Mesocosm experiment plots

Matthew Malishev[1]* & David Civitello [1]
[1] *Department of Biology, Emory University, 1510 Clifton Road NE, Atlanta, GA, USA, 30322*

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Corresponding author: matthew.malishev@gmail.com
This document can be found at https://github.com/darwinanddavis/SchistoMesocosm

Follow instructions in code chunks labelled 'fileoutput' to toggle pdf of plots saved to directory on/off ('Size_per_tank_over_time.pdf')

TO DO

- How much of the population does the sampling effort capture?
- ~~Scale diameter densities per tank over time to upper limit of each tank (set ylim to highest value for each tank)~~

- Scale diameter densities per tank over time to upper limit of all tanks (set ylim to highest value for all tanks)

- Split plots by line color code showing point where snails are reproductive viable (8 mm and above).
- Which tanks and conditions reach reproductive size?

- ~~Replot by size class and resource combo e.g. low resources and small size class v low resources and large size class~~

Overview

This document uses the schisto mesocosm 2016 data to explore cercariae production from snail hosts of different body sizes (diameter in mm and mass in mg) over a 14 week period under high and low N/P nutrient conditions. Host reproduction (egg masses) is also calculated.

Install dependencies

Get data

```
wd <- params$dir # working dir is set in yaml header
setwd(paste0(wd,"/"))
f <- "meso1_.csv"
f2 <- "meso2_.csv"
```

Load data

```
'data.frame':   720 obs. of  13 variables:
 $ Tank                : int  1 2 3 4 5 6 7 8 9 10 ...
 $ NP                  : chr  "High" "Low" "Low" "High" ...
 $ Size                : chr  "Small" "Intermediate" "Intermediate" "Small" ...
 $ Schisto             : chr  "No" "Yes" "Yes" "Yes" ...
 $ Week                : int  0 0 0 0 0 0 0 0 0 0 ...
 $ Snail               : int  60 60 60 60 60 60 60 60 60 60 ...
 $ Total_Biomass       : num  96 620.6 670.5 86.7 121.4 ...
 $ Cercarial_production: int  0 0 0 0 0 0 0 0 0 0 ...
 $ Infected_abundance  : int  0 0 0 0 0 0 0 0 0 0 ...
 $ Sampling_Effort     : int  NA NA NA NA NA NA NA NA NA NA ...
 $ Eggs                : int  NA NA NA NA NA NA NA NA NA NA ...
 $ Phyto_F             : num  NA NA NA NA NA NA NA NA NA NA ...
 $ Peri_F              : num  NA NA NA NA NA NA NA NA NA NA ...
```

Set plotting graphics

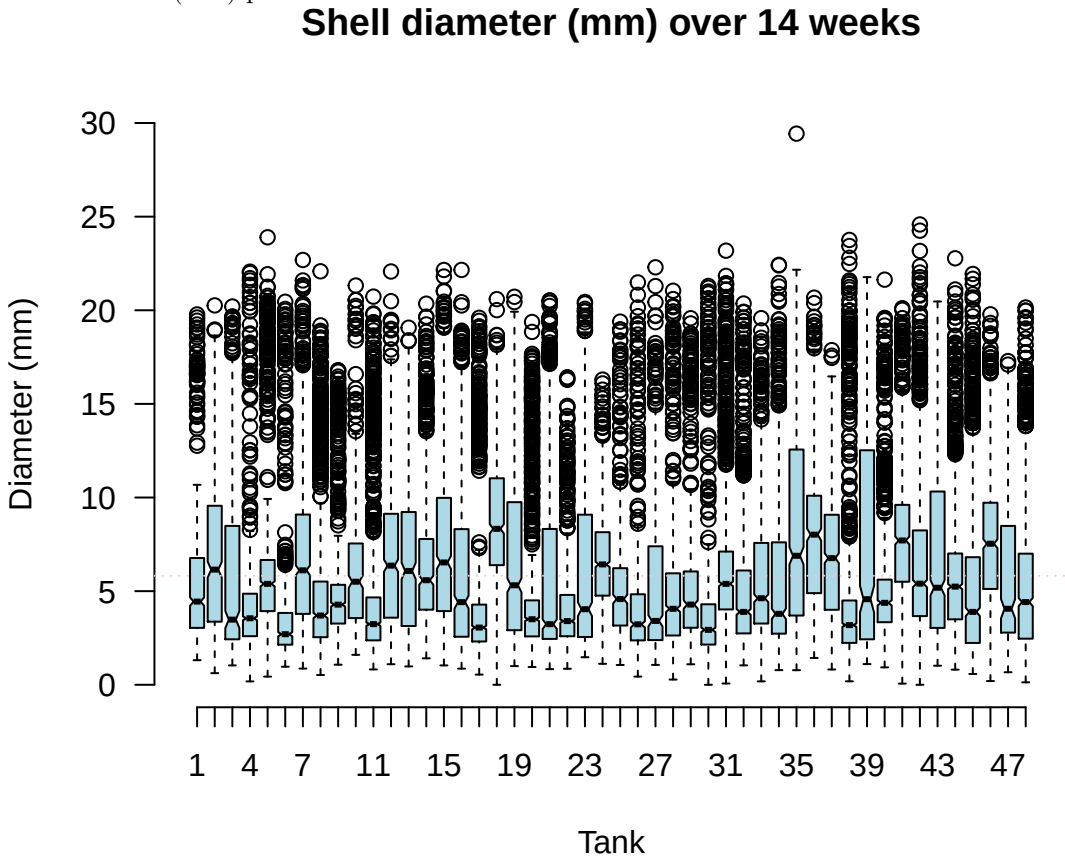
Set plotting parameters

Get only infected snails

Mesocosm 1 data sheet

Snail size per tank

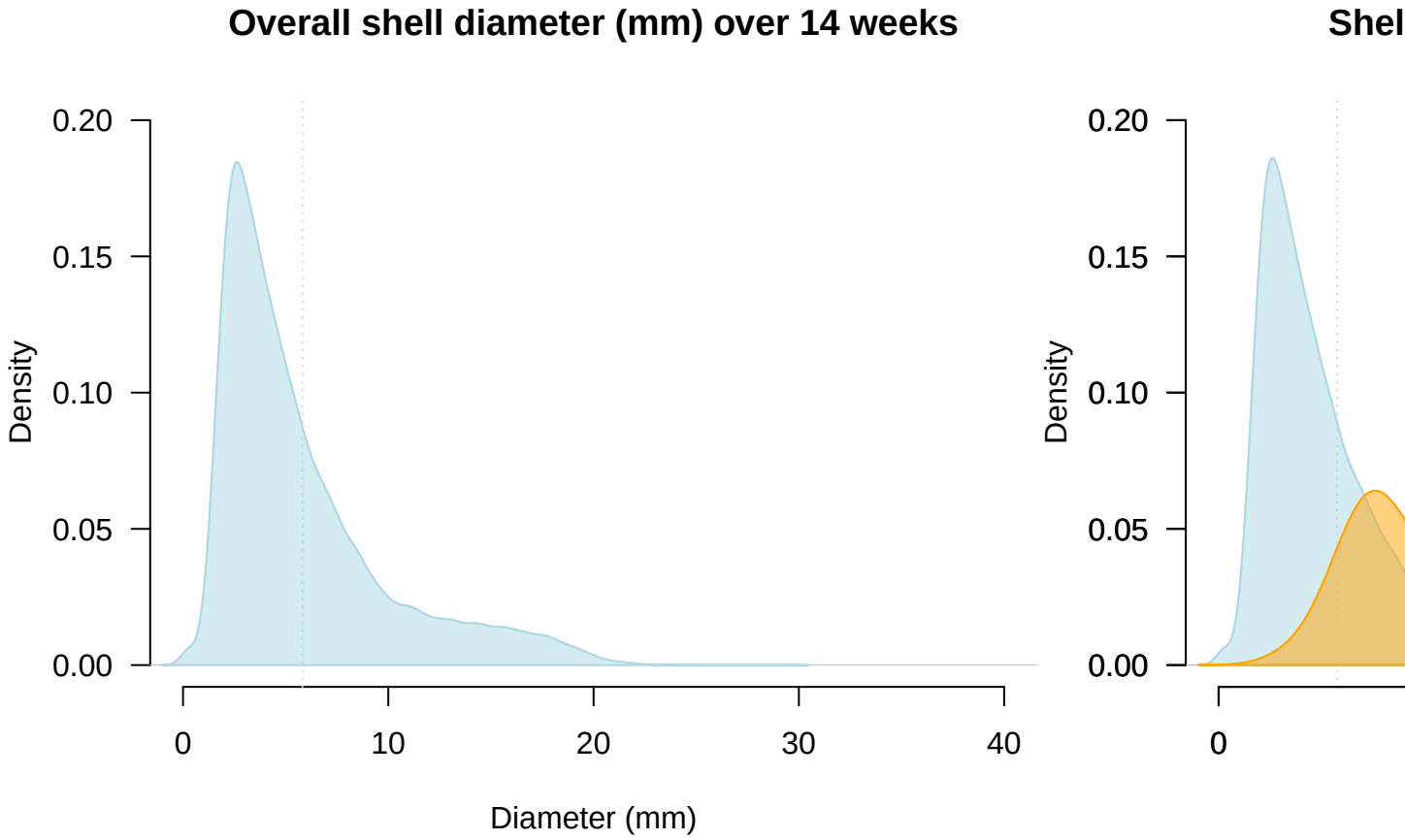
Shell diameter (mm) per tank




```
    Welch Two Sample t-test

data:  Diameter and Tank
t = -292.67, df = 54609, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -19.45879 -19.19989
sample estimates:
mean of x mean of y
 5.821956 25.151292
```

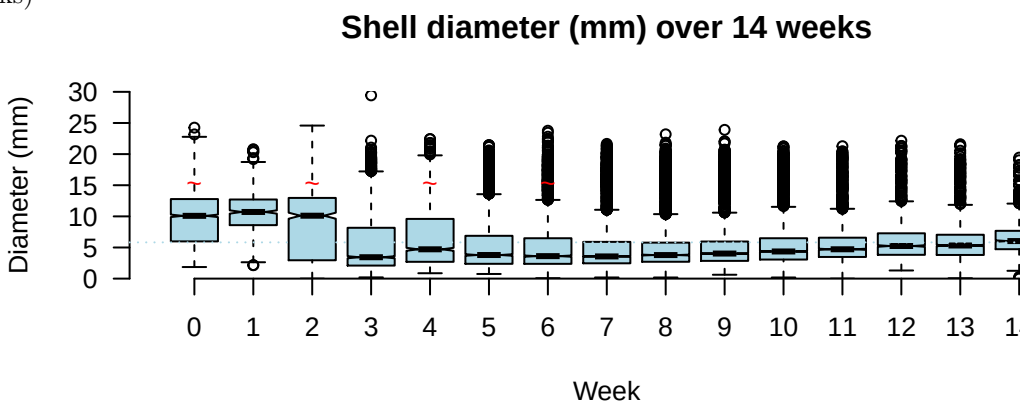
Snail diameter (mm) distribution

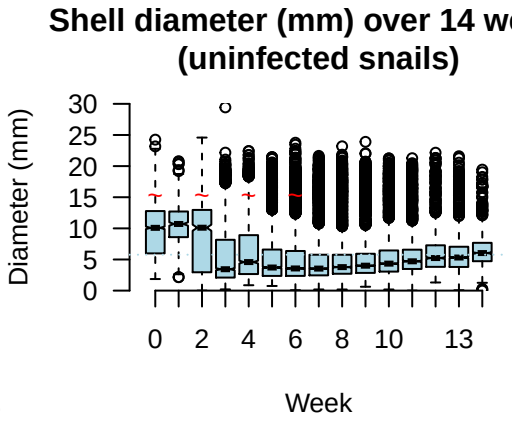


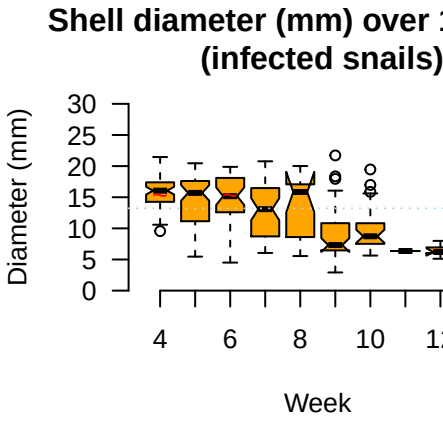

```
xchar= 0.9529 ; (yextra,ychar)= -0.004785 0.004785
points2( 29.8 29.8 , 0.1 0.09522 , pch= 20 20 , ...)
```

Snail size over time (weeks)

Shell diameter (mm) over time (weeks)







~1000 eggs inoculated at 0,2,4,6 weeks

Snail size over time (weeks) per tank

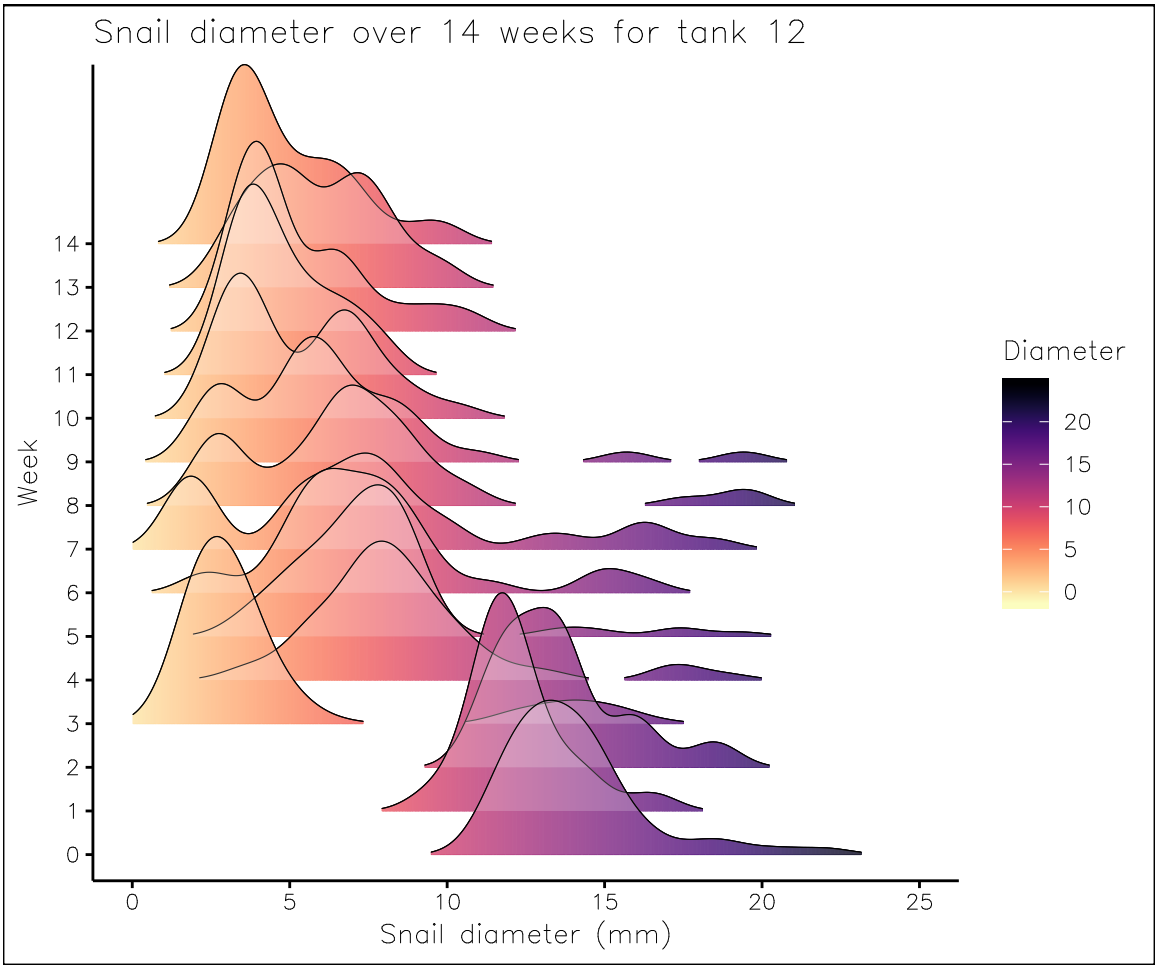
For all tanks (n = 48), see 'Size_per_tank_over_time.pdf' in /Users/malishev/Documents/Emory/research

~1000 eggs inoculated at 0,2,4,6 weeks

Select tank. Max 48

```
tank <- 12 # Select tank #. Max 48
paste0("Tank ",tank)
```

```
[1] "Tank 12"
```



Snail size over time (weeks) per tank (High resources)

See "Size_per_tank_over_time_HIGH.pdf" in /Users/malishev/Documents/Emory/research/mesocosm

Snail size over time (weeks) per tank (Low resources)

See "Size_per_tank_over_time_LOW.pdf" in /Users/malishev/Documents/Emory/research/mesocosm

Large snails over time (weeks) per tank (High resources)

See "Size_per_tank_over_time_HIGH_LARGE.pdf" in /Users/malishev/Documents/Emory/research/

Large snails over time (weeks) per tank (low resources)

See "Size_per_tank_over_time_LOW_LARGE.pdf" in /Users/malishev/Documents/Emory/research/m

Small snails over time (weeks) per tank (High resources)

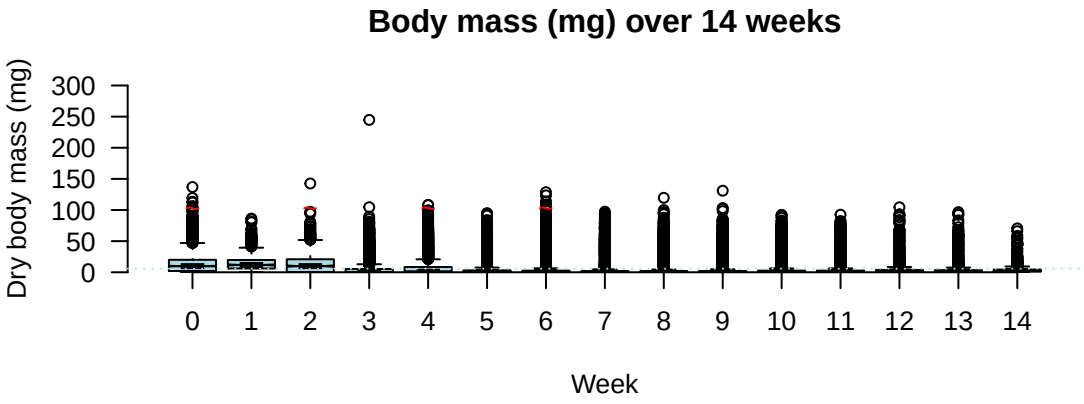
See "Size_per_tank_over_time_HIGH_SMALL.pdf" in /Users/malishev/Documents/Emory/research/

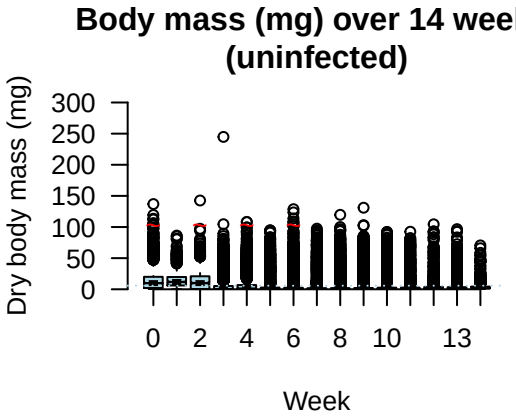
Small snails over time (weeks) per tank (low resources)

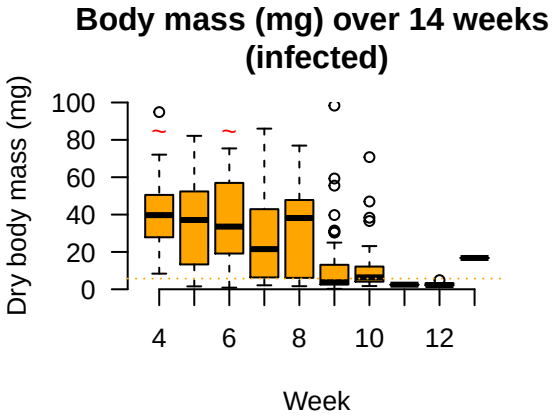
See "Size_per_tank_over_time_LOW_SMALL.pdf" in /Users/malishev/Documents/Emory/research/m

Body mass (mg) over time (weeks)

(Soft tissue dry mass in mg = 0.0096 * Diameter[in mm]^3)
~1000 eggs inoculated at 0,2,4,6 weeks

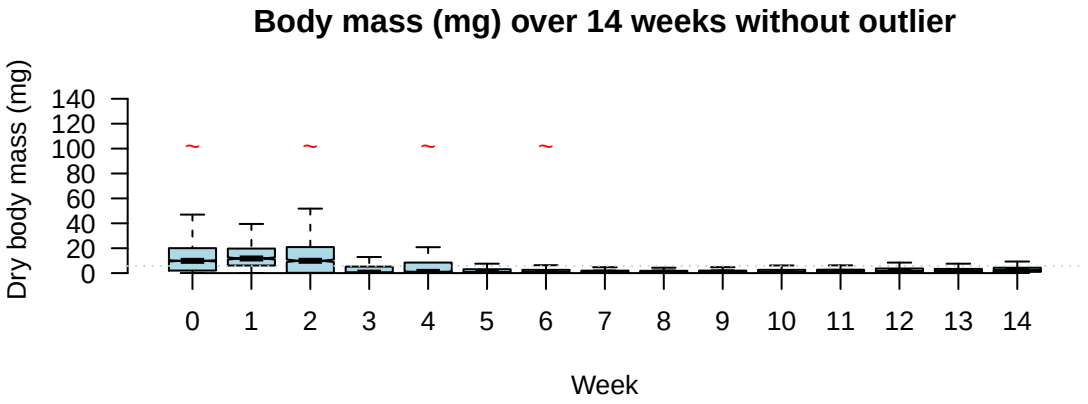


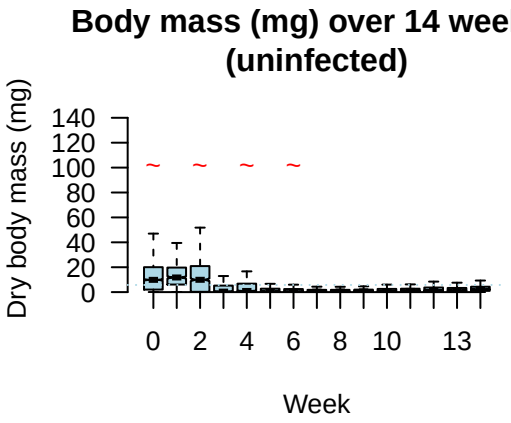


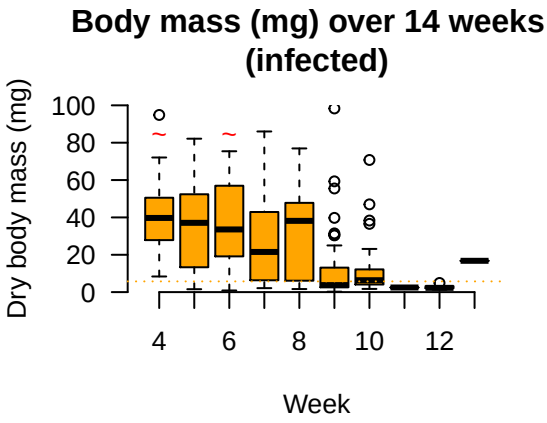



```
# A tibble: 1 x 2
  Biomass Cercariae
*   <dbl>     <int>
1    245.         0
```

Without max value of `as.numeric(outer)[1]`

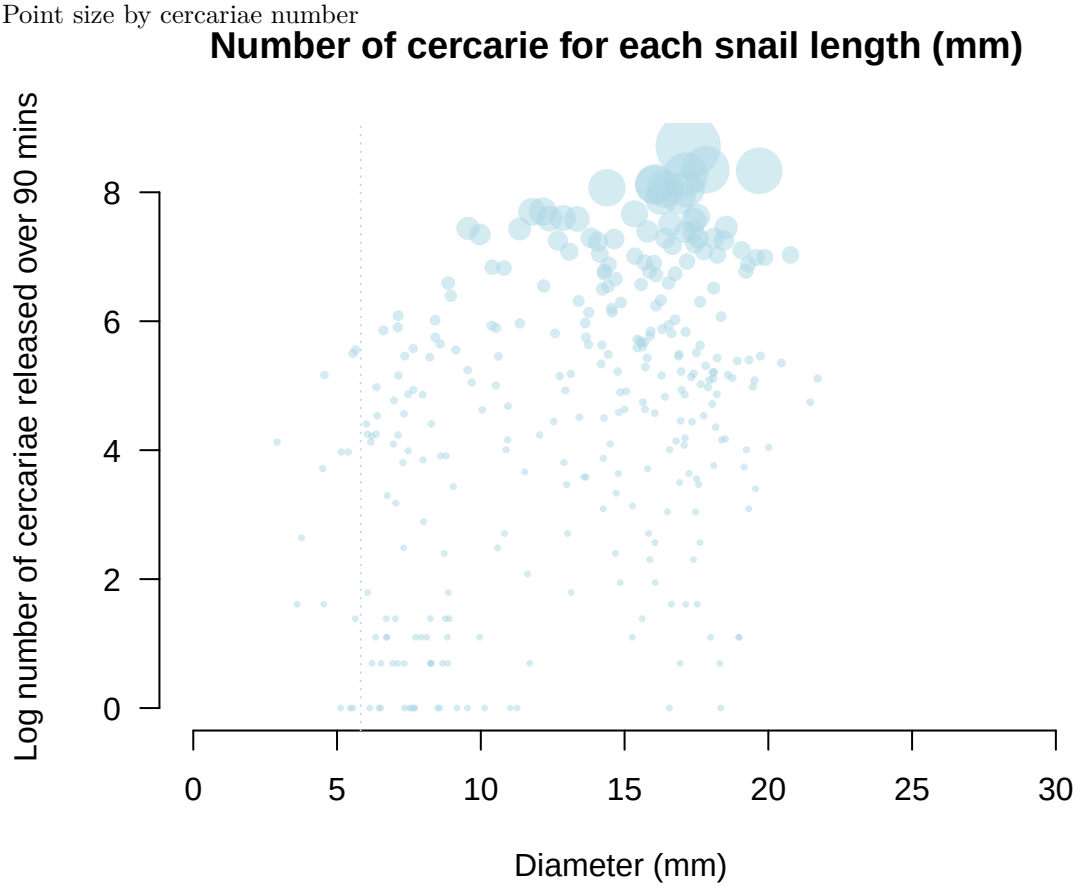

Body mass (mg) over 14 weeks without outlier
Dry body mass (mg)
140
120
100
80
60
40
20
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Week


Body mass (mg) over 14 weeks (uninfected)
Dry body mass (mg)
140
120
100
80
60
40
20
0
0 2 4 6 8 10 13
Week


Body mass (mg) over 14 weeks (infected)
Dry body mass (mg)
100
80
60
40
20
0
4 6 8 10 12
Week

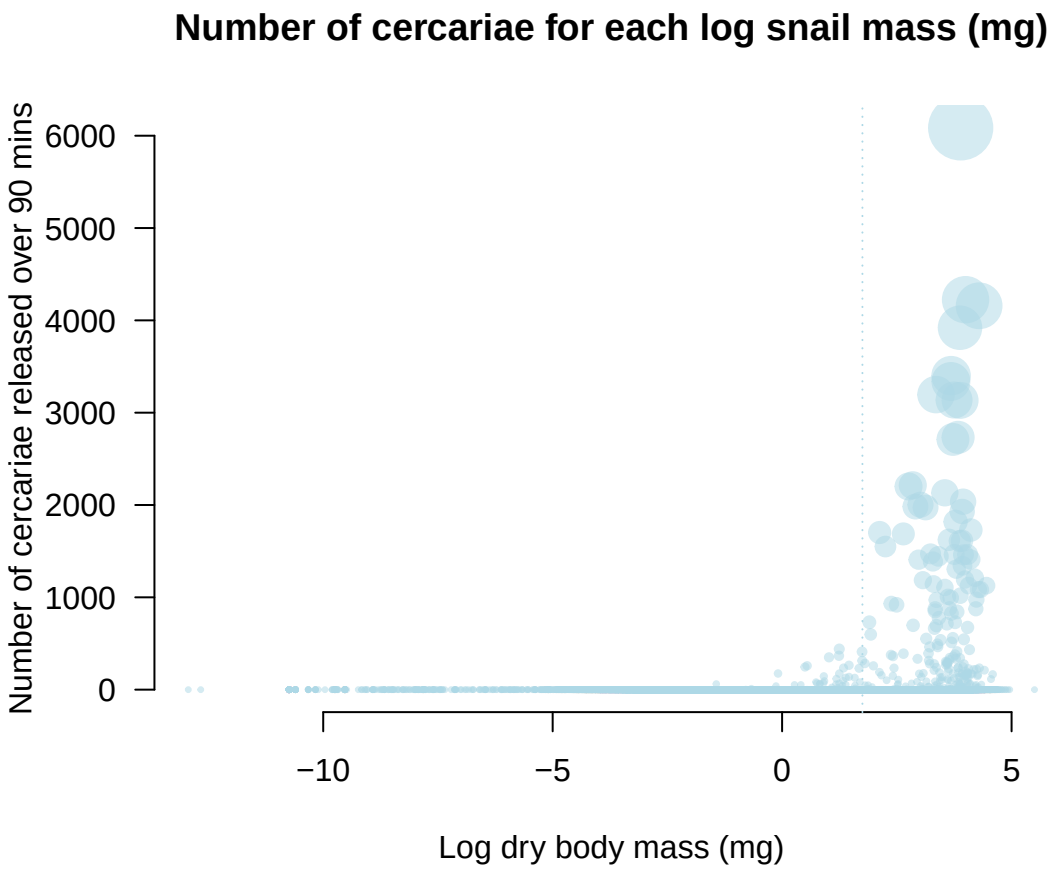
Snail size and number of cercariae produced

Point size by cercariae number



Linear log

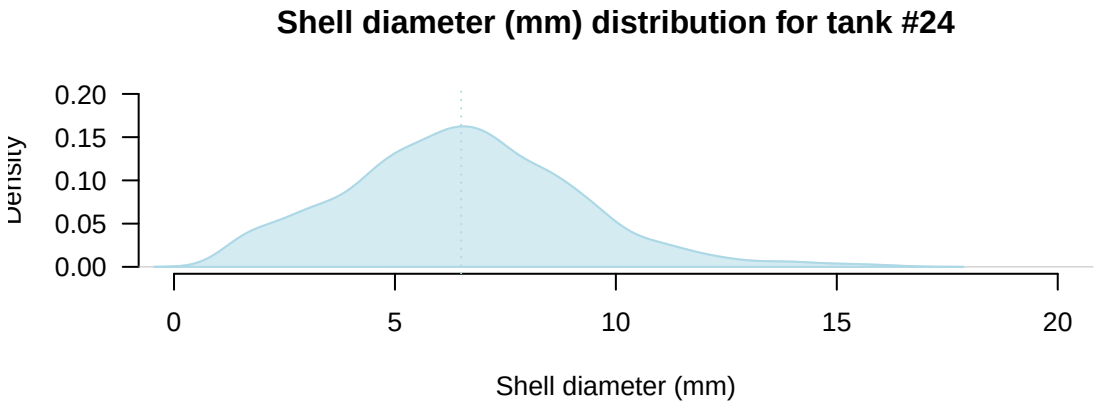
Snail mass and cercariae produced (mg)

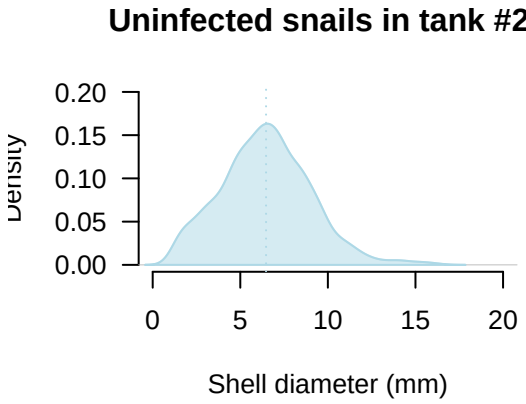


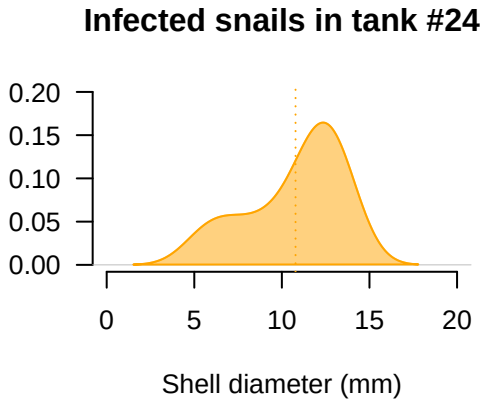
Snail size per tank

Shell diameter (mm)
Select tank. Max 48

```
[1] "Tank 24"
```

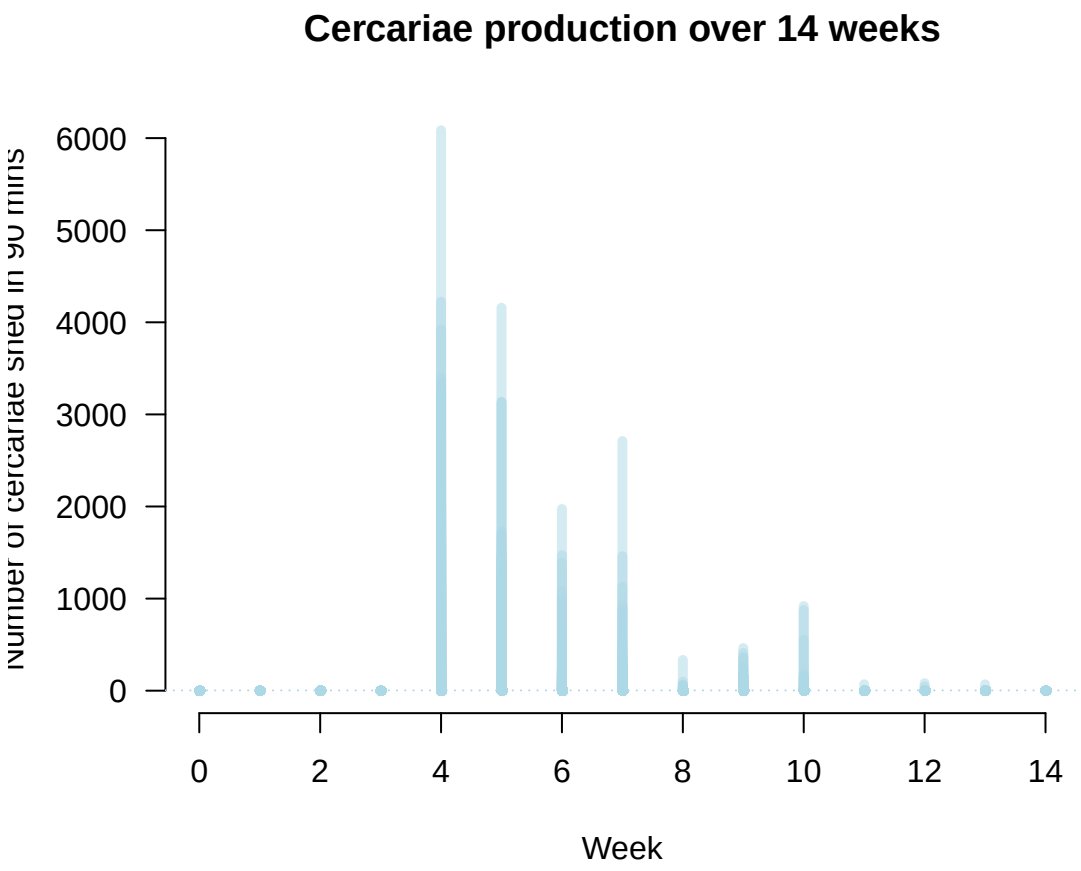






Cercariae production over time

Cercariae shed over 90 mins per week
~1000 eggs inoculated at 0,2,4,6 weeks
Snail abundance over time (weeks)

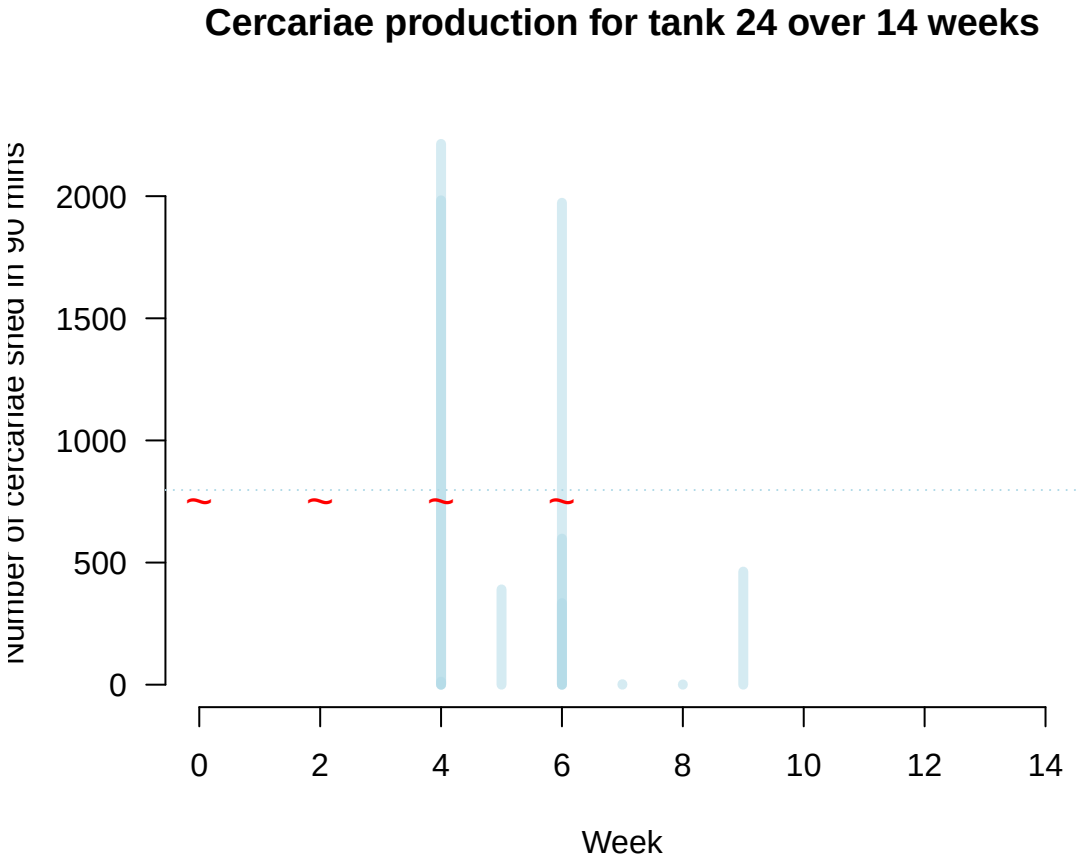


Tank cercariae production over time per tank

Select tank. Max 48

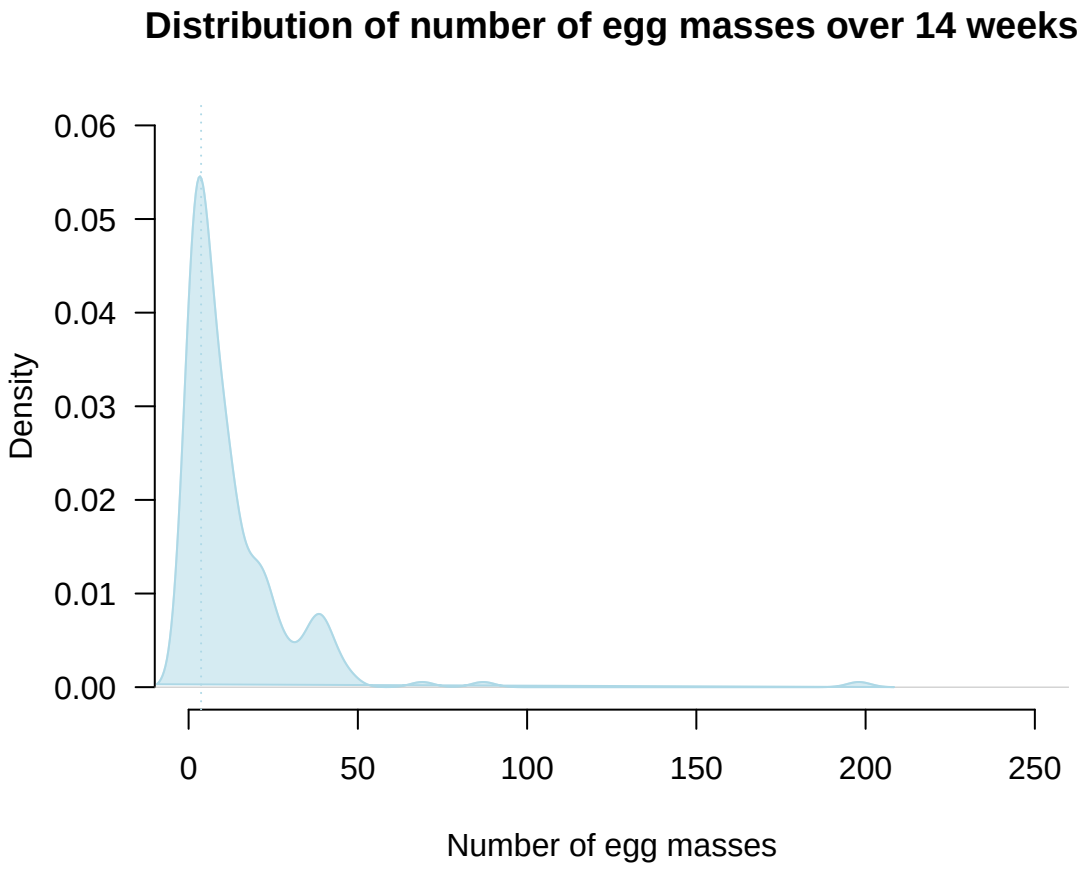
```
[1] "Tank 24"
```

```
[1] 2300
```

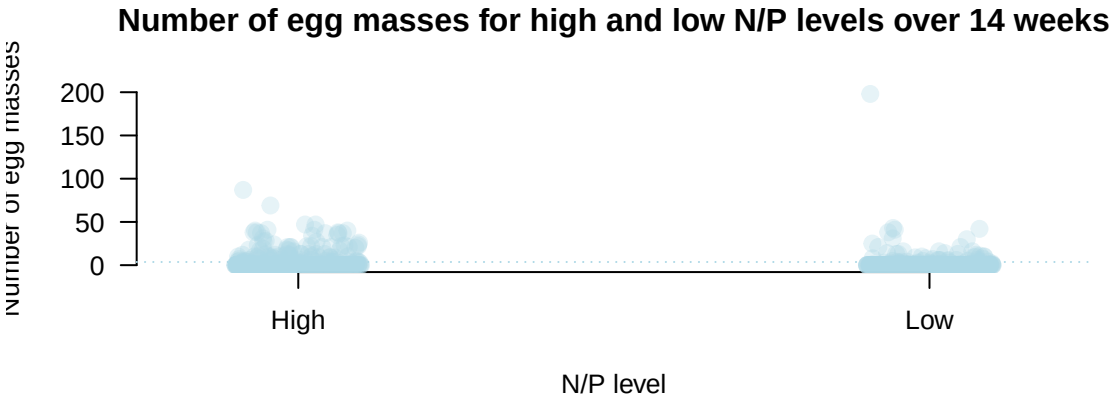

Cercariae production for tank 24 over 14 weeks
Number of cercariae shed in 90 mins
2000
1500
1000
500
0
0
2
4
6
8
10
12
14
Week

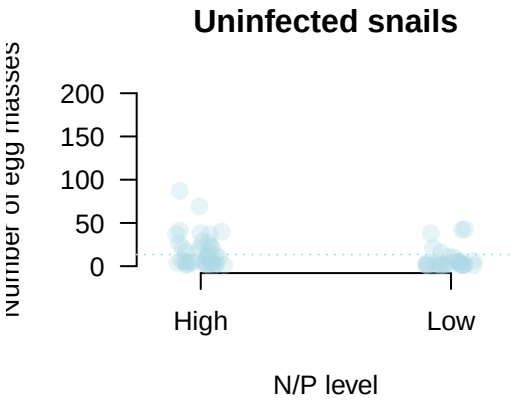
Mesocosm 2 data sheet

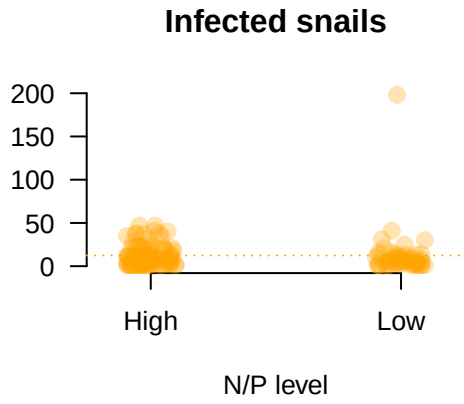
Egg mass distribution



N/P concentration v egg mass

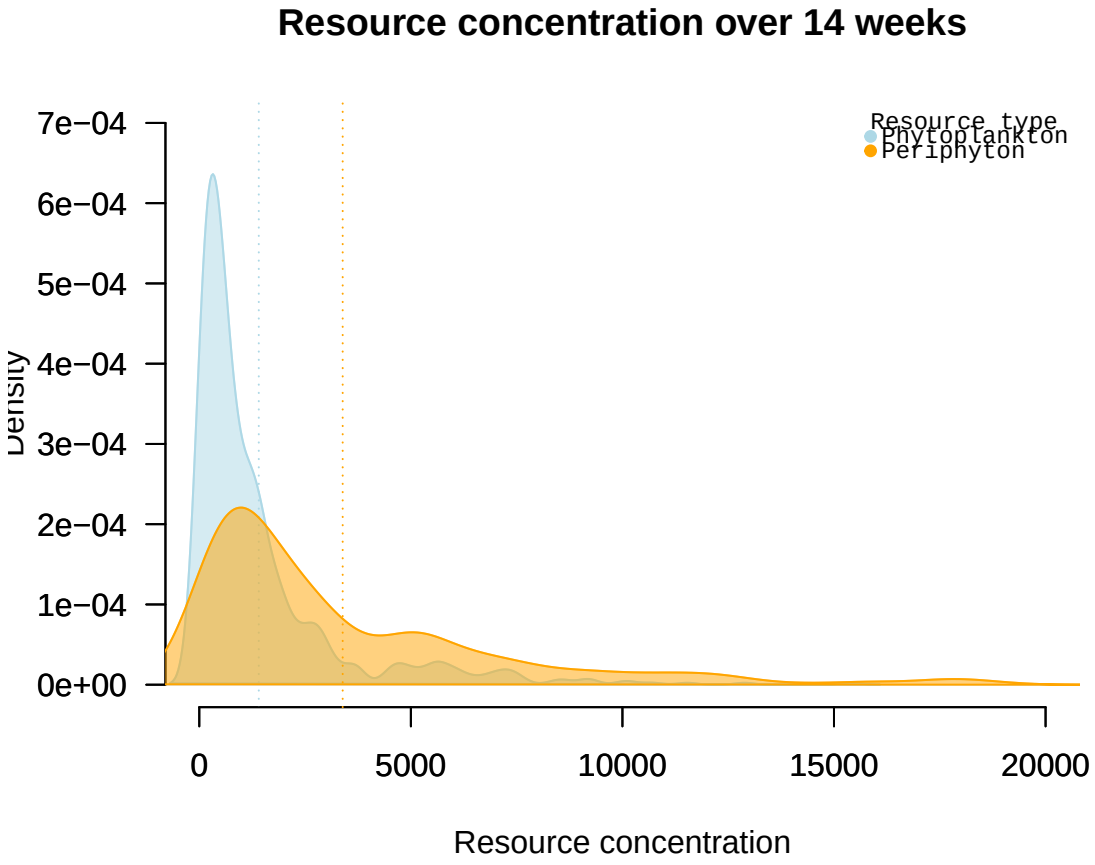






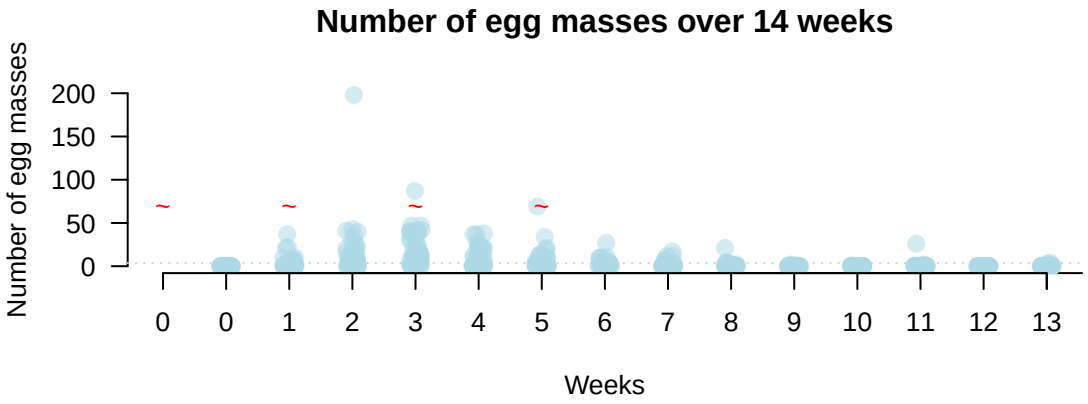
Phyto and Peri Distribution

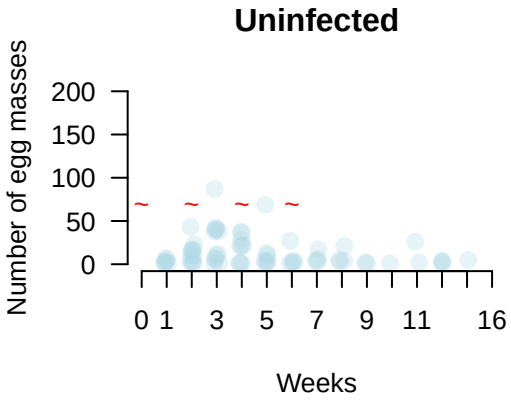
phyto = flourescence units
peri = flourescence per 2 weeks / 3.5 inch^2 tile (gross productivity biomass rate)

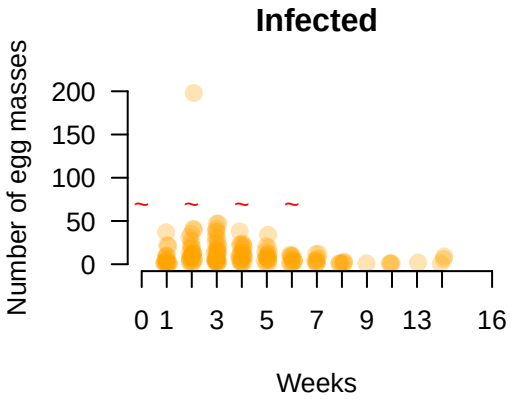


Egg Mass over time v presence of schisto

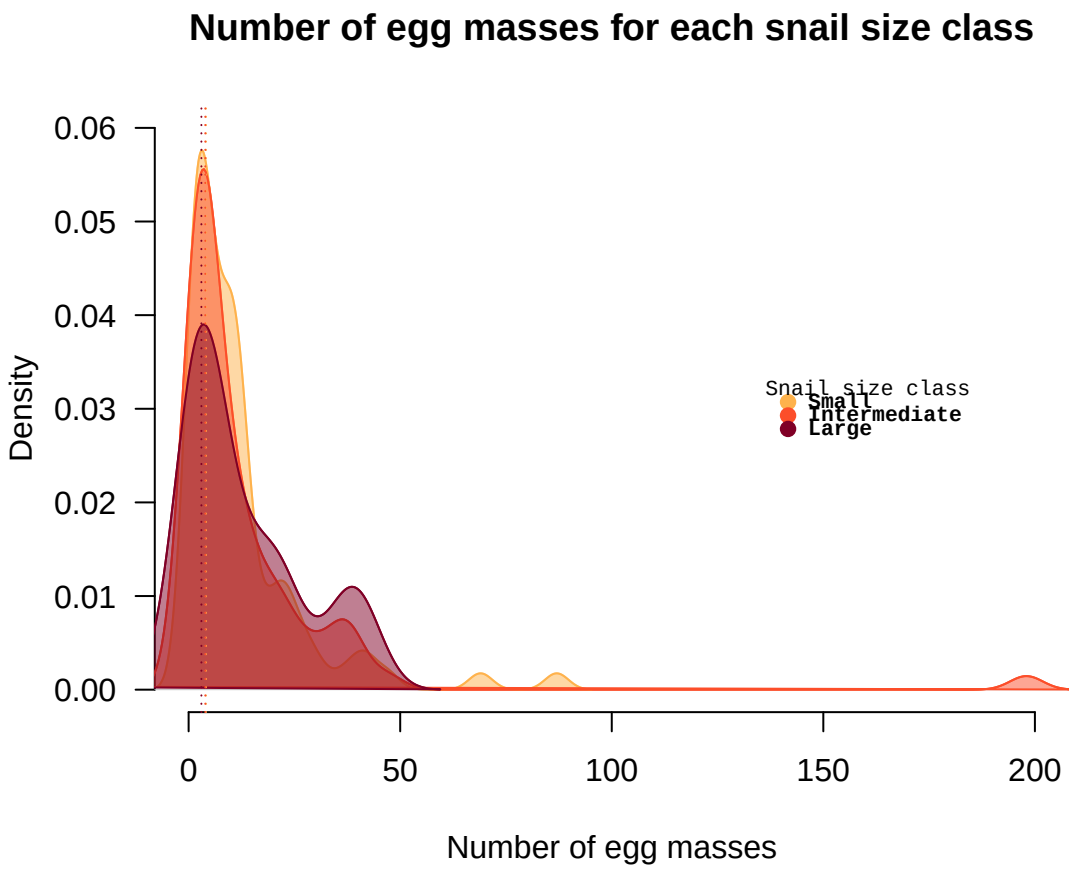
~1000 eggs inoculated at 0,2,4,6 weeks


Number of egg masses over 14 weeks
Number of egg masses
200
150
100
50
0
0 0 1 2 3 4 5 6 7 8 9 10 11 12 13
Weeks


Uninfected
Number of egg masses
200
150
100
50
0
0 1 3 5 7 9 11 16
Weeks


Infected
Number of egg masses
200
150
100
50
0
0 1 3 5 7 9 13 16
Weeks

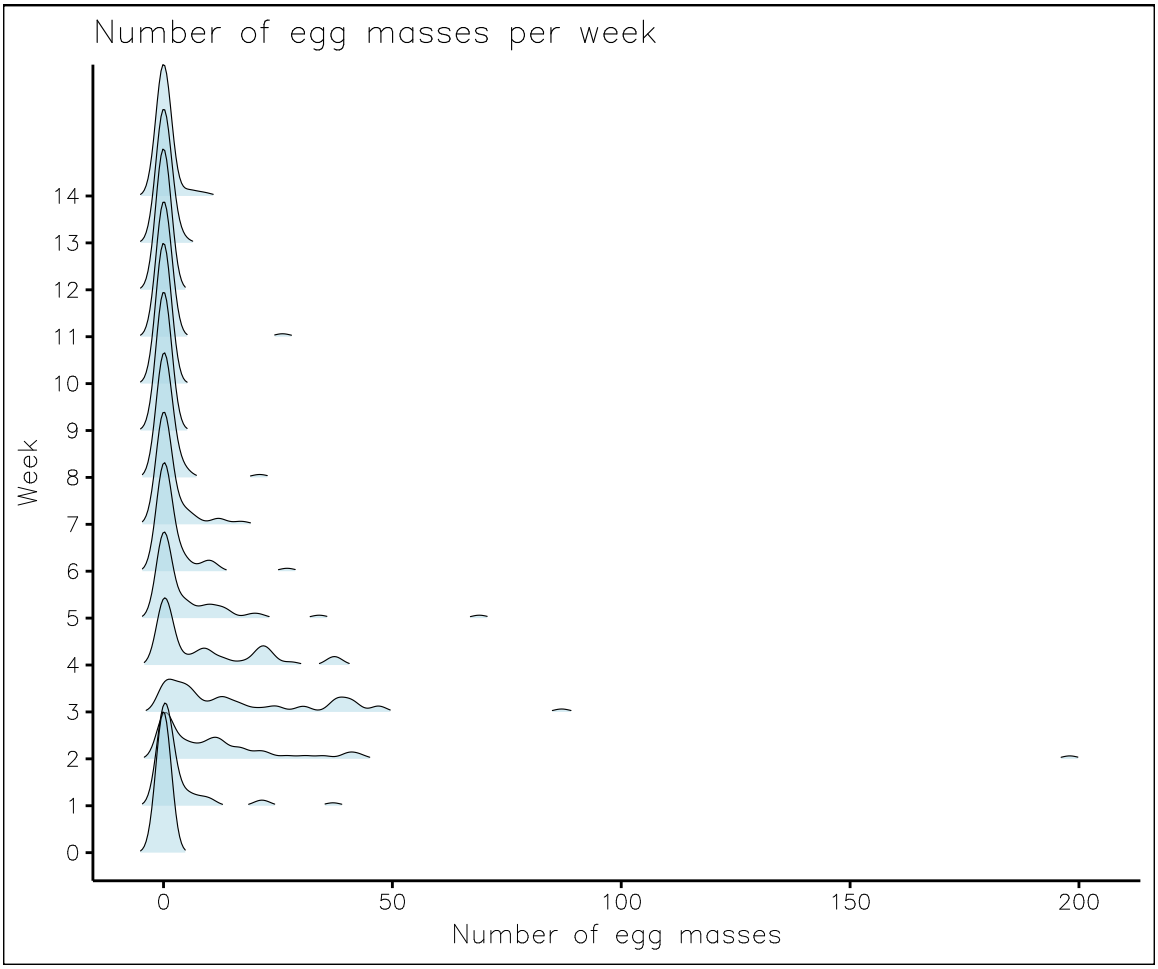
Size class vs Egg mass (with schisto)

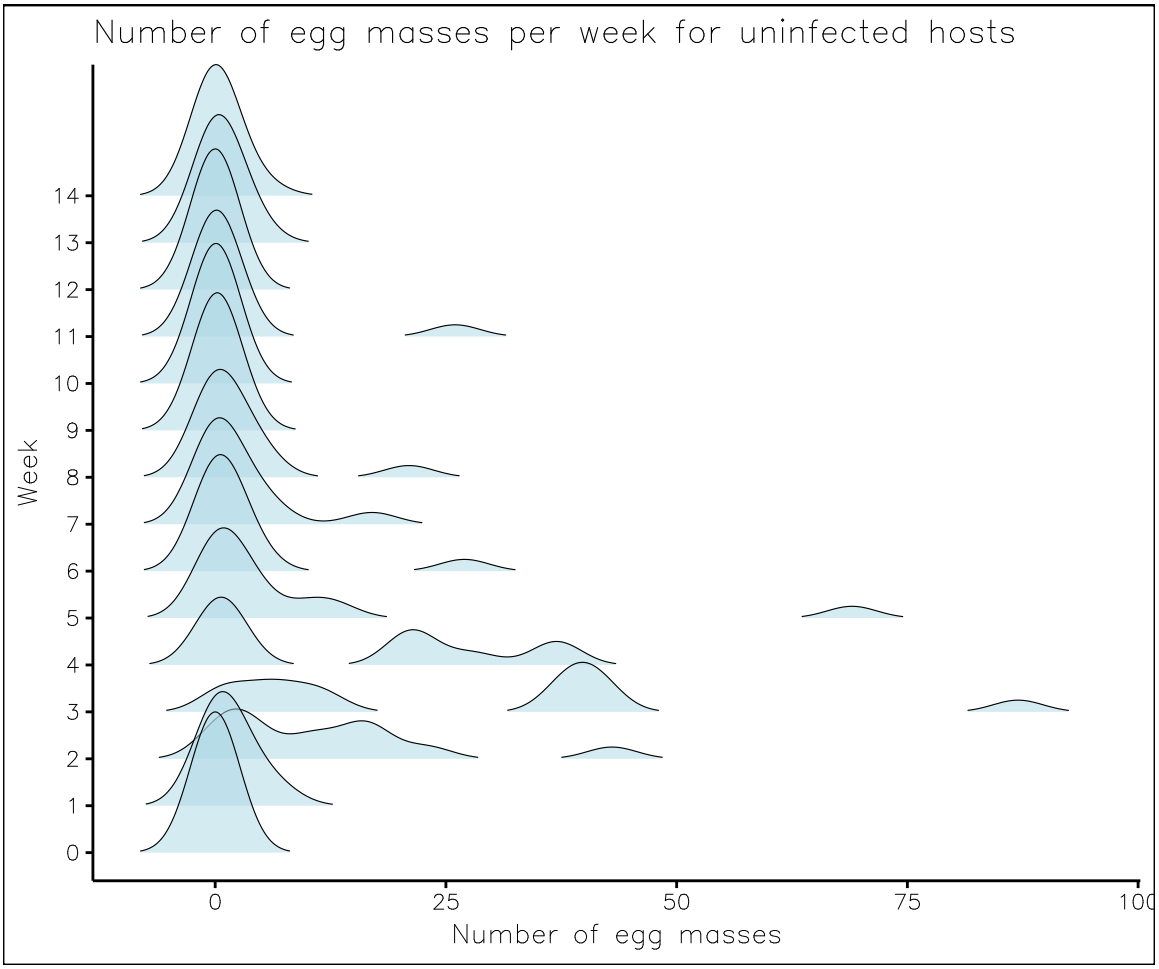


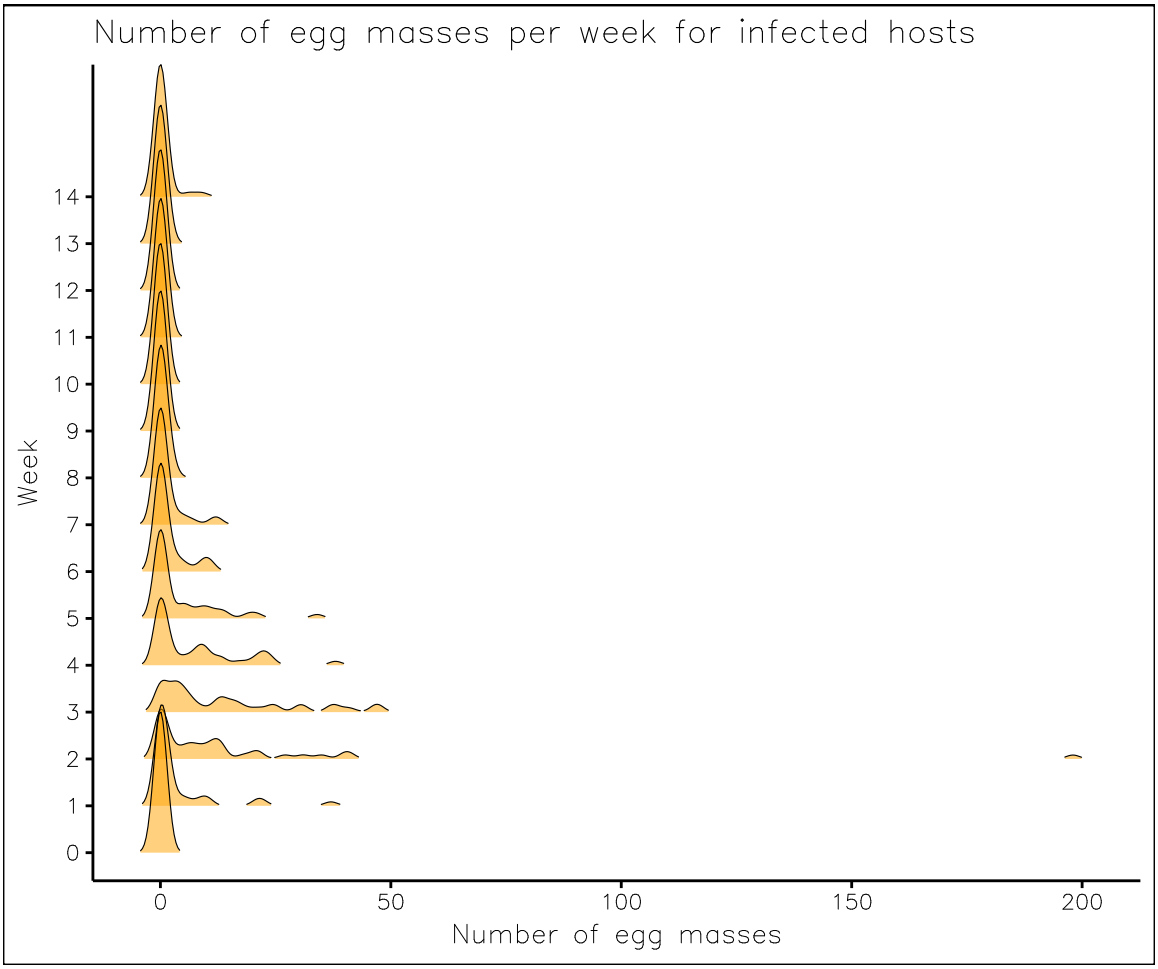

```
xchar= 4.765 ; (yextra,ychar)= -0.001435 0.001435
points2( 141.7 141.7 141.7 , 0.03072 0.02928 0.02785 , pch= 20 20 20 , ...)
```

Egg Mass over time (weeks)

~1000 eggs inoculated at 0,2,4,6 weeks


Number of egg masses per week
Week
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
50
100
150
200
Number of egg masses


Number of egg masses per week for uninfected hosts
Week
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
25
50
75
100
Number of egg masses


Number of egg masses per week for infected hosts
Week
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
50
100
150
200
Number of egg masses