

# The Coordinates Layer

INTERMEDIATE DATA VISUALIZATION WITH GGPLOT2



**Rick Scavetta**

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# Coordinates layer

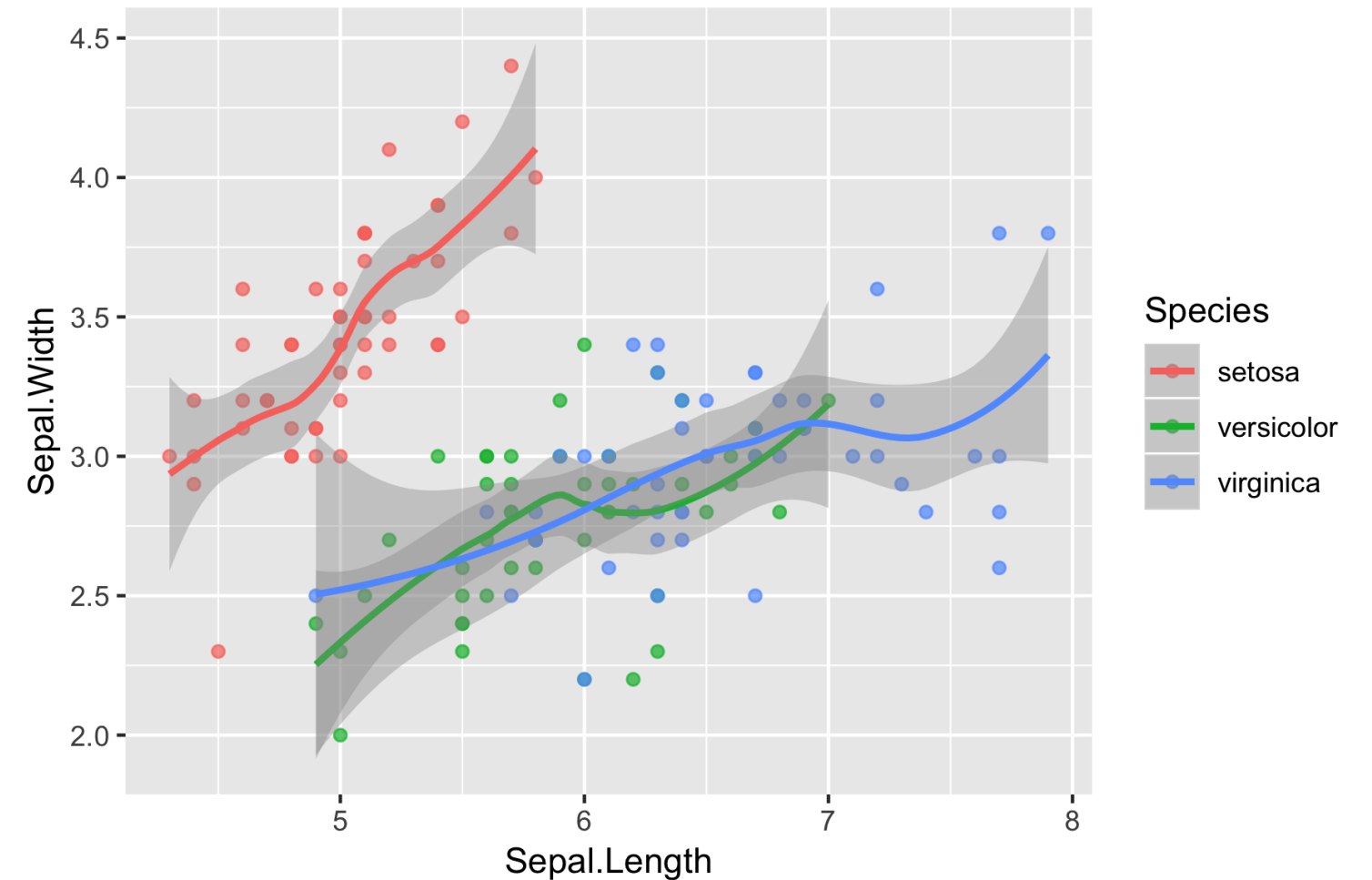
- Controls plot dimensions
- `coord_`
  - e.g. `coord_cartesian()`

# Zooming in

- `coord_cartesian(xlim = ...)`
- `scale_x_continuous(limits = ...)`
- `xlim(...)`

# Original plot

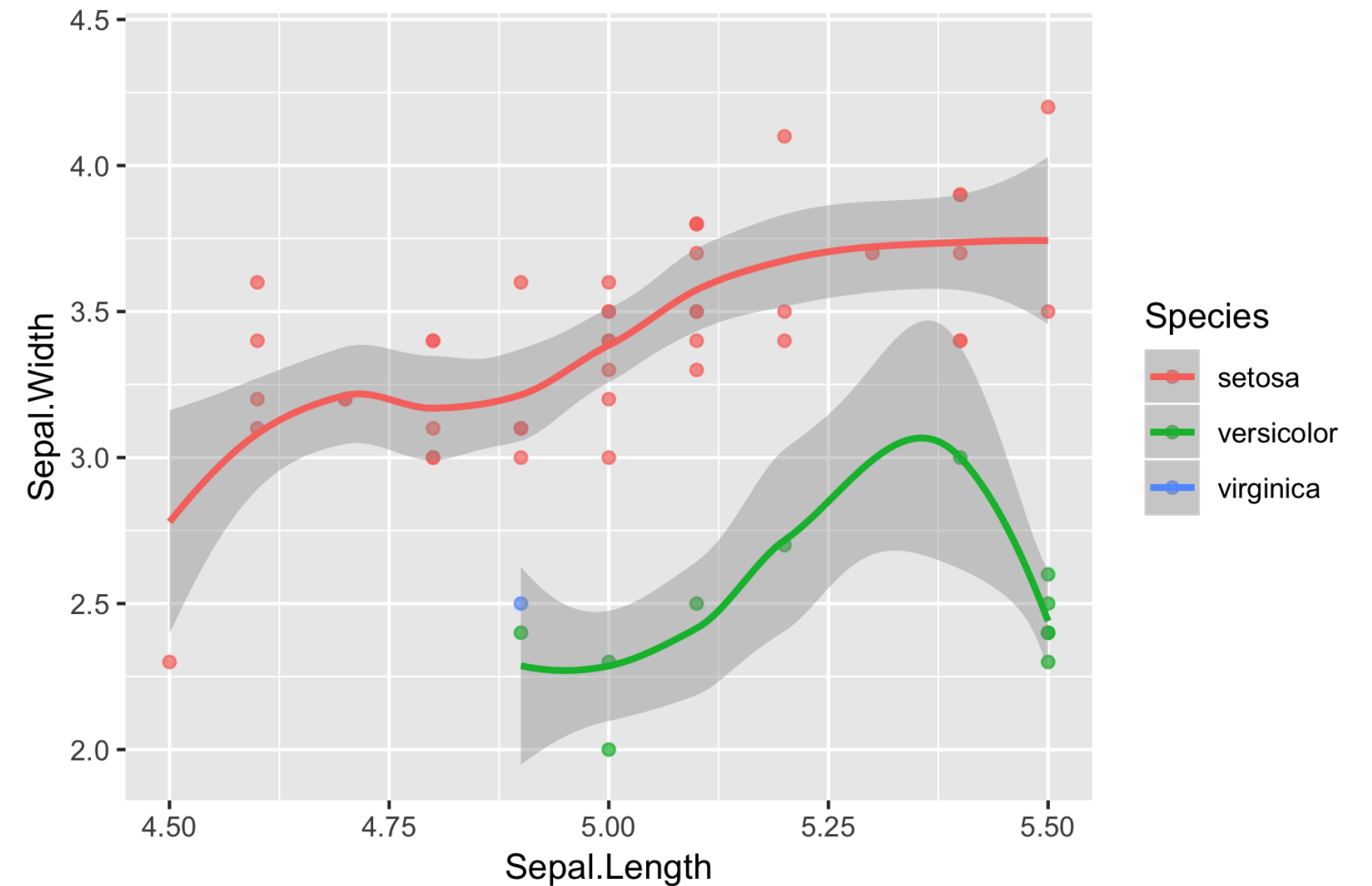
```
iris.smooth <- ggplot(  
  iris,  
  aes(x = Sepal.Length,  
      y = Sepal.Width,  
      color = Species)  
) +  
  geom_point(alpha = 0.7) +  
  geom_smooth()  
  
iris.smooth
```



# scale\_x\_continuous()

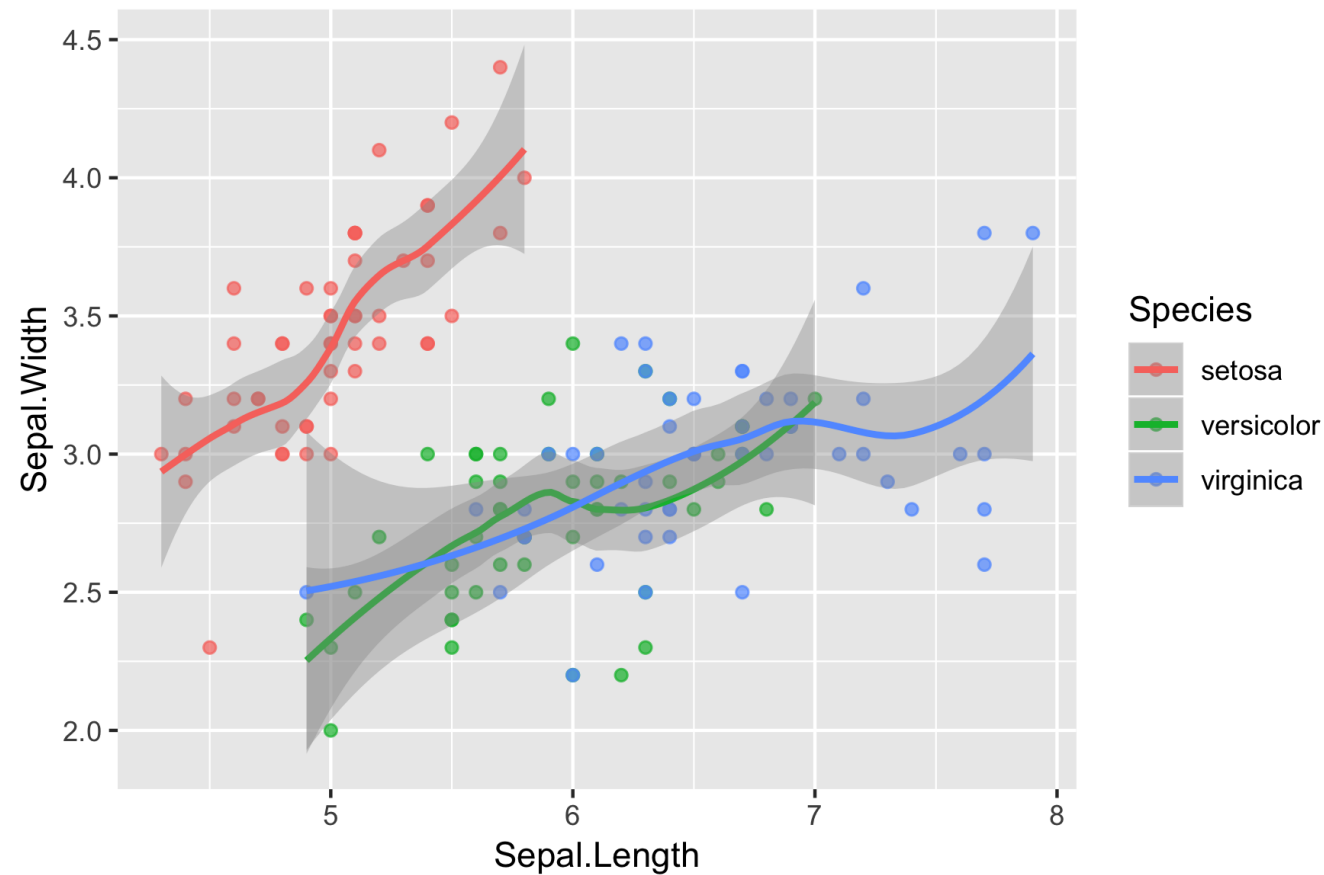
```
iris.smooth +  
  scale_x_continuous(limits = c(4.5, 5.5))
```

Removed 95 rows containing non-finite values  
(stat\_smooth).  
Removed 95 rows containing missing values  
(geom\_point).

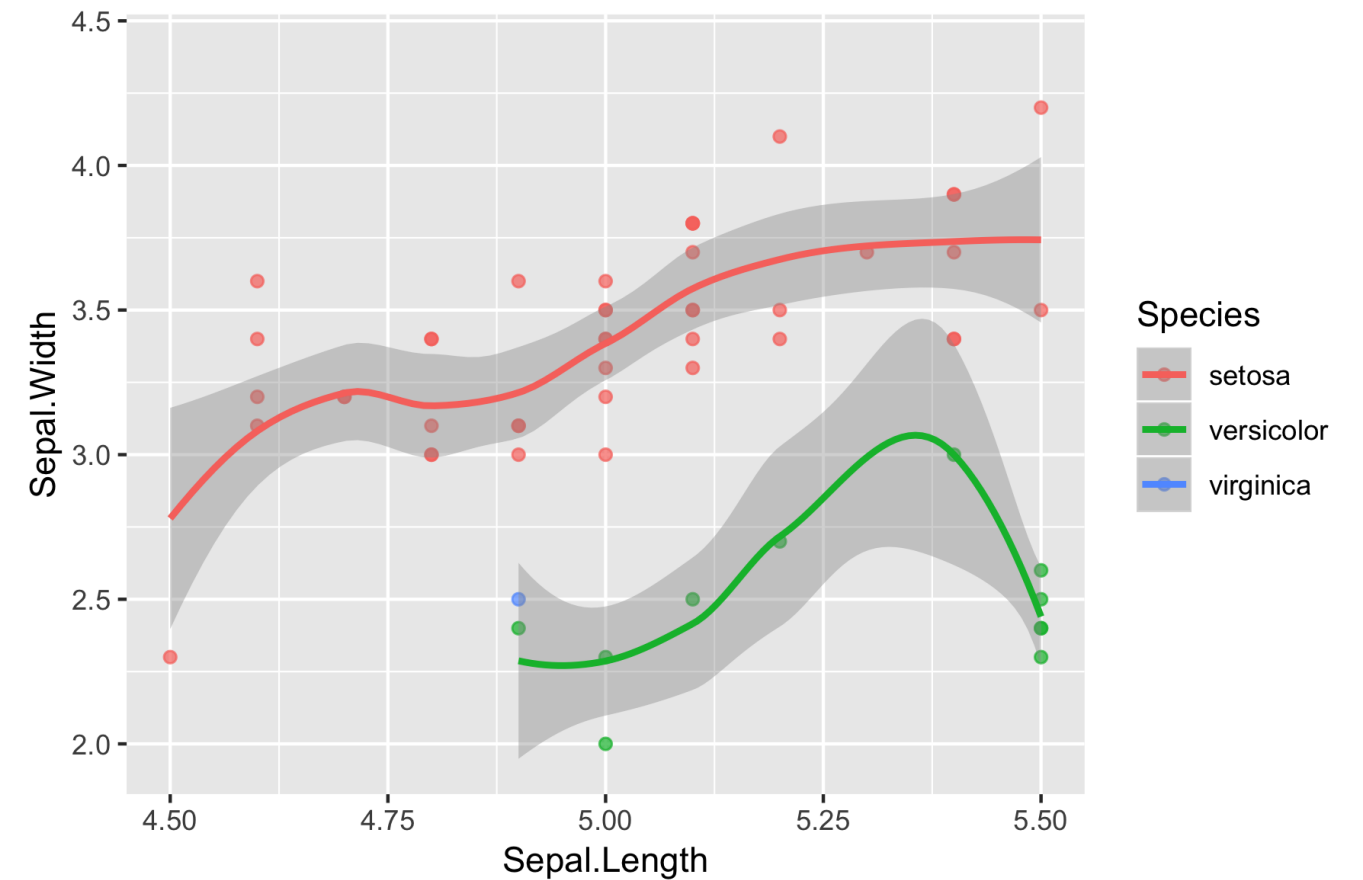


# scale\_x\_continuous()

Original plot



Zoom in with `scale_x_continuous()`

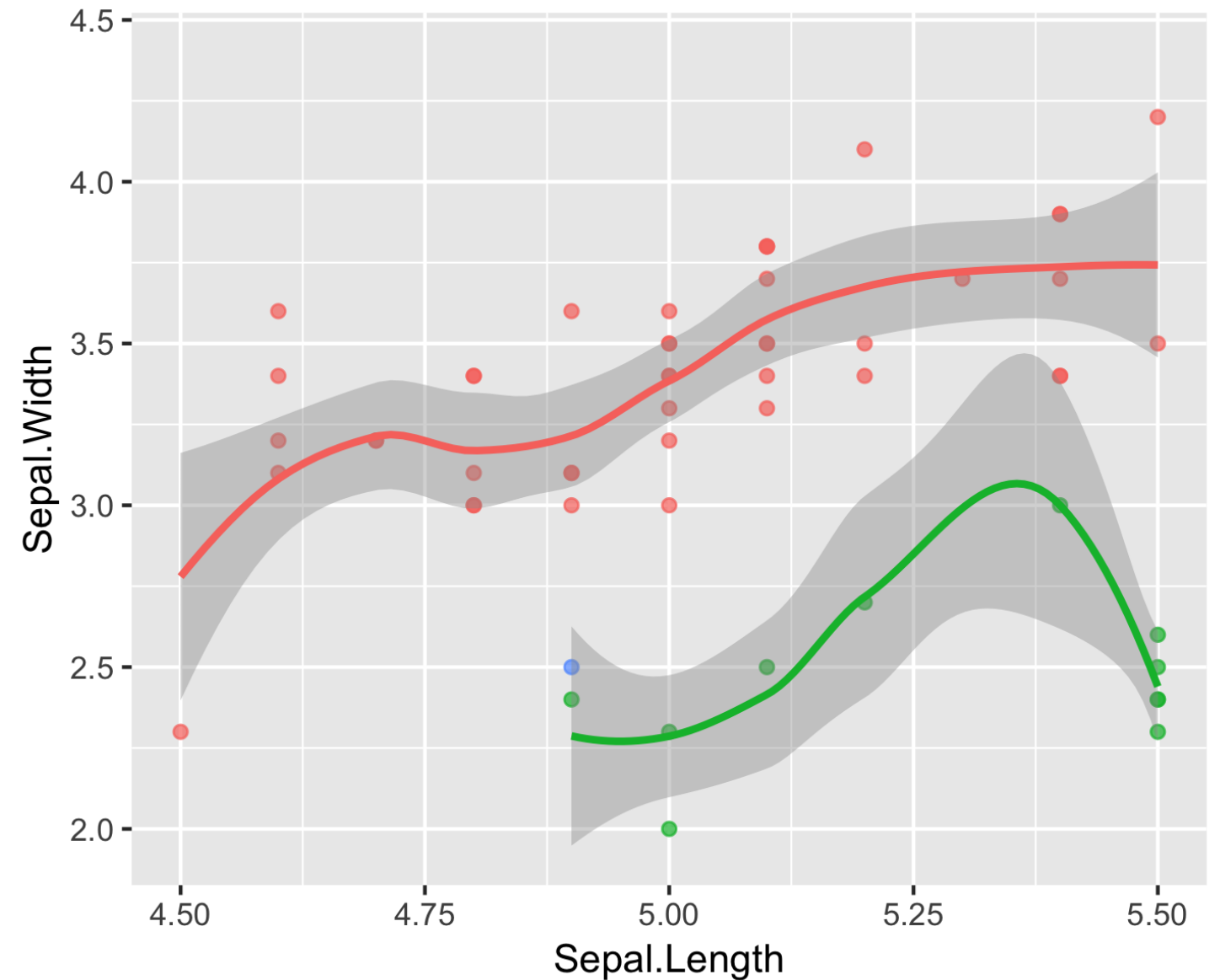


Part of original data is filtered out!

# xlim()

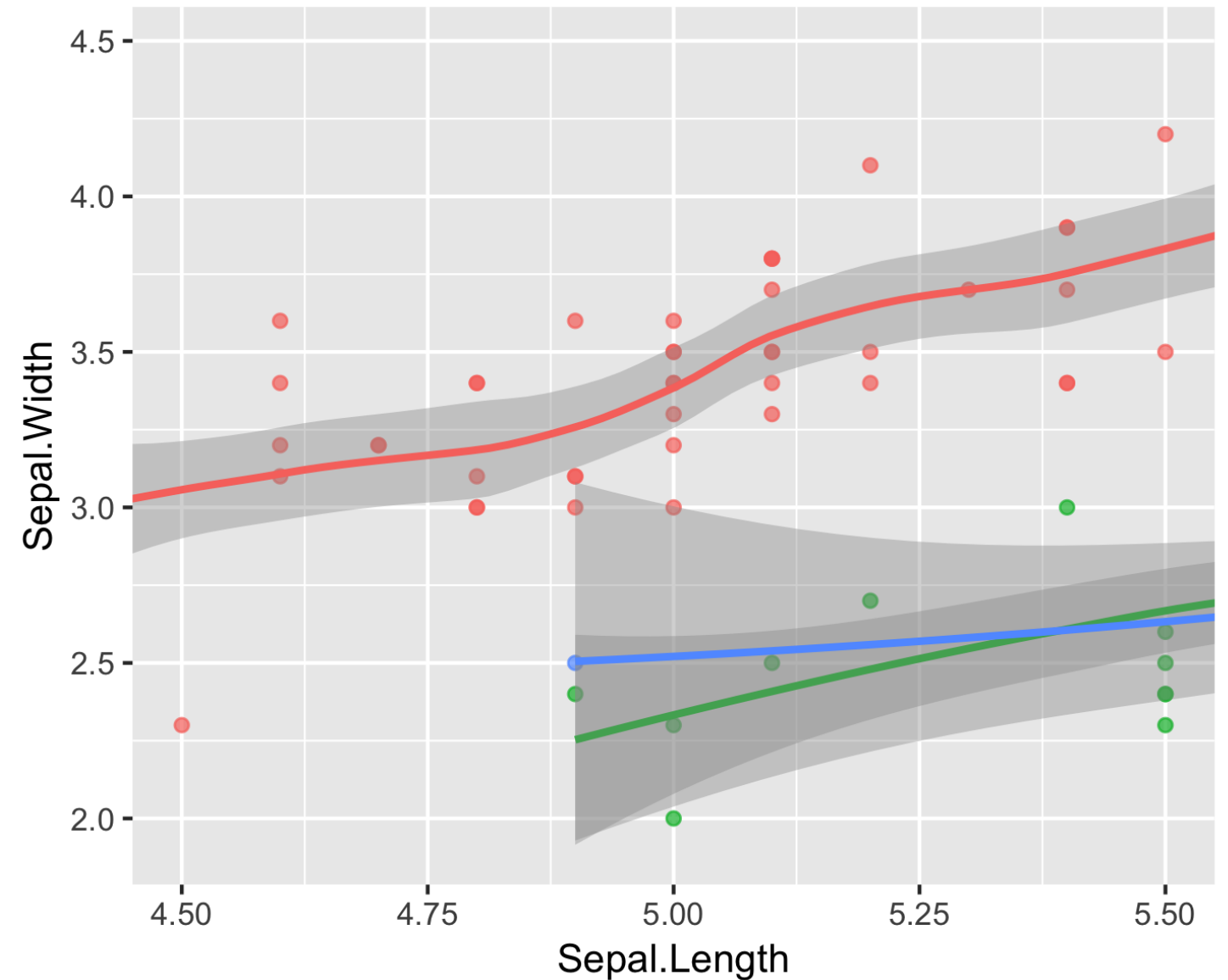
```
iris.smooth +  
  xlim(c(4.5, 5.5))
```

Removed 95 rows containing non-finite values  
(stat\_smooth).  
Removed 95 rows containing missing values  
(geom\_point).



# coord\_cartesian()

```
iris.smooth +  
  coord_cartesian(xlim = c(4.5, 5.5))
```





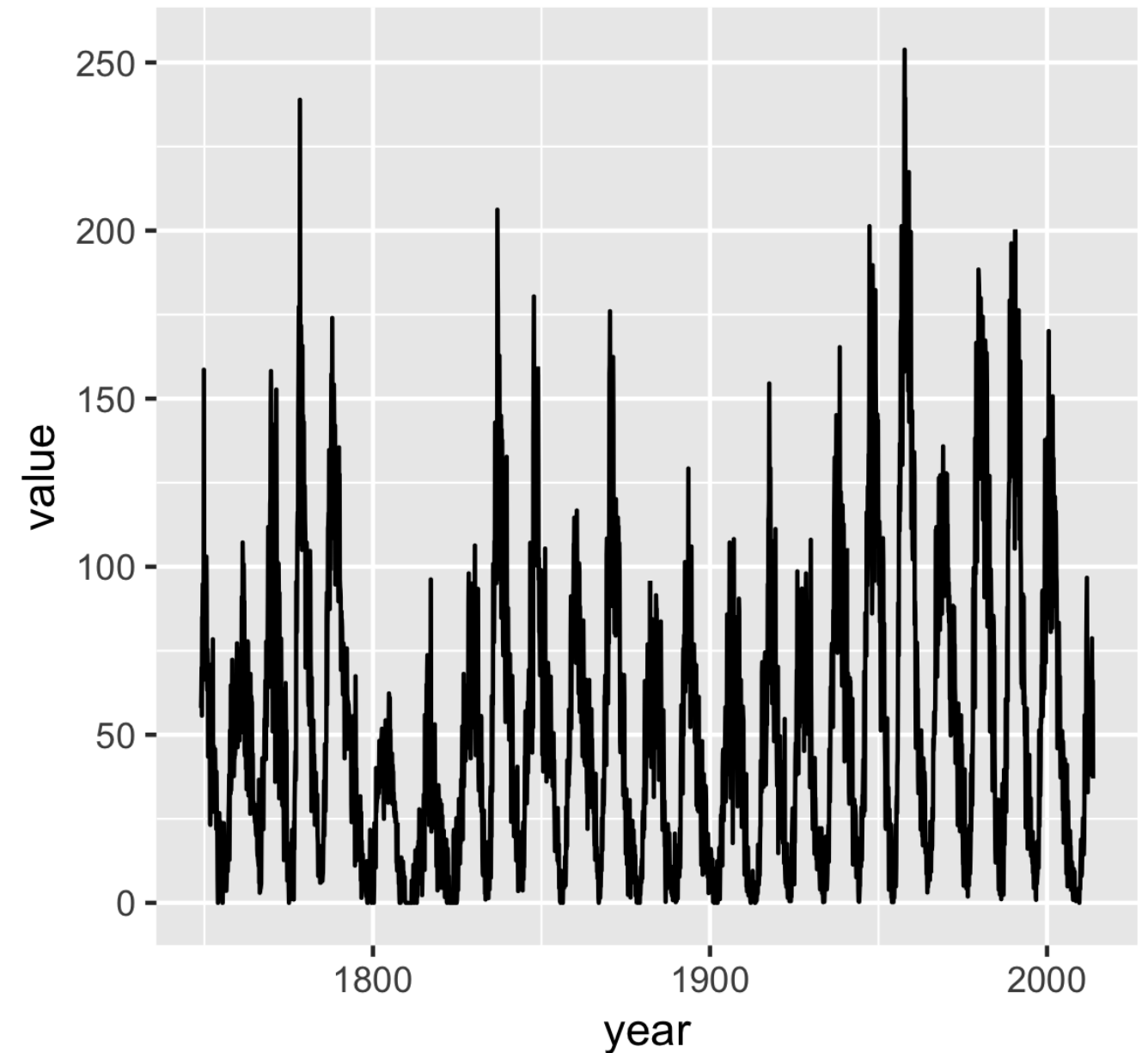
# Aspect ratio

- Height-to-width ratio
- Watch out for deception!
- No universal standard so far
- Typically use 1:1 if data is on the same scale

# Sunspots

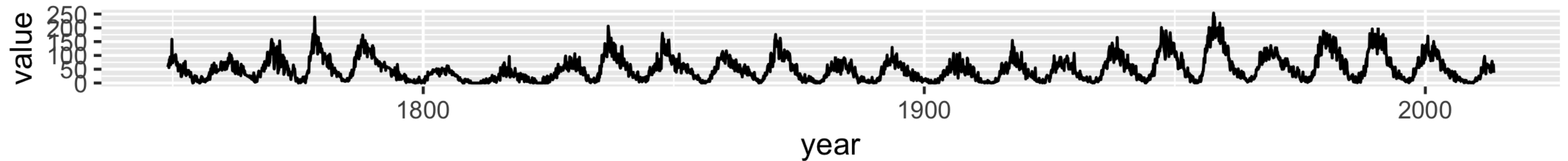
```
library(zoo)
sunspots.m <- data.frame(
  year = index(sunspot.month),
  value = reshape2::melt(sunspot.month)$value)

ggplot(sunspots.m, aes(x = year, y = value)) +
  geom_line() +
  coord_fixed() # default to 1:1 aspect ratio
```



# Sunspots

```
ggplot(sunspots.m, aes(x = year, y = value)) +  
  geom_line() +  
  coord_fixed(0.055)
```



# Practice time!

INTERMEDIATE DATA VISUALIZATION WITH GGPLOT2

# Coordinates vs. scales

INTERMEDIATE DATA VISUALIZATION WITH GGPIOT2



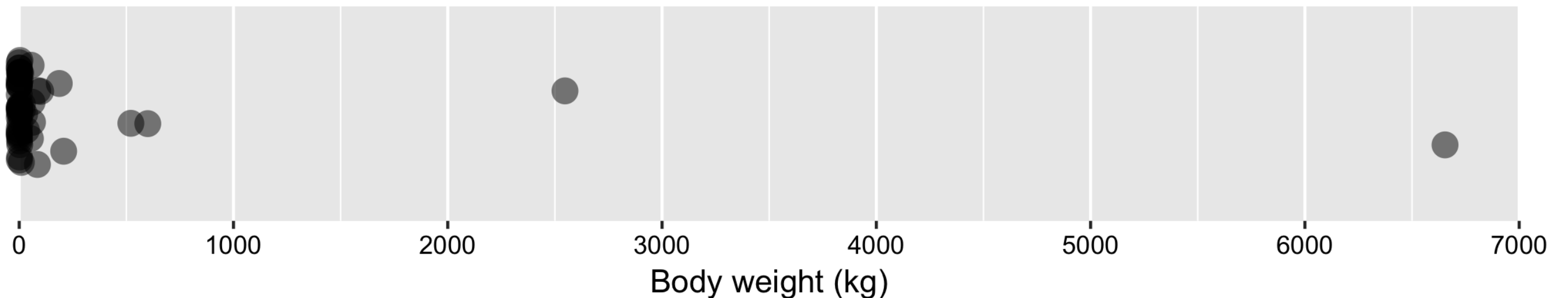
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# Plot the raw data

```
ggplot(msleep, aes(bodywt, y = 1)) +  
  geom_jitter() +  
  scale_x_continuous(limits = c(0, 7000),  
                    breaks = seq(0, 7000, 1000))
```

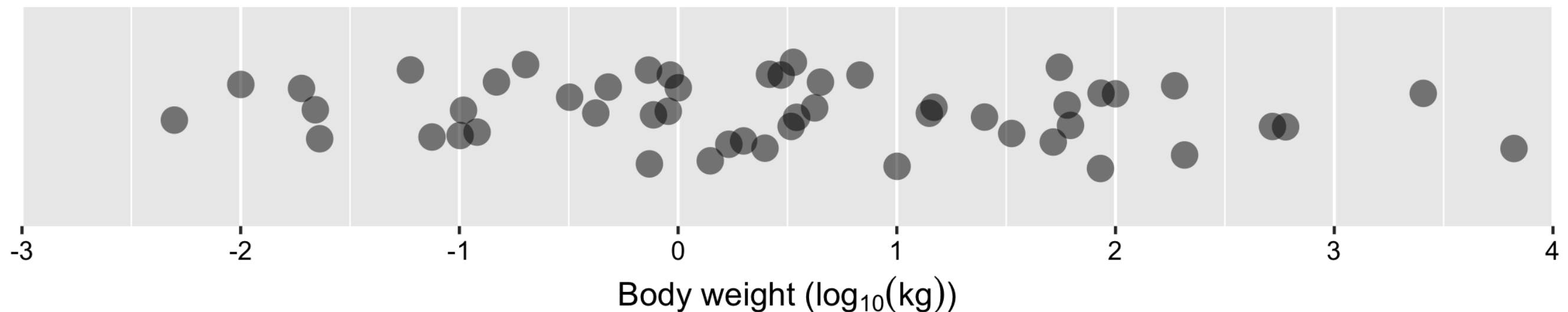
Raw values



# Transform the raw data

```
ggplot(msleep, aes(log10(bodywt), y = 1)) +  
  geom_jitter() +  
  scale_x_continuous(limits = c(-3, 4),  
                    breaks = -3:4)
```

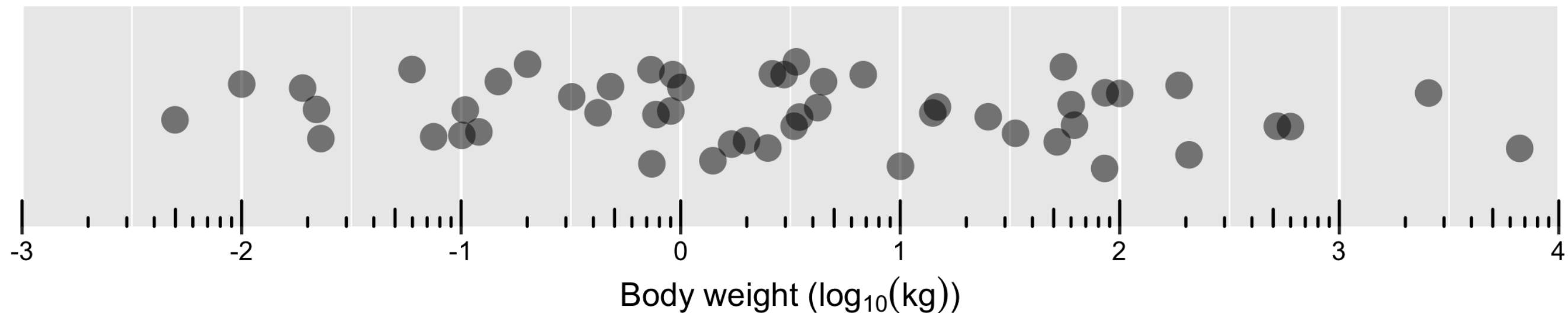
log10 trans of raw values



# Add logtick annotation

```
ggplot(msleep, aes(log10(bodywt), y = 1)) +  
  geom_jitter() +  
  scale_x_continuous(limits = c(-3, 4),  
                    breaks = -3:4) +  
  annotation_logticks(sides = "b")
```

log10 trans of raw values

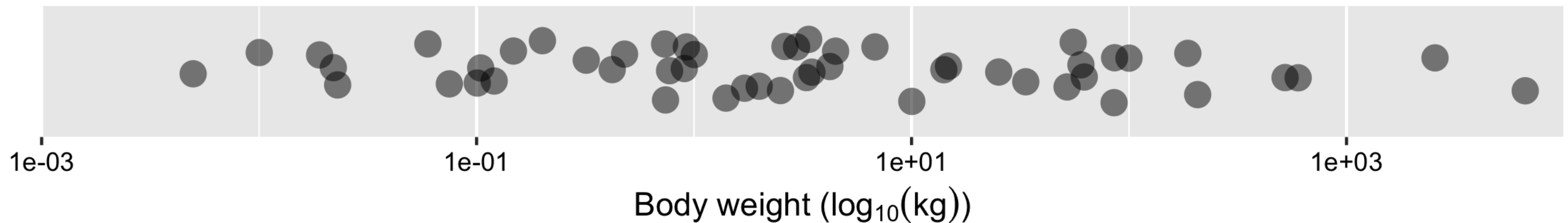




# Use `scale*_log10()`

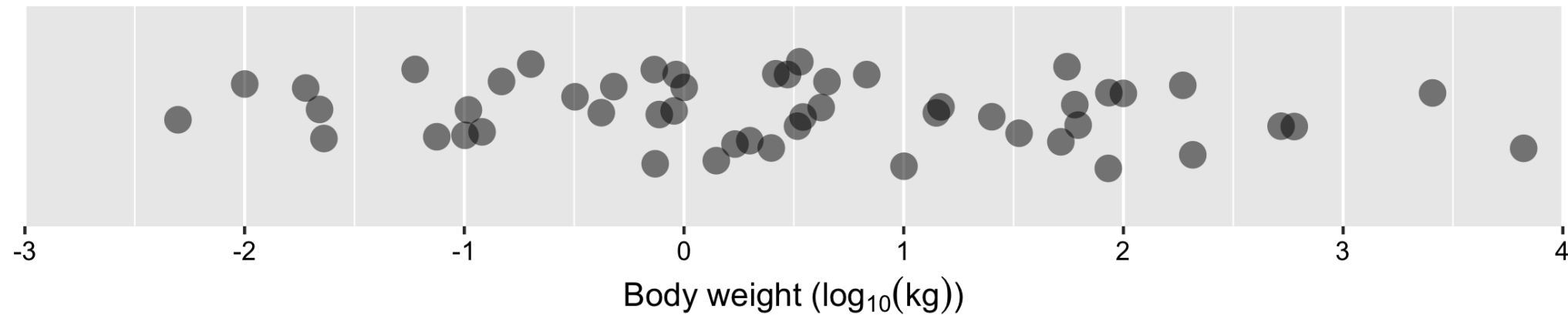
```
ggplot(msleep, aes(bodywt, y = 1)) +  
  geom_jitter() +  
  scale_x_log10(limits = c(1e-03, 1e+04))
```

log10 trans using `scale_x_log10()`

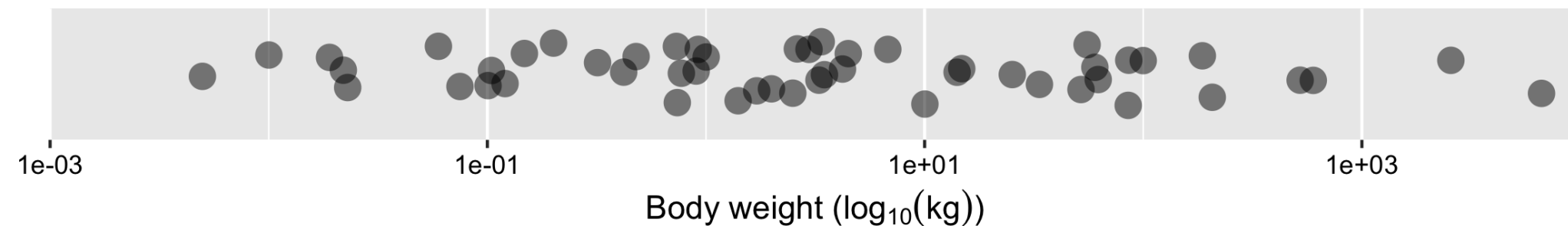


# Compare direct transform and `scale_*_log10()` output

log10 trans of raw values



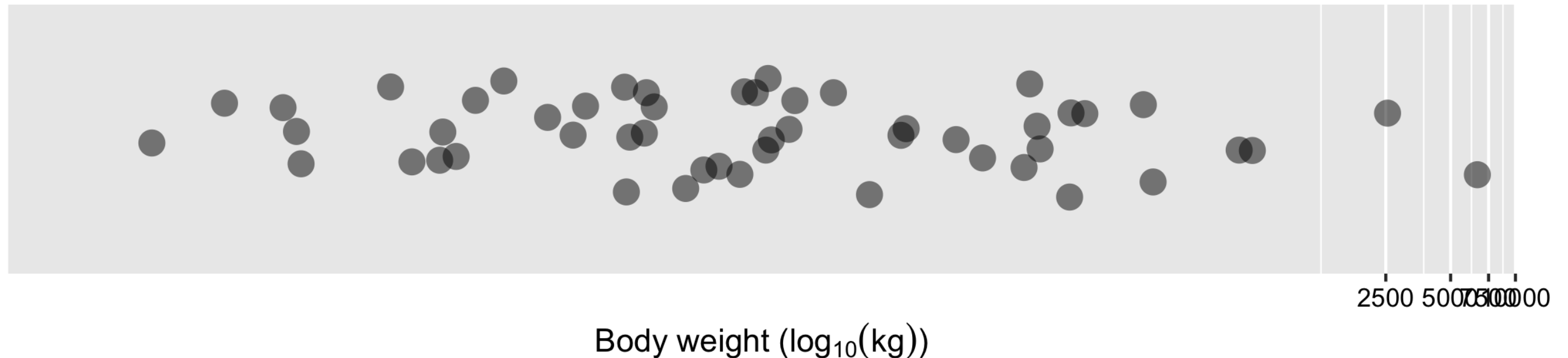
log10 trans using `scale_x_log10()`



# Use coord\_trans()

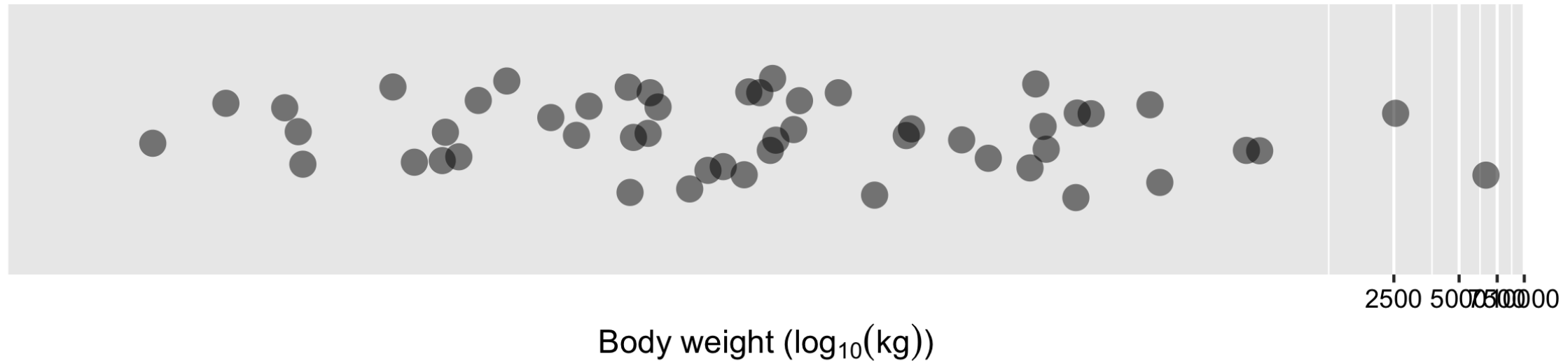
```
ggplot(msleep, aes(bodywt, y = 1)) +  
  geom_jitter() +  
  coord_trans(x = "log10")
```

log10 trans using coord\_trans()

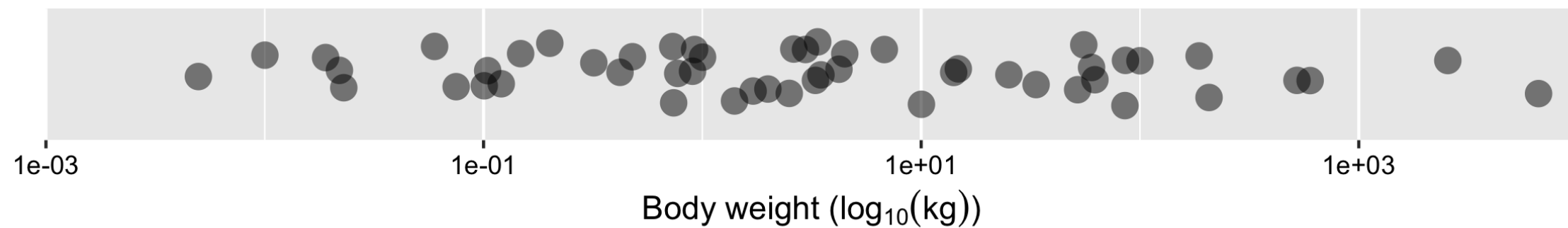


# Compare `scale_*_log10()` and `coord_trans()` output

log10 trans using `coord_trans()`

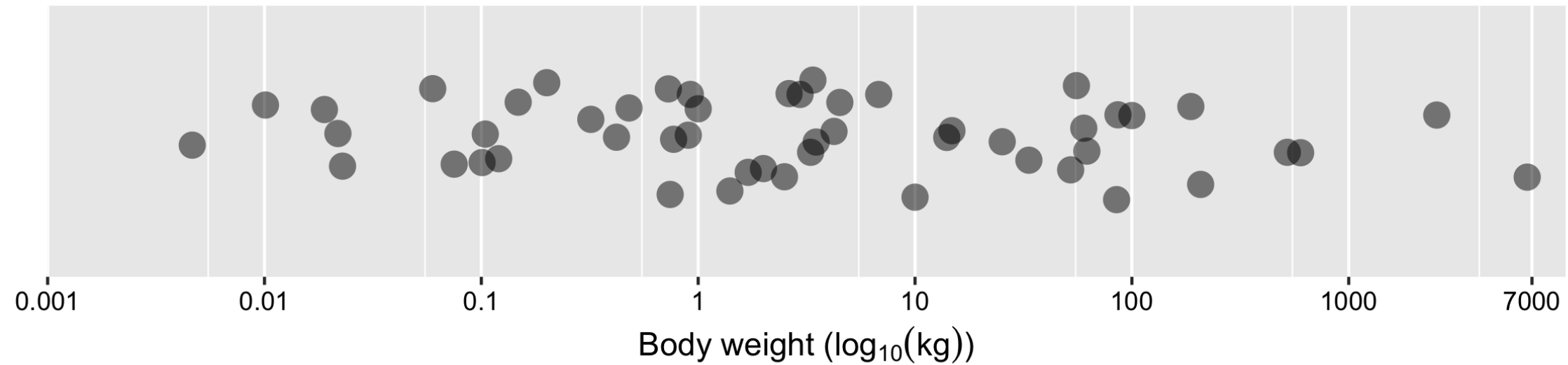


log10 trans using `scale_x_log10()`

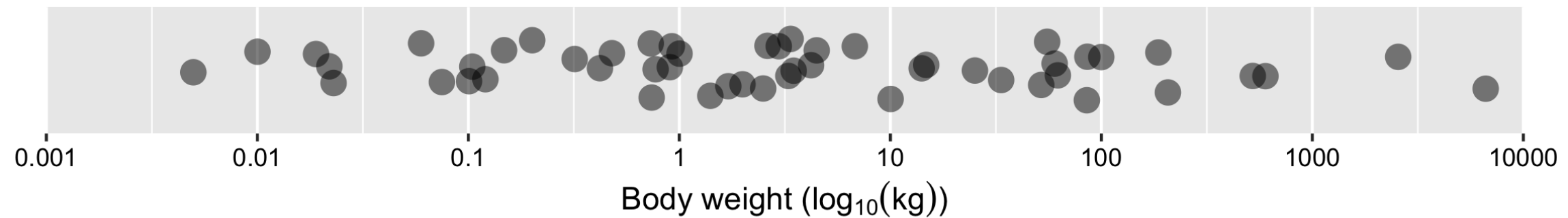


# Adjusting labels

log10 trans using coord\_trans()



log10 trans using scale\_x\_log10()



# Time for exercises

INTERMEDIATE DATA VISUALIZATION WITH GGPLOT2

# Double and flipped axes

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# Typical axis modifications

- Aspect ratios (see video 1)
  - Adjust for best perspective
- Transformation functions (e.g. log, see video 2)
  - Adjust if original scale is inappropriate
- Double x or y axes
  - Add raw and transformed values
- Flipped axes
  - Change direction of dependencies
  - Change geometry orientation

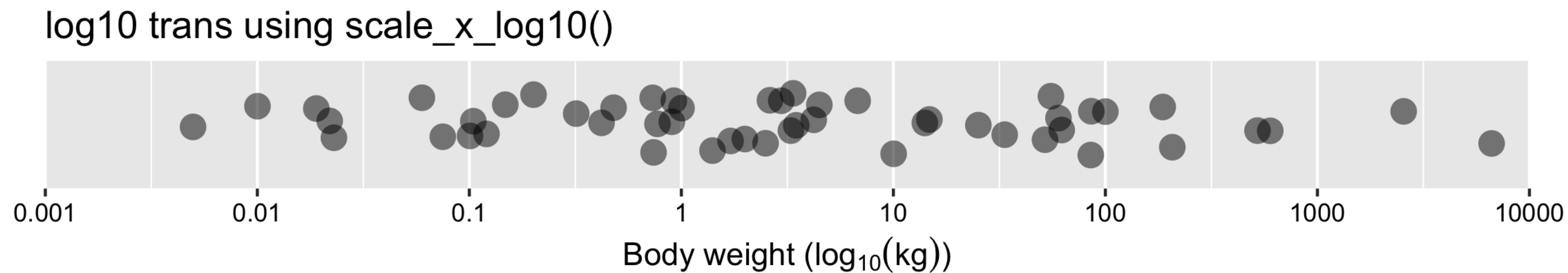


# Typical axis modifications

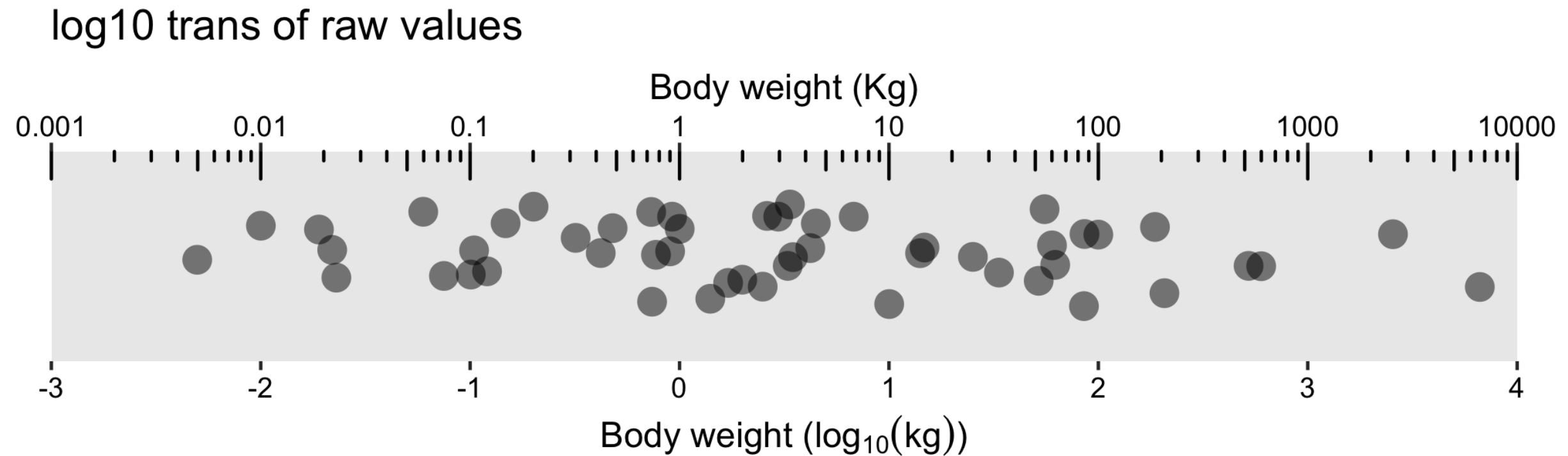
- Aspect ratios (see video 1)
  - Adjust for best perspective
- Transformation functions (e.g. log, see video 2)
  - Adjust if original scale is inappropriate
- **Double x or y axes**
  - **Add raw and transformed values**
- Flipped axes
  - Change direction of dependencies
  - Change geometry orientation

<sup>1</sup> See chapter 4, video 3 for more discussion on double x and y-axes.

# Double axes



# Adding raw and transformed axes

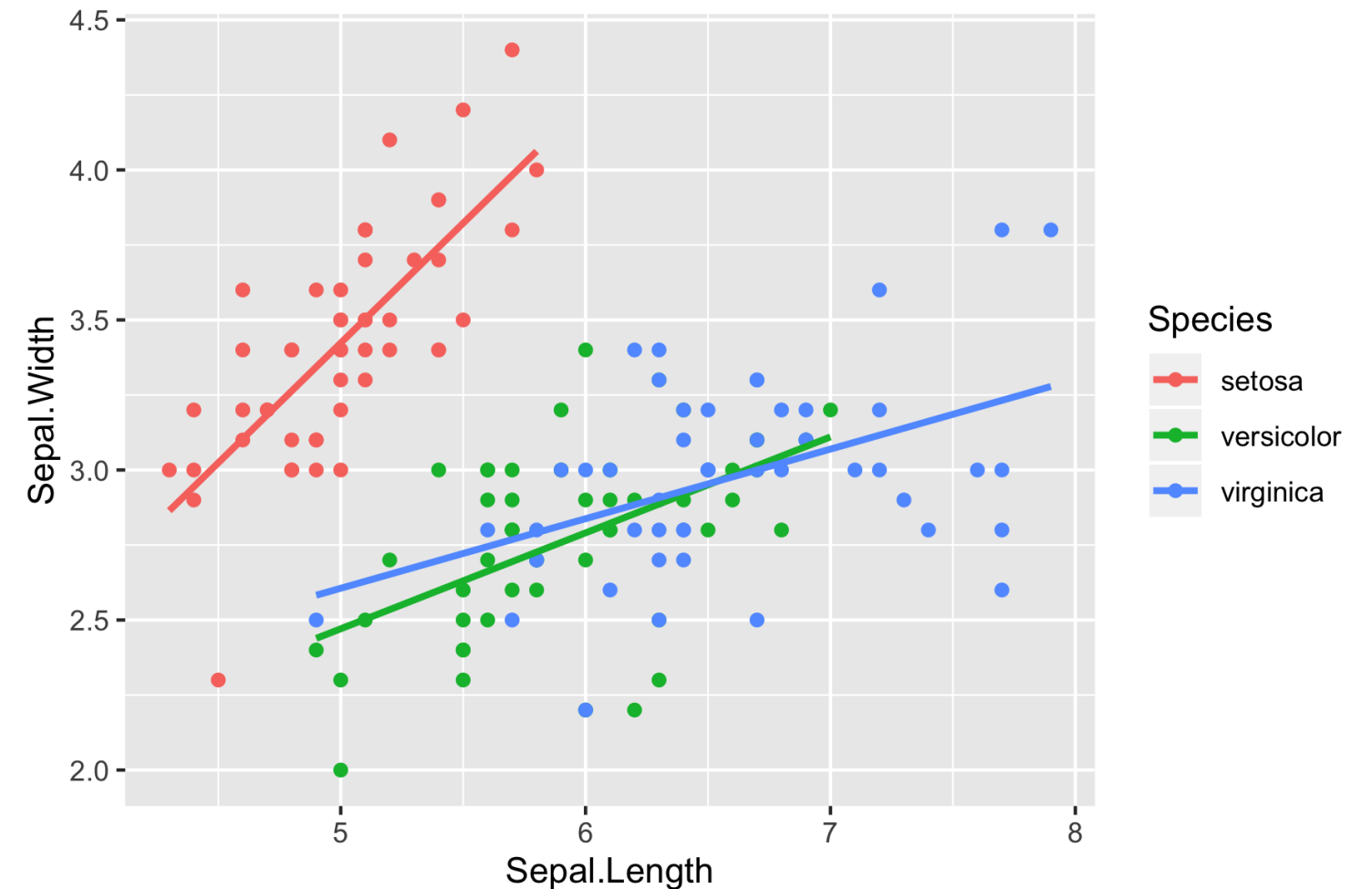


# Typical axis modifications

- Aspect ratios (see video 1)
  - Adjust for best perspective
- Transformation functions (e.g. log, see video 2)
  - Adjust if original scale is inappropriate
- Double x or y axes
  - Add raw and transformed values
- **Flipped axes**
  - **Change direction of dependencies**
  - **Change geometry orientation**

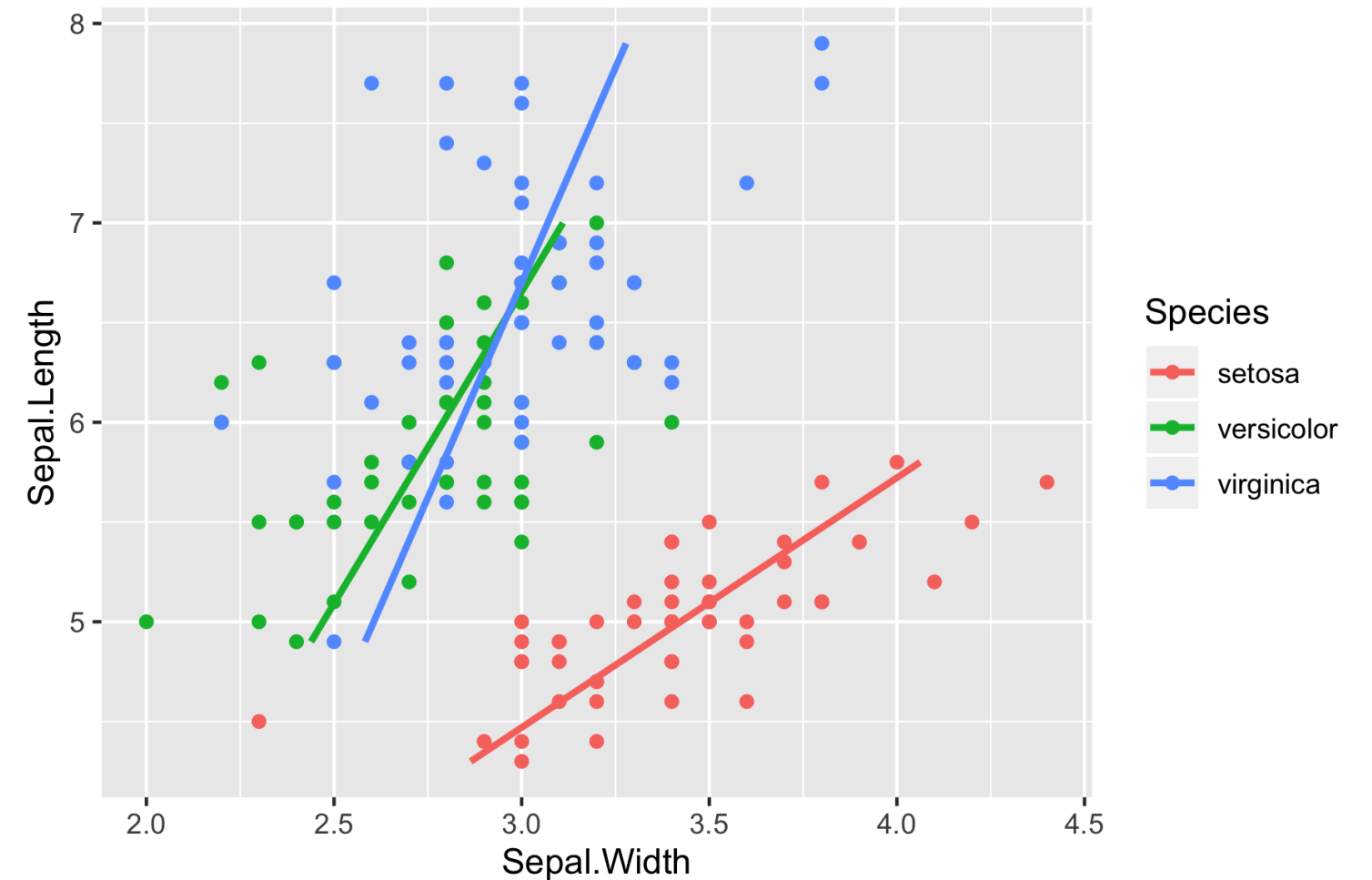
# Flipping axes

```
ggplot(iris, aes(x = Sepal.Length,  
                 y = Sepal.Width,  
                 color = Species)) +  
  geom_point() +  
  geom_smooth(method = "lm",  
             se = FALSE)
```



# coord\_flip()

```
ggplot(iris, aes(x = Sepal.Length,  
                 y = Sepal.Width,  
                 color = Species)) +  
  geom_point() +  
  geom_smooth(method = "lm",  
             se = FALSE) +  
  coord_flip()
```



# Let's practice!

INTERMEDIATE DATA VISUALIZATION WITH GGPLOT2

# Polar coordinates

INTERMEDIATE DATA VISUALIZATION WITH GGPLOT2



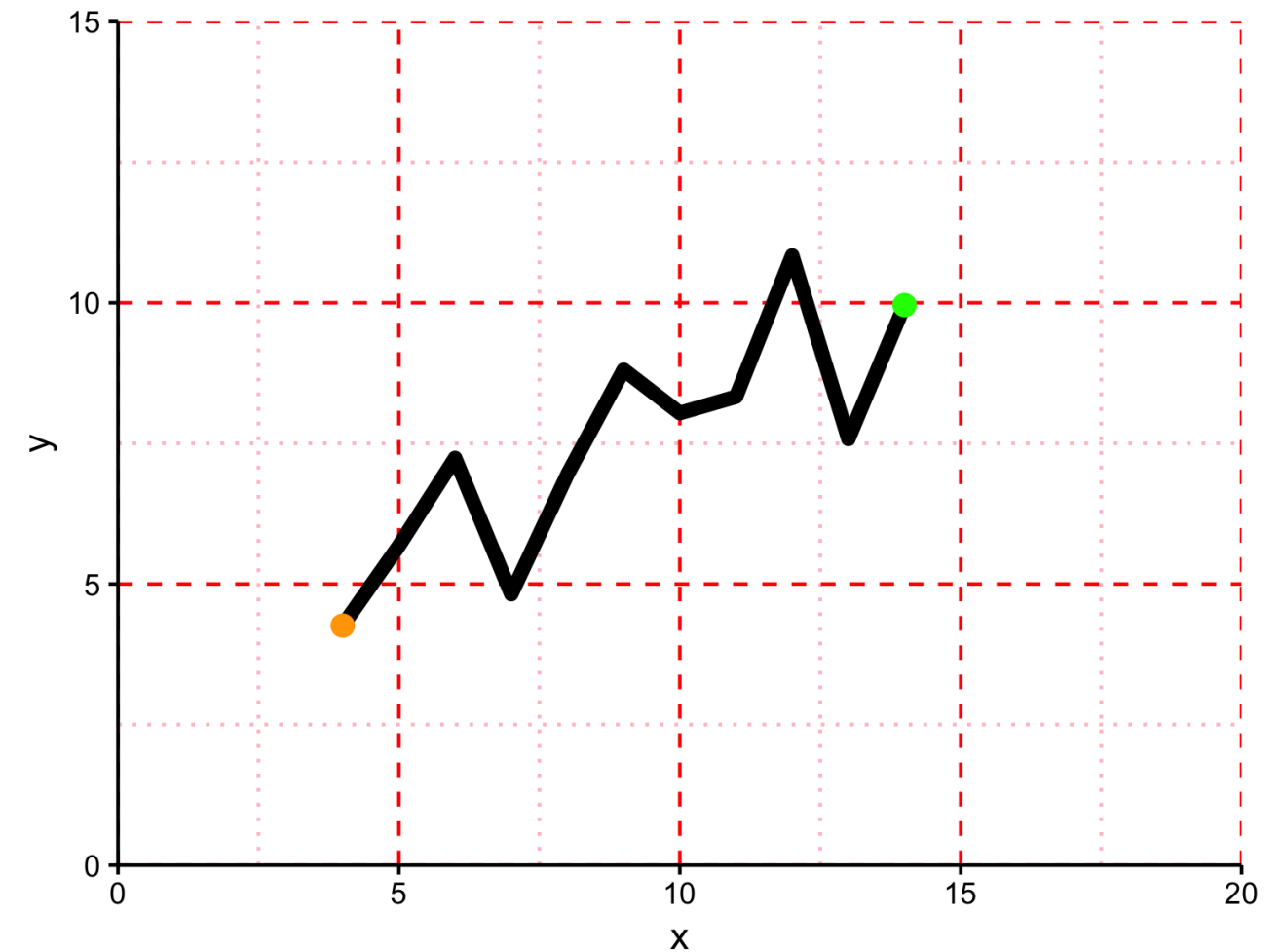
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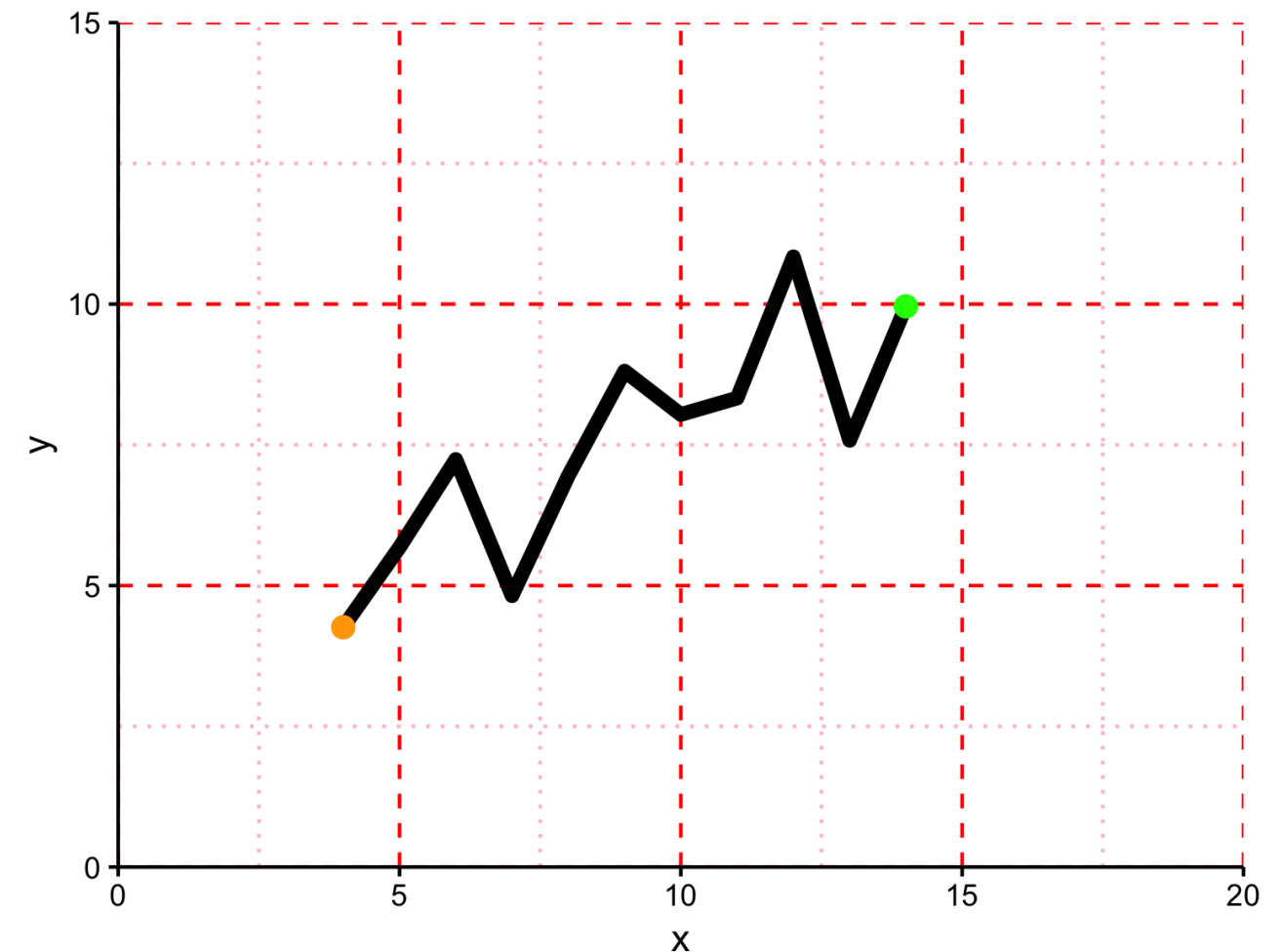
# Projections control perception

- Cartesian (2d)
  - Orthogonal x and y-axes
  - Modify axis limits and aspect ratio



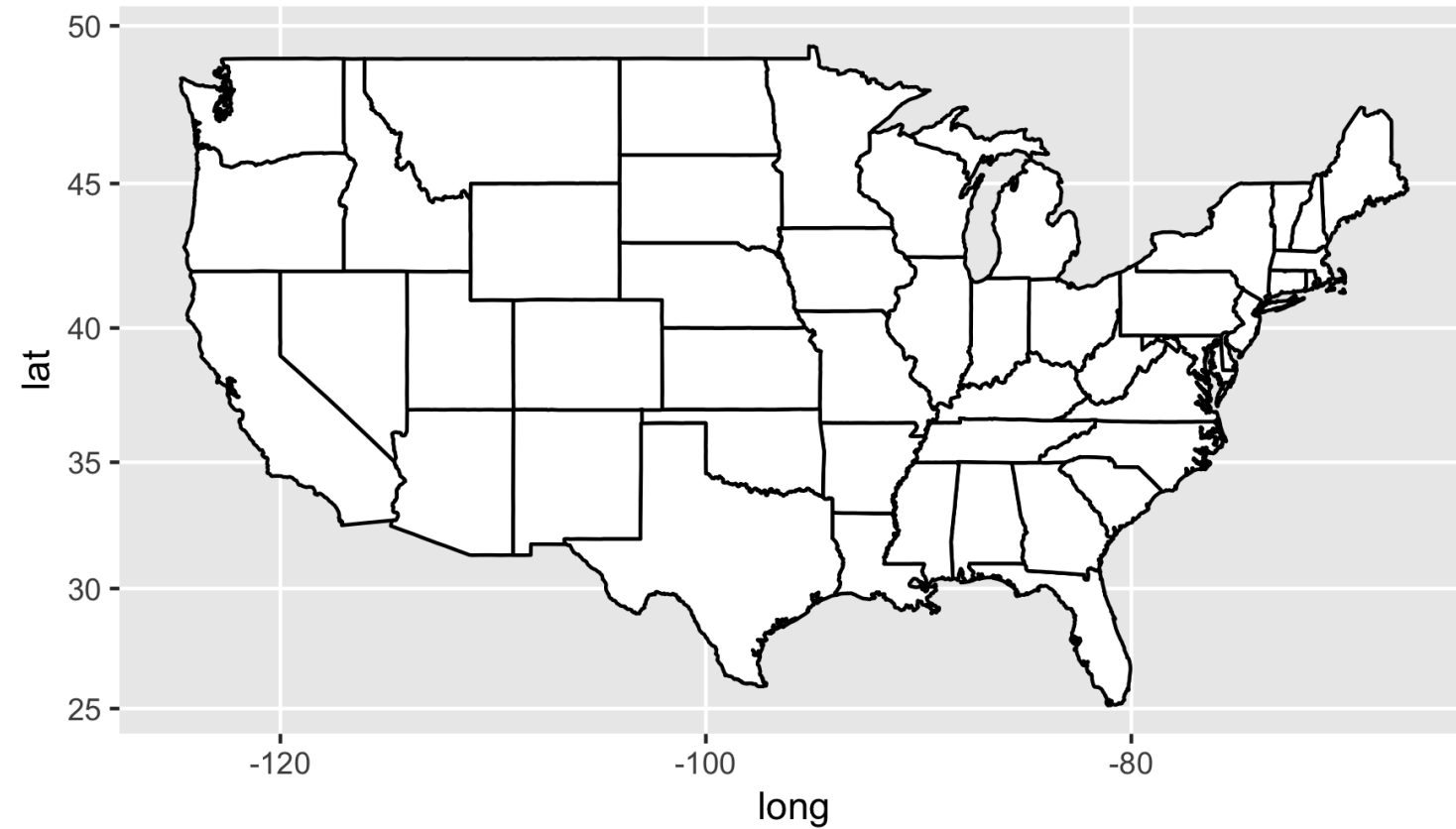
# Projections control perception

- Cartesian (2d)
  - Orthogonal x and y-axes
  - Modify axis limits and aspect ratio
- Maps
  - Many possible projections
  - See next course

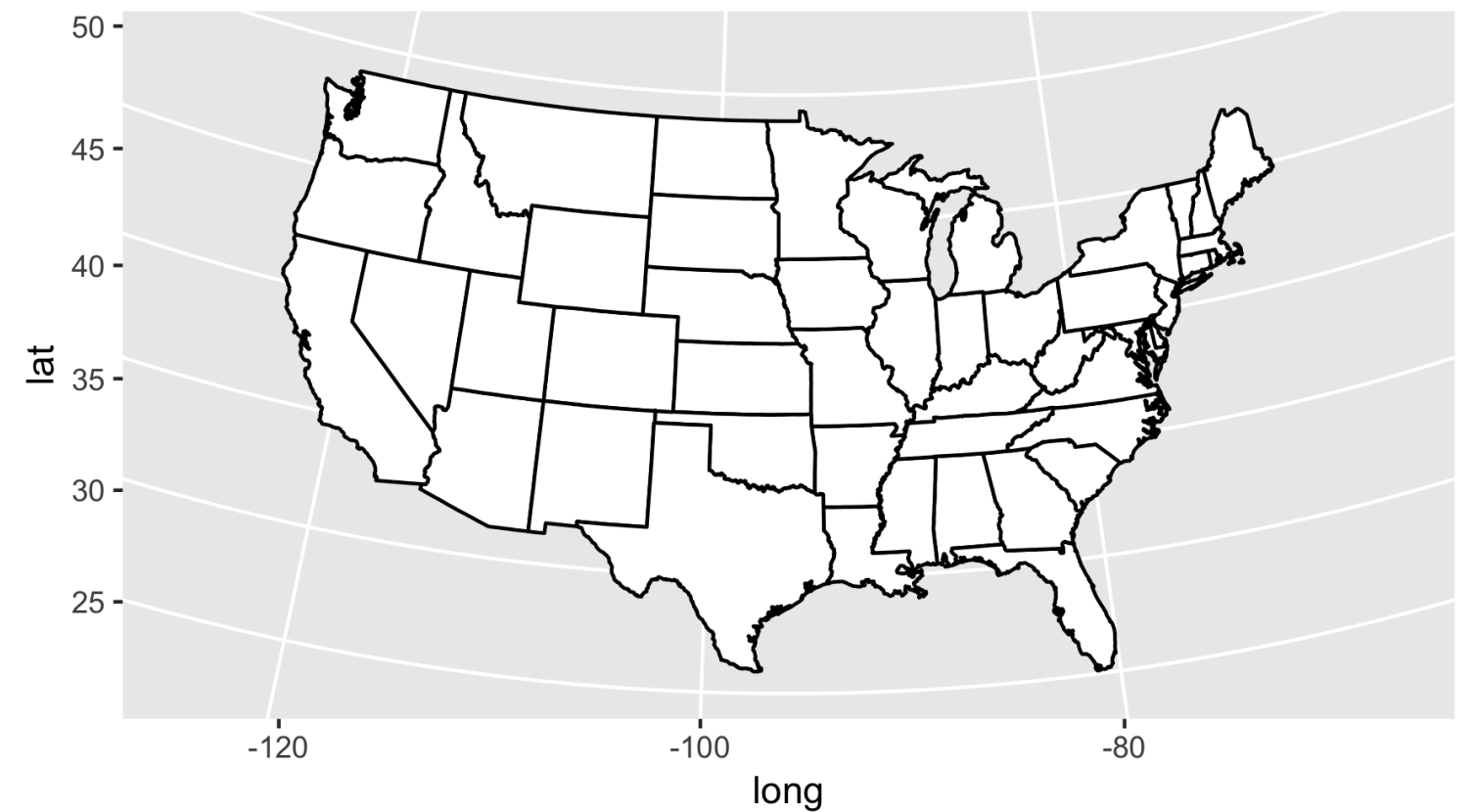


# A preview of map projections

The Mercator Projection



The Conic Projection

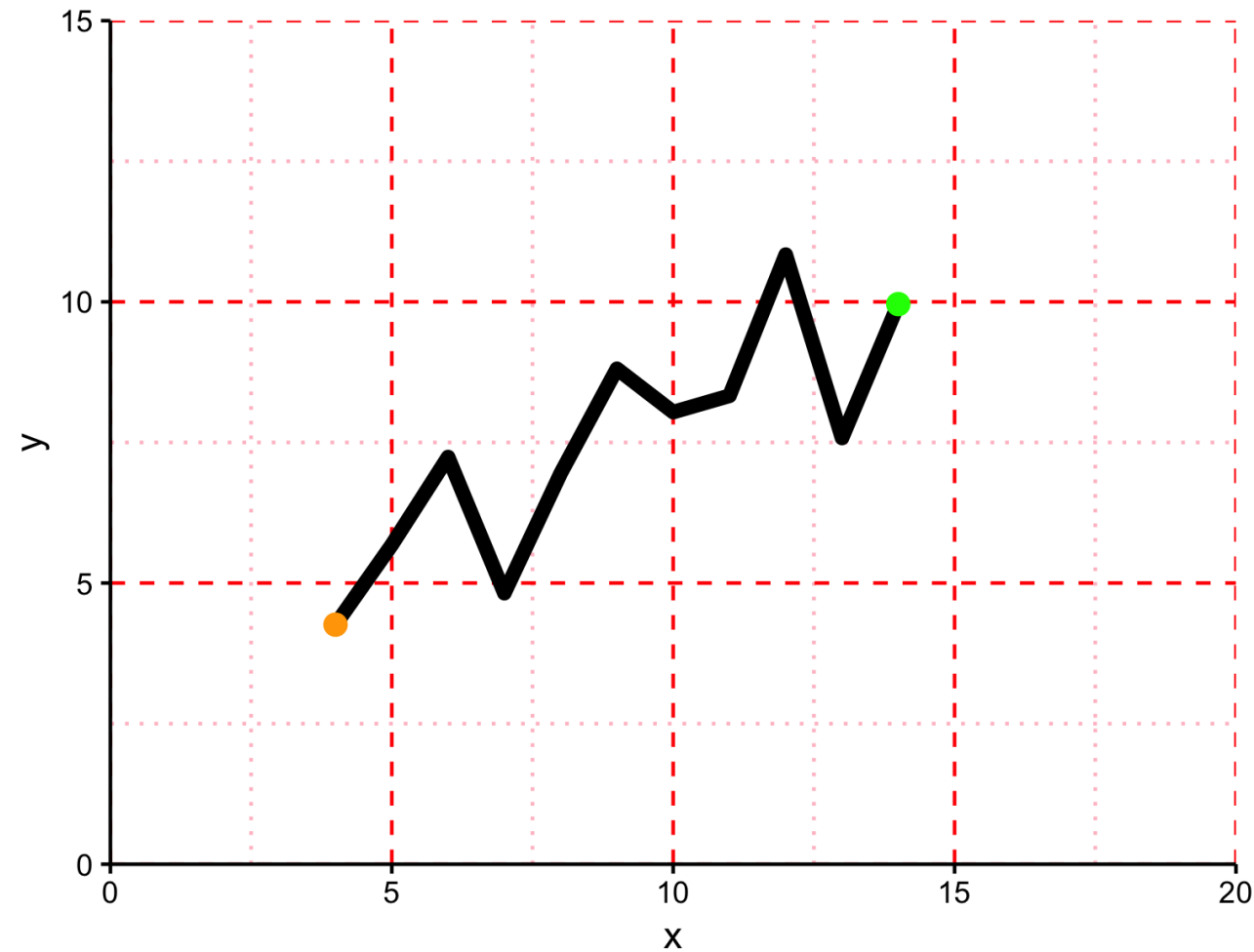


# Polar coordinates

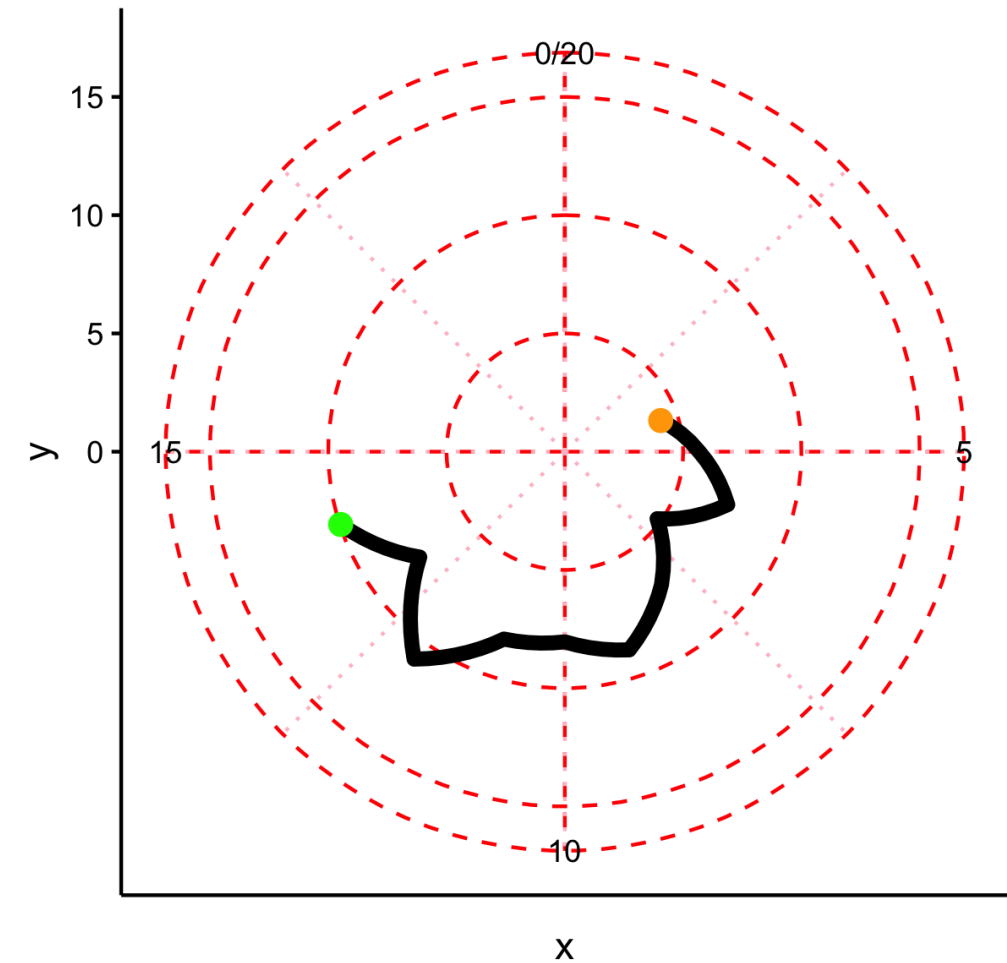
- Cartesian (2d)
  - Orthogonal x and y-axes.
- Maps
  - Many projections, see next course
- Polar
  - Transformed Cartesian space

# coord\_polar()

```
p + coord_fixed()
```

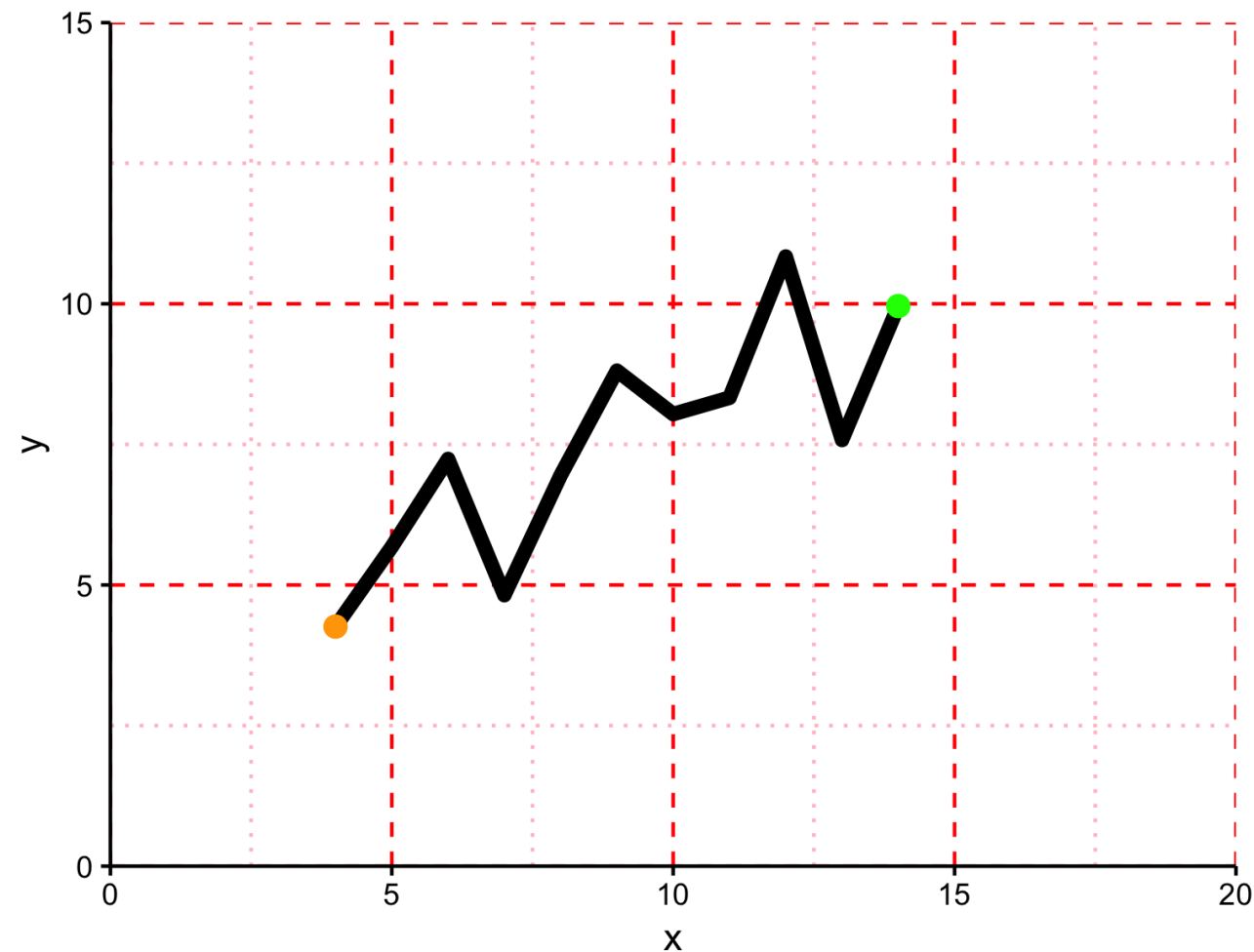


```
p + coord_polar()
```

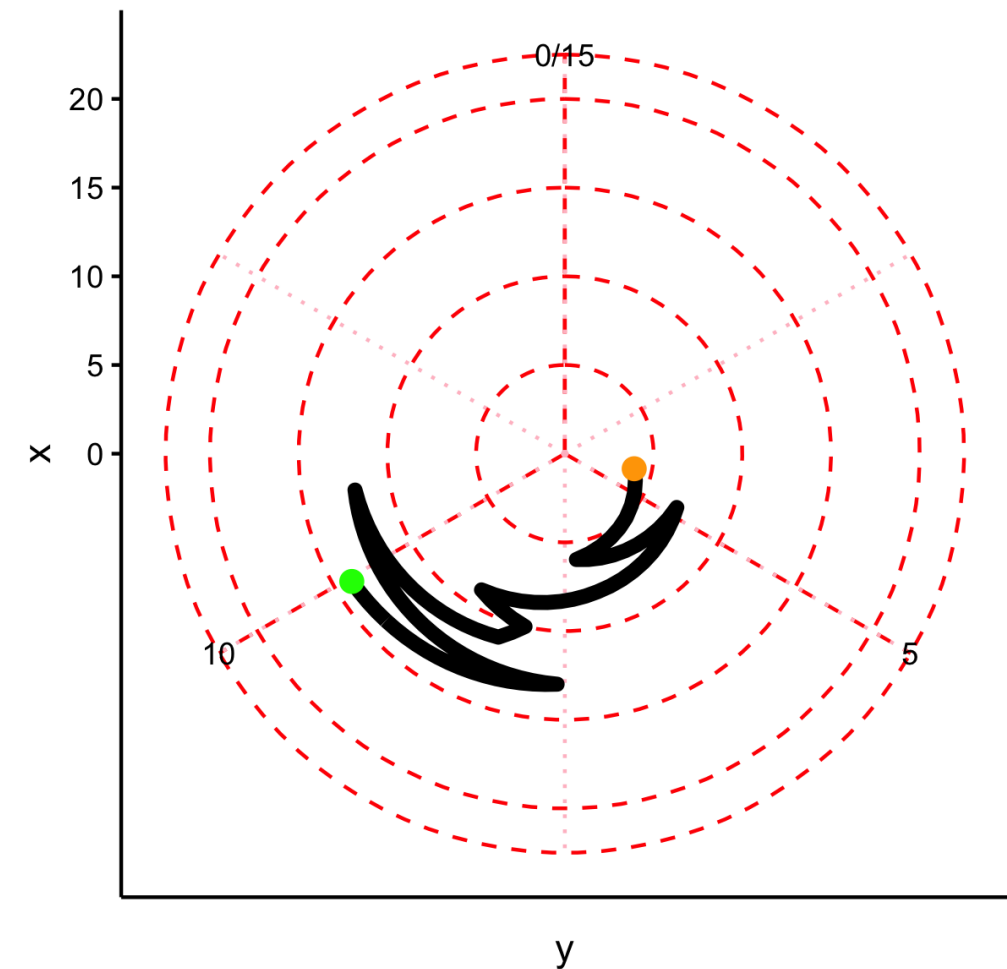


# coord\_polar(theta = "y")

```
p + coord_fixed()
```



```
p + coord_polar(theta = "y")
```



# Let's practice!

INTERMEDIATE DATA VISUALIZATION WITH GGPLOT2