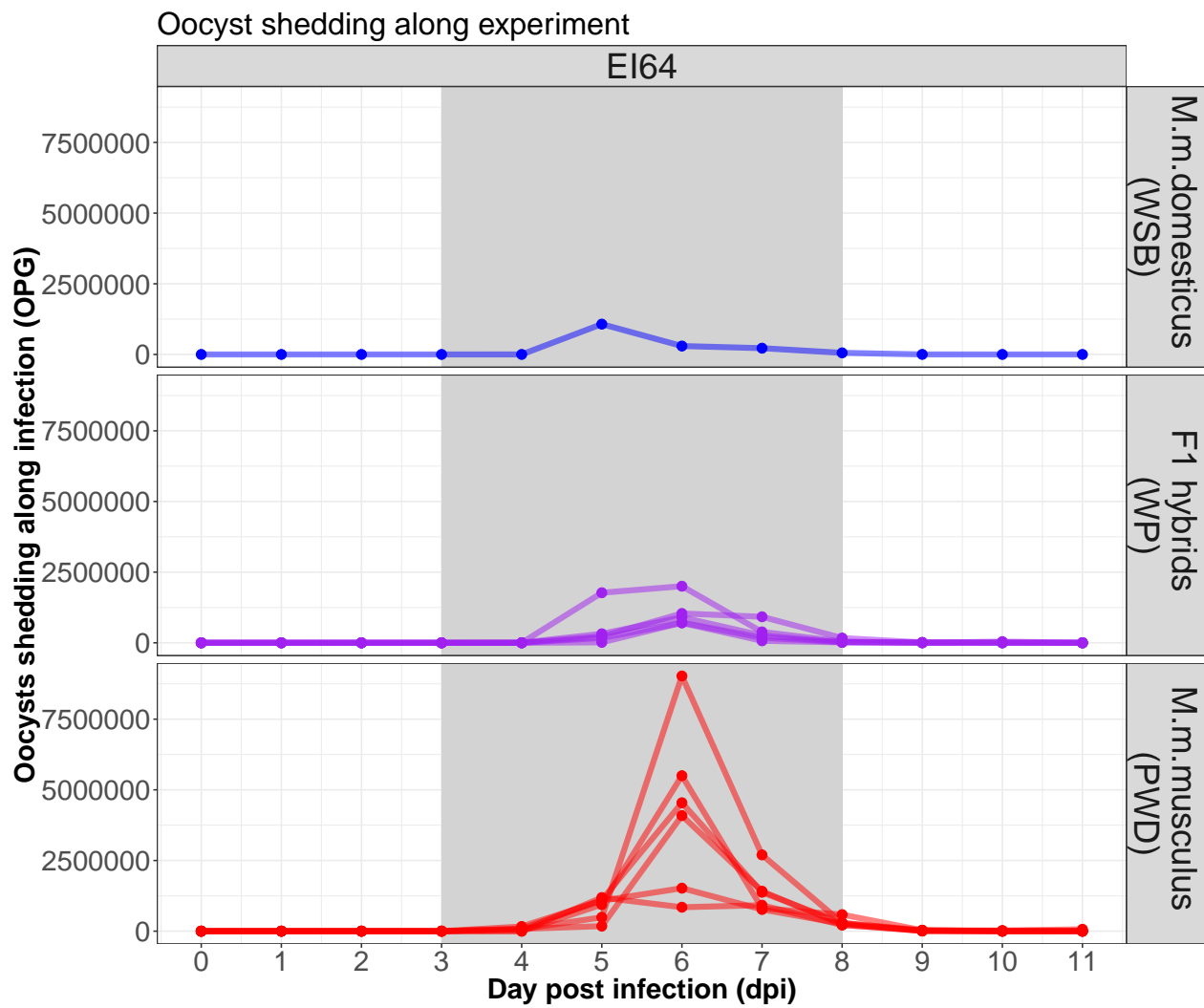


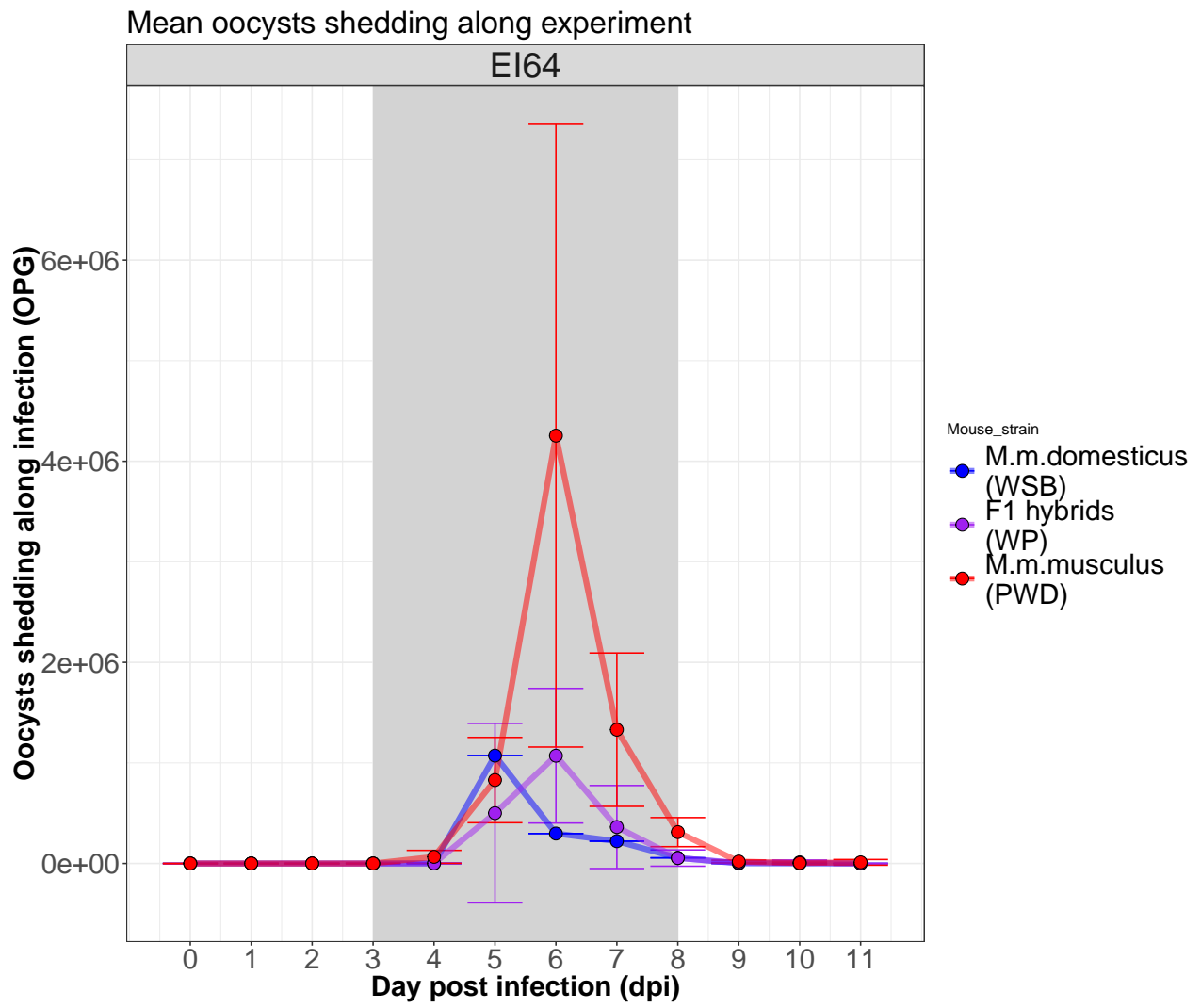
For statistical analysis, we compare the maximum relative weight loss between the different groups. We limit our analysis to the period : dpi3 to dpi8 (symptomatic period for E64 strain).

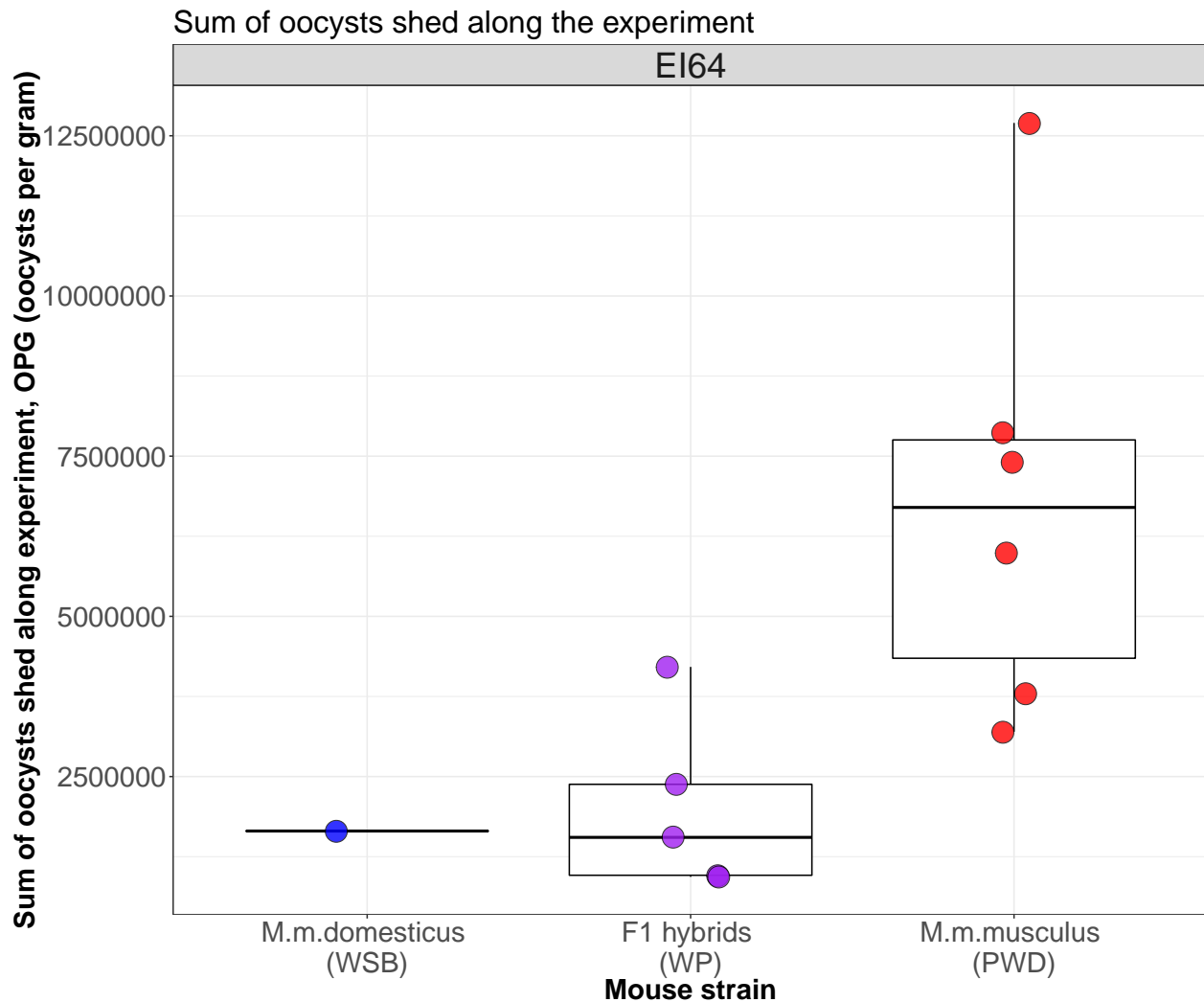


```
##
## Kruskal-Wallis rank sum test
##
## data: relativeWeight by Mouse_strain
## Kruskal-Wallis chi-squared = 7.3051, df = 2, p-value = 0.02592
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: max.loss_001$relativeWeight and max.loss_001$Mouse_strain
##
##           F1 hybrids \n(WP) M.m.domesticus \n(WSB)
## M.m.domesticus \n(WSB) 0.333 -
## M.m.musculus \n(PWD) 0.052 0.333
##
## P value adjustment method: BH
```

2. Parasite shedding







```
##
## Kruskal-Wallis rank sum test
##
## data: sum.oo by Mouse_strain
## Kruskal-Wallis chi-squared = 6.5667, df = 2, p-value = 0.0375
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: sum.oocysts_001$sum.oo and sum.oocysts_001$Mouse_strain
##
##
## F1 hybrids \n(WP) M.m.domesticus \n(WSB)
## M.m.domesticus \n(WSB) 1.000 -
## M.m.musculus \n(PWD) 0.052 0.429
##
## P value adjustment method: BH
```


3. Comparison host/parasite proxy

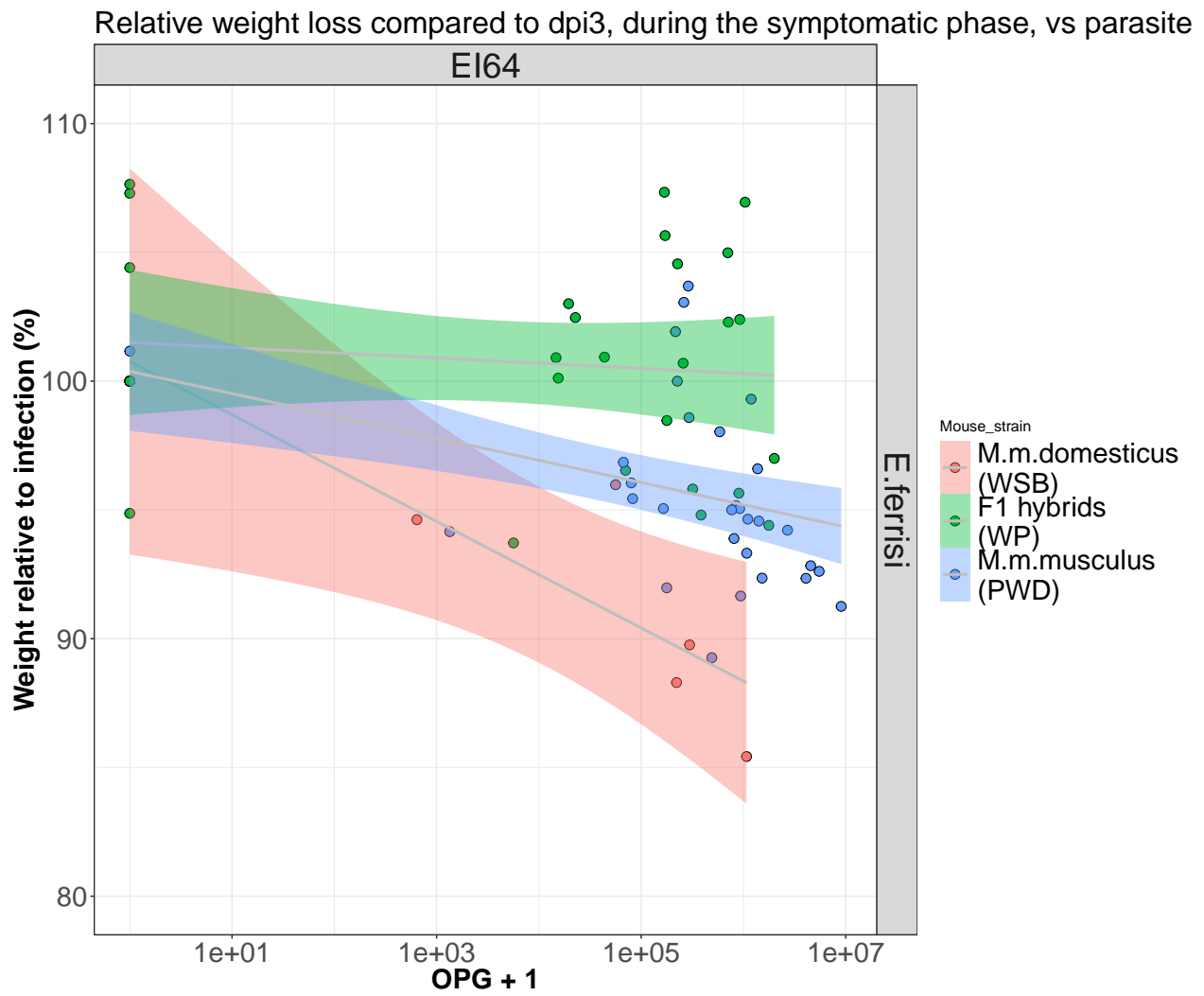
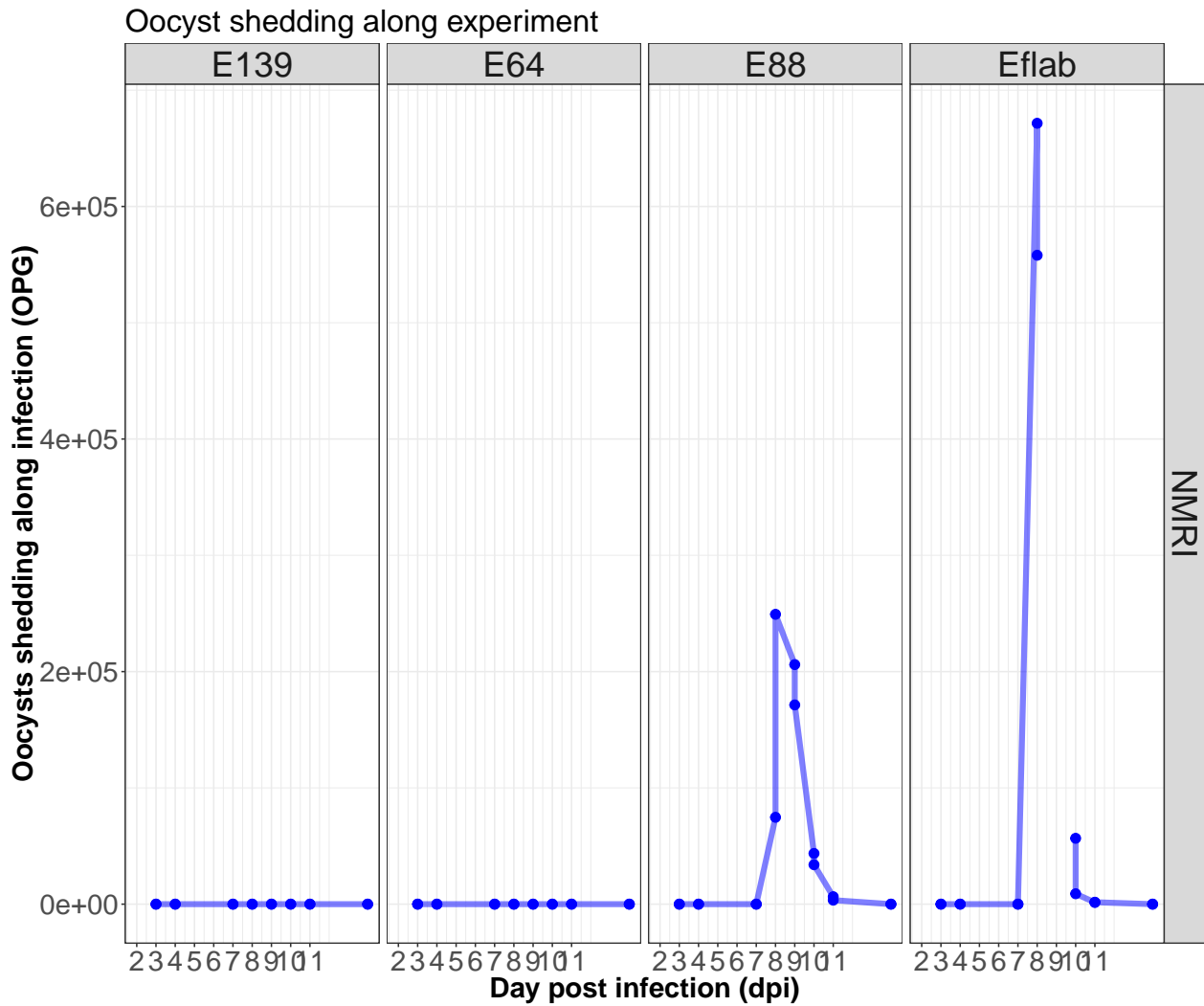


Figure 1: Weight as a function of OPG

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

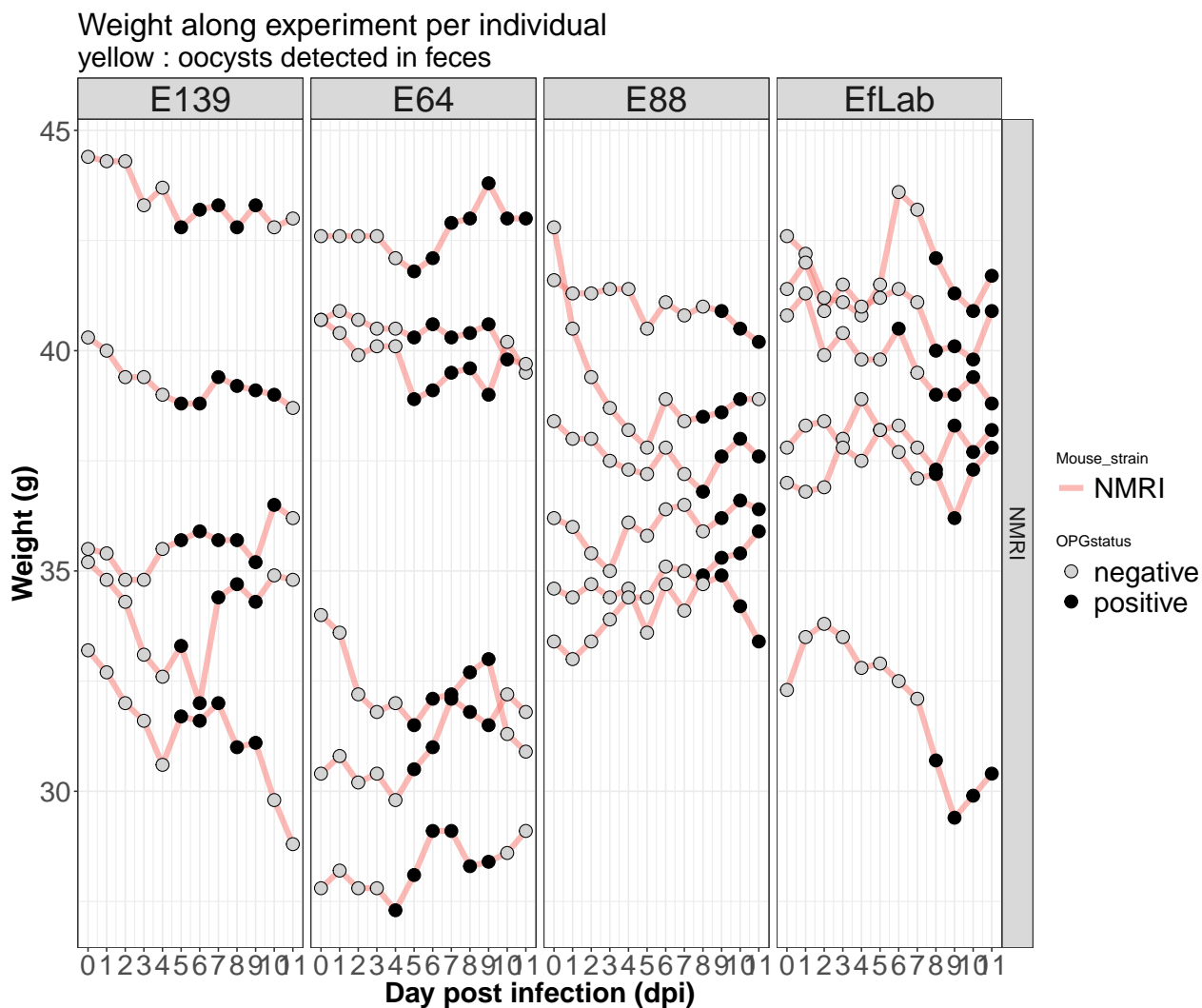
(Eflab, E88, E139, E64) in NMRI. 2 mice per cage. Only OPG recorded

Parasite shedding

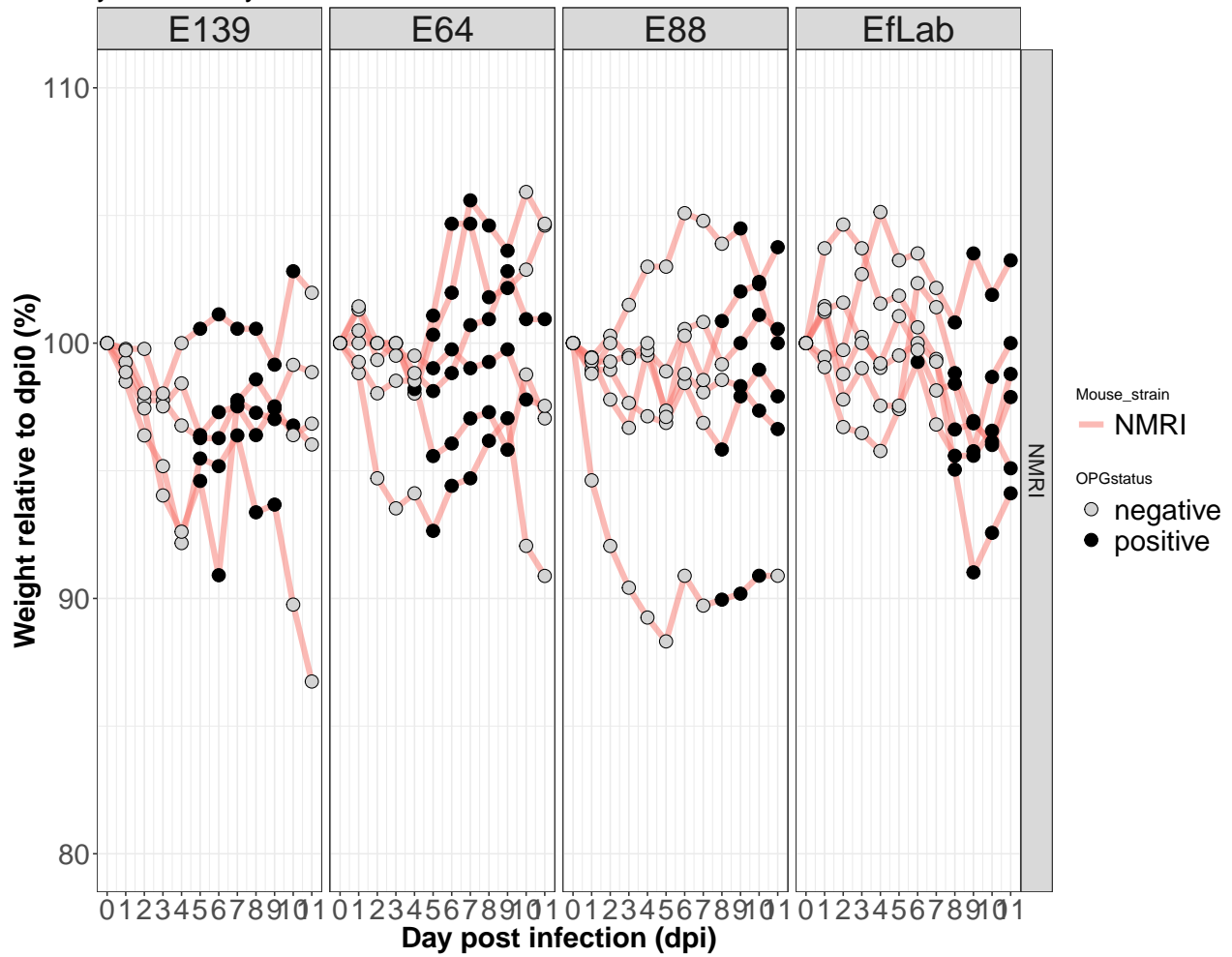


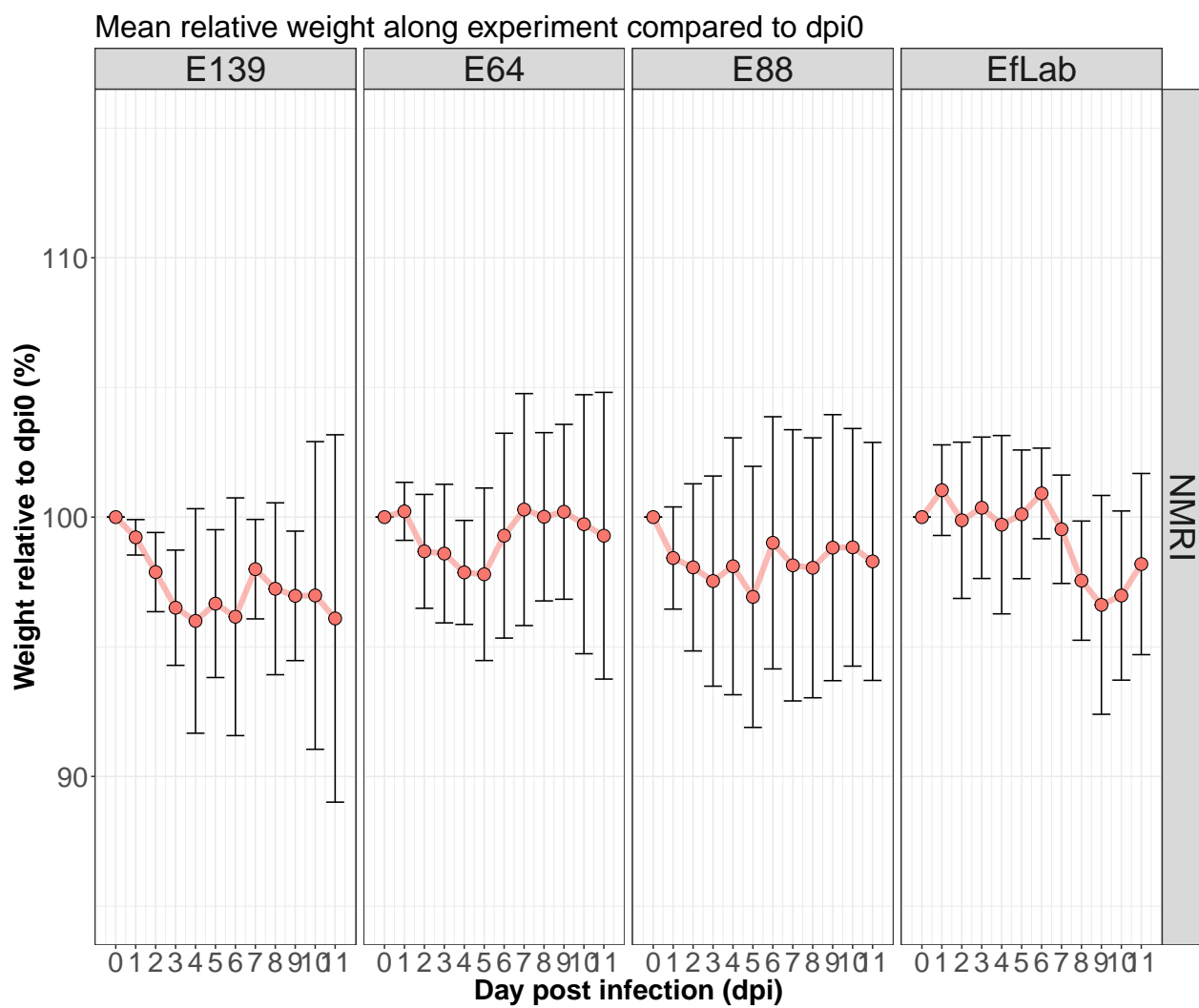
Expe_002: March 2018, NMRI mice infected with 4 *Eimeria* strains (Eflab, E88, E139, E64)

1. Weight loss

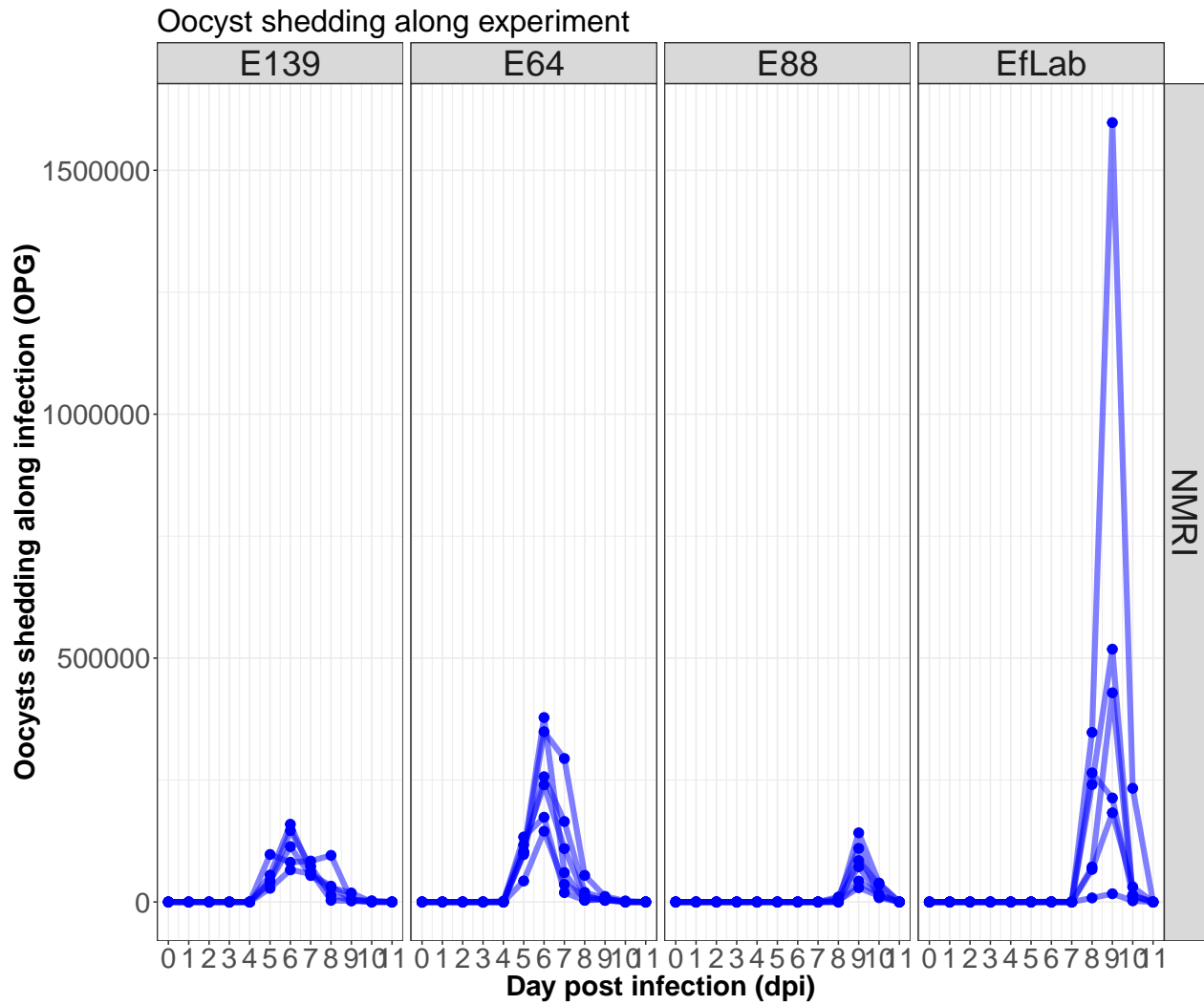


Relative weight along experiment compared to dpi0
yellow : oocysts detected in feces

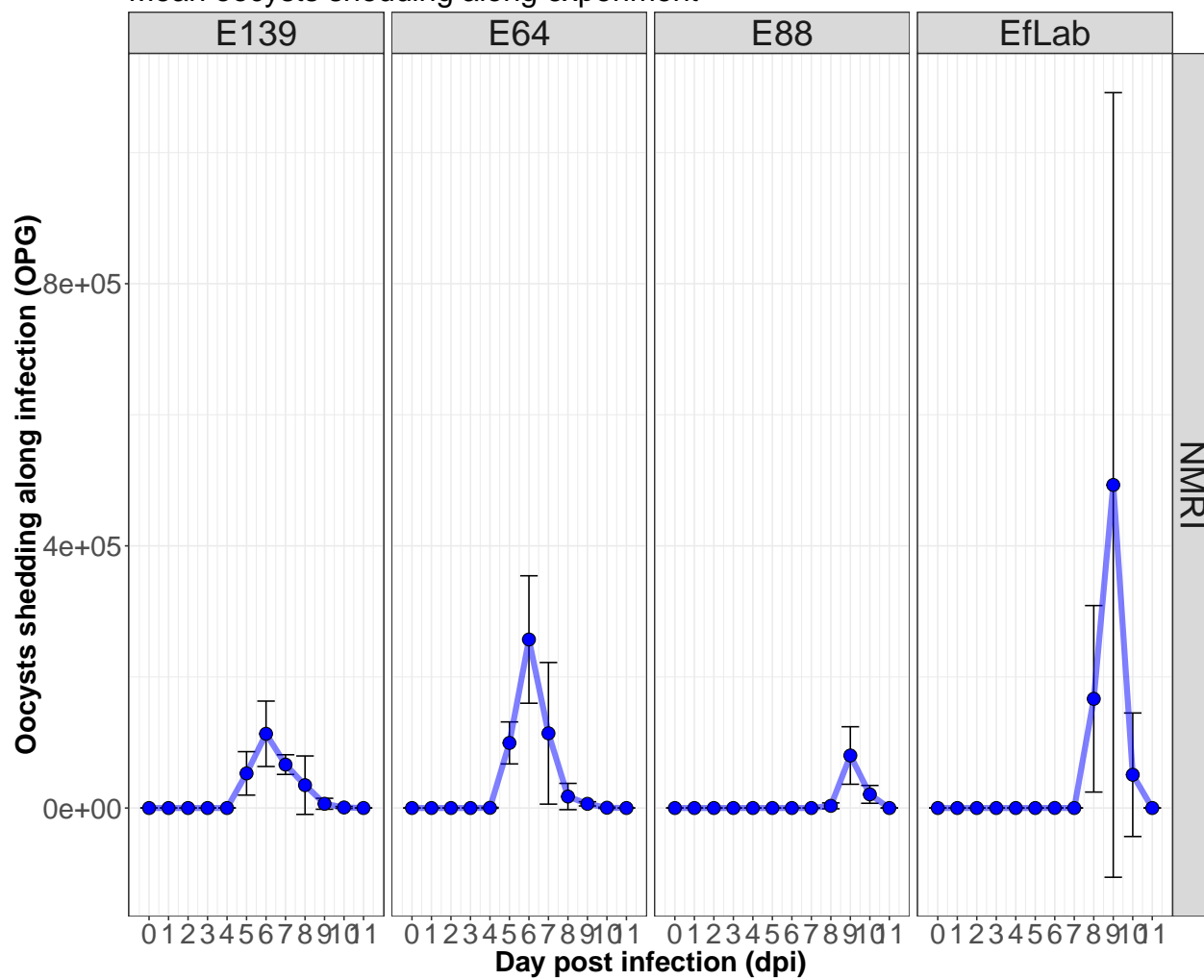




2. Parasite shedding



Mean oocysts shedding along experiment



3. Comparison host/parasite proxy

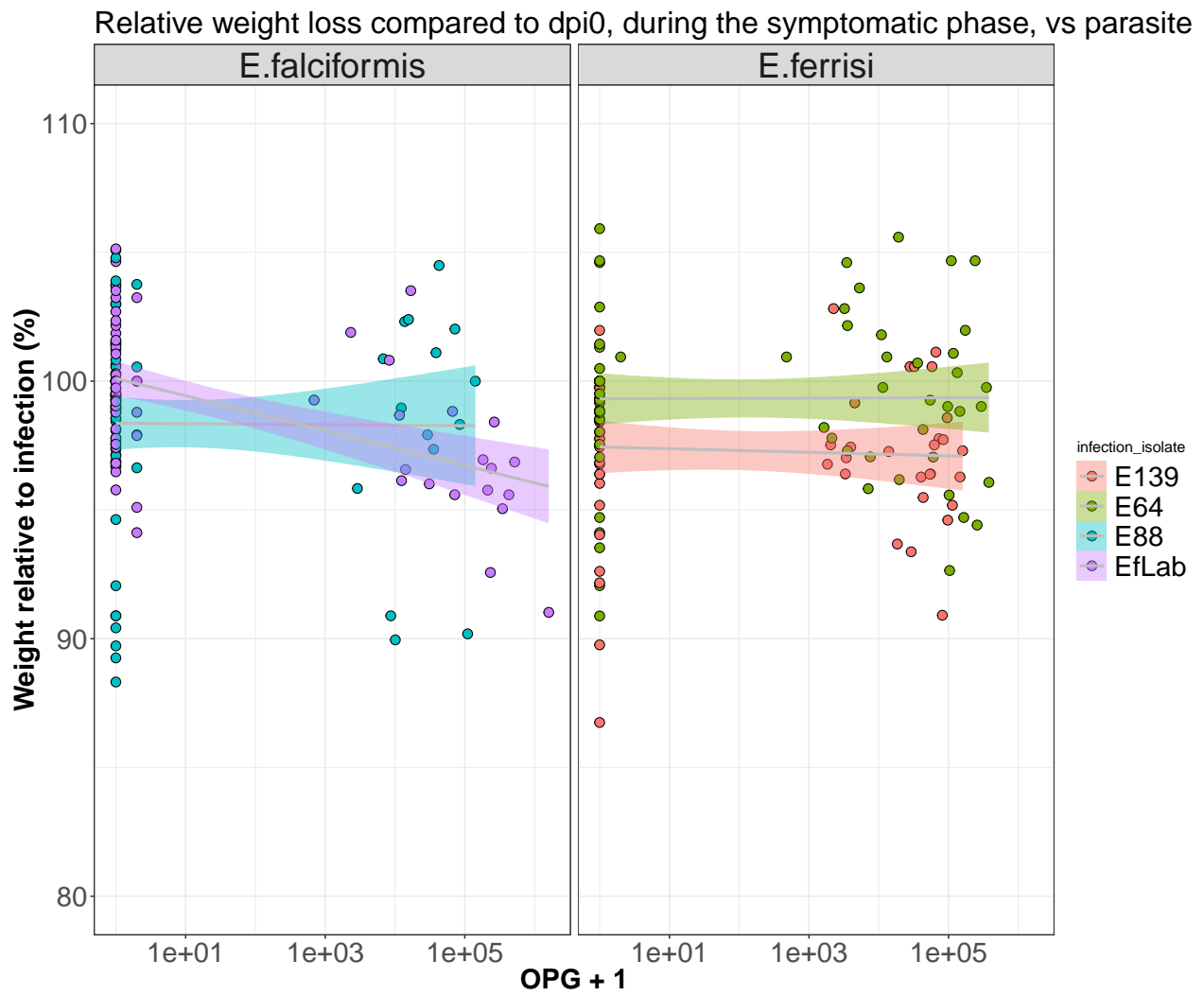
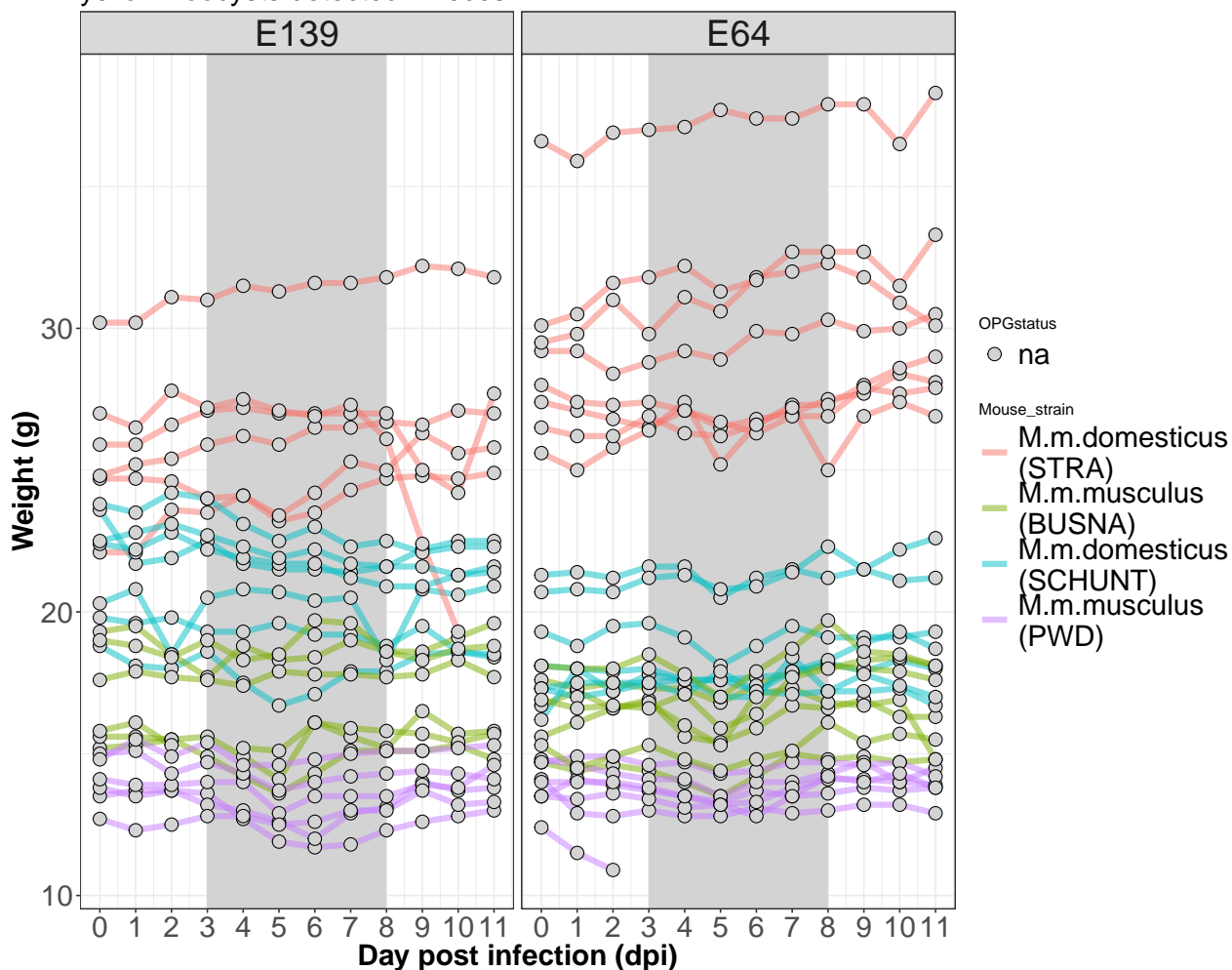


Figure 2: Weight as a function of OPG

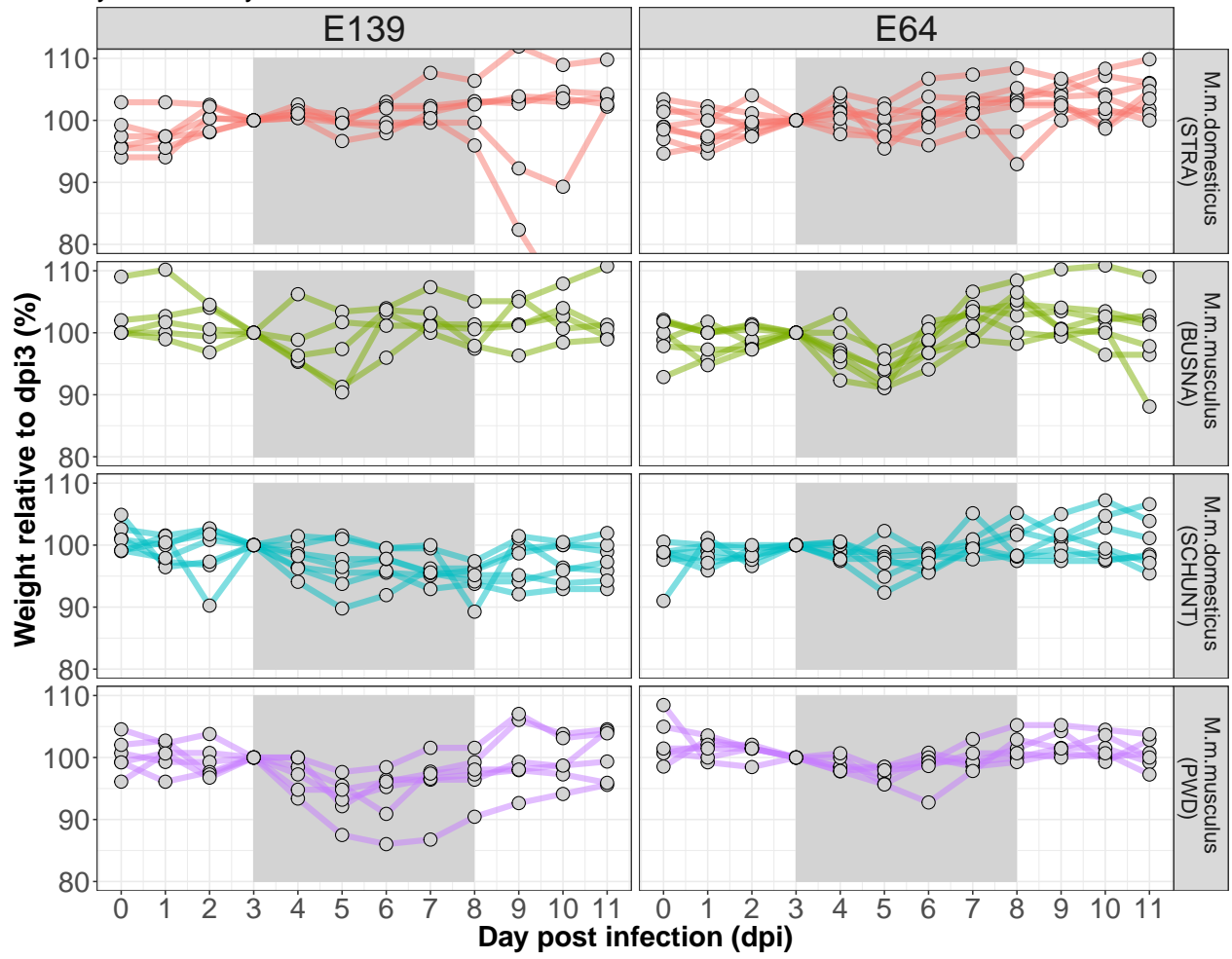
Expe_003 & Expe_004, April-May 2018, first batch Parental strains (F0) BUSNA, STRA, SCHUNT, PWD, infection with Eferri (E64 and E139) [2 batches]

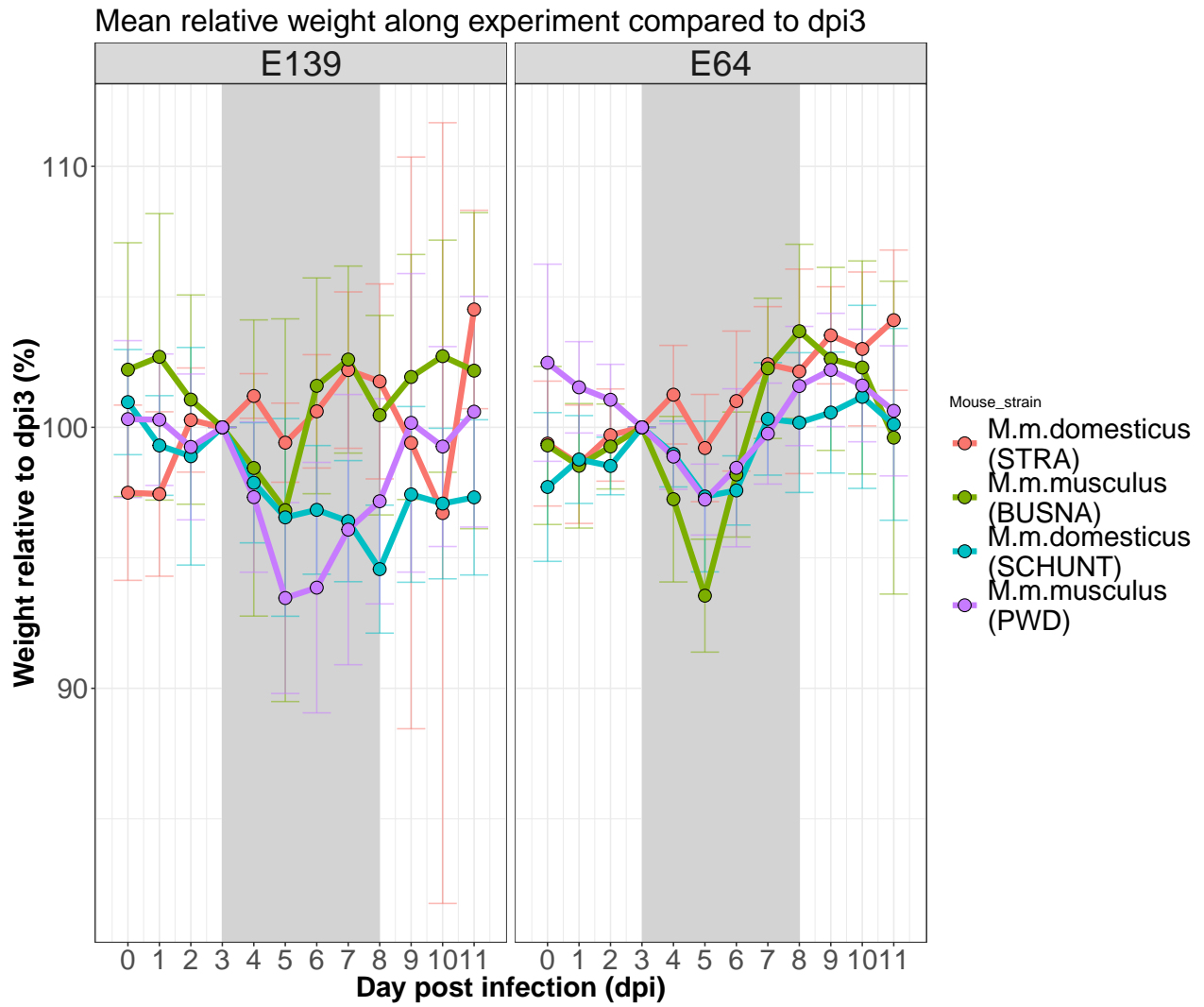
1. Weight loss

Weight along experiment per individual
yellow : oocysts detected in feces

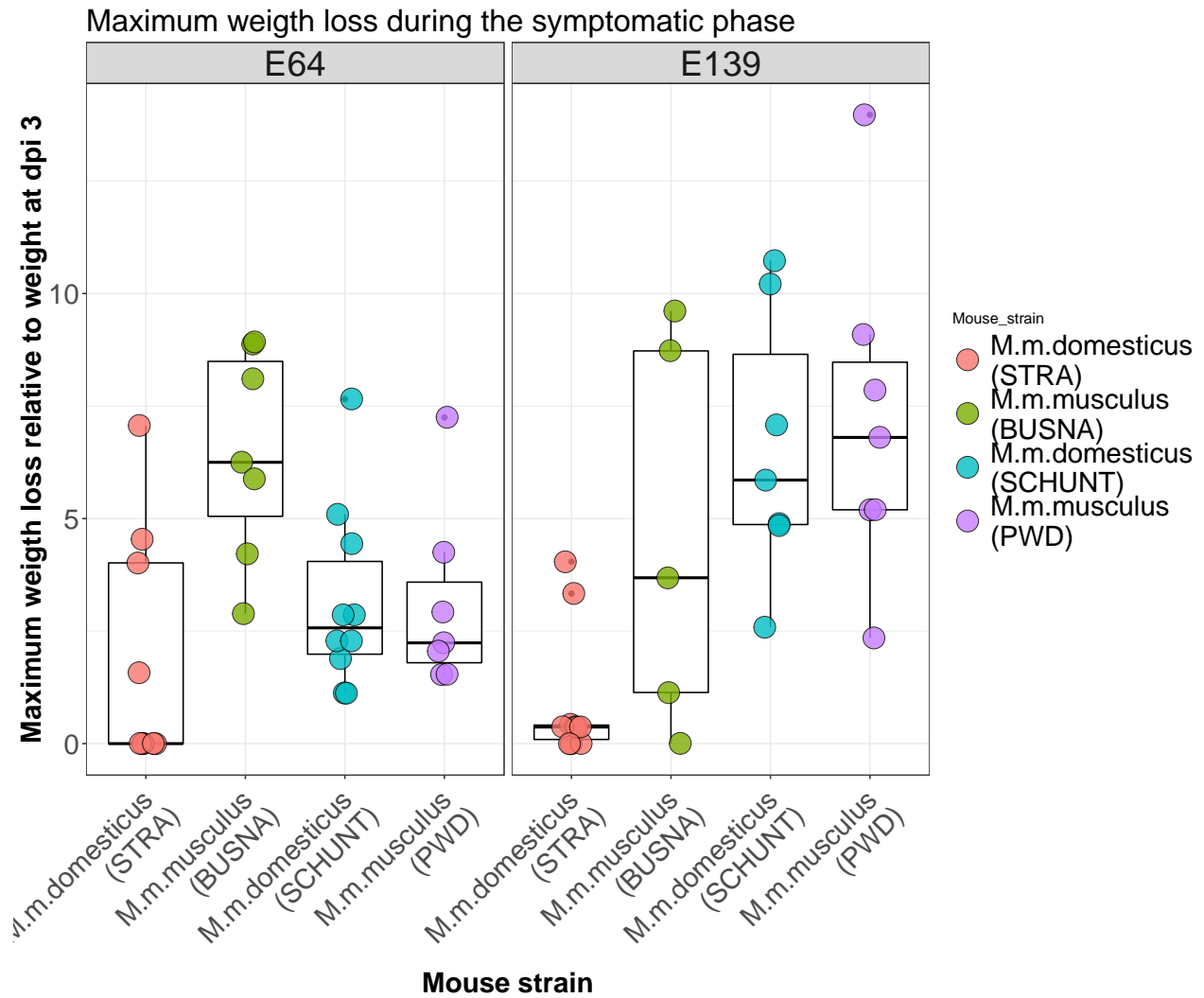


Relative weight along experiment compared to dpi3
yellow : oocysts detected in feces



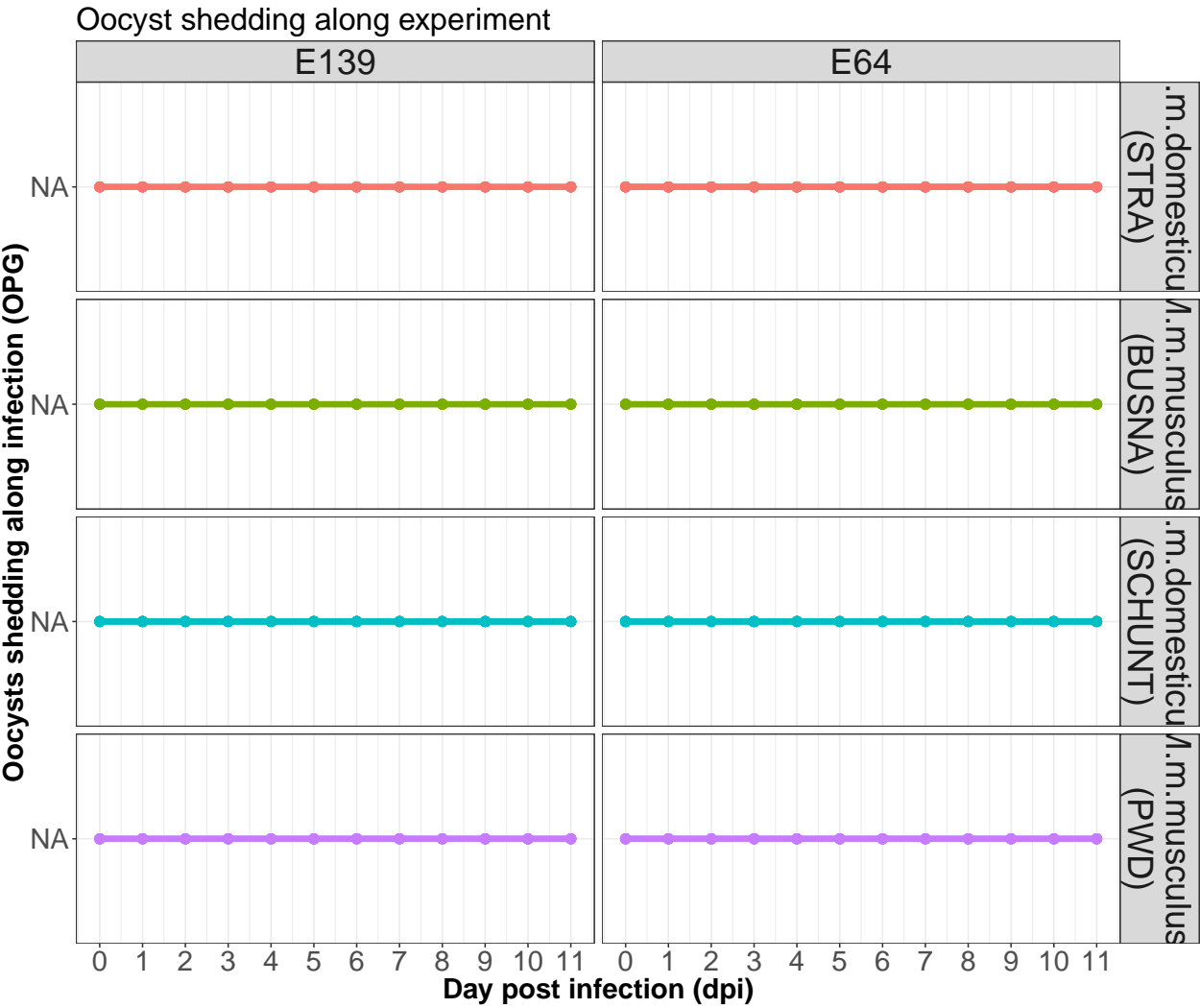


For statistical analysis, we compare the maximum relative weight loss between the different groups. We limit our analysis to the period : dpi3 to dpi8 (symptomatic period for E64 strain).

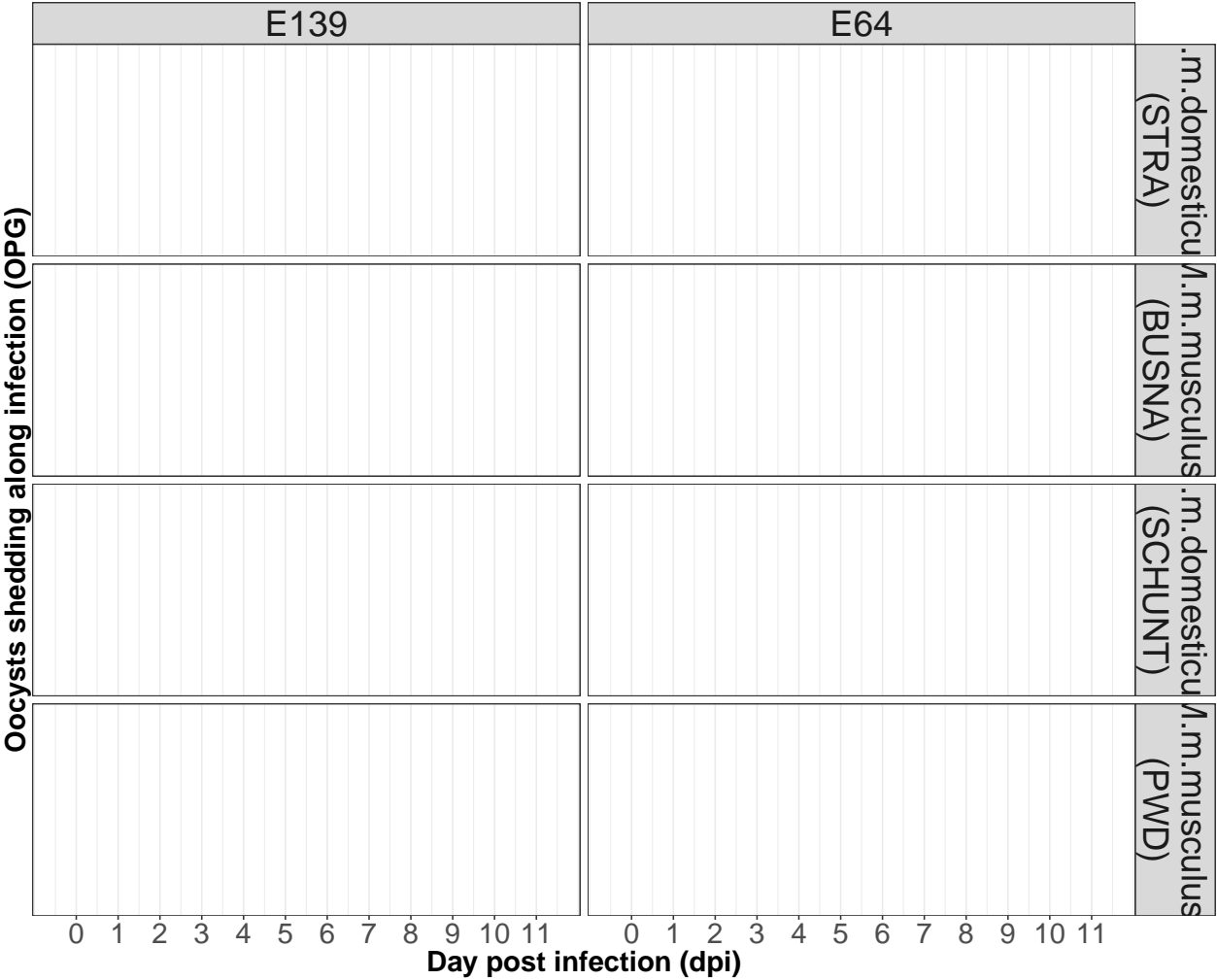


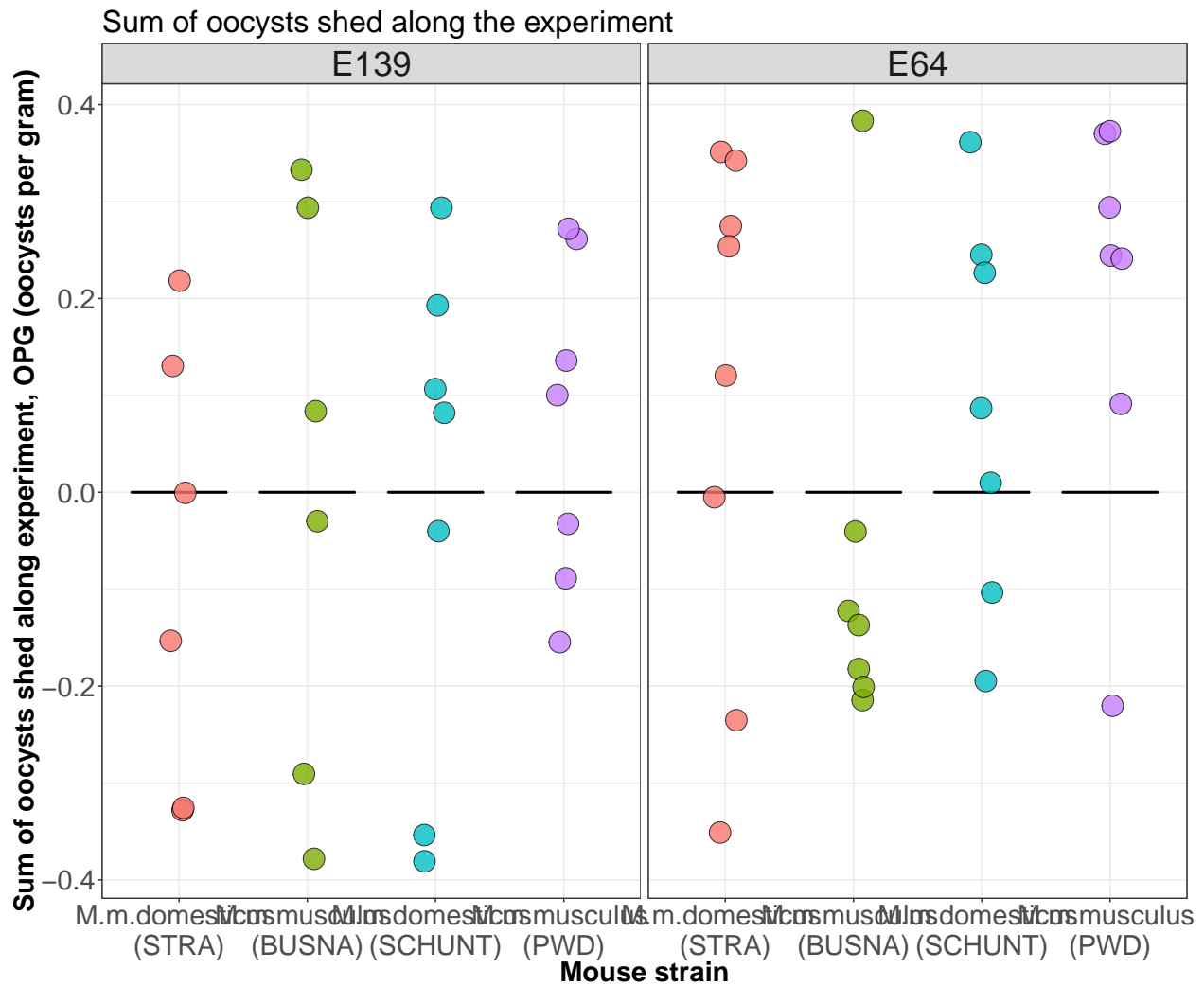
```
##
## Kruskal-Wallis rank sum test
##
## data: relativeWeight by Mouse_strain
## Kruskal-Wallis chi-squared = 20.177, df = 3, p-value = 0.000156
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: max.loss_003_4$relativeWeight and max.loss_003_4$Mouse_strain
##
##           M.m.domesticus \n(STRA) M.m.musculus \n(BUSNA)
## M.m.musculus \n(BUSNA)      0.0022                -
## M.m.domesticus \n(SCHUNT) 0.0014                0.4167
## M.m.musculus \n(PWD)      0.0014                0.6649
##           M.m.domesticus \n(SCHUNT)
## M.m.musculus \n(BUSNA)      -
## M.m.domesticus \n(SCHUNT) -
## M.m.musculus \n(PWD)      0.7060
##
## P value adjustment method: BH
```

2. Parasite shedding



Mean oocysts shedding along experiment



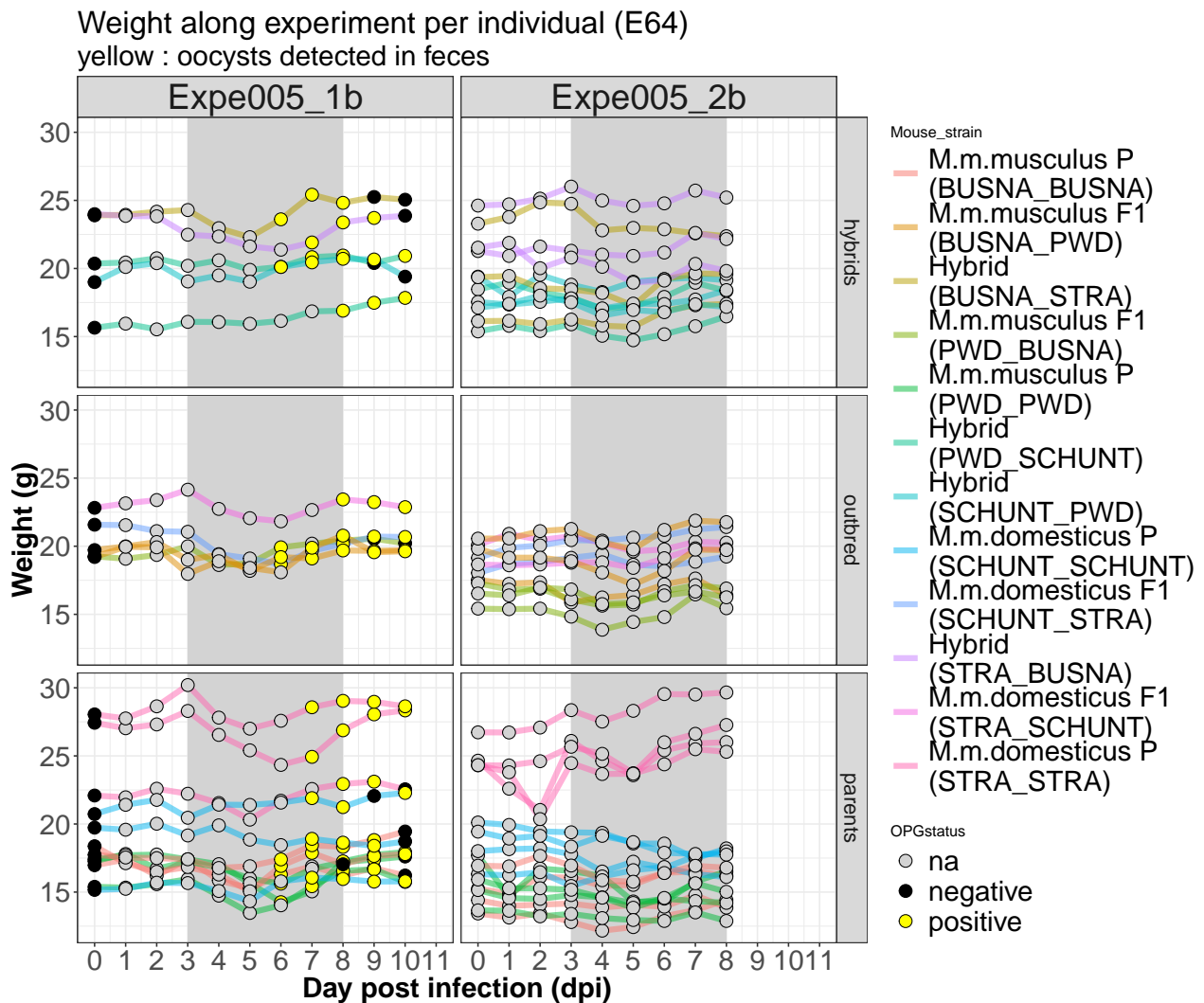


```
##
## Kruskal-Wallis rank sum test
##
## data: sum.oo by Mouse_strain
## Kruskal-Wallis chi-squared = NaN, df = 3, p-value = NA
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: sum.oocysts_003_4$sum.oo and sum.oocysts_003_4$Mouse_strain
##
##           M.m.domesticus \n(STRA) M.m.musculus \n(BUSNA)
## M.m.musculus \n(BUSNA)          -
## M.m.domesticus \n(SCHUNT)         -
## M.m.musculus \n(PWD)              -
##           M.m.domesticus \n(SCHUNT)
## M.m.musculus \n(BUSNA)          -
## M.m.domesticus \n(SCHUNT)         -
## M.m.musculus \n(PWD)              -
##
## P value adjustment method: BH
```

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)

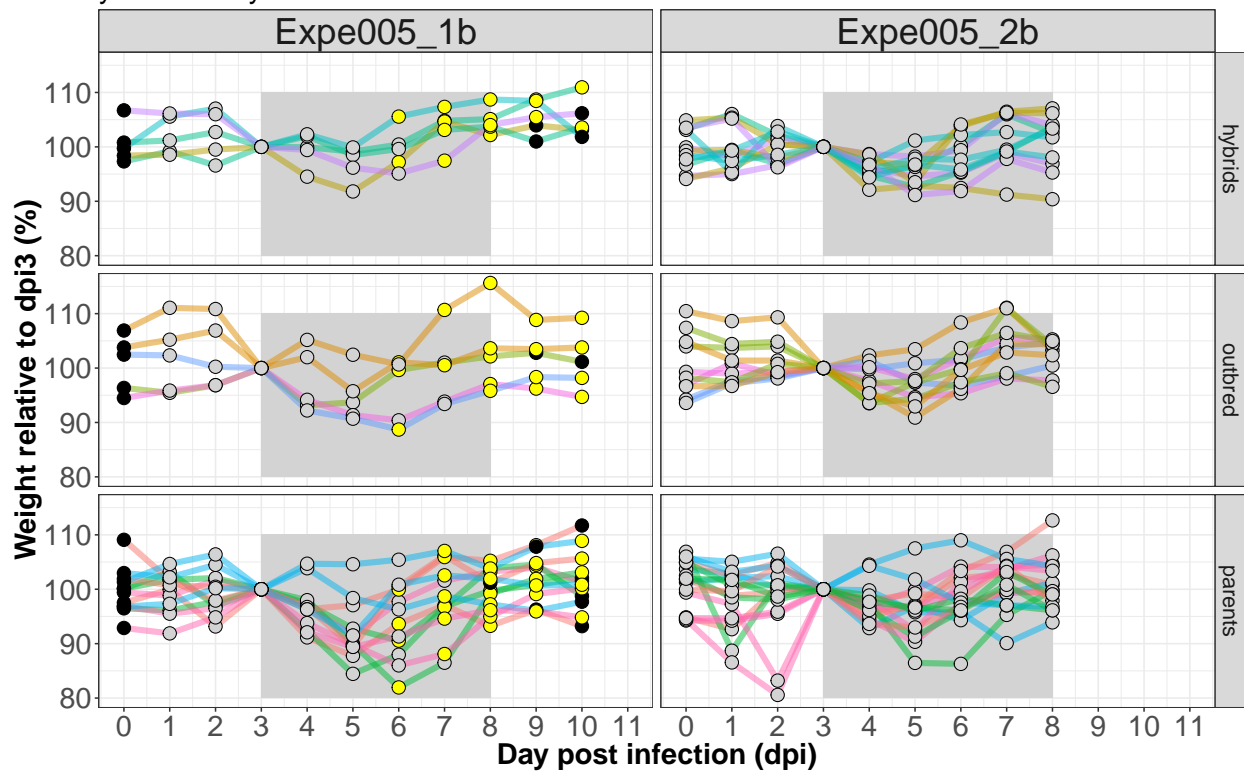
1. Weight loss

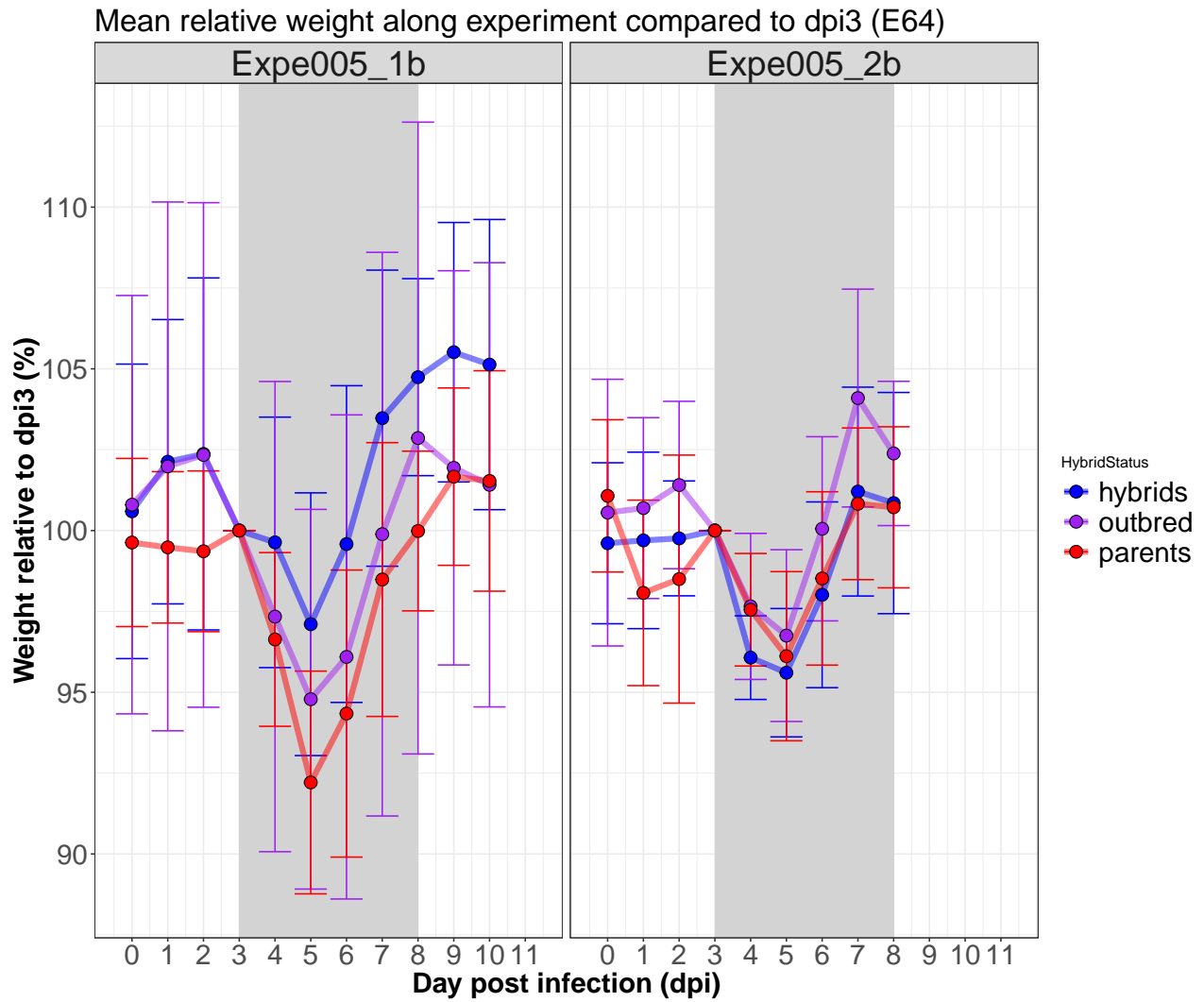
Eimeria ferrisi



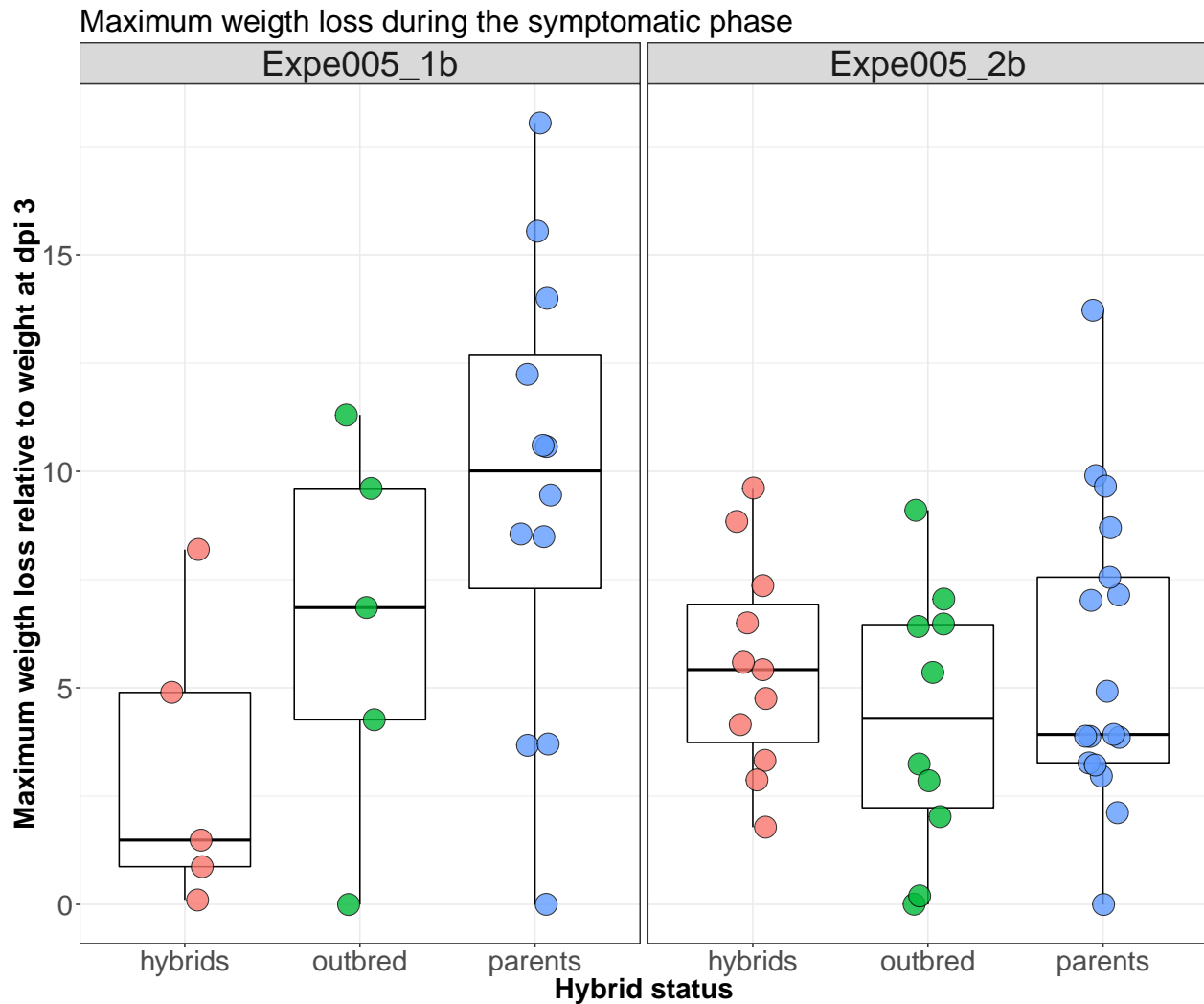
Relative weight along experiment compared to dpi3 (E64)

yellow : oocysts detected in feces





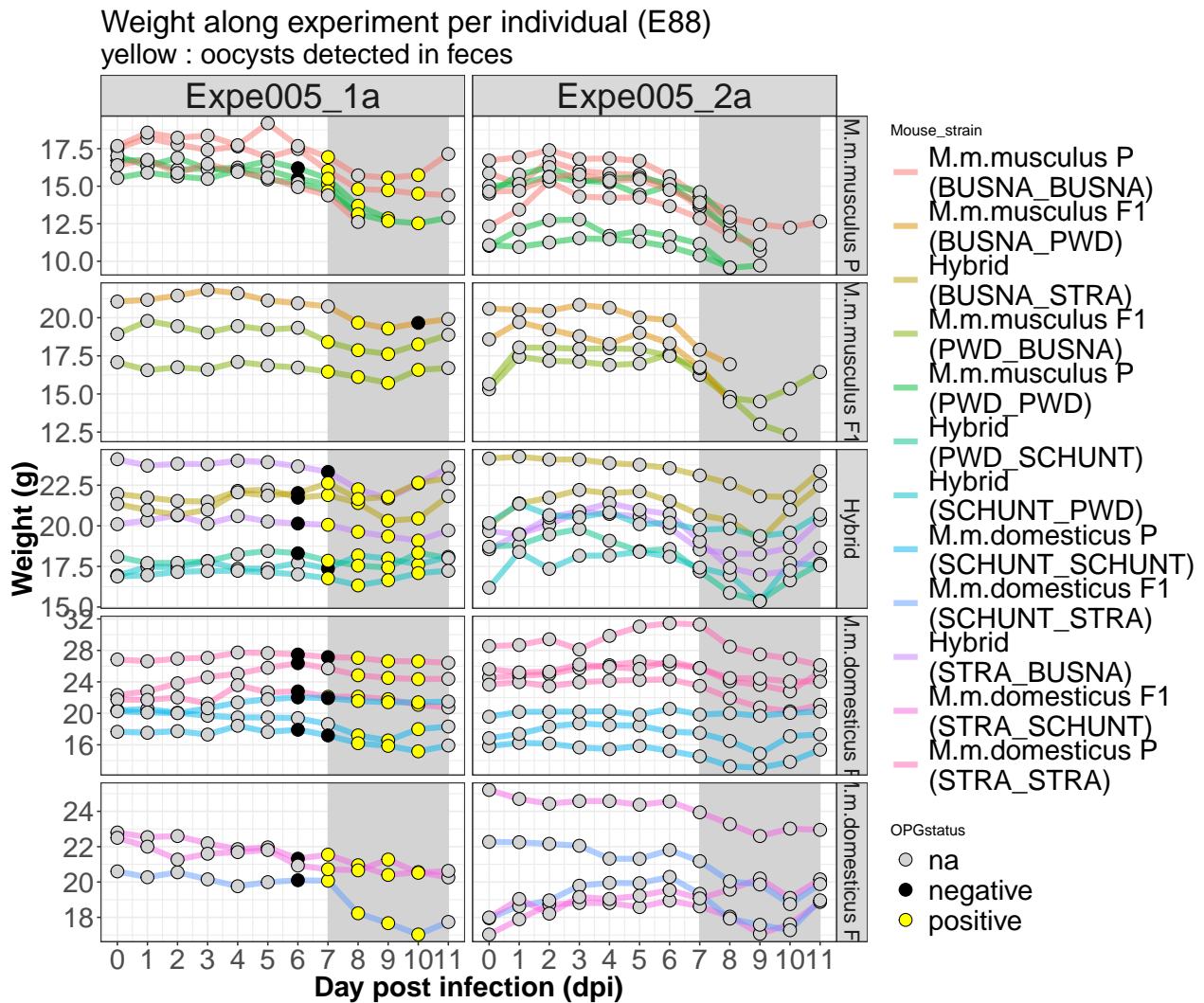
For statistical analysis, we compare the maximum relative weight loss between the different groups. We limit our analysis to the period : dpi3 to dpi8 (symptomatic period for E64 strain).



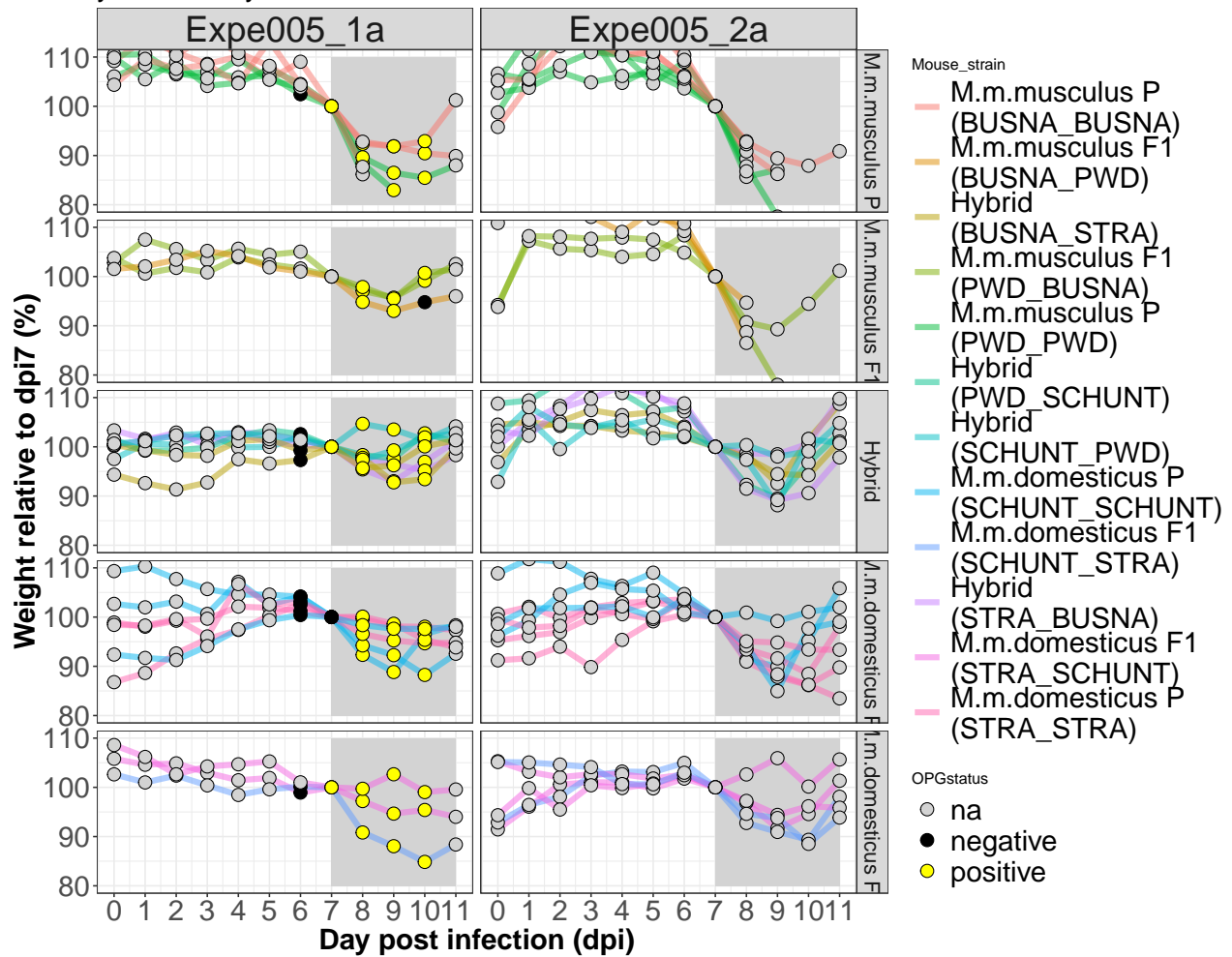
```
##
## Kruskal-Wallis rank sum test
##
## data: relativeWeight by HybridStatus
## Kruskal-Wallis chi-squared = 5.0441, df = 2, p-value = 0.0803
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: maxloss_E64B1$relativeWeight and maxloss_E64B1$HybridStatus
##
##      hybrids outbred
## outbred 0.42      -
## parents 0.08      0.42
##
## P value adjustment method: BH
##
## Kruskal-Wallis rank sum test
##
## data: relativeWeight by HybridStatus
## Kruskal-Wallis chi-squared = 1.3931, df = 2, p-value = 0.4983
```

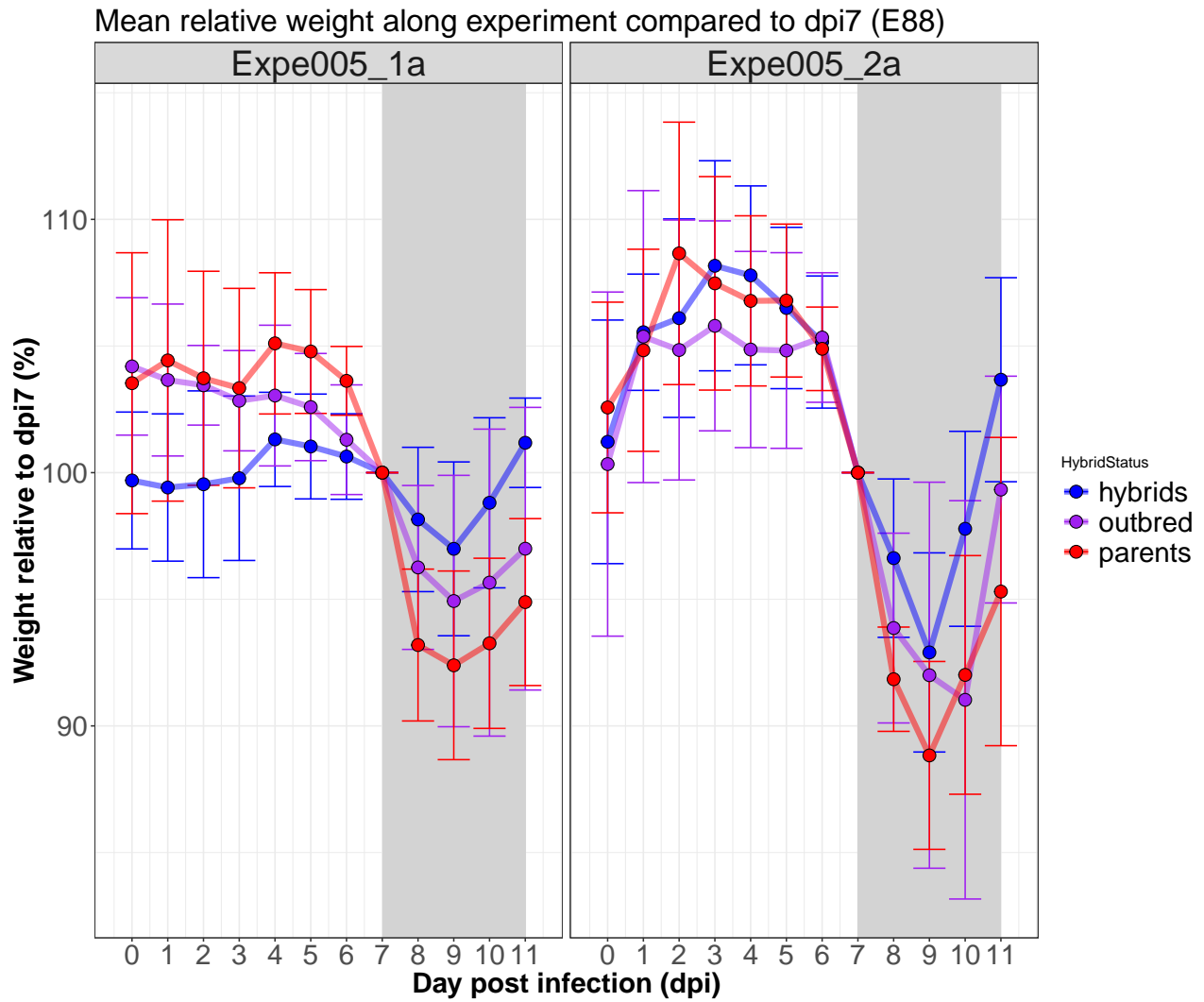
```
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: maxloss_E64B2$relativeWeight and maxloss_E64B2$HybridStatus
##
##      hybrids outbred
## outbred 0.52      -
## parents 0.93      0.52
##
## P value adjustment method: BH
```

Eimeria falciformis

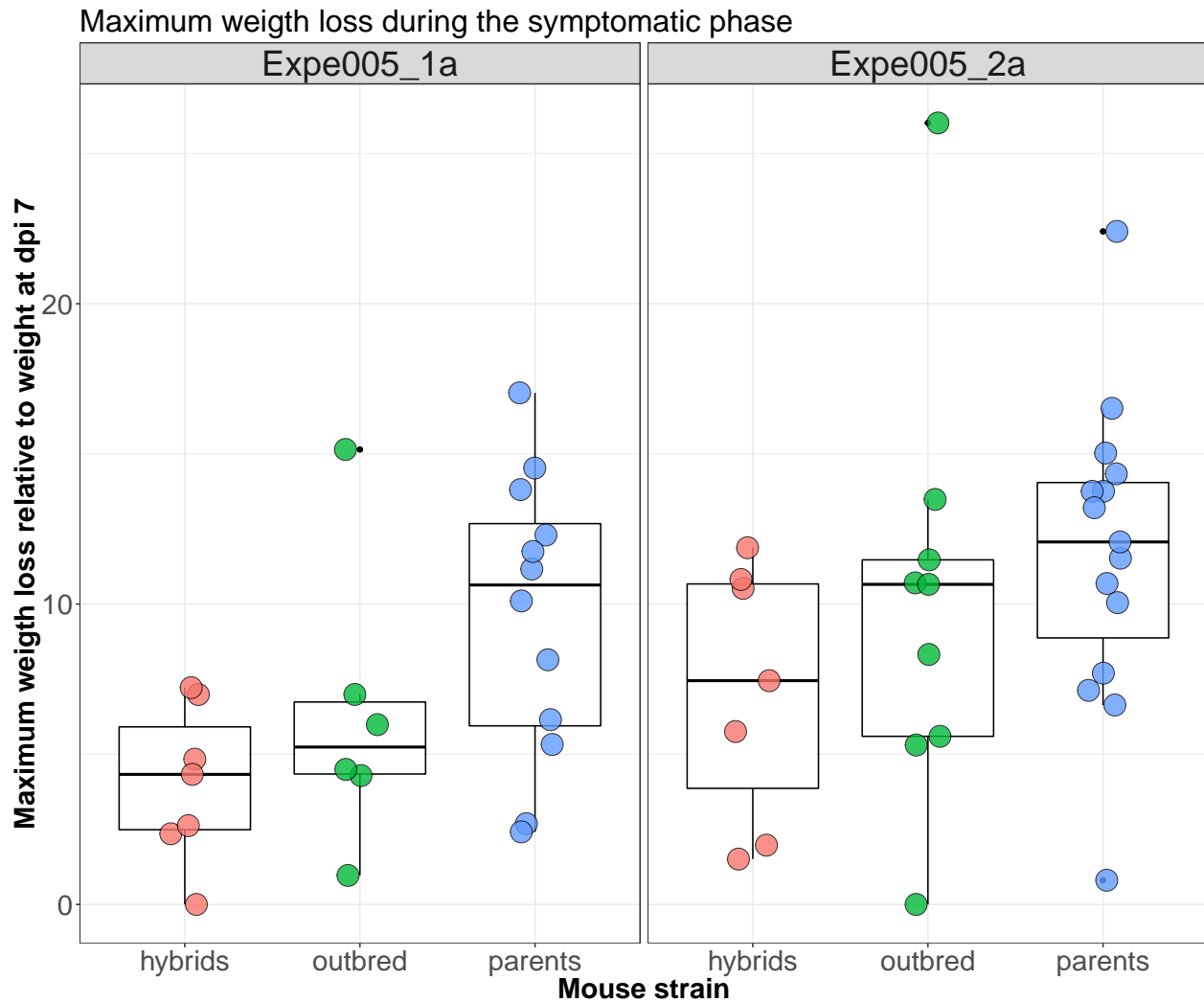


Relative weight along experiment compared to dpi7 (E88)
yellow : oocysts detected in feces





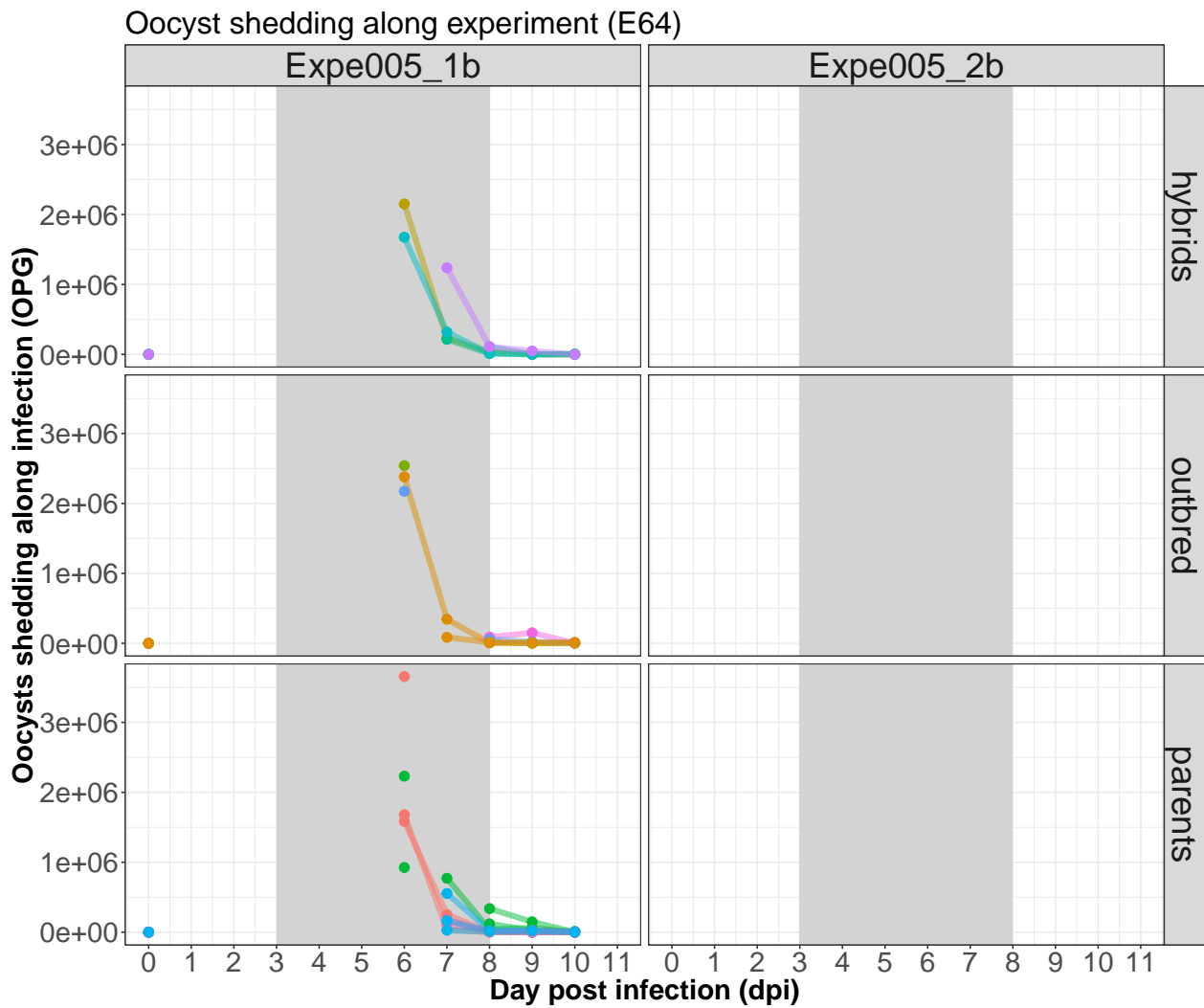
For statistical analysis, we compare the maximum relative weight loss between the different groups. We limit our analysis to the period : dpi7 to dpi11 (symptomatic period for E88 strain).



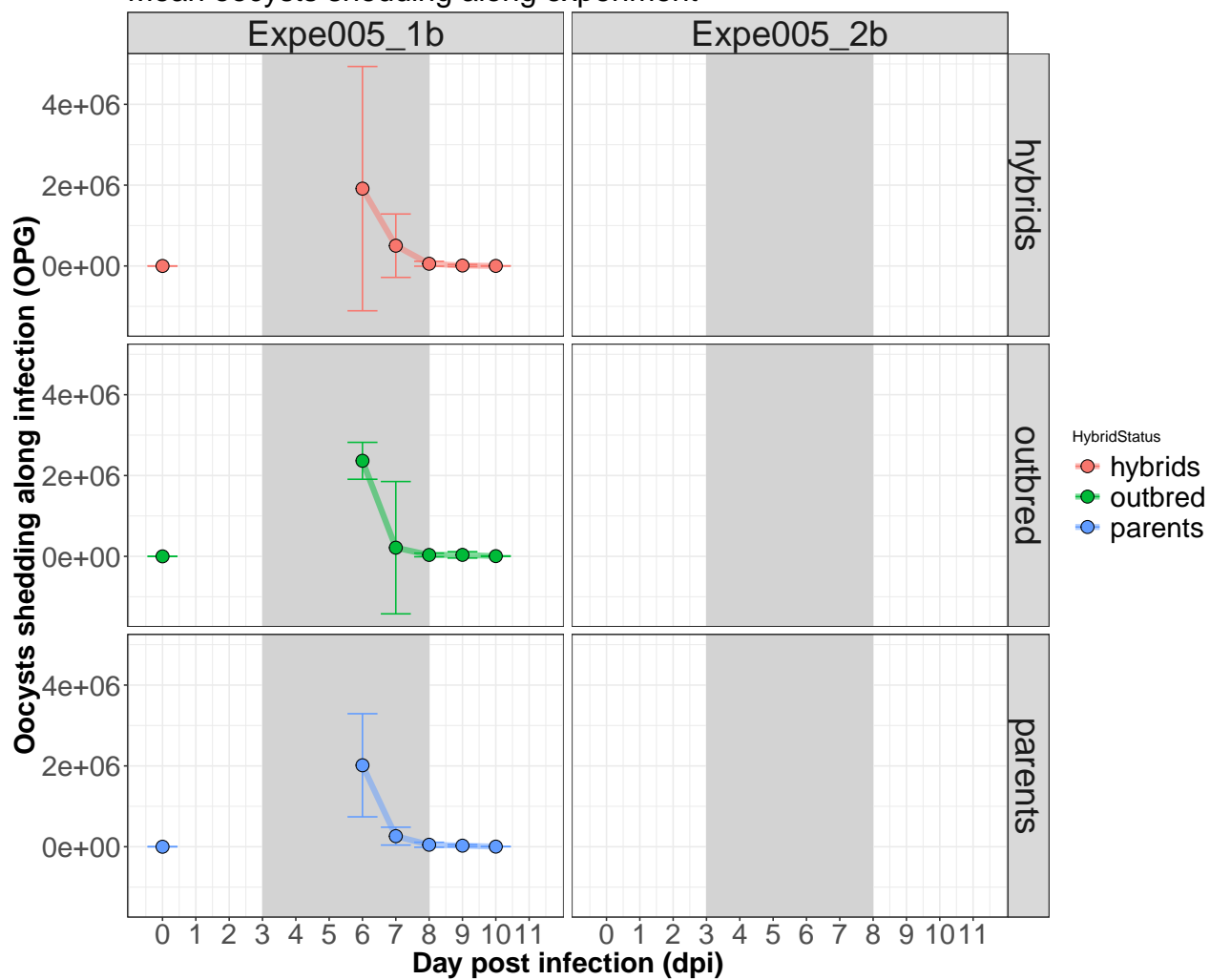
```
##
## Kruskal-Wallis rank sum test
##
## data: relativeWeight by HybridStatus
## Kruskal-Wallis chi-squared = 6.1426, df = 2, p-value = 0.04636
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: maxloss_E88B1$relativeWeight and maxloss_E88B1$HybridStatus
##
##      hybrids outbred
## outbred 0.534      -
## parents 0.039    0.319
##
## P value adjustment method: BH
##
## Kruskal-Wallis rank sum test
##
## data: relativeWeight by HybridStatus
## Kruskal-Wallis chi-squared = 4.3167, df = 2, p-value = 0.1155
```

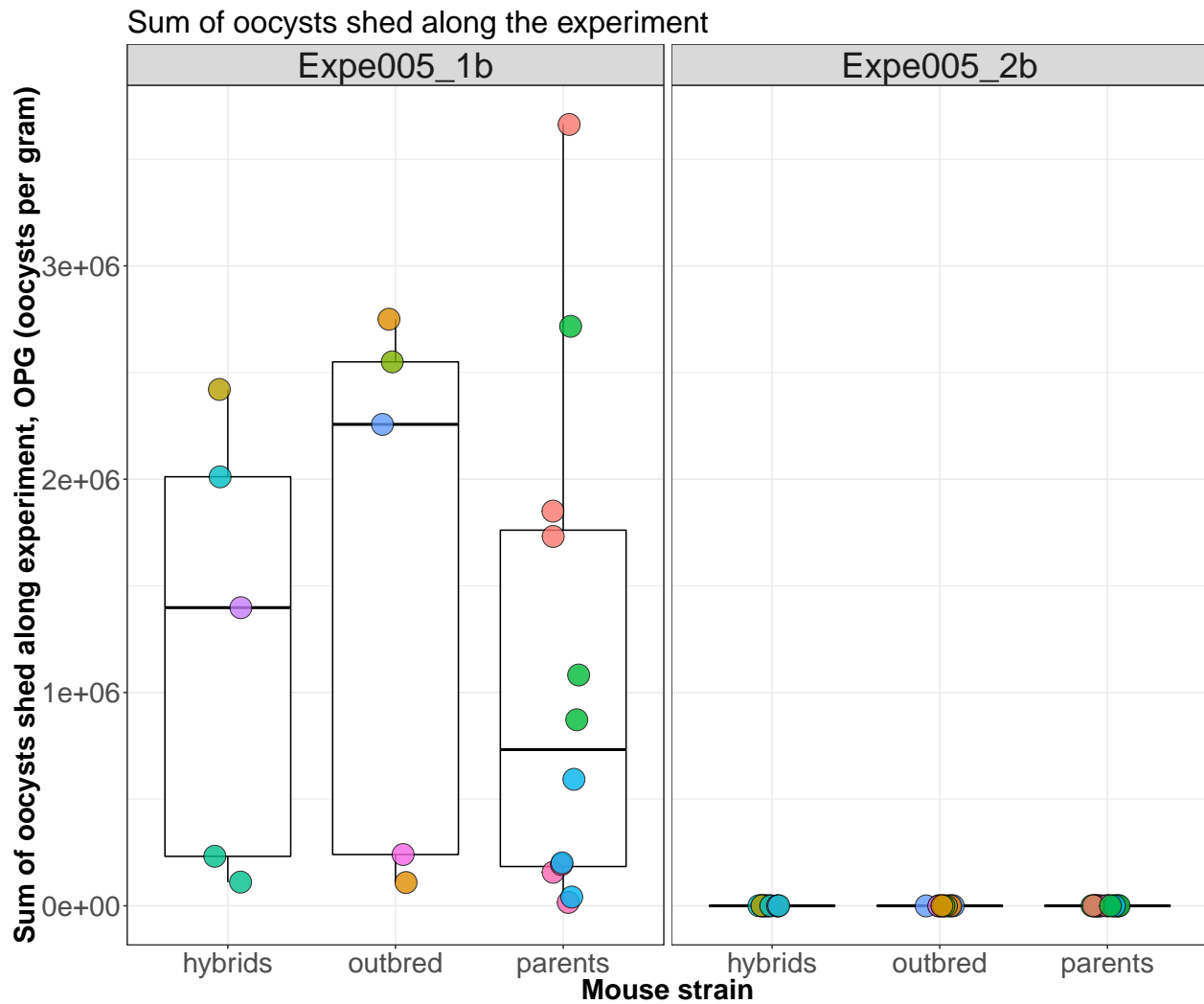
```
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: maxloss_E88B2$relativeWeight and maxloss_E88B2$HybridStatus
##
##      hybrids outbred
## outbred 0.54      -
## parents 0.14      0.36
##
## P value adjustment method: BH
```

2. Parasite shedding



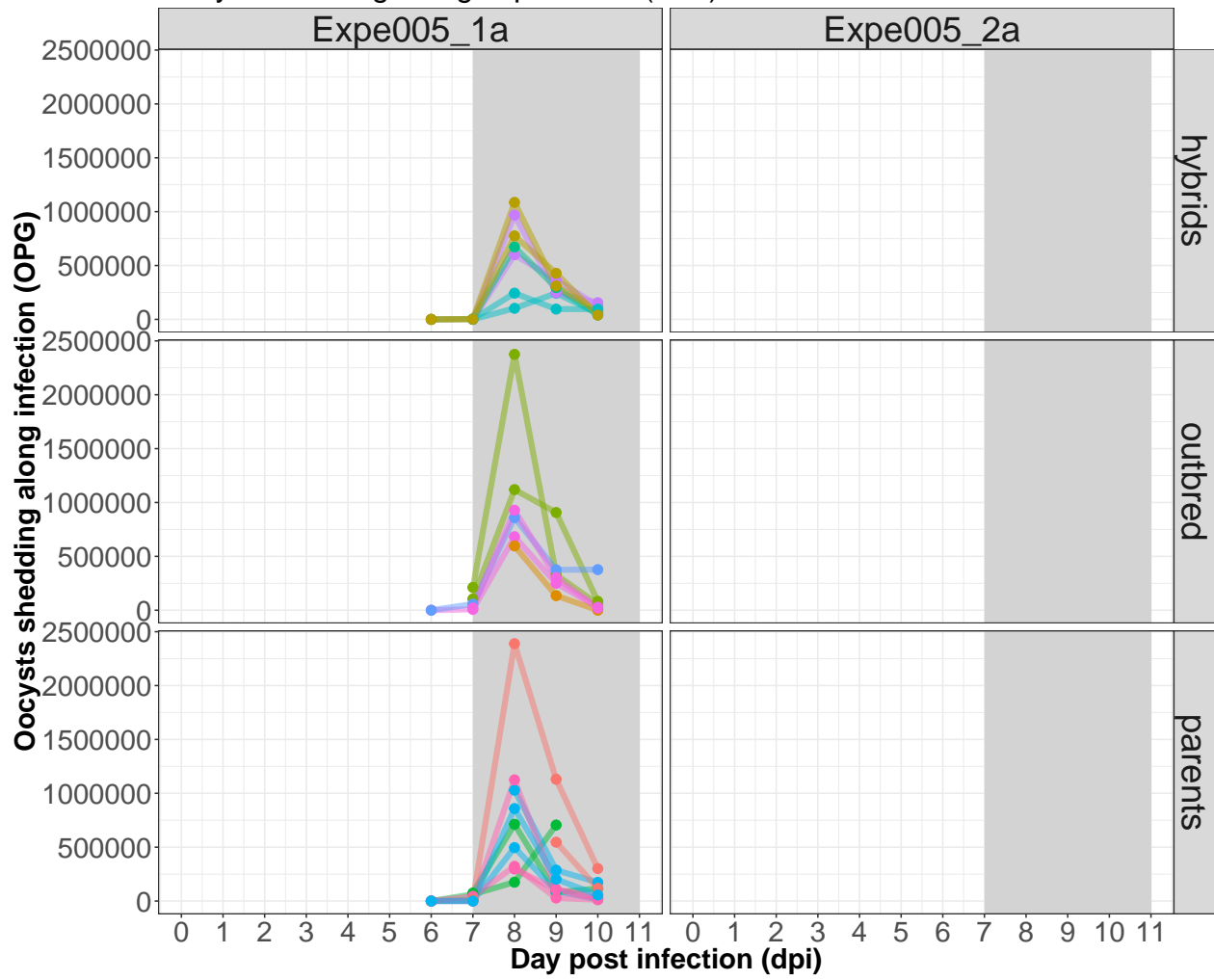
Mean oocysts shedding along experiment

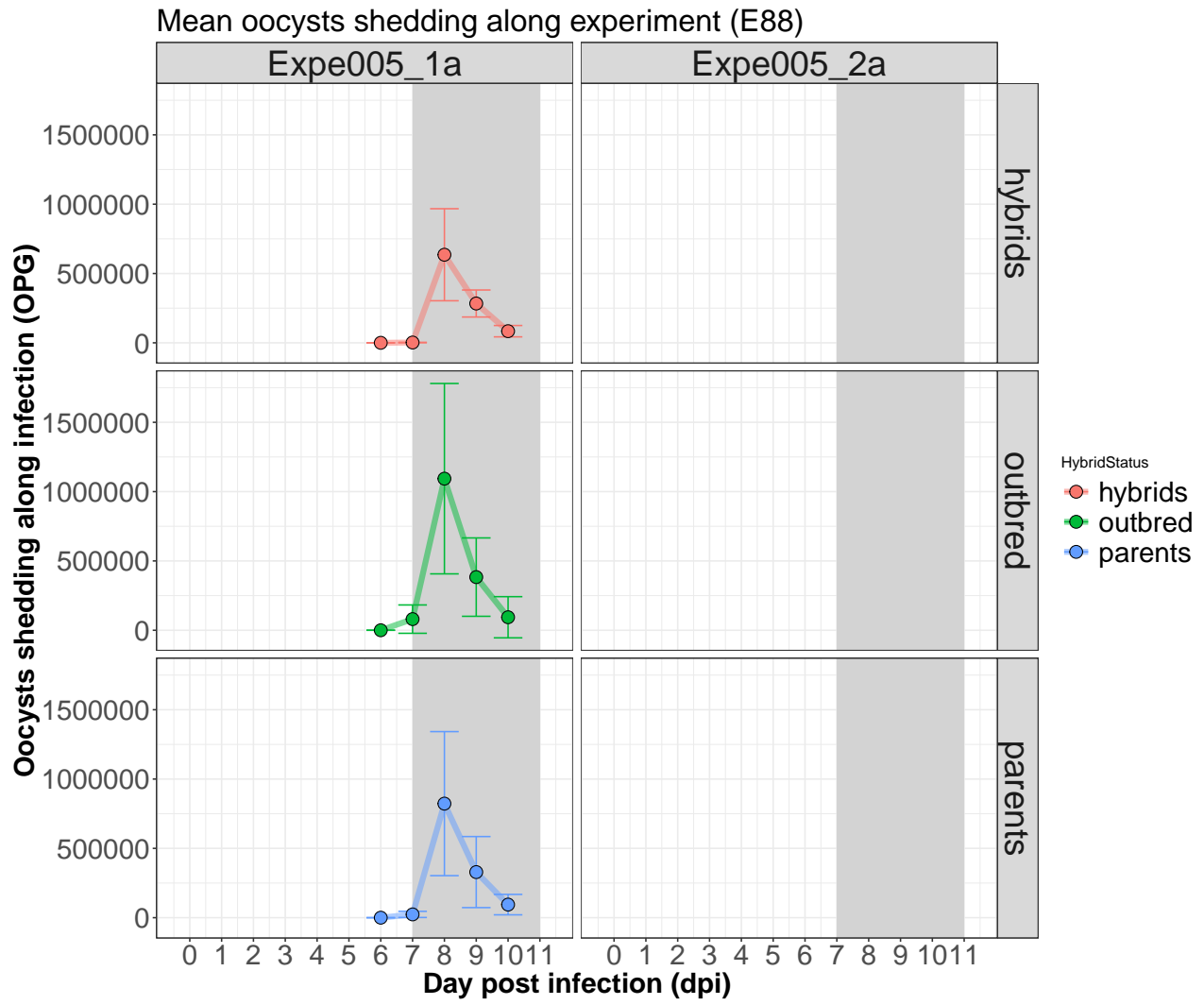


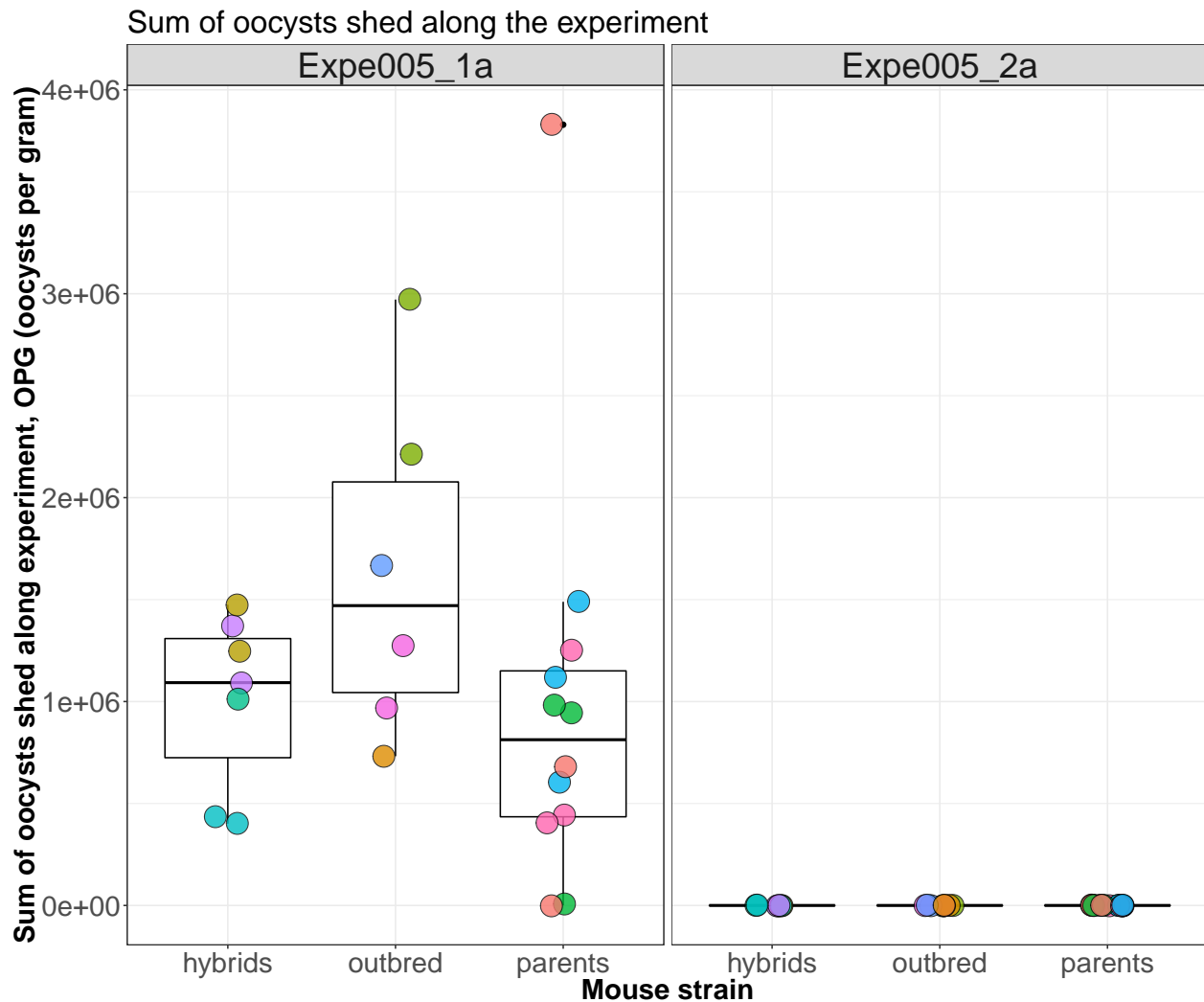


```
##
## Kruskal-Wallis rank sum test
##
## data: sum.oo by HybridStatus
## Kruskal-Wallis chi-squared = 0.39075, df = 2, p-value = 0.8225
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: sum.oocysts_005_64$sum.oo and sum.oocysts_005_64$HybridStatus
##
## hybrids outbred
## outbred 0.79 -
## parents 0.79 0.79
##
## P value adjustment method: BH
Eimeria falciformis
```

Oocyst shedding along experiment (E88)







```
##
## Kruskal-Wallis rank sum test
##
## data: sum.oo by HybridStatus
## Kruskal-Wallis chi-squared = 0.48335, df = 2, p-value = 0.7853
##
## Pairwise comparisons using Wilcoxon rank sum test
##
## data: sum.oocysts_005_88$sum.oo and sum.oocysts_005_88$HybridStatus
##
##      hybrids outbred
## outbred 0.96      -
## parents 0.96      0.96
##
## P value adjustment method: BH
```

Ideas:

- Add variable for each 4 parents and test the linear relationships for each of these variables set to 0 (copy of DNA), 1 (copy of DNA) (2 we can remove as we want outbred vs hybrids) + another variable HybridStatus : hybrid or outbred. + mixed effect (1|EH_ID, 1|Expe)

- Depend on the angle, but could be really interesting to quantify this for each mouse strain (outbreeding effect + hybrid effect) and show that it is highly strain specific. The focus on the article could be on that.
- Internal collaborators: Alice Balard, Vivian Mittné, Francisca Böhning, Emanuel Heitlinger
- External collaborators: Stuart J. Baird, Jaroslav Piálek, Ludovít Ďureje, Joëlle Göüy de Bellocq, Milos Macholán.
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