

Angle Analysis

Plants

- Population 1 was done from photographs on older plants, where we could only retrieve the angle for L1 - L4.
- Population 2 was performed on plants around 20 days old and was calculated from histology.
- Population 3 was measured from plants around 1 months old from only PIN1::GFP x e2/e2

Analysis

Libraries

```
library(reshape2)
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.1.3
```

Do analysis on

```
angleData <- read.csv("../data/anglePopulation1&2&3.csv")
head(angleData)
```

```
##   primordia leaf angle genotype plant population
## 1          L2L3 37.89         e2   E43          1
## 2          L2L3 55.71        3130   W13          1
## 3          L1L2 62.54         e2   E30          1
## 4          L2L3 65.03         e2   E82          1
## 5          L2L3 67.17         e2   E55          1
## 6          L2L3 69.20         e2   E21          1
```

```
angleDataLeaf <- angleData[,c(2,3,4,5,6)]
angleDataSub <- subset(angleDataLeaf, leaf != "L7L8")
levels(angleDataSub$genotype) <- c("WT", "e-2", "complemented e-2")
```

Make a boxplot that illustrates angle divergence.

```
ggplot(angleDataSub, aes(leaf, angle)) +
  geom_boxplot(outlier.size = 0) +
  geom_point(position = "jitter", alpha = .2) +
  facet_grid(~genotype) +
  scale_color_brewer(palette="Dark2") +
  theme_bw() +
  geom_hline(yintercept=137.5, linetype = "dotted") +
  scale_y_continuous(breaks=c(50, 100, 137.5, 150, 200)) +
  theme(axis.title.x = element_text(face="bold", size=30),
        axis.title.y = element_text(face="bold", size=30),
        axis.text.x = element_text(size=16),
        axis.text.y = element_text(size=16),
```

```

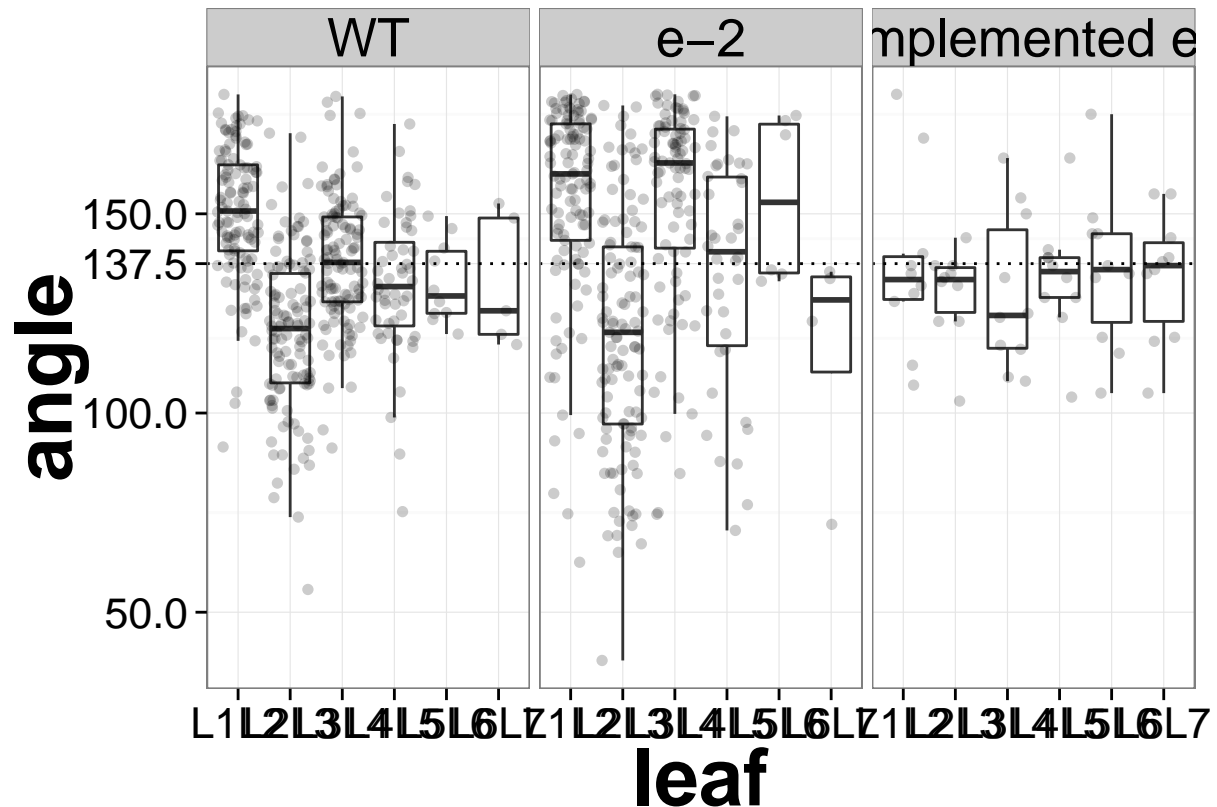
legend.title = element_text(size=30),
legend.text = element_text(size=20),
strip.text.x = element_text(size = 20),
legend.position="none")

```

```

## Warning: Removed 63 rows containing non-finite values (stat_boxplot).
## Warning: Removed 140 rows containing non-finite values (stat_boxplot).
## Warning: Removed 63 rows containing missing values (geom_point).
## Warning: Removed 140 rows containing missing values (geom_point).

```



Make a diagram illustrating how many plants of e2 and wt are distichous, spiral & other.

Spiral = Both L2L3 and L3L4 between 147.5 and 127.5. Decussate = Leaf L2L3 between 80 to 100 and L3L4 between 190 to 170. Other = Everything else.

At this point it may be beneficial to change to the wide format where each plant in a single observation by casting.

```

angleDataPlant <- angleData[,-c(6,1)]
castAngleData <- dcast(angleDataPlant, plant + genotype ~ leaf, value.var = "angle")

```

How many of each genotype

```
summary(castAngleData$genotype)
```

```

##          3130          e2 pin1.gfp.e2
##          114          123           11

```

```
wtAngle <- subset(castAngleData, genotype == "3130")

#Spiral WT
wtSpiralL34 <- subset(wtAngle, L3L4 <= 150 & L3L4 >= 120)
dim(wtSpiralL34) #75
```

```
## [1] 75 9
```

```
wtDecL34 <- subset(wtAngle, L3L4 <= 195 & L3L4 >= 165)
dim(wtDecL34) #5
```

```
## [1] 5 9
```

```
##e2
```

```
e2Angle <- subset(castAngleData, genotype == "e2")
dim(e2Angle)
```

```
## [1] 123 9
```

```
#Spiral e2
e2SpiralL34 <- subset(e2Angle, L3L4 <= 150 & L3L4 >= 120)
dim(e2SpiralL34) #18
```

```
## [1] 18 9
```

```
e2DecL34 <- subset(e2Angle, L3L4 <= 195 & L3L4 >= 165)
dim(e2DecL34) #39
```

```
## [1] 39 9
```

```
39/88
```

```
## [1] 0.4432
```

```
44+39
```

```
## [1] 83
```

```
83/88
```

```
## [1] 0.9432
```

```
#How many plant were recorded for L3L4
summary(is.na(e2Angle$L3L4)) #87
```

```
##      Mode  FALSE   TRUE  NA's
## logical      87    36     0
```

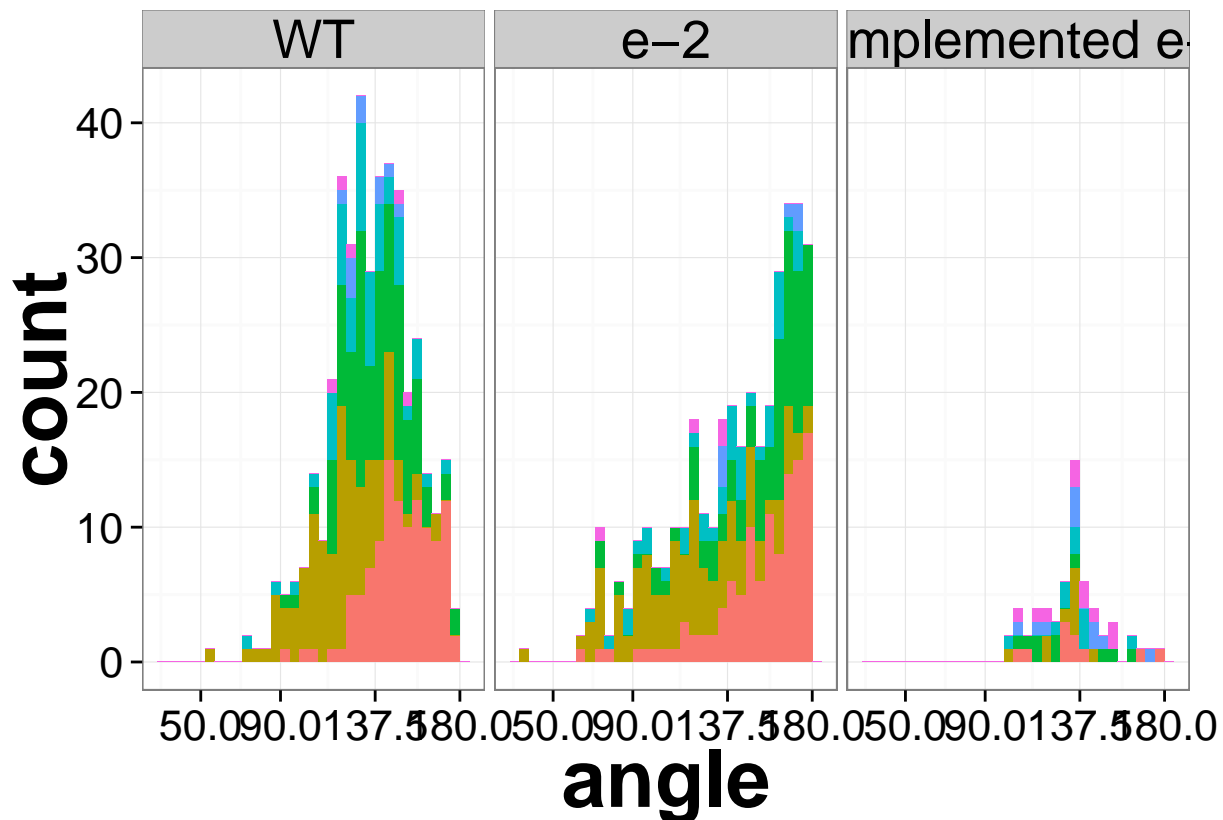
```
#Other
88 - 39 -18 #=31
```

```
## [1] 31
```

A few other ways to look at this data

```
ggplot(angleDataSub, aes(angle, fill = leaf)) +
  geom_bar() +
  facet_grid(.~genotype) +
  scale_color_brewer(palette="Dark2") +
  theme_bw() +
  scale_x_continuous(breaks=c(50, 90, 137.5, 180, 200)) +
  theme(axis.title.x = element_text(face="bold", size=30),
        axis.title.y = element_text(face="bold", size=30),
        axis.text.x = element_text(size=16),
        axis.text.y = element_text(size=16),
        legend.title = element_text(size=30),
        legend.text = element_text(size=20),
        strip.text.x = element_text(size = 20),
        legend.position="none"
  )
```

```
## stat_bin: binwidth defaulted to range/30. Use 'binwidth = x' to adjust this.
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```



```

angleDataSubL12 <- subset(angleDataSub, leaf == "L1L2")
angleDataSubL23 <- subset(angleDataSub, leaf == "L2L3")
angleDataSubL34 <- subset(angleDataSub, leaf == "L3L4")
angleDataSubL45 <- subset(angleDataSub, leaf == "L4L5")

angleDataSubSub <- rbind(angleDataSubL12, angleDataSubL23, angleDataSubL34, angleDataSubL45)

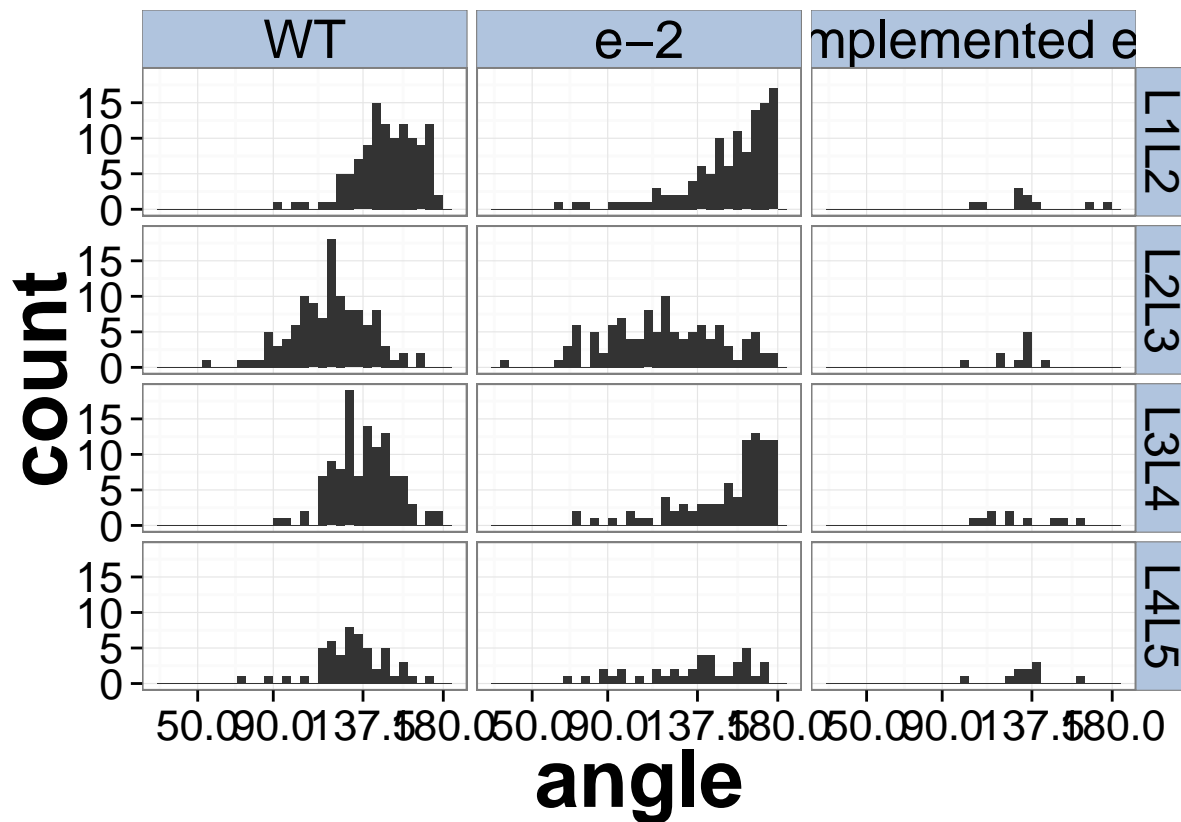
ggplot(angleDataSubSub, aes(angle)) +
  geom_bar() +
  facet_grid(leaf~genotype) +
  scale_color_brewer(palette="Dark2") +
  theme_bw() +
  scale_x_continuous(breaks=c(50, 90, 137.5, 180, 200)) +
  theme(axis.title.x = element_text(face="bold", size=30),
        axis.title.y = element_text(face="bold", size=30),
        axis.text.x = element_text(size=16),
        axis.text.y = element_text(size=16),
        legend.title = element_text(size=30),
        legend.text = element_text(size=20),
        strip.text.x = element_text(size = 20),
        strip.text.y = element_text(size = 18),
        strip.background = element_rect(fill="#b0c4de"),
        legend.position="none"
  )

```

```

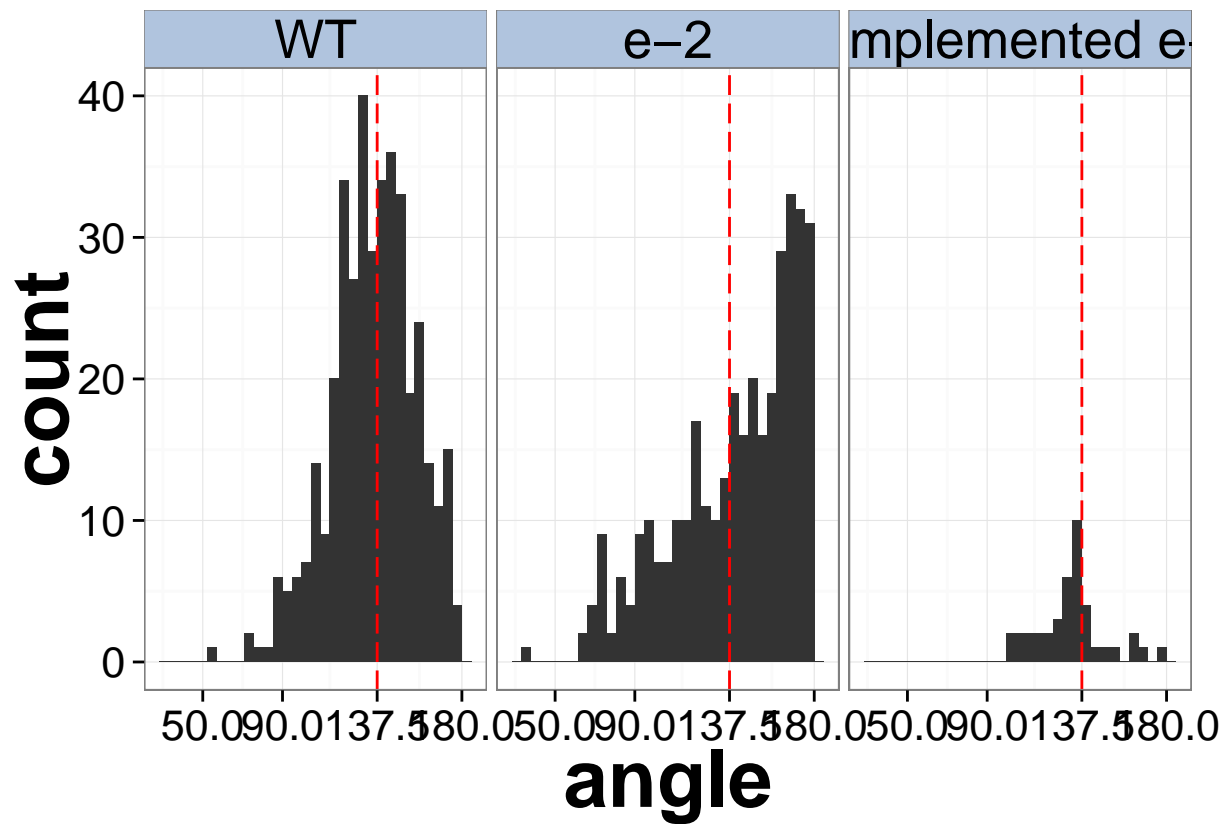
## stat_bin: binwidth defaulted to range/30. Use 'binwidth = x' to adjust this.
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## stat_bin: binwidth defaulted to range/30. Use 'binwidth = x' to adjust this.

```



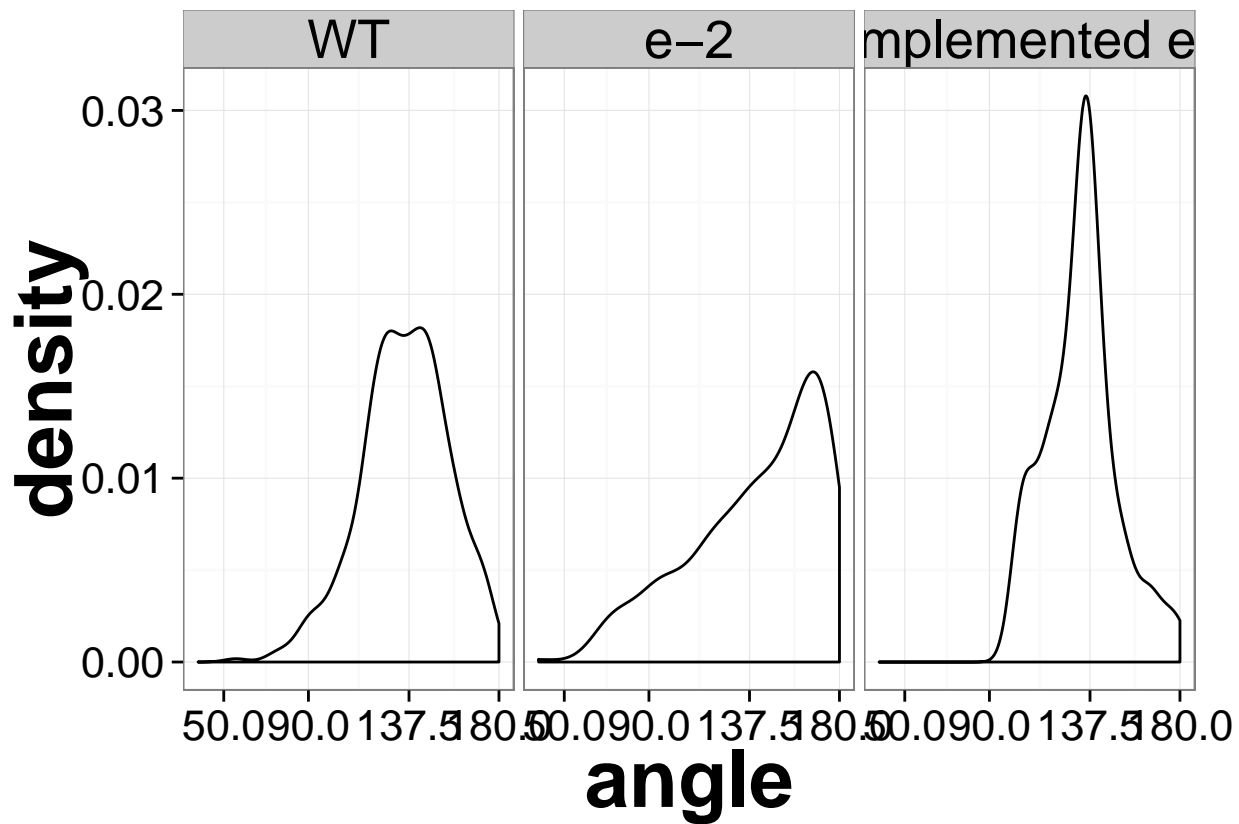
```
ggplot(angleDataSubSub, aes(angle)) +
  geom_bar() +
  facet_grid(~genotype) +
  theme_bw() +
  scale_x_continuous(breaks=c(50, 90, 137.5, 180, 200)) +
  geom_vline(xintercept=137.5, color = "red", linetype= "longdash") +
  theme(axis.title.x = element_text(face="bold", size=30),
        axis.title.y = element_text(face="bold", size=30),
        axis.text.x = element_text(size=16),
        axis.text.y = element_text(size=16),
        legend.title = element_text(size=30),
        legend.text = element_text(size=20),
        strip.text.x = element_text(size = 20),
        strip.text.y = element_text(size = 18),
        strip.background = element_rect(fill="#b0c4de"),
        legend.position="none"
  )
```

```
## stat_bin: binwidth defaulted to range/30. Use 'binwidth = x' to adjust this.
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## stat_bin: binwidth defaulted to range/30. Use 'binwidth = x' to adjust this.
```



```
ggplot(angleDataSub, aes(angle)) +
  geom_density() +
  facet_grid(~genotype) +
  scale_color_brewer(palette="Dark2") +
  theme_bw() +
  scale_x_continuous(breaks=c(50, 90, 137.5, 180, 200)) +
  theme(axis.title.x = element_text(face="bold", size=30),
        axis.title.y = element_text(face="bold", size=30),
        axis.text.x = element_text(size=16),
        axis.text.y = element_text(size=16),
        legend.title = element_text(size=30),
        legend.text = element_text(size=20),
        strip.text.x = element_text(size = 20),
        legend.position="none"
  )
```

```
## Warning: Removed 63 rows containing non-finite values (stat_density).
## Warning: Removed 140 rows containing non-finite values (stat_density).
```



```
ggplot(angleDataSub, aes(angle, fill = leaf, alpha = 50)) +
  geom_density() +
  facet_grid(~genotype) +
  scale_color_brewer(palette="Dark2") +
  theme_bw() +
  scale_x_continuous(breaks=c(50, 90, 137.5, 180, 200)) +
  theme(axis.title.x = element_text(face="bold", size=30),
        axis.title.y = element_text(face="bold", size=30),
        axis.text.x = element_text(size=16),
        axis.text.y = element_text(size=16),
        legend.title = element_text(size=30),
        legend.text = element_text(size=20),
        strip.text.x = element_text(size = 20)
  )
```

```
## Warning: Removed 1 rows containing non-finite values (stat_density).
## Warning: Removed 62 rows containing non-finite values (stat_density).
## Warning: Removed 10 rows containing non-finite values (stat_density).
## Warning: Removed 14 rows containing non-finite values (stat_density).
## Warning: Removed 36 rows containing non-finite values (stat_density).
## Warning: Removed 80 rows containing non-finite values (stat_density).
```