

# Biodeposition\_size\_scaling

## Quarto

```
library(ggplot2)
library(ggpubr)
library(data.table)
```

Warning: package 'data.table' was built under R version 4.3.2

```
setwd("~/GitHub/EAD-ASEB-Ssolidissima-OA/data")

bd_Pousse <- read.csv("Pousse_Meseck_Raw Data Surfclam Biodeposition.csv", stringsAsFactors = FALSE)

bd_Pousse$Dry.weight..mg. <- bd_Pousse$DW_corr

str(bd_Pousse)
```

```
'data.frame':  112 obs. of  32 variables:
 $ Date      : chr  "5/15/2019" "5/15/2019" "5/15/2019" "5/15/2019" ...
 $ pH        : num   8 8 8 8 8 8 8 7.5 7.5 7.5 ...
 $ Length..mm.: num  16.5 16.2 17.3 17.9 16.8 ...
 $ Dry.weight..mg.: num  0.0402 0.0503 0.0648 0.0819 0.049 0.0717 0.07 0.0802 0.0634 0.09 ...
 $ Length20mm : num   NA NA NA NA NA NA NA NA NA NA ...
 $ DW_Pred    : num   NA NA NA NA NA NA NA NA NA NA ...
 $ DW_diff    : num   NA NA NA NA NA NA NA NA NA NA ...
 $ DW_corr    : num  0.0402 0.0503 0.0648 0.0819 0.049 0.0717 0.07 0.0802 0.0634 0.09 ...
 $ time.h.    : num   1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 ...
 $ slope      : num  0.0176 NA NA NA NA ...
 $ int        : num  -0.269 NA NA NA NA ...
 $ sum        : num  15.9 NA NA NA NA ...
 $ feces      : int    2 3 4 5 6 7 8 2 3 4 ...
 $ TPM        : num   1.86 3.79 2.65 1.88 3.46 ...
 $ PIM        : num   1.56 3.31 2.25 1.54 3.03 ...
 $ POM        : num   0.303 0.48 0.395 0.335 0.431 0.245 0.128 0.367 0.31 0.376 ...
 $ X..organic : num  16.3 12.7 14.9 17.8 12.4 ...
 $ ER..mg.h.  : num   1.24 2.53 1.77 1.25 2.31 ...
 $ OER        : num   0.202 0.32 0.263 0.223 0.287 ...
 $ IER        : num   1.04 2.21 1.5 1.03 2.02 ...
 $ X          : logi   NA NA NA NA NA NA ...
 $ pseudofeces: int    2 3 4 5 6 7 8 2 3 4 ...
 $ TPM.1      : num   2.91 2.5 2.58 3.3 2.05 ...
 $ PIM.1      : num   1.64 2.18 2.2 2.87 1.78 ...
 $ POM.1      : num   1.269 0.313 0.389 0.429 0.272 ...
 $ X..organ   : num  43.6 12.5 15 13 13.3 ...
```

```

$ RR..mg.h.      : num  1.94 1.66 1.72 2.2 1.37 ...
$ ORR            : num  0.846 0.209 0.259 0.286 0.181 ...
$ IRR            : num  1.09 1.46 1.46 1.92 1.19 ...
$ TSM            : num  15.8 15.8 15.8 15.8 15.8 ...
$ PIM.2          : num  13.4 13.4 13.4 13.4 13.4 ...
$ POM.2          : num  2.38 2.38 2.38 2.38 2.38 ...

```

```

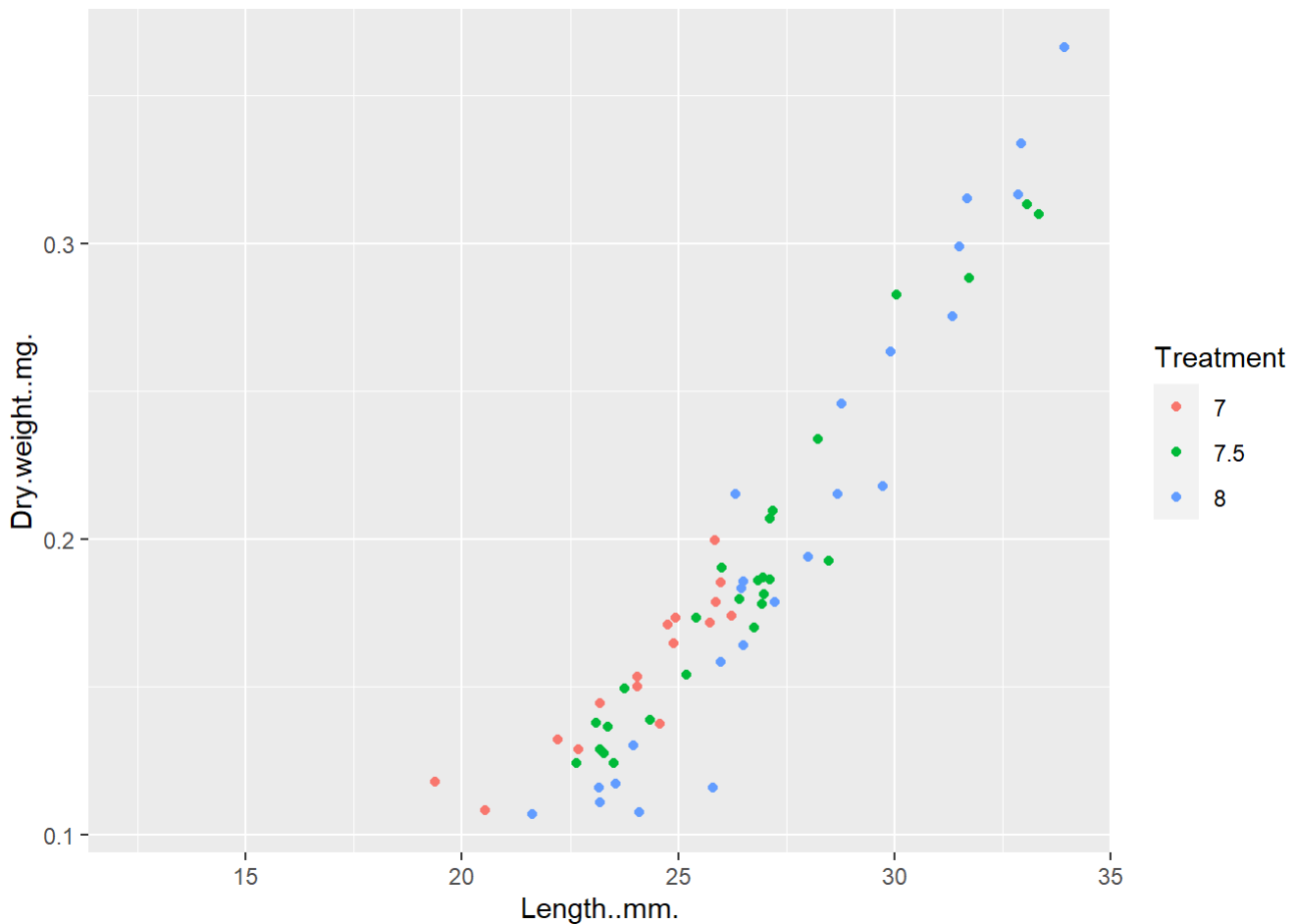
bd_Pousse$Treatment <- as.factor(bd_Pousse$pH)
bd_Pousse$OER[bd_Pousse$OER<=-.5]<-NA
bd_Pousse$IER[bd_Pousse$IER<=-.5]<-NA
#bd_Pousse$Dry.weight..mg.[bd_Pousse$Dry.weight..mg.>=.5]<-NA I added a QC step to the google slice
bd_Pousse$Dry.weight..mg.[bd_Pousse$Dry.weight..mg.<=.10]<-NA

# There were two dry weight values I didn't trust so I estimated them from the length based on the

gg1 <- ggplot(data = bd_Pousse, aes(x=Length..mm., y=Dry.weight..mg., color = Treatment))+ geom_point()
gg1

```

Warning: Removed 39 rows containing missing values (`geom\_point()`).



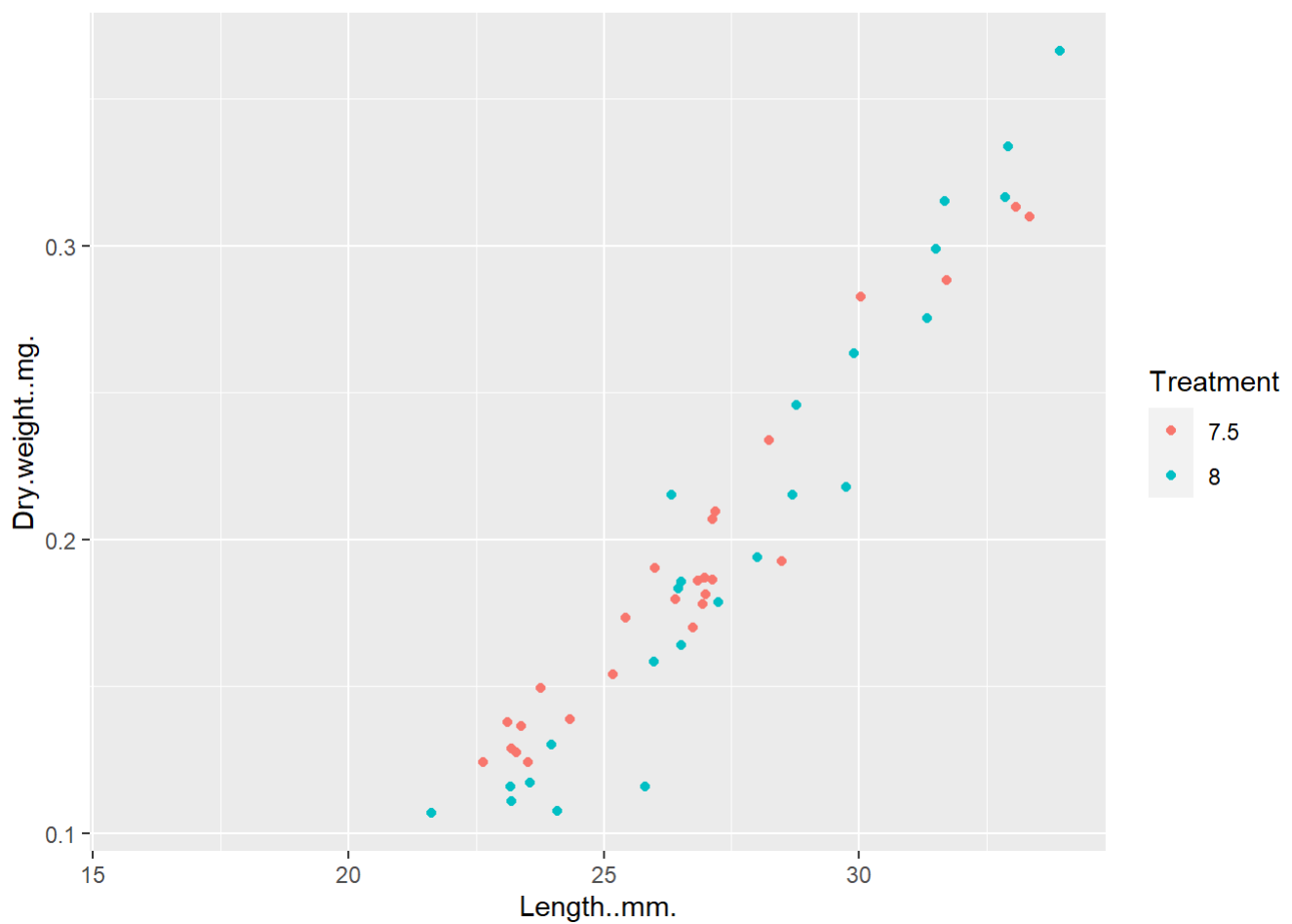
```

bd_Pousse <- bd_Pousse[bd_Pousse$Treatment=="8"|bd_Pousse$Treatment=="7.5",]

```

```
gg1 <- ggplot(data = bd_Pousse, aes(x=Length..mm., y=Dry.weight..mg., color = Treatment))+ geom_point()
gg1
```

Warning: Removed 20 rows containing missing values (`geom\_point()`).

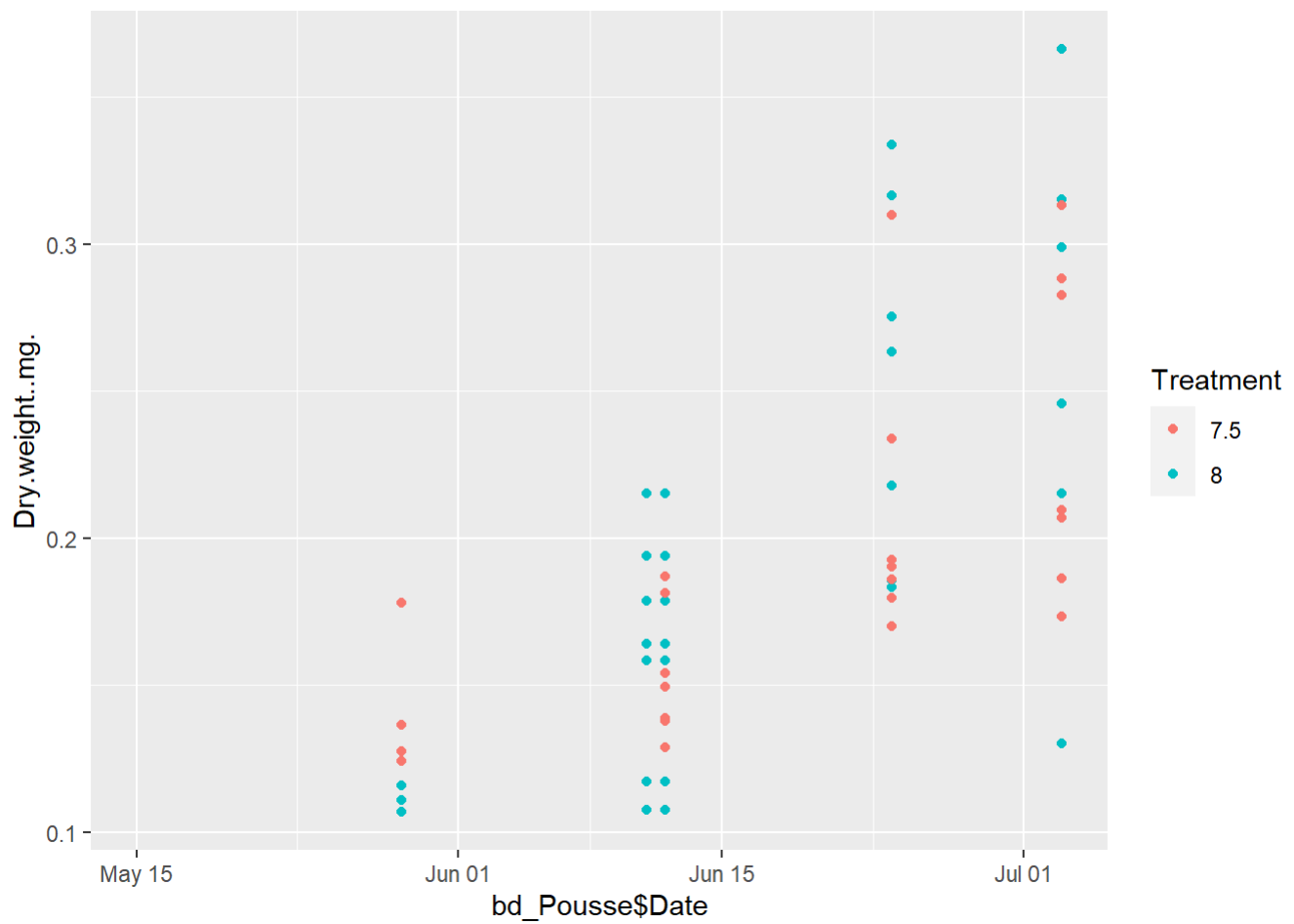


```
bd_Pousse$Date <- as.Date(bd_Pousse$Date, format = "%m/%d/%Y")

cutoff <- as.Date("5/11/2019", format = "%m/%d/%Y")
bd_Pousse$Dry.weight..mg.[bd_Pousse$Date<=cutoff]<- NA

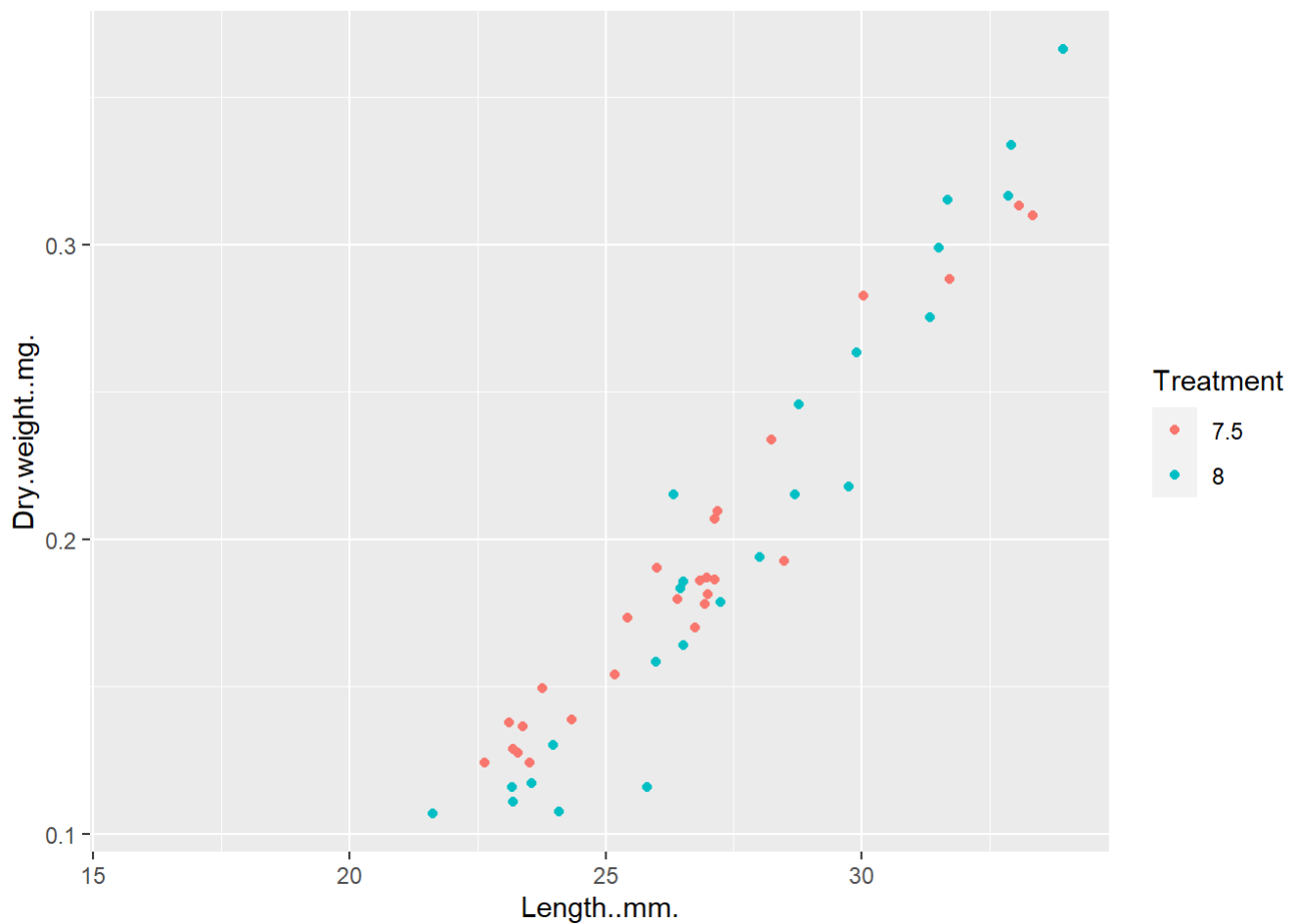
gg1 <- ggplot(data = bd_Pousse, aes(x=bd_Pousse$Date, y=Dry.weight..mg., color = Treatment))+ geom_point()
gg1
```

Warning: Removed 20 rows containing missing values (`geom\_point()`).



```
gg1 <- ggplot(data = bd_Pousse, aes(x=Length..mm., y=Dry.weight..mg., color = Treatment))+ geom_point()
gg1
```

Warning: Removed 20 rows containing missing values (`geom\_point()`).



You can add options to executable code like this

```
gg1 <- ggplot(data = bd_Pousse, aes(x=Dry.weight..mg., y=OER, color = Treatment))+
  geom_point()+
  xlab("Dry weight") +
  ylab("OER")+
  #ylim(0,9)+
  #scale_color_discrete(name="Site")+
  #ggtitle ('OER as a function of DW')+
  stat_smooth(
    method = 'nls',
    formula = y ~ A * x^B,
    method.args = list(start = c(A = 2.3, B = 0.72)),
    se = FALSE
  )#stat_smooth(color = 1, method = 'nls', formula = 'y~a*exp(b*x)',
  #           method.args = list(start=c(A = 2.3, B=.72)), se=FALSE) +
  facet_wrap(~ Treatment)
```

```
<ggproto object: Class FacetWrap, Facet, gg>
  compute_layout: function
  draw_back: function
  draw_front: function
  draw_labels: function
  draw_panels: function
```

```

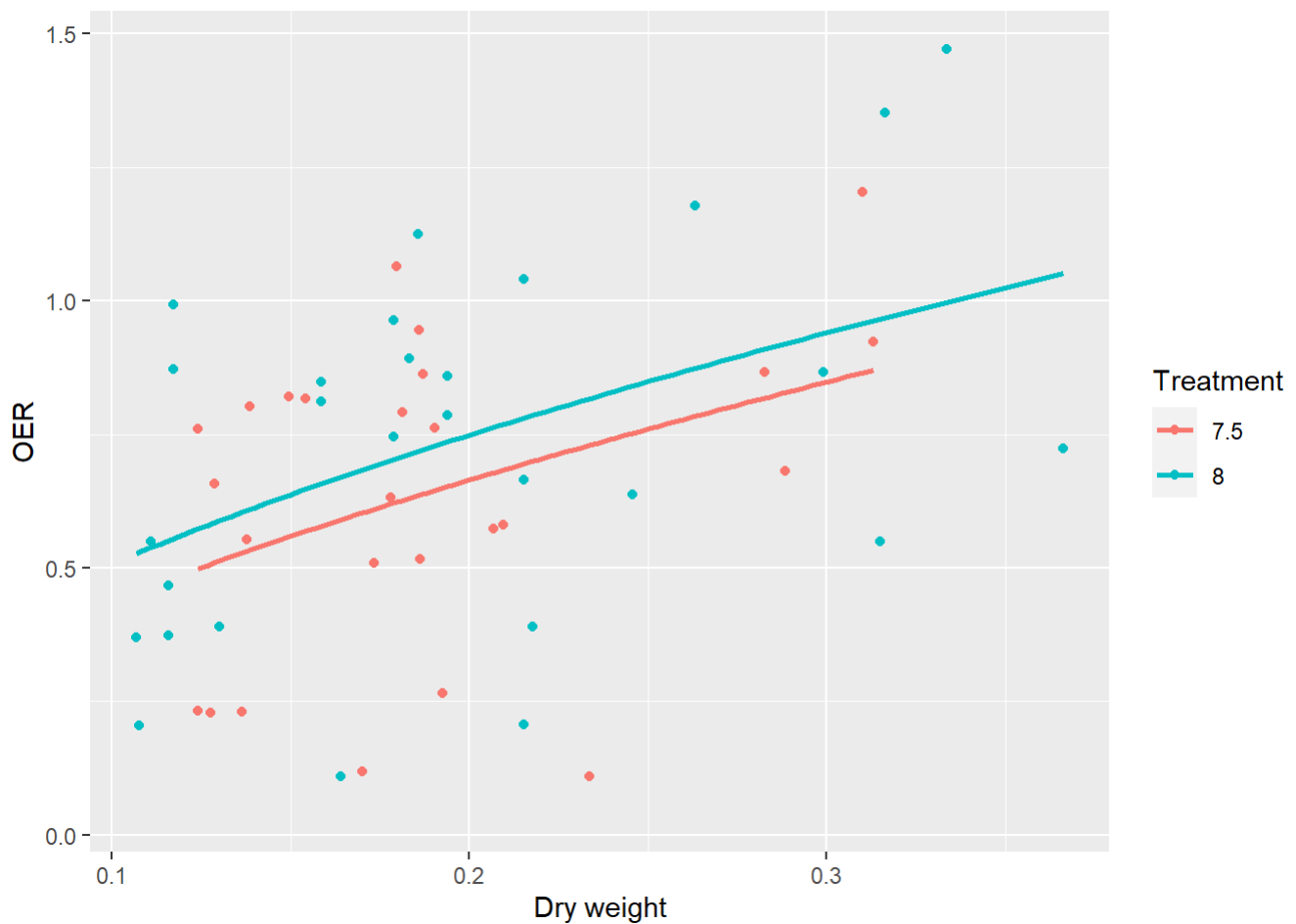
finish_data: function
init_scales: function
map_data: function
params: list
setup_data: function
setup_params: function
shrink: TRUE
train_scales: function
vars: function
super: <ggproto object: Class FacetWrap, Facet, gg>

```

```
gg1
```

Warning: Removed 23 rows containing non-finite values (`stat\_smooth()`).

Warning: Removed 23 rows containing missing values (`geom\_point()`).



```

nls_8 <- nls(OER ~ A * Dry.weight..mg.^B,
             start = list(A = 2.3, B = 0.72),
             data = bd_Pousse[bd_Pousse$Treatment=="8",],
             na.action=na.exclude)
nls_7.5 <- nls(OER ~ A * Dry.weight..mg.^B,
              start = list(A = 2.3, B = 0.72),

```

```

      data = bd_Pousse[bd_Pousse$Treatment=="7.5",],
      na.action=na.exclude)
# nls_7 <- nls(OER ~ A * Dry.weight..mg.^B,
#             start = list(A = 2.3, B = 0.72),
#             data = bd_Pousse[bd_Pousse$Treatment=="7",],
#             na.action=na.exclude)
summary(nls_8)

```

Formula:  $OER \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	1.8451	0.6347	2.907	0.00737 **
B	0.5602	0.2174	2.577	0.01599 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3113 on 26 degrees of freedom

Number of iterations to convergence: 4

Achieved convergence tolerance: 2.522e-07

(14 observations deleted due to missingness)

```
summary(nls_7.5)
```

Formula:  $OER \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	1.7484	0.8418	2.077	0.0487 *
B	0.6010	0.2936	2.047	0.0518 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2791 on 24 degrees of freedom

Number of iterations to convergence: 3

Achieved convergence tolerance: 9.132e-06

(9 observations deleted due to missingness)

```

# summary(nls_7)

nls_all <- nls(OER ~ A * Dry.weight..mg.^B,
              start = list(A = 2.3, B = 0.72),
              data = bd_Pousse,
              na.action=na.exclude)
summary(nls_all)

```

Formula: OER ~ A \* Dry.weight..mg.^B

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	1.8467	0.5106	3.617	0.000675 ***
B	0.5952	0.1723	3.455	0.001105 **

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2935 on 52 degrees of freedom

Number of iterations to convergence: 3

Achieved convergence tolerance: 5.633e-07

(23 observations deleted due to missingness)

```
nls_all_exp_only <- nls(OER ~ Dry.weight..mg.^B,  
  start = list( B = 0.72),  
  data = bd_Pousse,  
  na.action=na.exclude)  
summary(nls_all_exp_only)
```

Formula: OER ~ Dry.weight..mg.^B

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
B	0.23374	0.03625	6.448	3.48e-08 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3031 on 53 degrees of freedom

Number of iterations to convergence: 5

Achieved convergence tolerance: 2.171e-07

(23 observations deleted due to missingness)

```
length(bd_Pousse$Length..mm.)
```

[1] 77

```
length(bd_Pousse$Dry.weight..mg.)
```

[1] 77

```
nls_all.len <- nls(OER ~ A * Length..mm.^B,  
  start = list(A = 1, B = 2),  
  data = bd_Pousse,
```



```
na.action=na.exclude)
summary(nls_all)
```

Formula: OER ~ A \* Dry.weight..mg.^B

Parameters:

```
Estimate Std. Error t value Pr(>|t|)
A    1.8467     0.5106   3.617 0.000675 ***
B     0.5952     0.1723   3.455 0.001105 **
```

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2935 on 52 degrees of freedom

Number of iterations to convergence: 3

Achieved convergence tolerance: 5.633e-07

(23 observations deleted due to missingness)

```
AIC(nls_all,nls_all_exp_only,nls_all.len)
```

Warning in AIC.default(nls\_all, nls\_all\_exp\_only, nls\_all.len): models are not all fitted to the same number of observations

	df	AIC
nls_all	3	24.82144
nls_all_exp_only	2	27.30488
nls_all.len	3	15.28495

```
BIC(nls_all,nls_all_exp_only,nls_all.len)
```

Warning in BIC.default(nls\_all, nls\_all\_exp\_only, nls\_all.len): models are not all fitted to the same number of observations

	df	BIC
nls_all	3	30.78839
nls_all_exp_only	2	31.28285
nls_all.len	3	22.15633

```
gg1 <- ggplot(data = bd_Pousse, aes(x=Dry.weight..mg., y=IER, color = Treatment))+
  geom_point()+
  xlab("Dry weight") +
  ylab("IER")+
  #ylim(0,9)+
  #scale_color_discrete(name="Site")+
  #ggtitle ('IER as a function of DW')+
  stat_smooth(
    method = 'nls',
    formula = y ~ A * x^B,
```

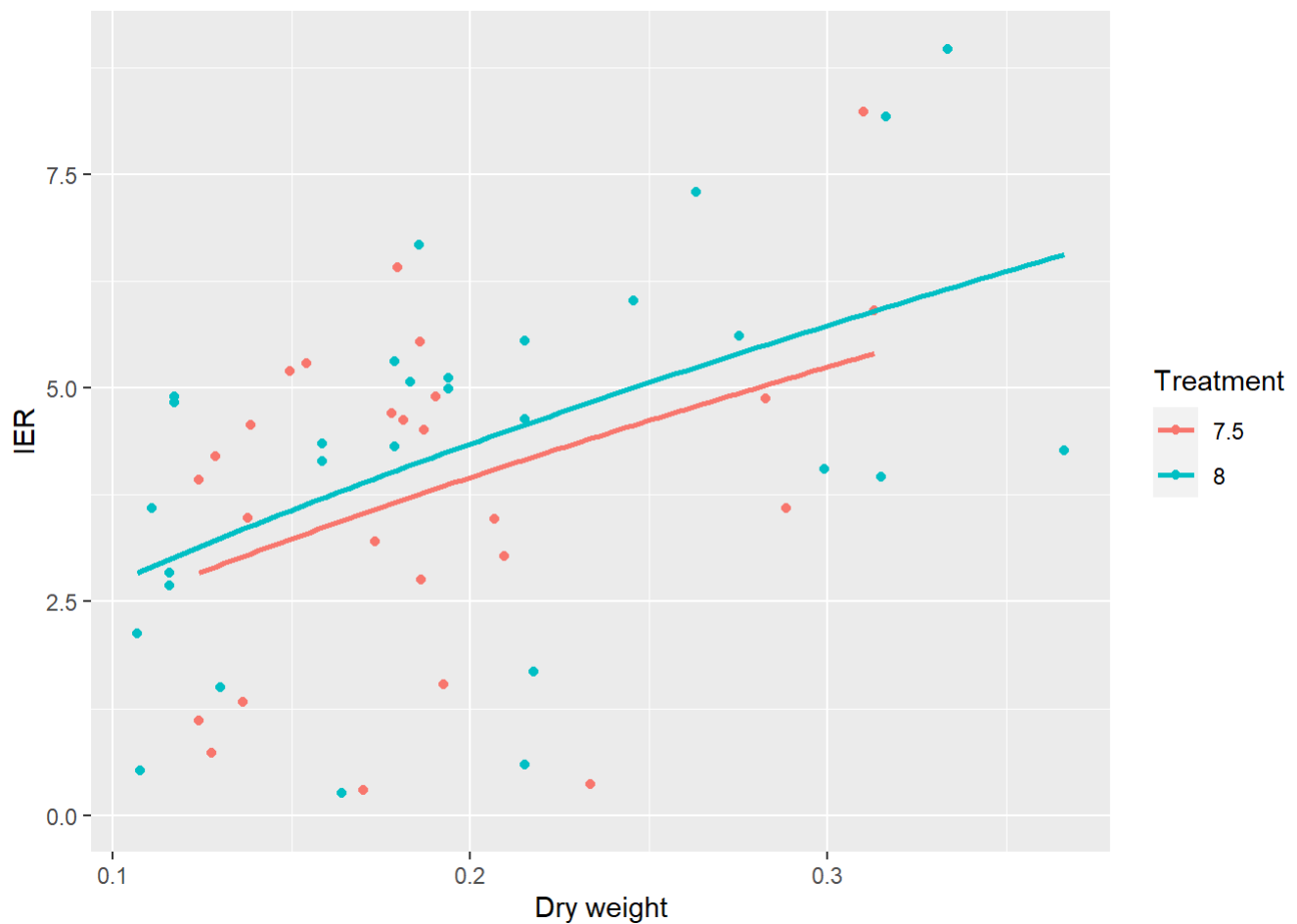
```
method.args = list(start = c(A = 2.3, B = 0.72)),
se = FALSE
)#stat_smooth(color = 1, method = 'nls', formula = 'y~a*exp(b*x)',
#           method.args = list(start=c(A = 2.3, B=.72)), se=FALSE) +
facet_wrap(~ Treatment)
```

```
<ggproto object: Class FacetWrap, Facet, gg>
  compute_layout: function
  draw_back: function
  draw_front: function
  draw_labels: function
  draw_panels: function
  finish_data: function
  init_scales: function
  map_data: function
  params: list
  setup_data: function
  setup_params: function
  shrink: TRUE
  train_scales: function
  vars: function
  super: <ggproto object: Class FacetWrap, Facet, gg>
```

```
gg1
```

Warning: Removed 22 rows containing non-finite values (`stat\_smooth()`).

Warning: Removed 22 rows containing missing values (`geom\_point()`).



```
nls_8 <- nls(IER ~ A * Dry.weight..mg.^B,
             start = list(A = 2.3, B = 0.72),
             data = bd_Pousse[bd_Pousse$Treatment=="8",],
             na.action=na.exclude)
nls_7.5 <- nls(IER ~ A * Dry.weight..mg.^B,
               start = list(A = 2.3, B = 0.72),
               data = bd_Pousse[bd_Pousse$Treatment=="7.5",],
               na.action=na.exclude)
# nls_7 <- nls(IER ~ A * Dry.weight..mg.^B,
#              start = list(A = 2.3, B = 0.72),
#              data = bd_Pousse[bd_Pousse$Treatment=="7",],
#              na.action=na.exclude)
summary(nls_8)
```

Formula:  $IER \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	13.0034	4.4958	2.892	0.00747 **
B	0.6808	0.2248	3.029	0.00535 **

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.877 on 27 degrees of freedom

Number of iterations to convergence: 5

Achieved convergence tolerance: 7.329e-07

(13 observations deleted due to missingness)

```
summary(nls_7.5)
```

Formula: IER ~ A \* Dry.weight..mg.^B

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	12.1454	6.4828	1.873	0.0732 .
B	0.6973	0.3287	2.121	0.0444 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.866 on 24 degrees of freedom

Number of iterations to convergence: 5

Achieved convergence tolerance: 2.542e-06

(9 observations deleted due to missingness)

```
# summary(nls_7)

nls_all <- nls(IER ~ A * Dry.weight..mg.^B,
              start = list(A = 2.3, B = 0.72),
              data = bd_Pousse,
              na.action=na.exclude)
summary(nls_all)
```

Formula: IER ~ A \* Dry.weight..mg.^B

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	13.0164	3.7405	3.480	0.001012 **
B	0.7083	0.1827	3.876	0.000294 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.847 on 53 degrees of freedom

Number of iterations to convergence: 4

Achieved convergence tolerance: 3.99e-07

(22 observations deleted due to missingness)

```
nls_all_exp_only <- nls(IER ~ Dry.weight..mg.^B,
  start = list( B = 0.72),
  data = bd_Pousse,
  na.action=na.exclude)
summary(nls_all_exp_only)
```

Formula: IER ~ Dry.weight..mg.^B

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
B	-0.70051	0.05473	-12.8	<2e-16 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.598 on 54 degrees of freedom

Number of iterations to convergence: 7

Achieved convergence tolerance: 7.828e-06

(22 observations deleted due to missingness)

```
length(bd_Pousse$Length..mm.)
```

[1] 77

```
length(bd_Pousse$Dry.weight..mg.)
```

[1] 77

```
nls_all.len <- nls(IER ~ A * Length..mm.^B,
  start = list(A = 1, B = 2),
  data = bd_Pousse,
  na.action=na.exclude)
summary(nls_all)
```

Formula: IER ~ A \* Dry.weight..mg.^B

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	13.0164	3.7405	3.480	0.001012 **
B	0.7083	0.1827	3.876	0.000294 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.847 on 53 degrees of freedom

Number of iterations to convergence: 4

Achieved convergence tolerance: 3.99e-07  
(22 observations deleted due to missingness)

```
AIC(nls_all,nls_all_exp_only,nls_all.len)
```

Warning in AIC.default(nls\_all, nls\_all\_exp\_only, nls\_all.len): models are not all fitted to the same number of observations

	df	AIC
nls_all	3	227.5125
nls_all_exp_only	2	264.0854
nls_all.len	3	284.8632

```
BIC(nls_all,nls_all_exp_only,nls_all.len)
```

Warning in BIC.default(nls\_all, nls\_all\_exp\_only, nls\_all.len): models are not all fitted to the same number of observations

	df	BIC
nls_all	3	233.5345
nls_all_exp_only	2	268.1001
nls_all.len	3	291.7346

```
gg1 <- ggplot(data = bd_Pousse, aes(x=Dry.weight..mg., y=ORR, color = Treatment))+  
  geom_point()+  
  xlab("Dry weight") +  
  ylab("ORR")+  
  #ylim(0,9)+  
  #scale_color_discrete(name="Site")+  
  #ggtitle ('ORR as a function of DW')+  
  stat_smooth(  
    method = 'nls',  
    formula = y ~ A * x^B,  
    method.args = list(start = c(A = 2.3, B = 0.72)),  
    se = FALSE  
  )#stat_smooth(color = 1, method = 'nls', formula = 'y~a*exp(b*x)',  
    # method.args = list(start=c(A = 2.3, B=.72)), se=FALSE) +  
  facet_wrap(~ Treatment)
```

```
<ggproto object: Class FacetWrap, Facet, gg>  
  compute_layout: function  
  draw_back: function  
  draw_front: function  
  draw_labels: function  
  draw_panels: function  
  finish_data: function  
  init_scales: function  
  map_data: function  
  params: list
```

```

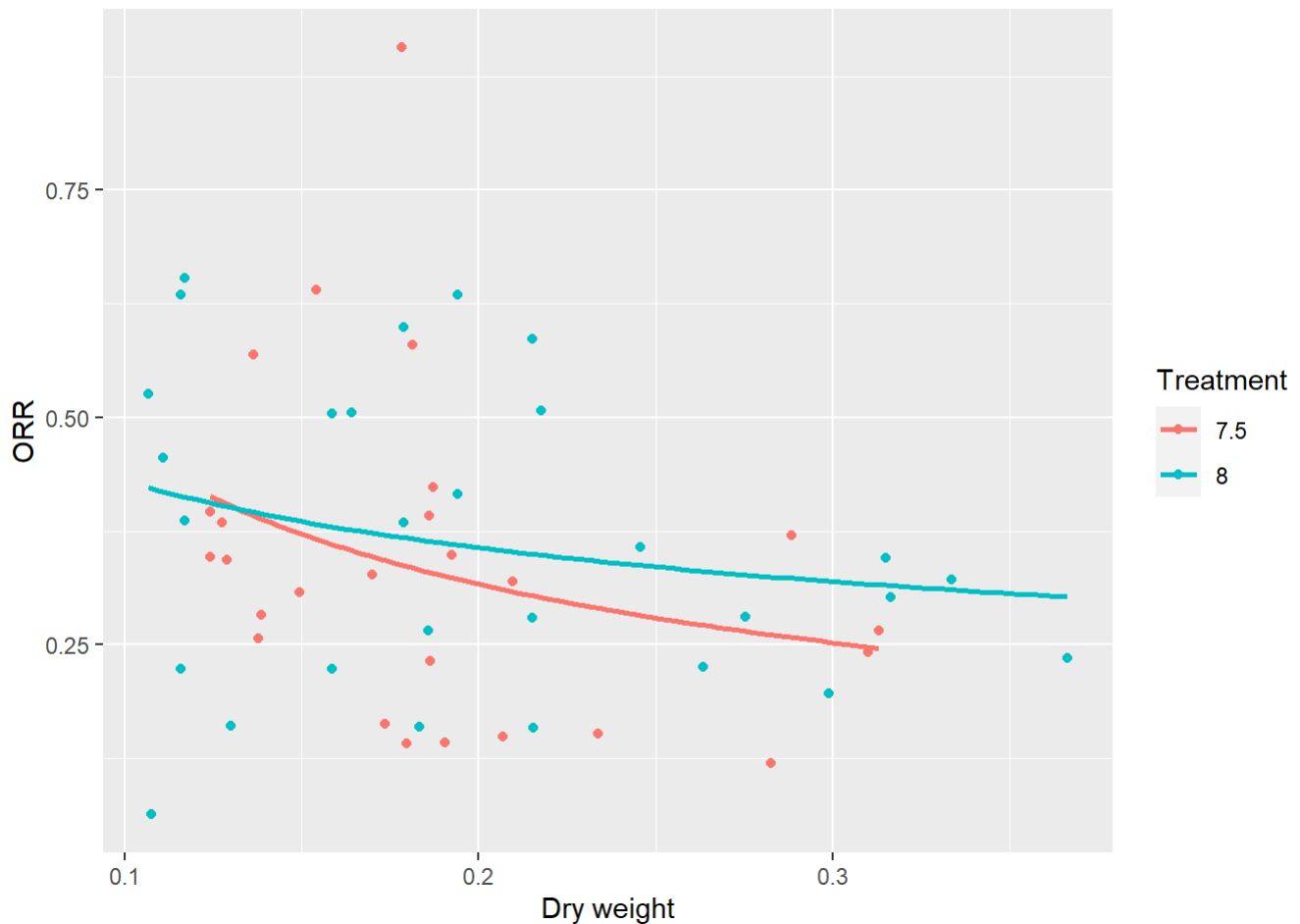
setup_data: function
setup_params: function
shrink: TRUE
train_scales: function
vars: function
super: <ggproto object: Class FacetWrap, Facet, gg>

```

```
gg1
```

Warning: Removed 22 rows containing non-finite values (`stat\_smooth()`).

Warning: Removed 22 rows containing missing values (`geom\_point()`).



```

nls_8 <- nls(ORR ~ A * Dry.weight..mg.^B,
             start = list(A = 2.3, B = 0.72),
             data = bd_Pousse[bd_Pousse$Treatment=="8",],
             na.action=na.exclude)
nls_7.5 <- nls(ORR ~ A * Dry.weight..mg.^B,
               start = list(A = 2.3, B = 0.72),
               data = bd_Pousse[bd_Pousse$Treatment=="7.5",],
               na.action=na.exclude)
# nls_7 <- nls(ORR ~ A * Dry.weight..mg.^B,
#             start = list(A = 2.3, B = 0.72),

```

```
# data = bd_Pousse[bd_Pousse$Treatment=="7",],
# na.action=na.exclude)
summary(nls_8)
```

Formula:  $ORR \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	0.23080	0.09473	2.436	0.0217 *
B	-0.27061	0.22932	-1.180	0.2483

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1655 on 27 degrees of freedom

Number of iterations to convergence: 8

Achieved convergence tolerance: 3.051e-06

(13 observations deleted due to missingness)

```
summary(nls_7.5)
```

Formula:  $ORR \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	0.12914	0.09414	1.372	0.183
B	-0.55737	0.40426	-1.379	0.181

Residual standard error: 0.1754 on 24 degrees of freedom

Number of iterations to convergence: 8

Achieved convergence tolerance: 6.992e-06

(9 observations deleted due to missingness)

```
# summary(nls_7)

nls_all <- nls(ORR ~ A * Dry.weight..mg.^B,
              start = list(A = 2.3, B = -0.72),
              data = bd_Pousse,
              na.action=na.exclude)
summary(nls_all)
```

Formula:  $ORR \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
--	----------	------------	---------	----------



```
A 0.19148 0.06936 2.761 0.0079 **
```

```
B -0.35674 0.20166 -1.769 0.0826 .
```

```
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 0.1682 on 53 degrees of freedom

Number of iterations to convergence: 6

Achieved convergence tolerance: 8.505e-07

(22 observations deleted due to missingness)

```
nls_all_exp_only <- nls(ORR ~ Dry.weight..mg.^B,  
  start = list( B = 0.72),  
  data = bd_Pousse,  
  na.action=na.exclude)  
summary(nls_all_exp_only)
```

Formula: ORR ~ Dry.weight..mg.^B

Parameters:

```
Estimate Std. Error t value Pr(>|t|)
```

```
B 0.62784 0.04817 13.04 <2e-16 ***
```

```
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 0.2048 on 54 degrees of freedom

Number of iterations to convergence: 3

Achieved convergence tolerance: 4.5e-06

(22 observations deleted due to missingness)

```
length(bd_Pousse$Length..mm.)
```

```
[1] 77
```

```
length(bd_Pousse$Dry.weight..mg.)
```

```
[1] 77
```

```
nls_all.len <- nls(ORR ~ A * Length..mm.^B,  
  start = list(A = 1, B = 2),  
  data = bd_Pousse,  
  na.action=na.exclude)  
summary(nls_all)
```

Formula: ORR ~ A \* Dry.weight..mg.^B

Parameters:

```
Estimate Std. Error t value Pr(>|t|)
A  0.19148    0.06936   2.761  0.0079 **
B -0.35674    0.20166  -1.769  0.0826 .
---
```

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1682 on 53 degrees of freedom

Number of iterations to convergence: 6

Achieved convergence tolerance: 8.505e-07

(22 observations deleted due to missingness)

```
AIC(nls_all,nls_all_exp_only,nls_all.len)
```

Warning in AIC.default(nls\_all, nls\_all\_exp\_only, nls\_all.len): models are not all fitted to the same number of observations

	df	AIC
nls_all	3	-36.04160
nls_all_exp_only	2	-15.34253
nls_all.len	3	-45.25707

```
BIC(nls_all,nls_all_exp_only,nls_all.len)
```

Warning in BIC.default(nls\_all, nls\_all\_exp\_only, nls\_all.len): models are not all fitted to the same number of observations

	df	BIC
nls_all	3	-30.01961
nls_all_exp_only	2	-11.32786
nls_all.len	3	-38.34488

```
gg1 <- ggplot(data = bd_Pousse, aes(x=Dry.weight..mg., y=IRR, color = Treatment))+
  geom_point()+
  xlab("Dry weight") +
  ylab("IRR")+
  #ylim(0,9)+
  #scale_color_discrete(name="Site")+
  #ggtitle ('IRR as a function of DW')+
  stat_smooth(
    method = 'nls',
    formula = y ~ A * x^B,
    method.args = list(start = c(A = 2.3, B = 0.72)),
    se = FALSE
  )#stat_smooth(color = 1, method = 'nls', formula = 'y~a*exp(b*x)',
  # method.args = list(start=c(A = 2.3, B=.72)), se=FALSE) +
  facet_wrap(~ Treatment)
```

```

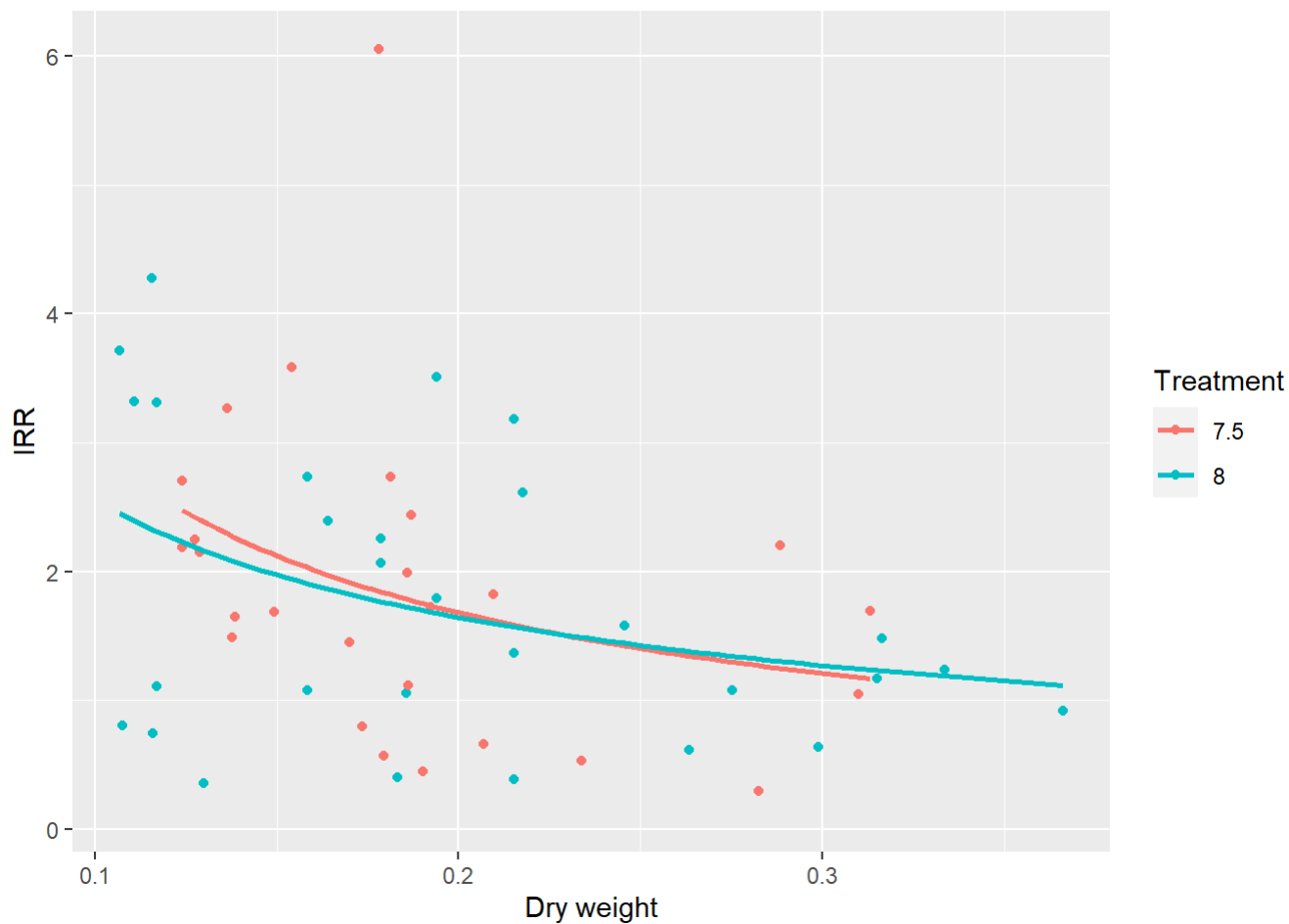
<ggproto object: Class FacetWrap, Facet, gg>
  compute_layout: function
  draw_back: function
  draw_front: function
  draw_labels: function
  draw_panels: function
  finish_data: function
  init_scales: function
  map_data: function
  params: list
  setup_data: function
  setup_params: function
  shrink: TRUE
  train_scales: function
  vars: function
  super: <ggproto object: Class FacetWrap, Facet, gg>

```

```
gg1
```

Warning: Removed 22 rows containing non-finite values (`stat\_smooth()`).

Warning: Removed 22 rows containing missing values (`geom\_point()`).



```
nls_8 <- nls(IRR ~ A * Dry.weight..mg.^B,
            start = list(A = 2.3, B = 0.72),
            data = bd_Pousse[bd_Pousse$Treatment=="8",],
            na.action=na.exclude)
nls_7.5 <- nls(IRR ~ A * Dry.weight..mg.^B,
              start = list(A = 2.3, B = 0.72),
              data = bd_Pousse[bd_Pousse$Treatment=="7.5",],
              na.action=na.exclude)
# nls_7 <- nls(IRR ~ A * Dry.weight..mg.^B,
#             start = list(A = 2.3, B = 0.72),
#             data = bd_Pousse[bd_Pousse$Treatment=="7",],
#             na.action=na.exclude)
summary(nls_8)
```

Formula:  $IRR \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	0.5907	0.3523	1.677	0.1052
B	-0.6360	0.3177	-2.002	0.0555 .

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.073 on 27 degrees of freedom

Number of iterations to convergence: 7

Achieved convergence tolerance: 3.653e-07

(13 observations deleted due to missingness)

```
summary(nls_7.5)
```

Formula:  $IRR \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	0.4552	0.4244	1.072	0.294
B	-0.8115	0.5092	-1.594	0.124

Residual standard error: 1.17 on 24 degrees of freedom

Number of iterations to convergence: 7

Achieved convergence tolerance: 8.461e-07

(9 observations deleted due to missingness)

```
# summary(nls_7)
```

```
nls_all <- nls(IRR ~ A * Dry.weight..mg.^B,
```

```

      start = list(A = 2.3, B = 0.72),
      data = bd_Pousse,
      na.action=na.exclude)
summary(nls_all)

```

Formula:  $IRR \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	0.5574	0.2745	2.031	0.0473 *
B	-0.6823	0.2655	-2.570	0.0130 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.1 on 53 degrees of freedom

Number of iterations to convergence: 7

Achieved convergence tolerance: 1.466e-06

(22 observations deleted due to missingness)

```

nls_all_exp_only <- nls(IRR ~ Dry.weight..mg.^B,
      start = list( B = -0.72),
      data = bd_Pousse,
      na.action=na.exclude)
summary(nls_all_exp_only)

```

Formula:  $IRR \sim Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
B	-0.36498	0.04411	-8.274	3.58e-11 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.107 on 54 degrees of freedom

Number of iterations to convergence: 5

Achieved convergence tolerance: 1.552e-07

(22 observations deleted due to missingness)

```
length(bd_Pousse$Length..mm.)
```

[1] 77

```
length(bd_Pousse$Dry.weight..mg.)
```

[1] 77

```
nls_all.len <- nls(IRR ~ A * Length..mm.^B,
  start = list(A = 1, B = 2),
  data = bd_Pousse,
  na.action=na.exclude)
summary(nls_all)
```

Formula:  $IRR \sim A * Dry.weight..mg.^B$

Parameters:

	Estimate	Std. Error	t value	Pr(> t )
A	0.5574	0.2745	2.031	0.0473 *
B	-0.6823	0.2655	-2.570	0.0130 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.1 on 53 degrees of freedom

Number of iterations to convergence: 7

Achieved convergence tolerance: 1.466e-06

(22 observations deleted due to missingness)

```
AIC(nls_all,nls_all_exp_only,nls_all.len)
```

Warning in AIC.default(nls\_all, nls\_all\_exp\_only, nls\_all.len): models are not all fitted to the same number of observations

	df	AIC
nls_all	3	170.5797
nls_all_exp_only	2	170.2265
nls_all.len	3	228.6004

```
BIC(nls_all,nls_all_exp_only,nls_all.len)
```

Warning in BIC.default(nls\_all, nls\_all\_exp\_only, nls\_all.len): models are not all fitted to the same number of observations

	df	BIC
nls_all	3	176.6017
nls_all_exp_only	2	174.2411
nls_all.len	3	235.5126