UNIVERSIDADE FEDERAL DE PELOTAS

INSTITUTO DE FÍSICA E MATEMÁTICA – IFM

Introdução ao ggplot2

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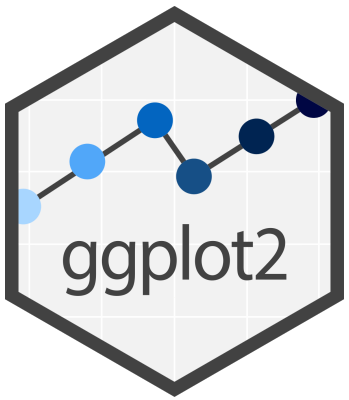
Introdução

O `ggplot2` é um pacote de código aberto para a visualização gráfica de dados para a linguagem de programação R. Foi criada por Hadley Wickham em 2005 (Wickham 2016), sendo uma implementação do livro `Grammar Graphics` de Leland Wilkison também lançado em 2005 (Wilkinson 2011).

Ele aborda que visualização gráfica dos dados pode ser divida em componentes semânticos, como escalas e camadas.



Por que usar o ggplot2?

1. Alta costumização gráfica.
2. Alta diversidade de modelos de gráficos.
3. Integração com outros pacotes do tidyverse, como por exemplo `dplyr` (Wickham et al. 2023), `forcats` (Wickham 2023) e o `plotly` (Sievert 2020).
4. Criação de gráficos a partir de camadas, podendo sobrepor diferentes gráficos.

Como instalar o ggplot2?

```
#instalando pacote ggplot2
install.packages("ggplot2")

#instalando dplyr, forcats e patchwork
install.packages("dplyr")
install.packages("forcats")
install.packages("patchwork")
```

Para usar o ggplot2 em seus scripts tem que carrega-lo

```
#Carregando o pacote ggplot2
library(ggplot2)

#Carregando dplyr, forcats e patchwork
library(dplyr)
library(forcats)
library(patchwork)
```

Banco de dados *iris*

Para essa oficina será utilizado bancos de dados **iris**.

iris - é referente tamanho de pételas e sepalas de 3 espécies do gênero *Iris* do trabalho de Fisher em 1936 (*Iris setosa*,*Iris versicolor* e *Iris virginica*)

```
data(iris)
```

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa

Box-plot

```
iris%>%ggplot(aes(x=Species, y=Petal.Length))+
  geom_boxplot()
```

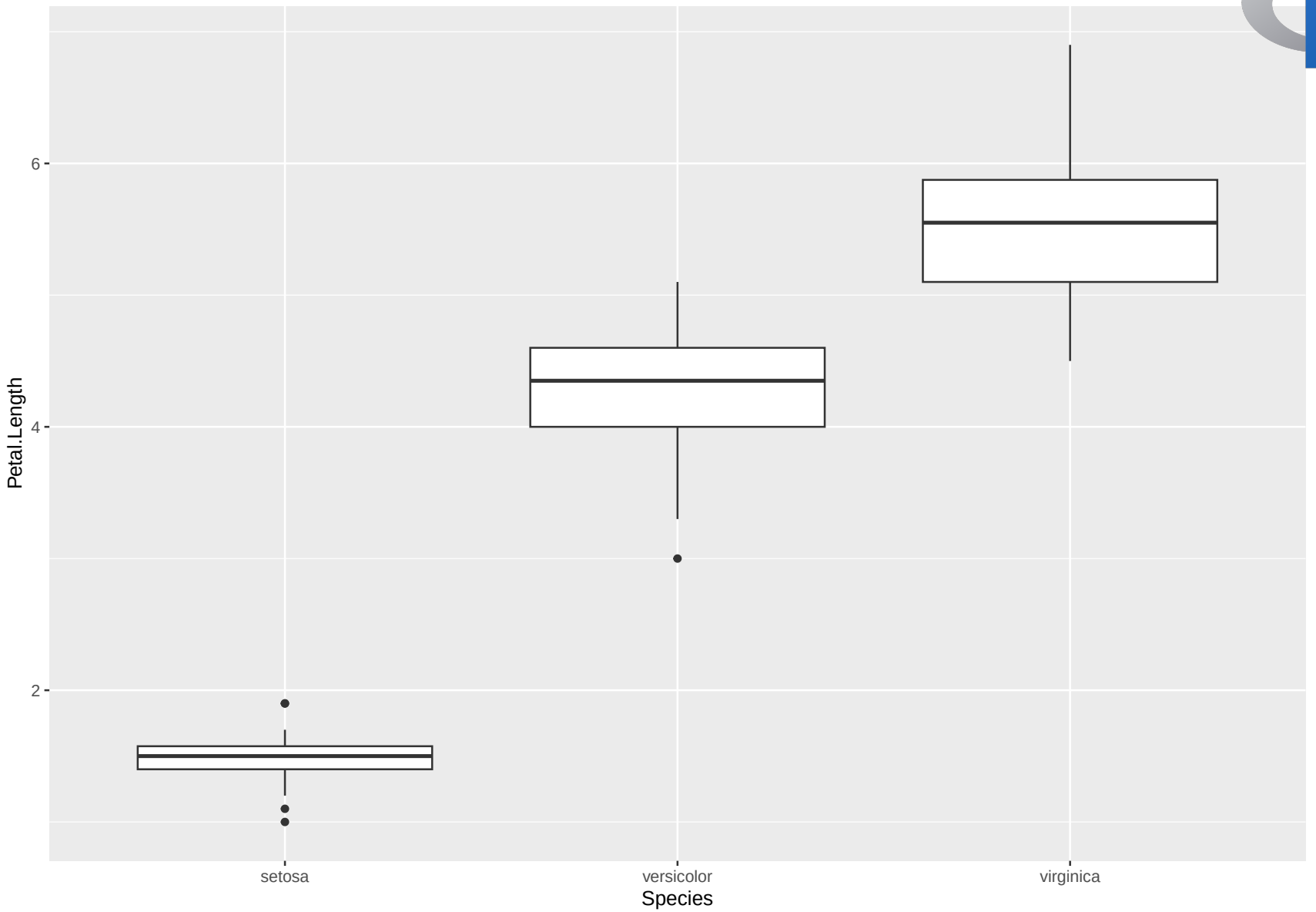
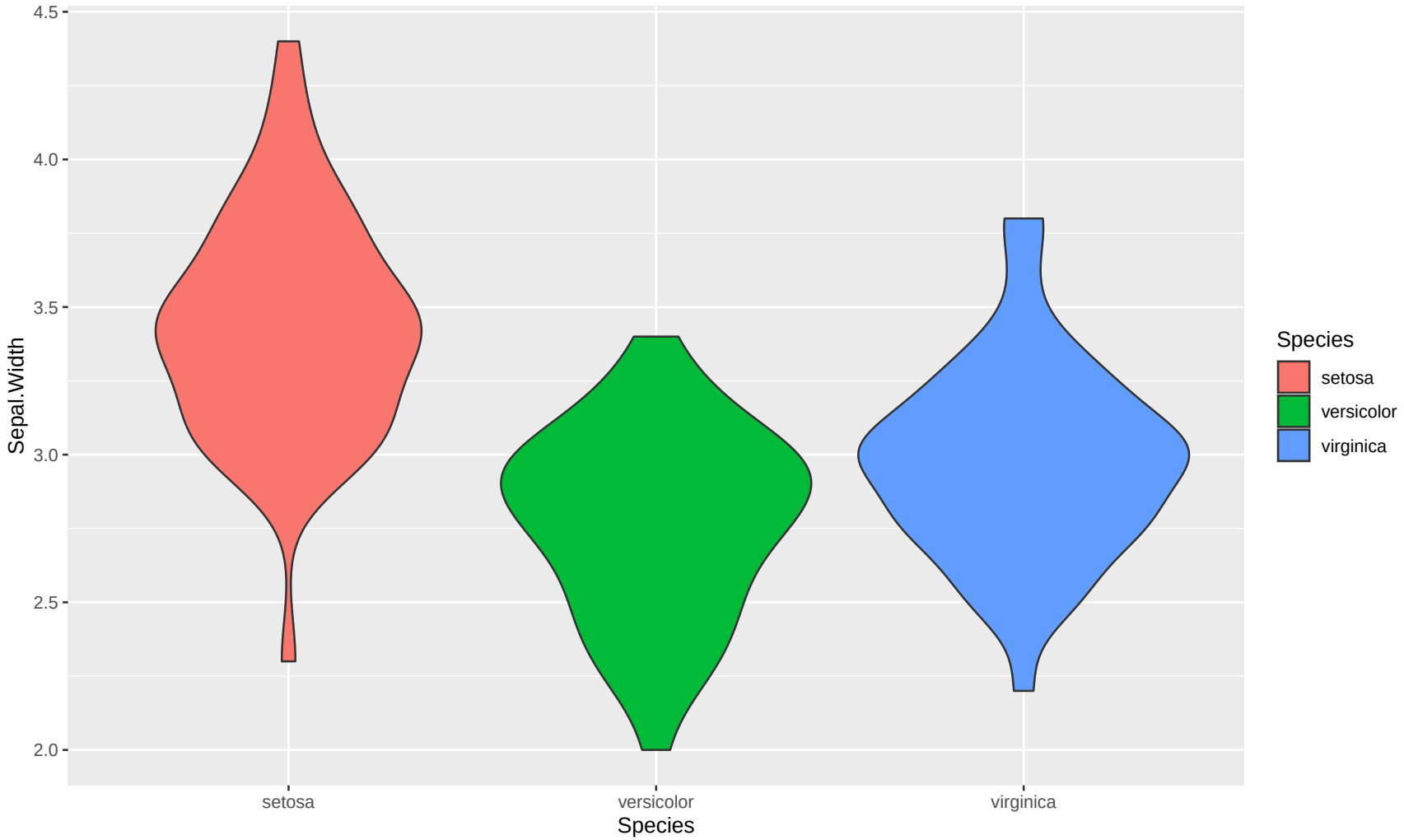

Petal.Length
6
4
2
setosa
versicolor
virginica
Species

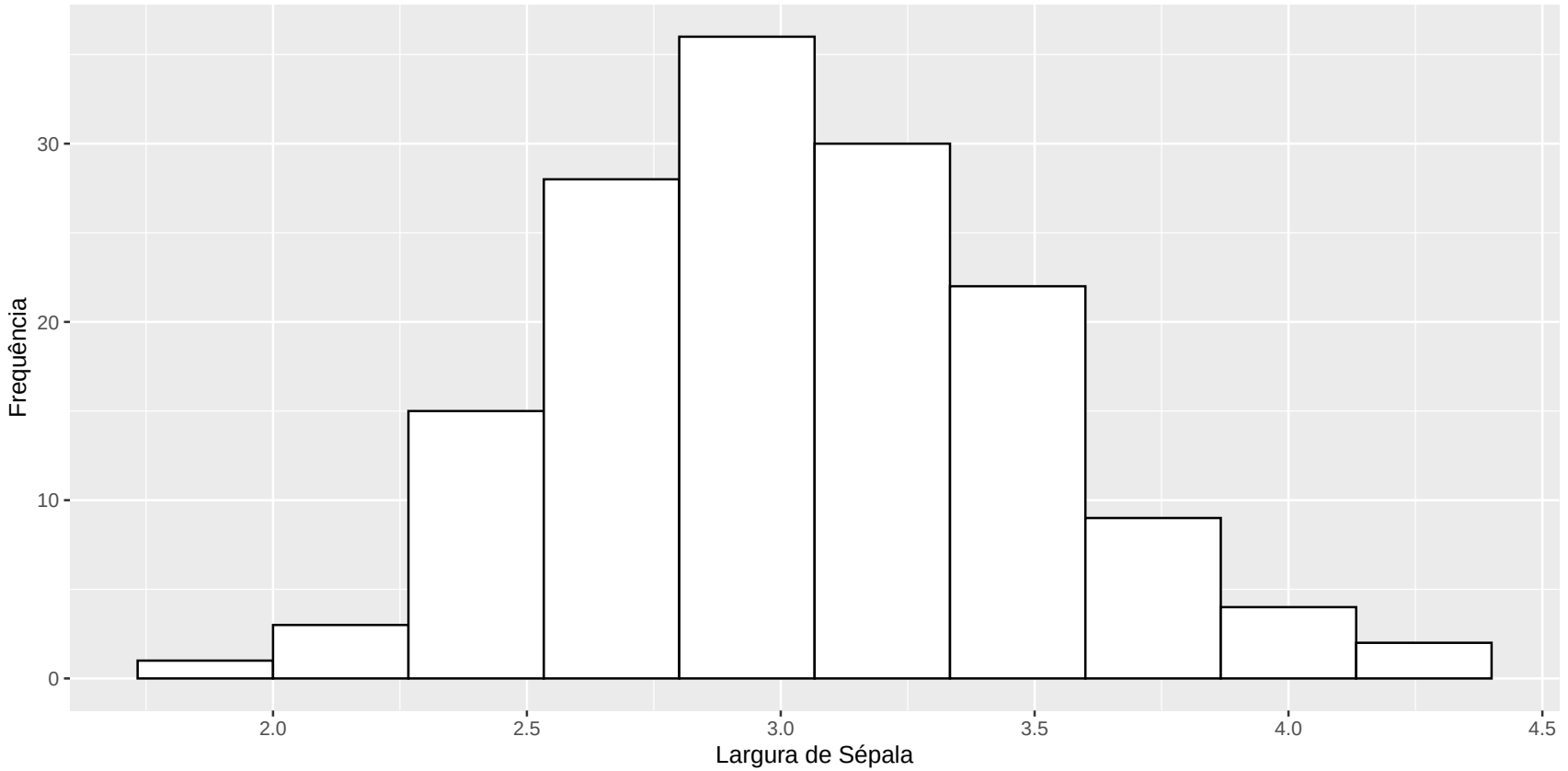
Gráfico violino

```
ggplot(iris, aes(x=Species,y=Sepal.Width, fill=Species))+
  geom_violin()
```

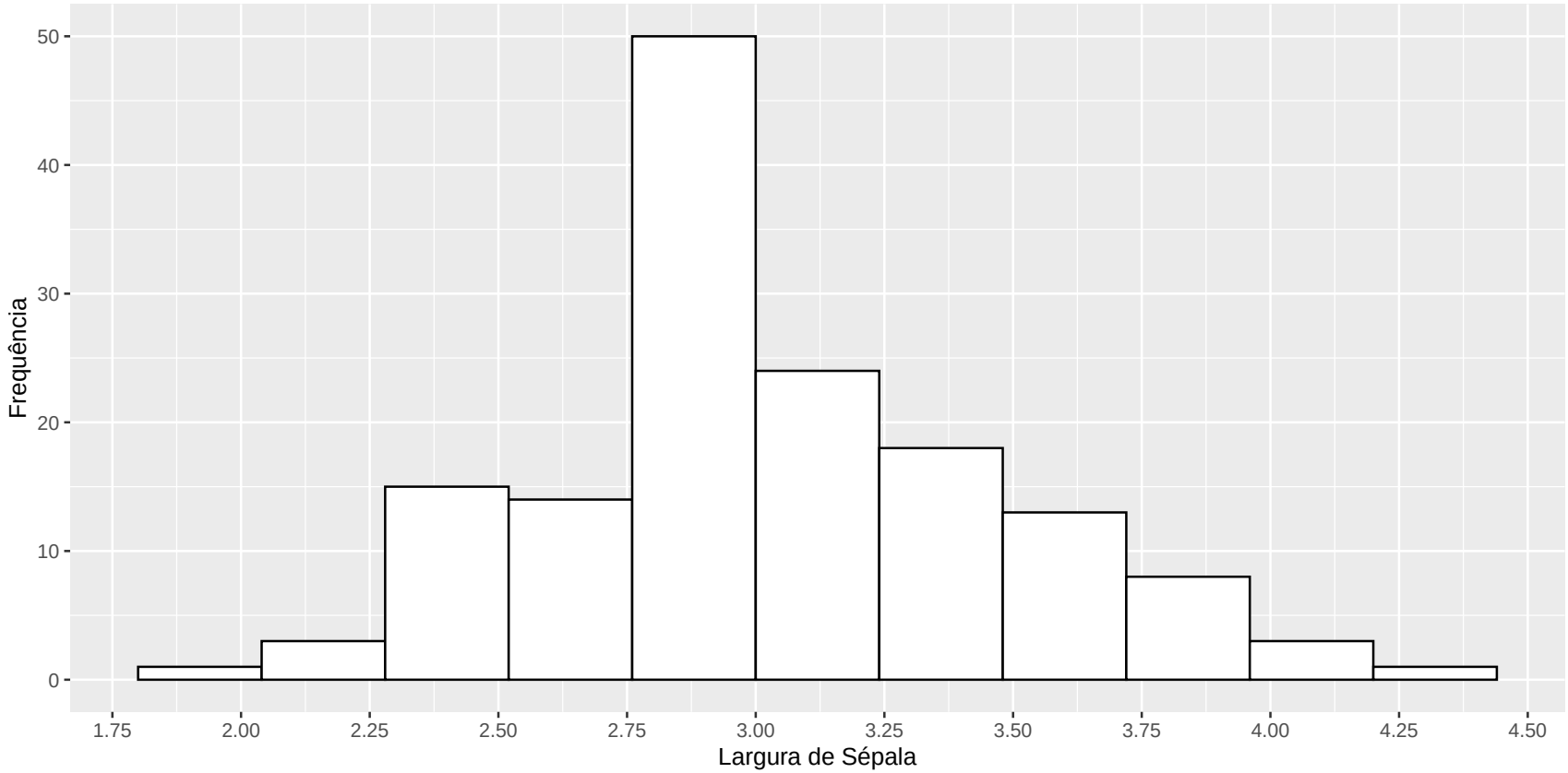


Histograma

```
ggplot(iris,aes(x=Sepal.Width))+
  geom_histogram(bins=10, color="black",
                 fill="white")+
  labs(y="Frequência", x="Largura de Sépala")
```

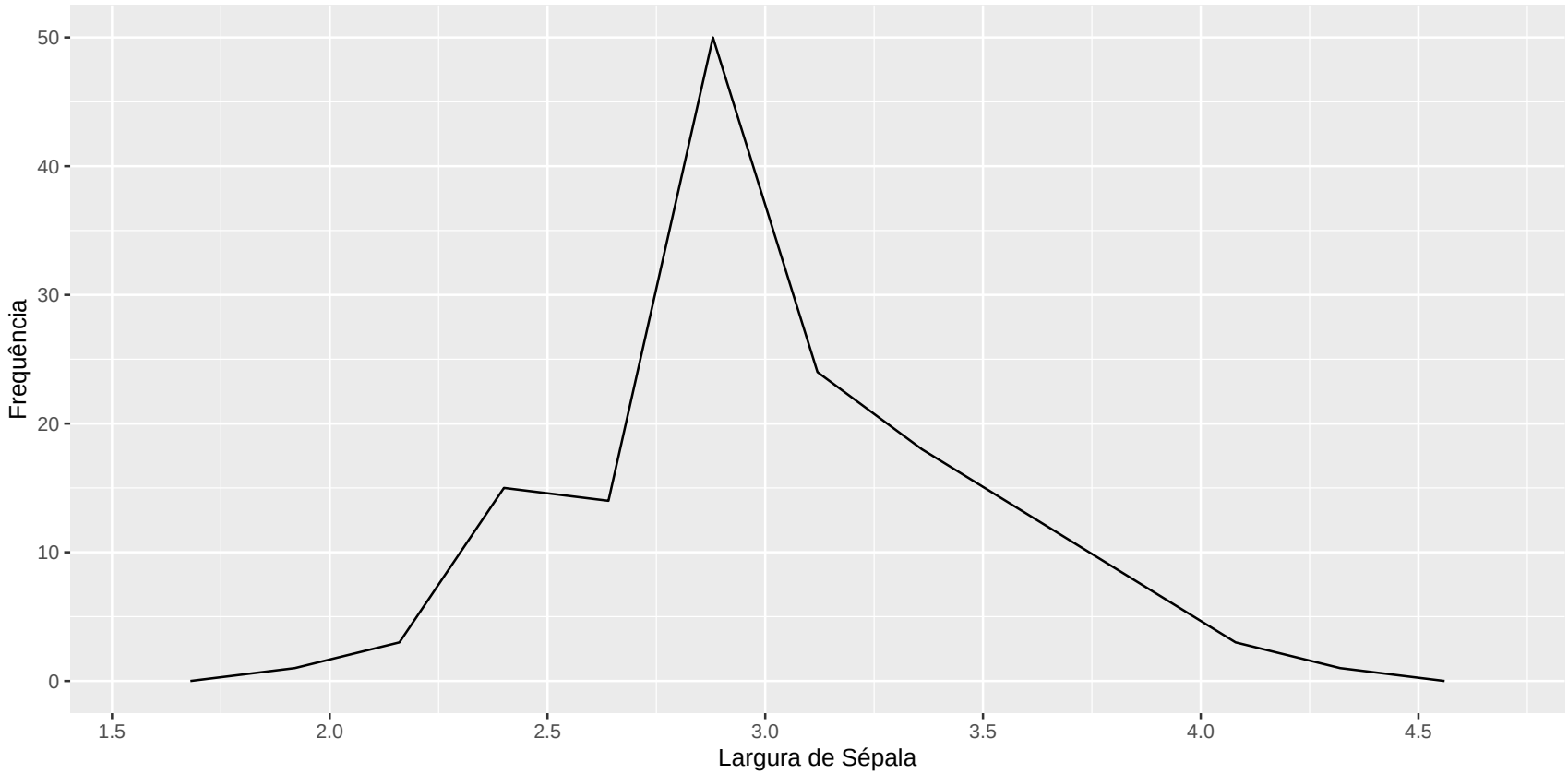


```
ggplot(iris,aes(x=Sepal.Width))+
  geom_histogram(bins=11, color="black",
                 fill="white")+
  labs(y="Frequência", x="Largura de Sépala")+
  scale_x_continuous(n.breaks = 11)
```

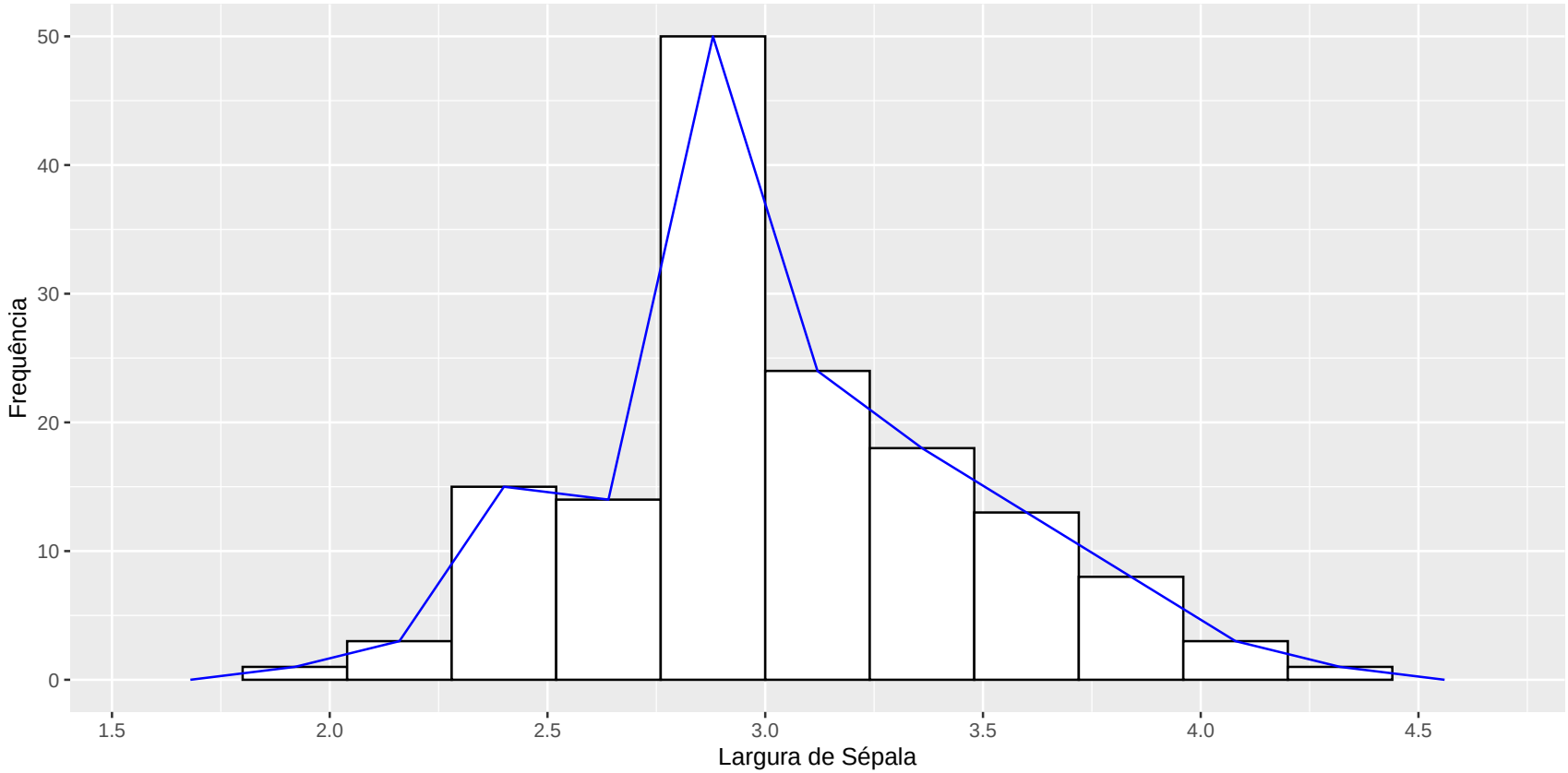


Polígono

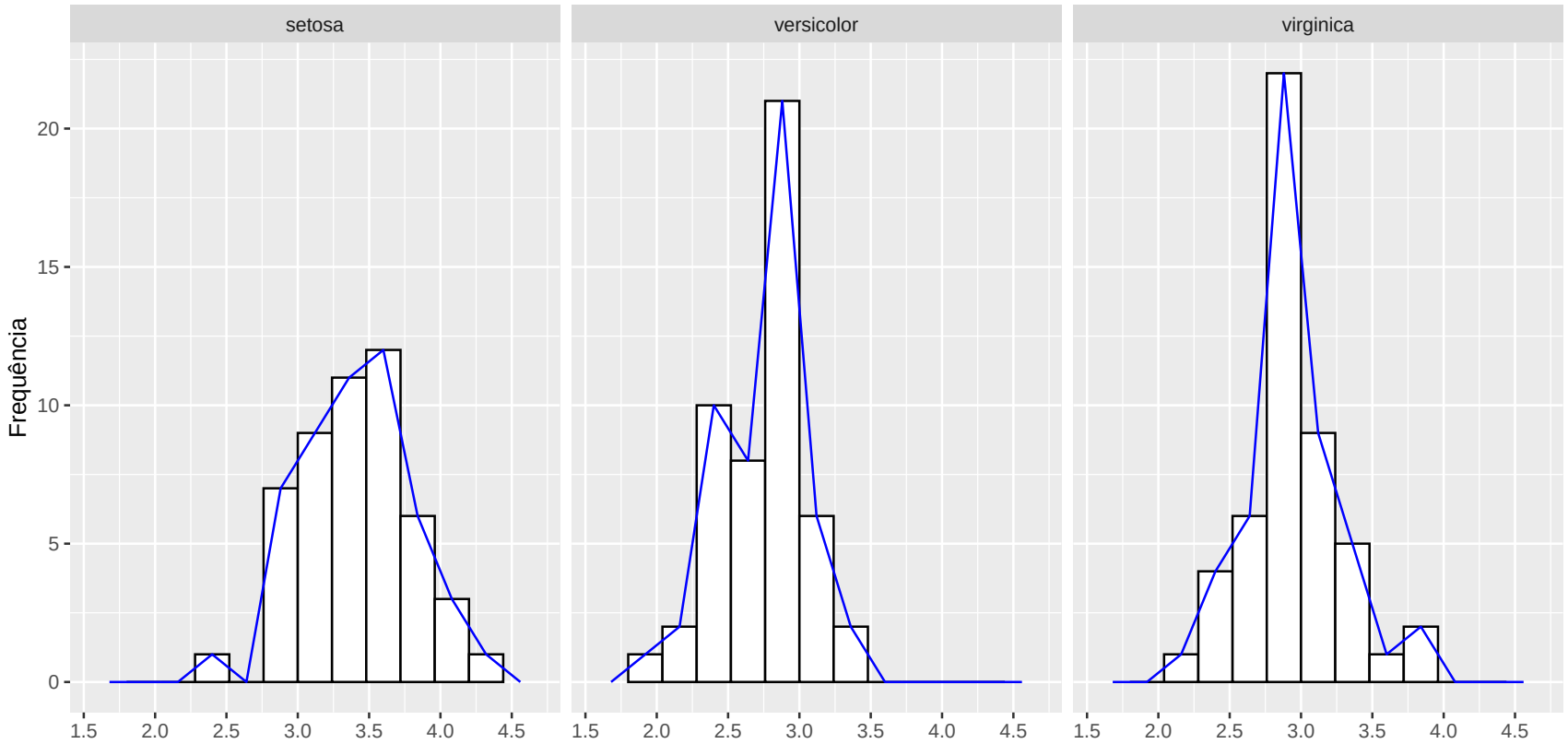
```
ggplot(iris,aes(x=Sepal.Width))+
  geom_freqpoly(bins=11, color="black")+
  labs(y="Frequência", x="Largura de Sépala")+
  scale_x_continuous(n.breaks = 11)
```



```
ggplot(iris,aes(x=Sepal.Width))+
  labs(y="Frequência", x="Largura de Sépala")+
  scale_x_continuous(n.breaks = 11)+
  geom_histogram(bins=11, color="black",
                 fill="white")+
  geom_freqpoly(bins=11, color="blue")
```



```
ggplot(iris,aes(x=Sepal.Width))+
  labs(y="Frequência", x="Largura de Sépala")+
  scale_x_continuous(n.breaks = 11)+
  geom_histogram(bins=11, color="black",
                 fill="white")+
  geom_freqpoly(bins=11, color="blue")+
  facet_grid(~Species)
```



```
ggplot(iris,aes(x=Sepal.Width))+
  labs(y="Frequência", x="Largura de Sépala")+
  scale_x_continuous(n.breaks = 11)+
  geom_histogram(bins=11, color="black",
                 fill="white")+
  geom_freqpoly(bins=11, color="blue")+
  facet_grid(Species~.)
```

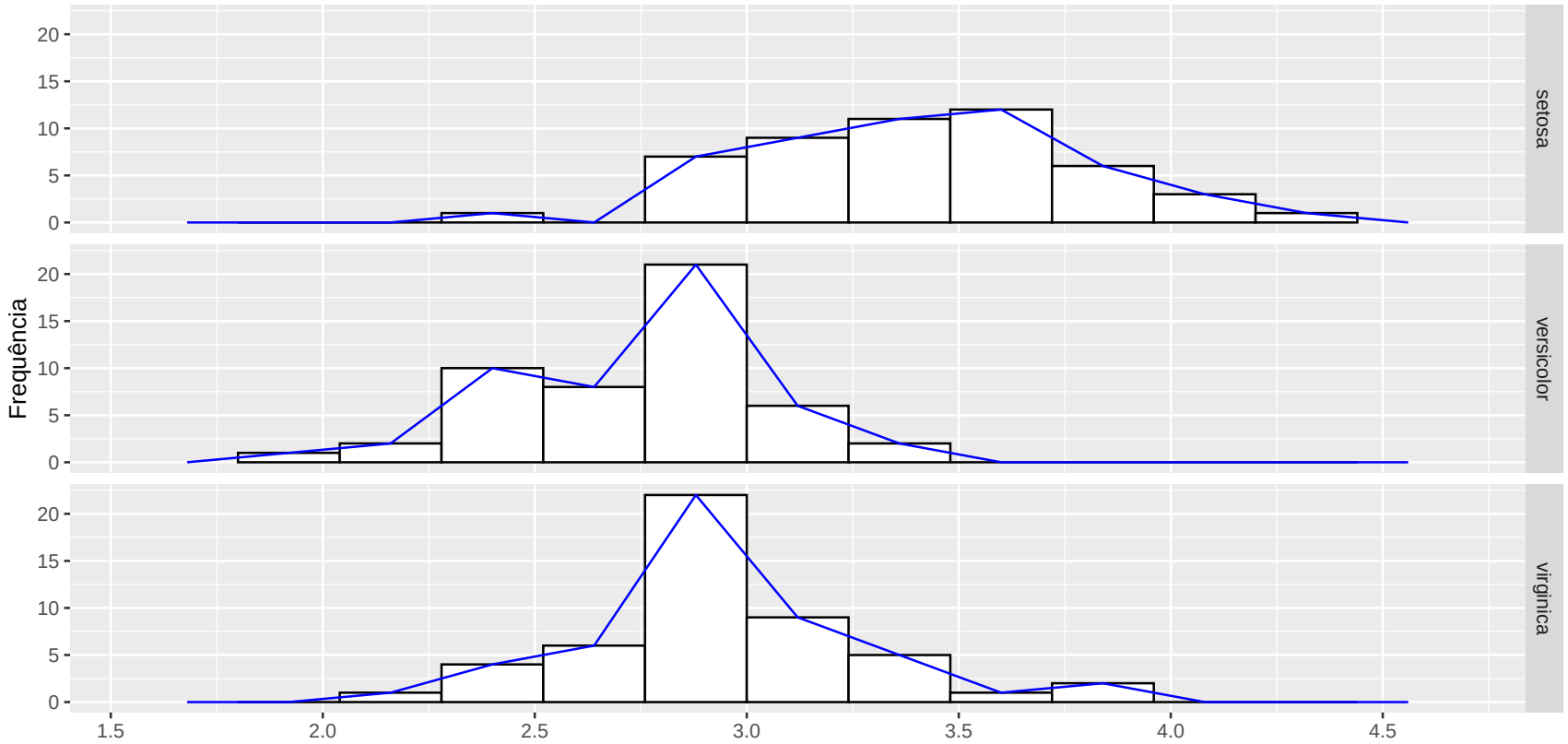


Gráfico de densidade

```
ggplot(iris,aes(x=Sepal.Width))+
  geom_density(color="black", fill="white")+
  labs(y="Frequência", x="Largura de Sépala")
```

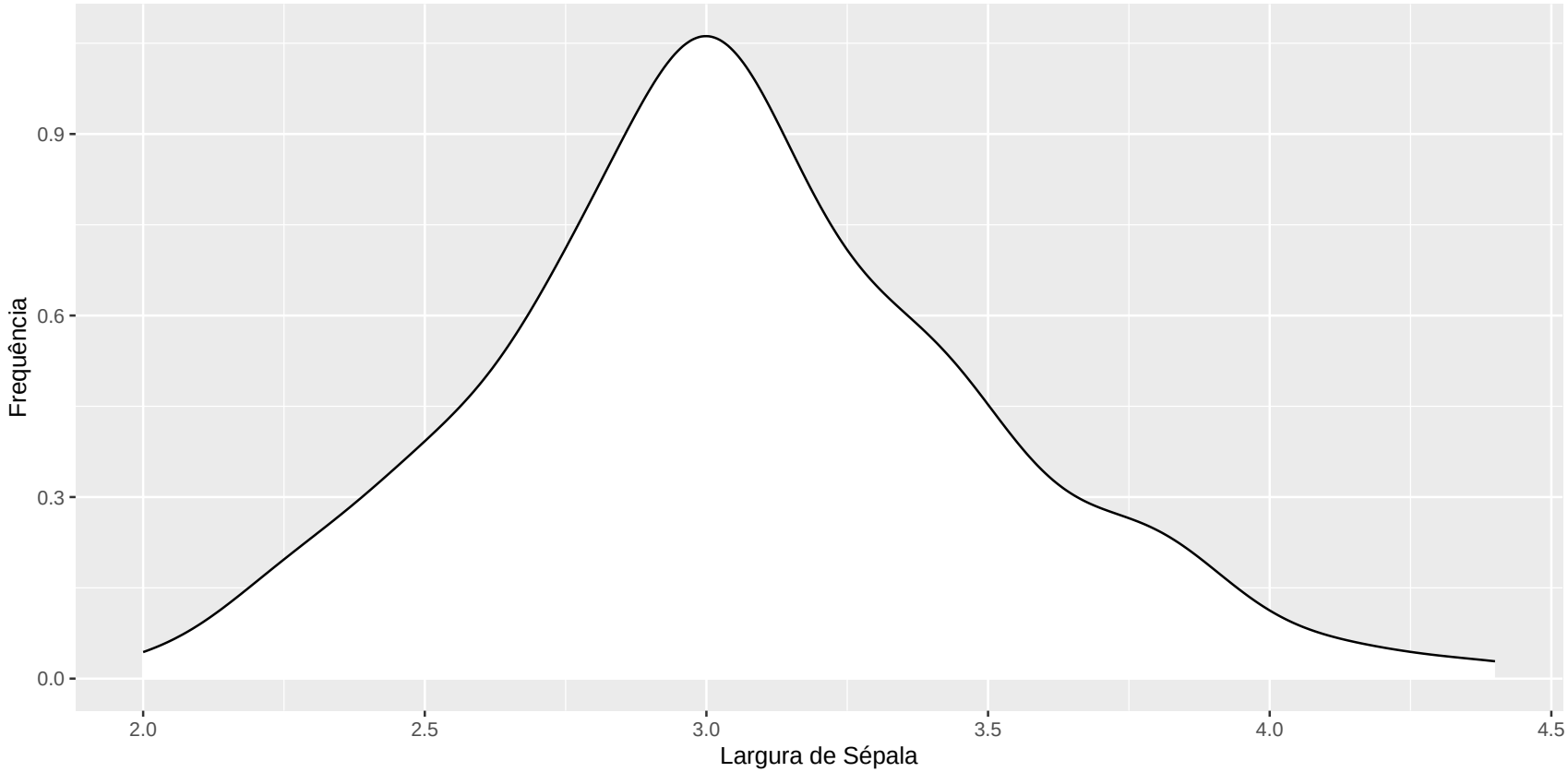
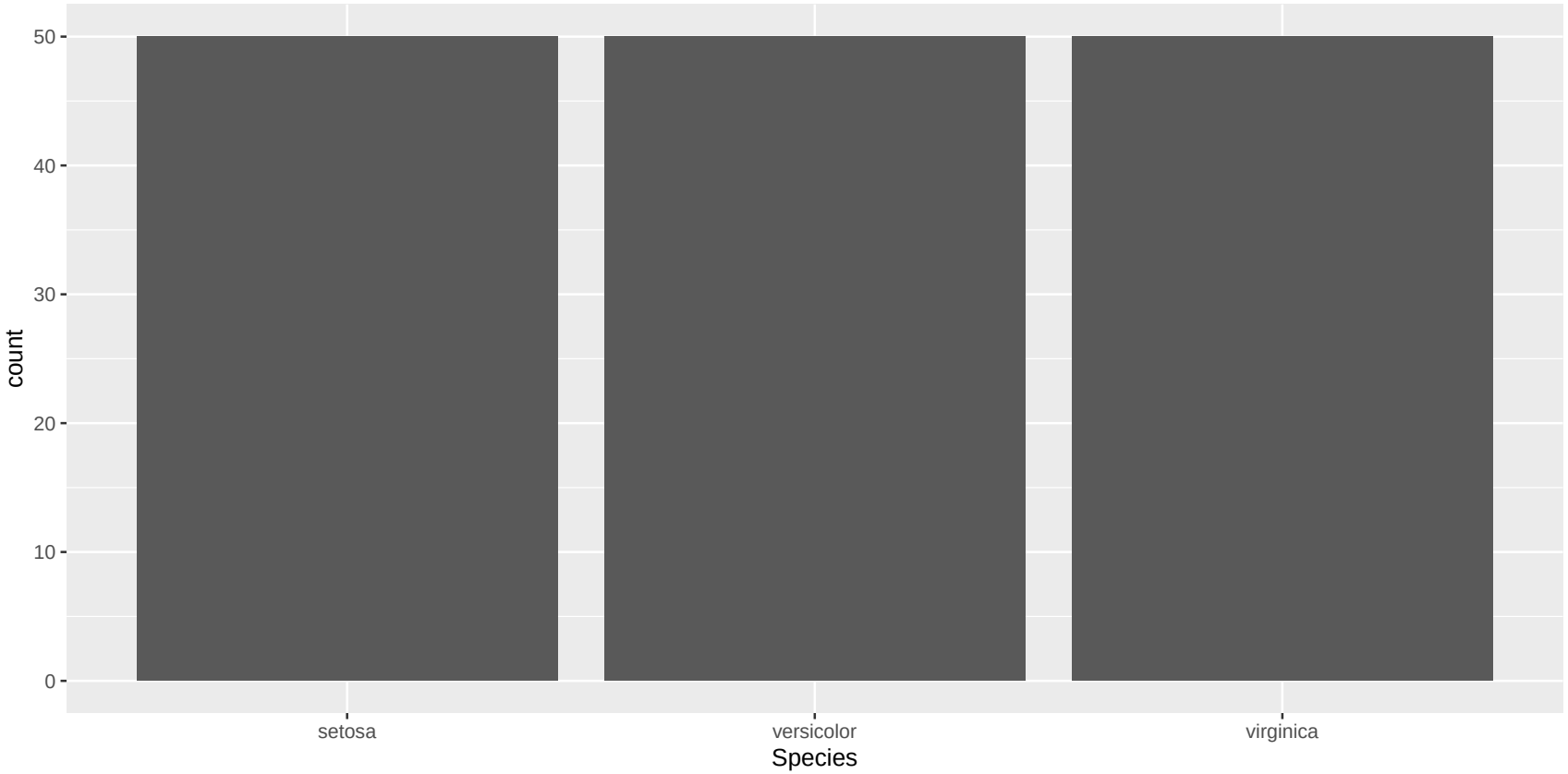


Gráfico de barras de frequência

```
iris%>%ggplot(aes(x=Species))+
  geom_bar()
```



```
iris%>%group_by(Species)%>%
  summarise(count=n())%>%
  ggplot(aes(x=Species, fill=Species, y=count))+
  geom_col(color="black")
```

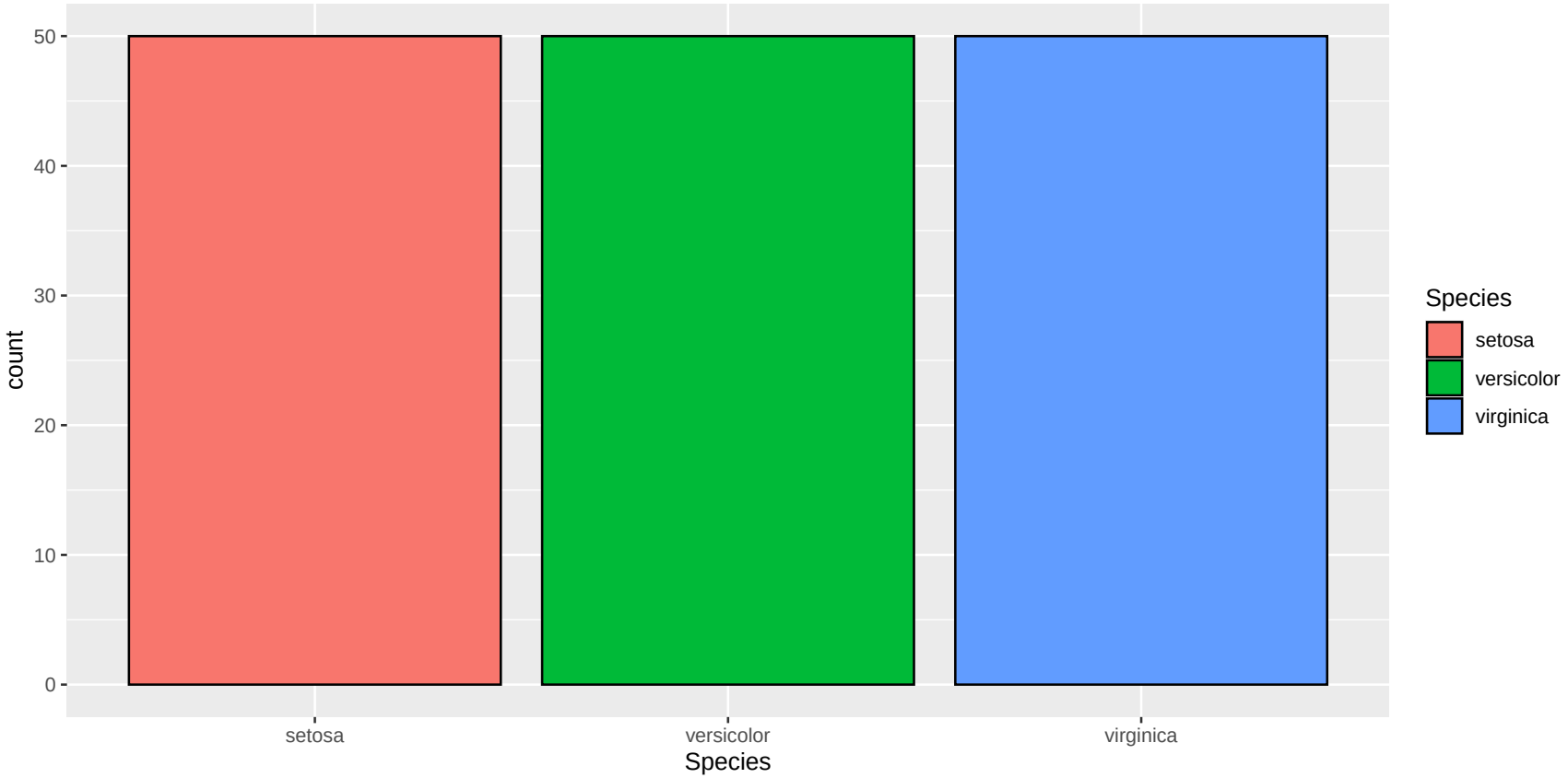
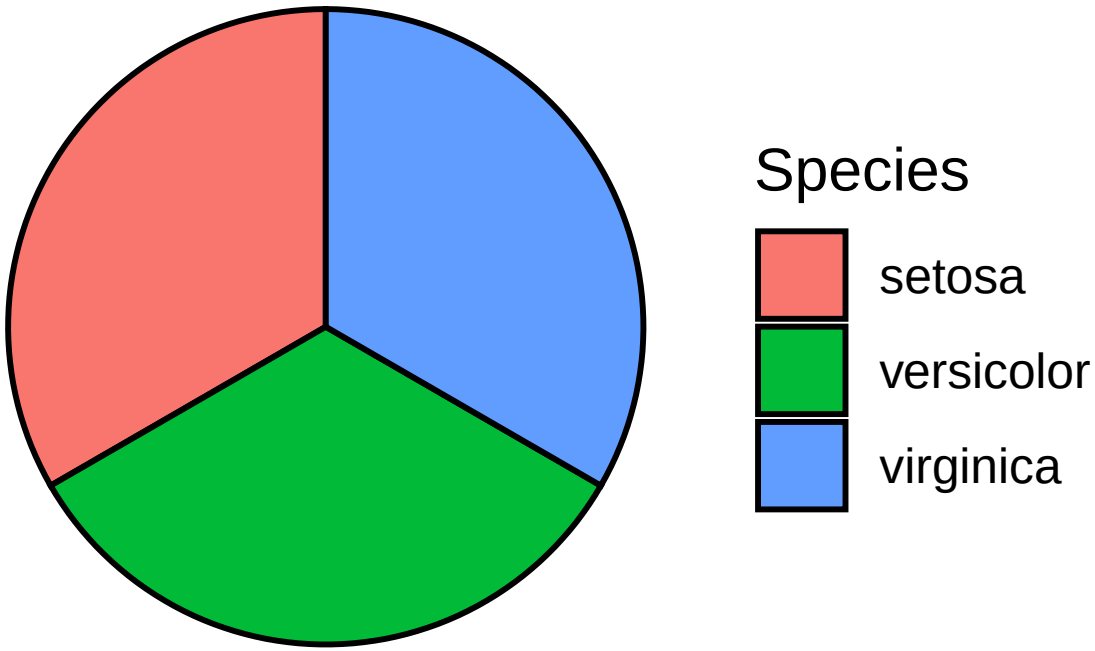


Gráfico de pizza

```
iris%>%group_by(Species)%>%
  summarise(count=n()/150*100)%>%
  ggplot(aes(x=" ", fill=Species, y=count))+
  geom_col(color="black")+
  coord_polar(theta="y")+
  theme_void()
```



```
iris%>%group_by(Species)%>%
  summarise(count=round(n()/150*100, 2))%>%
  ggplot(aes(x=" ", fill=Species, y=count))+
  geom_col(color="black")+
  coord_polar(theta="y")+
  geom_label(aes(label = count),
             position = position_stack(vjust = 0.5),
             show.legend = FALSE)+
  theme_void()
```

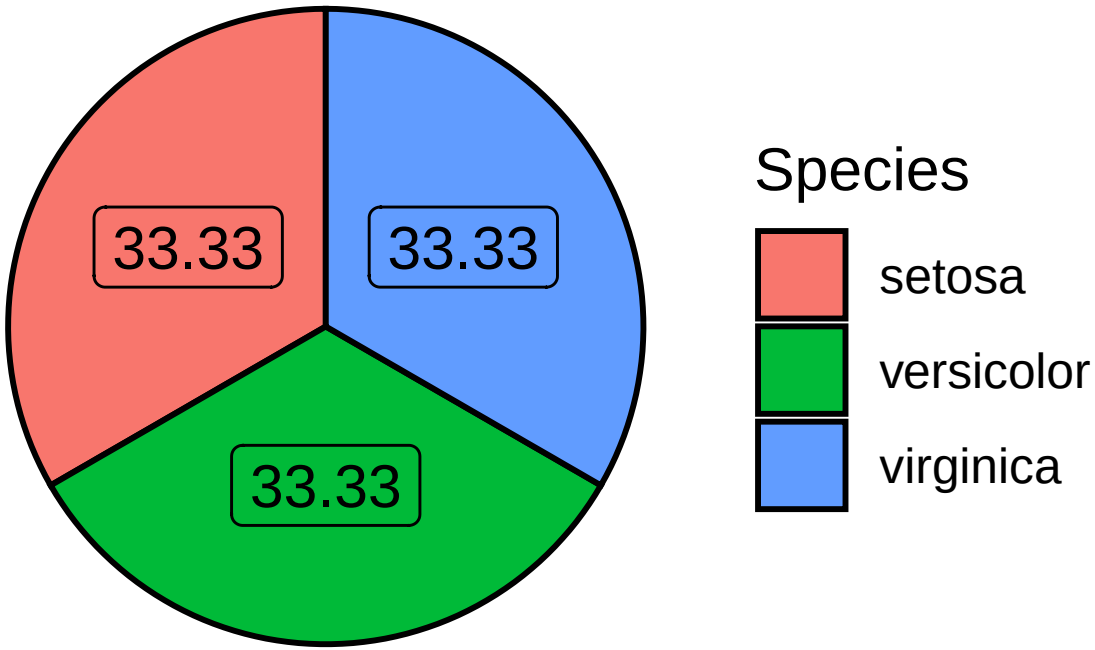
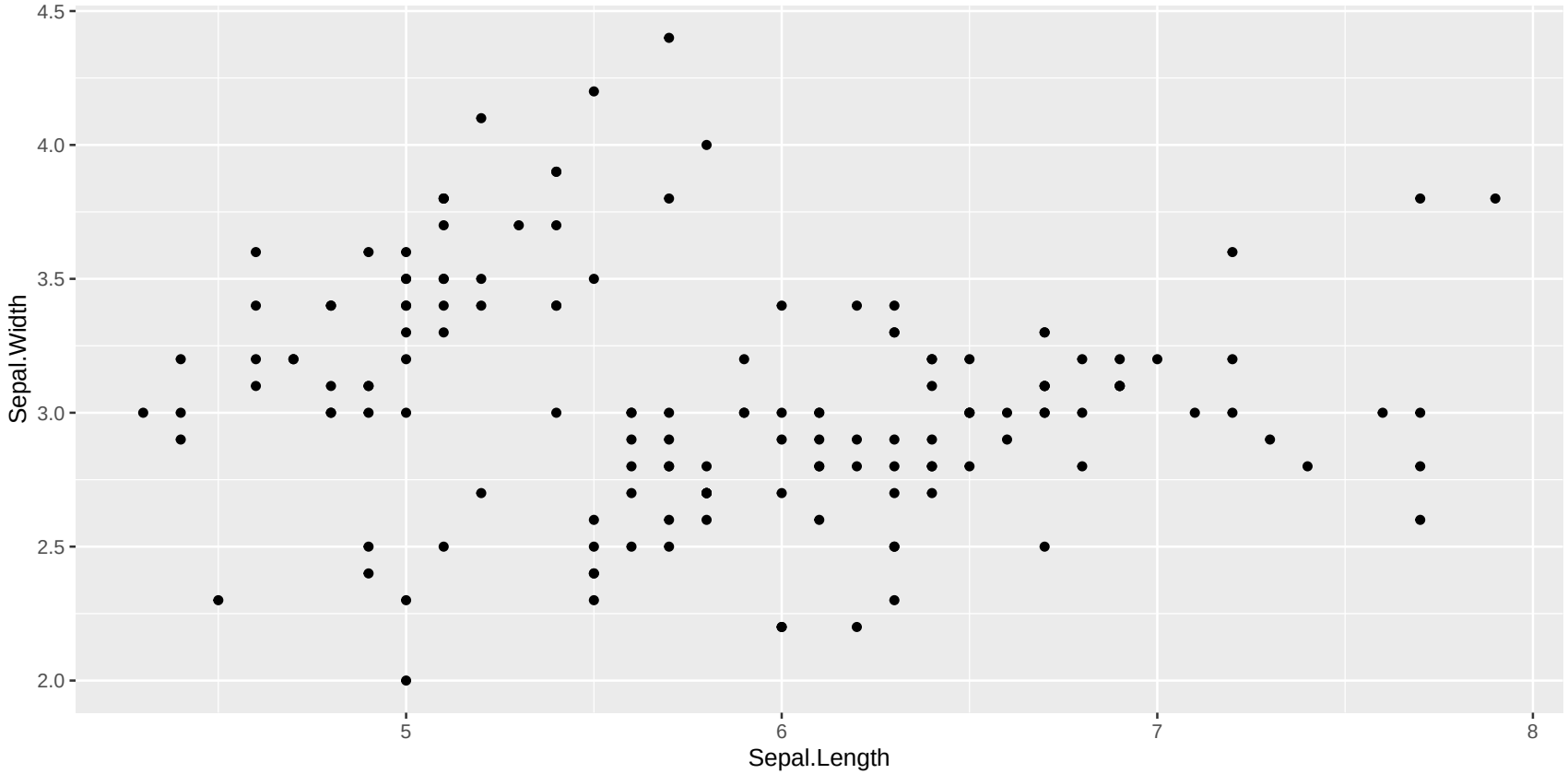
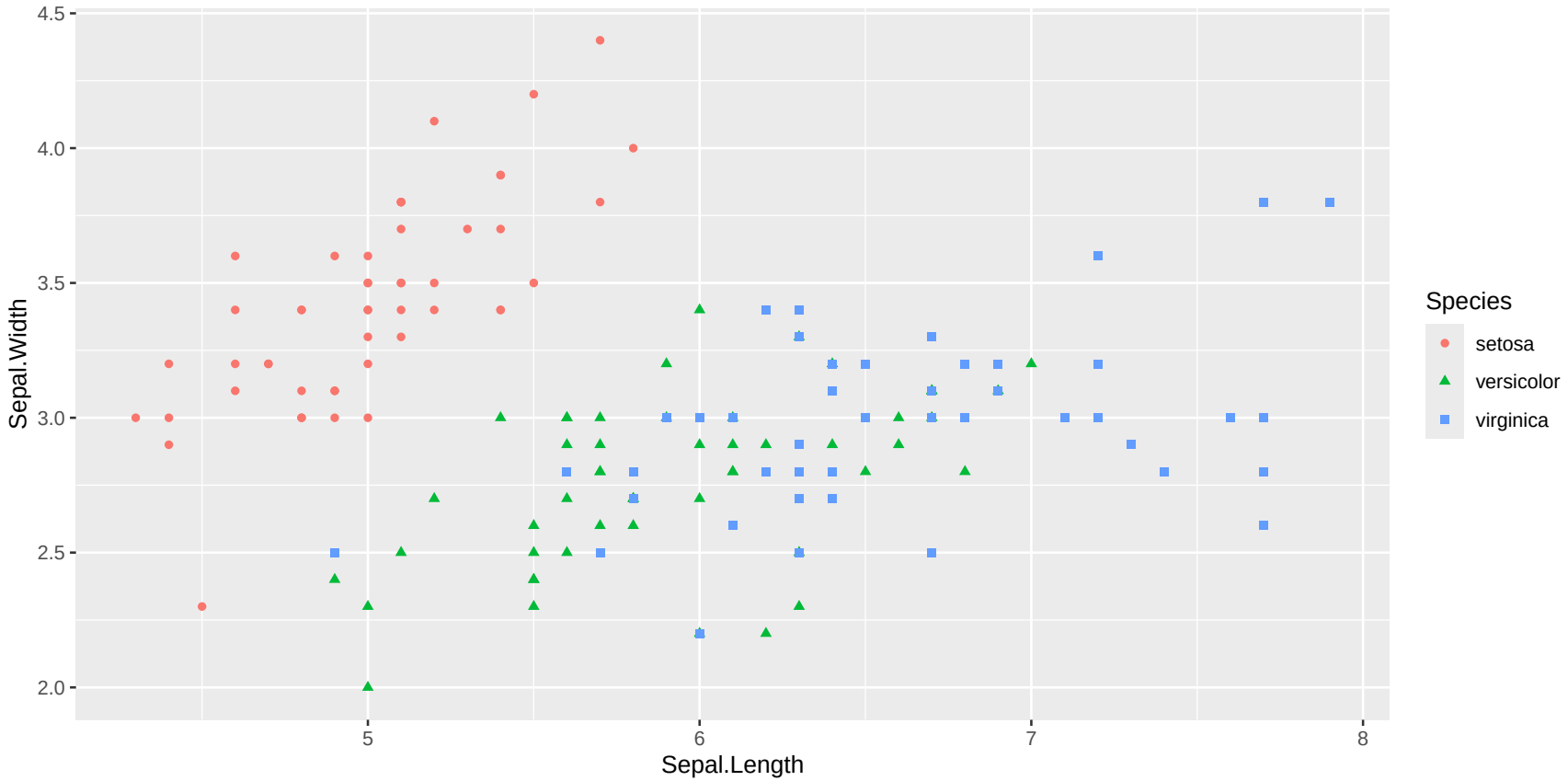


Gráfico de pontos

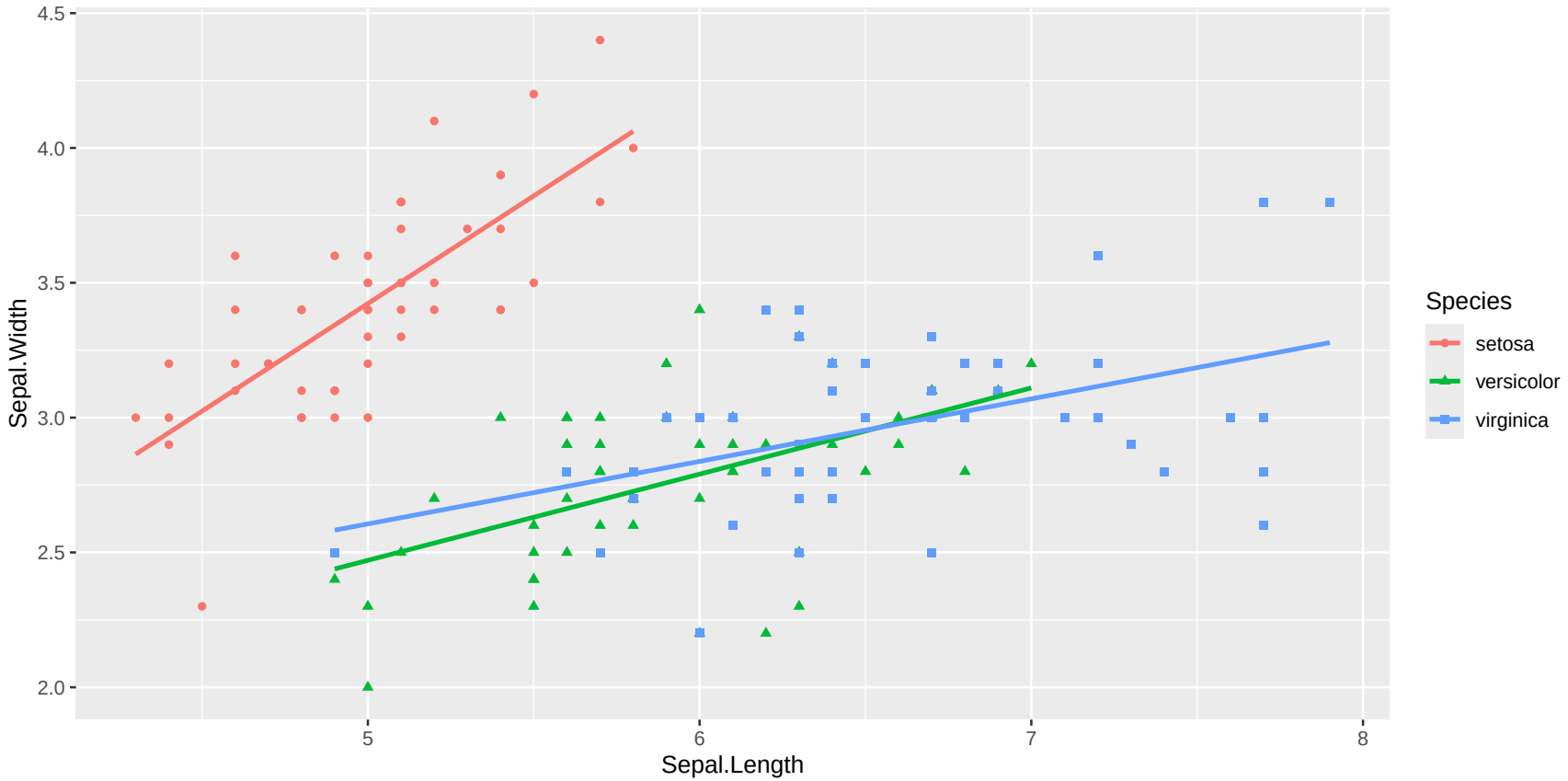
```
ggplot(iris,aes(x=Sepal.Length, y=Sepal.Width))+
  geom_point()
```



```
ggplot(iris,aes(x=Sepal.Length, y=Sepal.Width,
                color=Species, shape=Species))+
  geom_point()
```



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



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

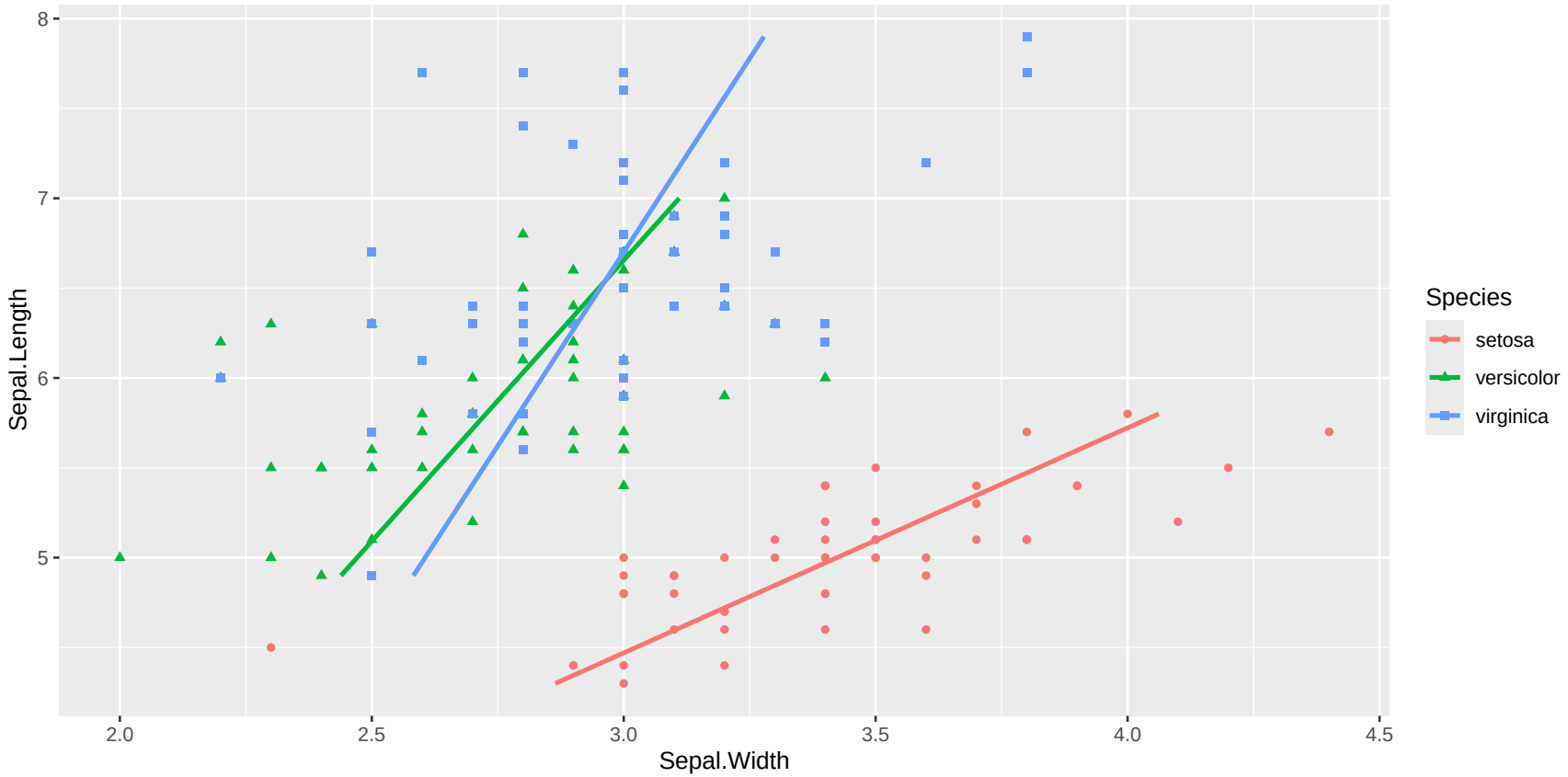
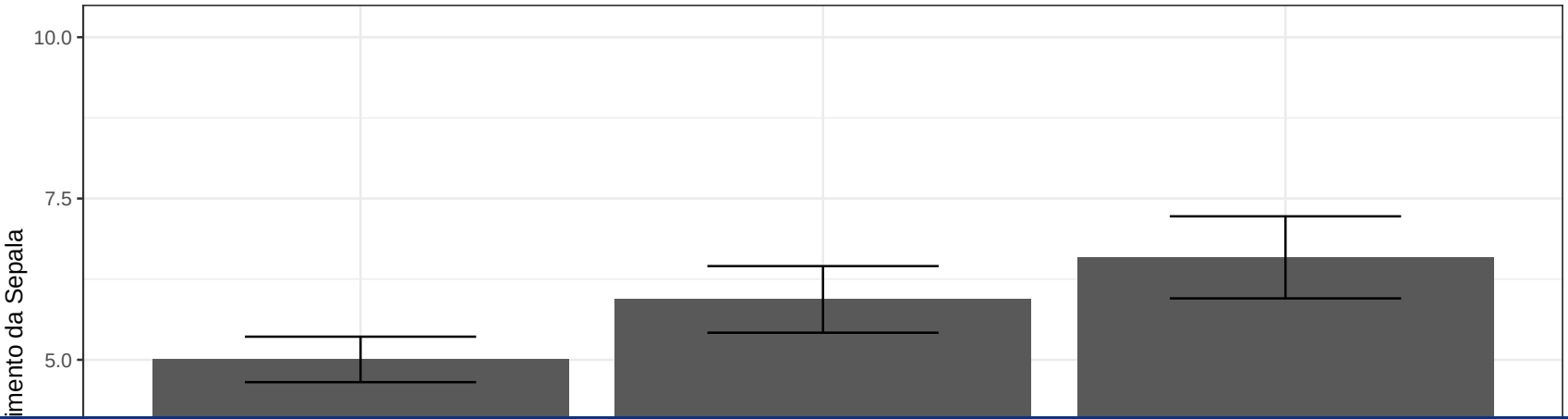
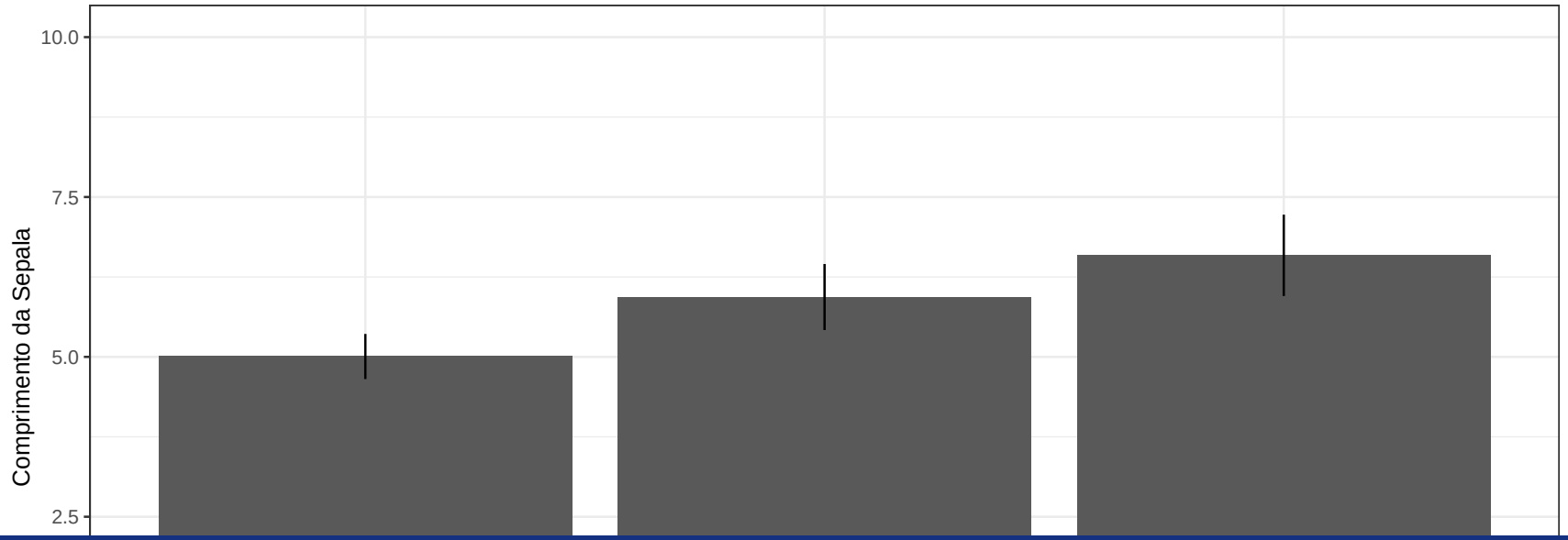


Gráfico de barras (média e desvio)

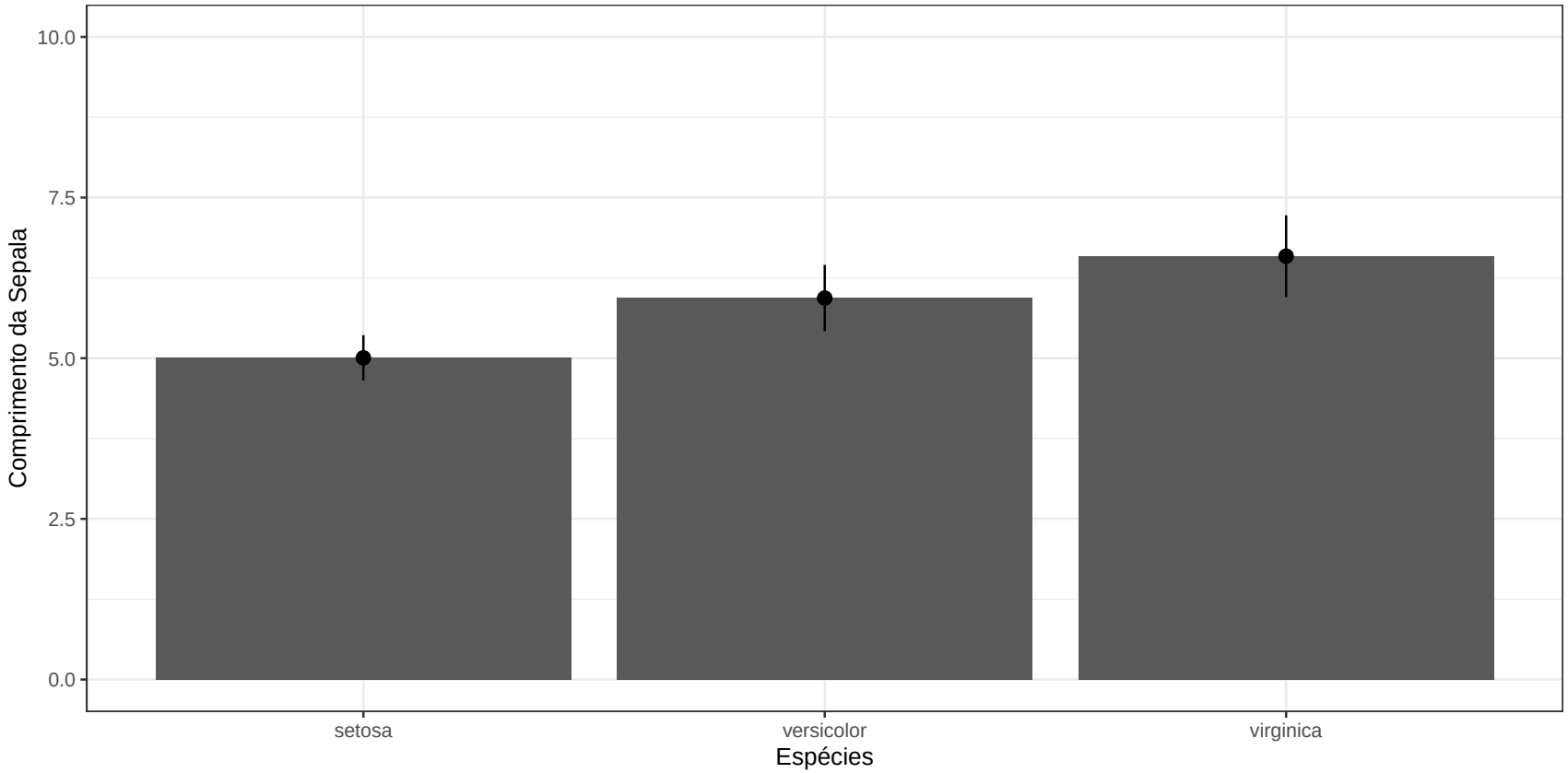
```
iris%>%group_by(Species)%>%
  summarise(mean=mean(Sepal.Length),
            sd=sd(Sepal.Length),
            se=sd(Sepal.Length)/sqrt(length(Sepal.Length)))
  ggplot(aes(x=Species, y=mean))+
  geom_col()+
  geom_errorbar(aes(ymin=mean-sd,ymax=mean+sd), width=0.5)+
  labs(y="Comprimento da Sepala", x="Espécies")+
  theme_bw()+
  scale_y_continuous(limits=c(0,10))
```

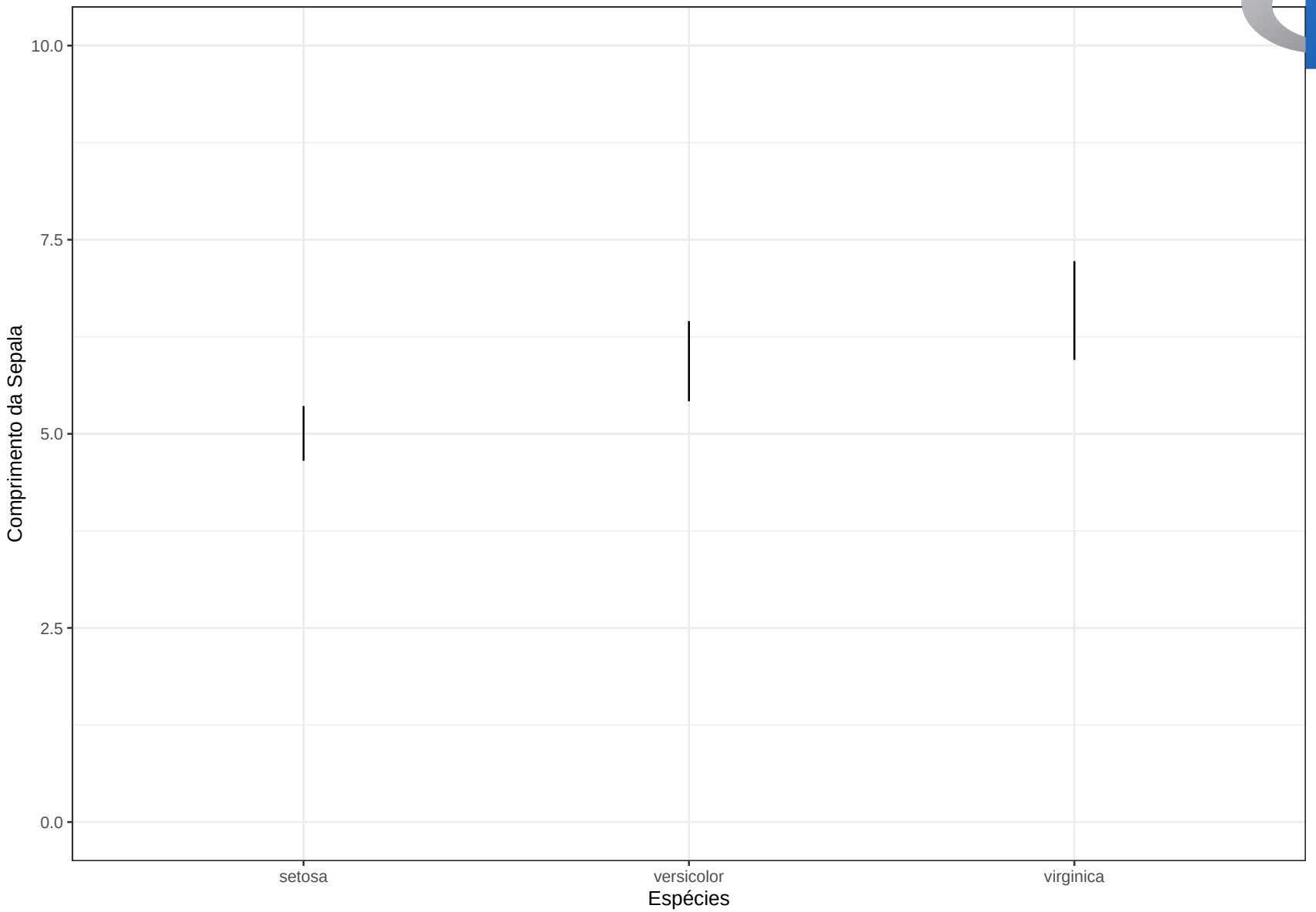


```r
iris%>%group_by(Species)%>%
  summarise(mean=mean(Sepal.Length),
            sd=sd(Sepal.Length),
            se=sd(Sepal.Length)/sqrt(length(Sepal.Length)))%>%
  ggplot(aes(x=Species, y=mean))+
  geom_col()+
  geom_linerange(aes(ymin=mean-sd,ymax=mean+sd))+
  labs(y="Comprimento da Sepala", x="Espécies")+
  theme_bw()+
  scale_y_continuous(limits=c(0,10))
```



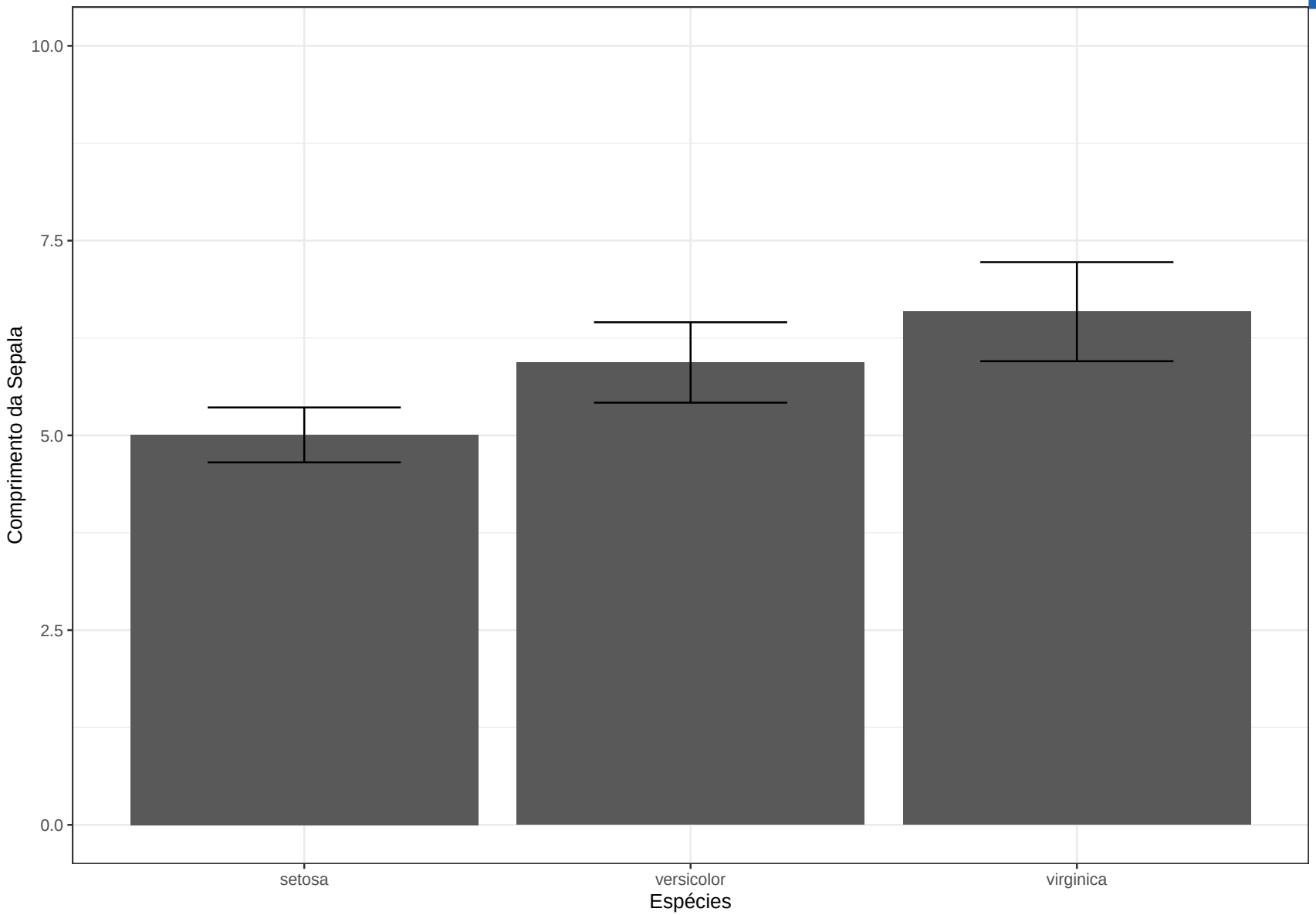
```
iris%>%group_by(Species)%>%
  summarise(mean=mean(Sepal.Length), sd=sd(Sepal.Length),se
```

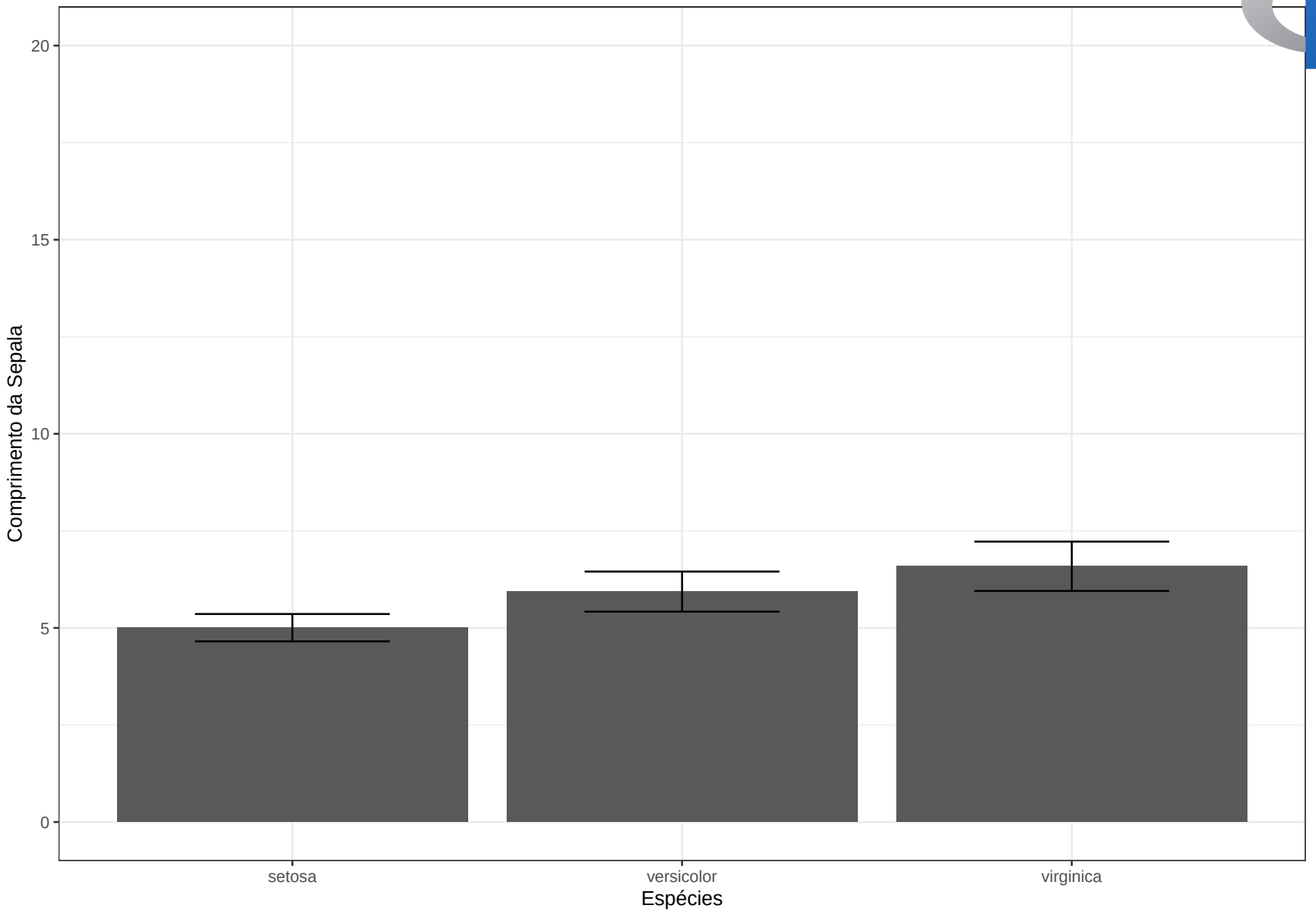



10.0
7.5
5.0
2.5
0.0
Comprimento da Sepala
setosa
versicolor
virginica
Espécies

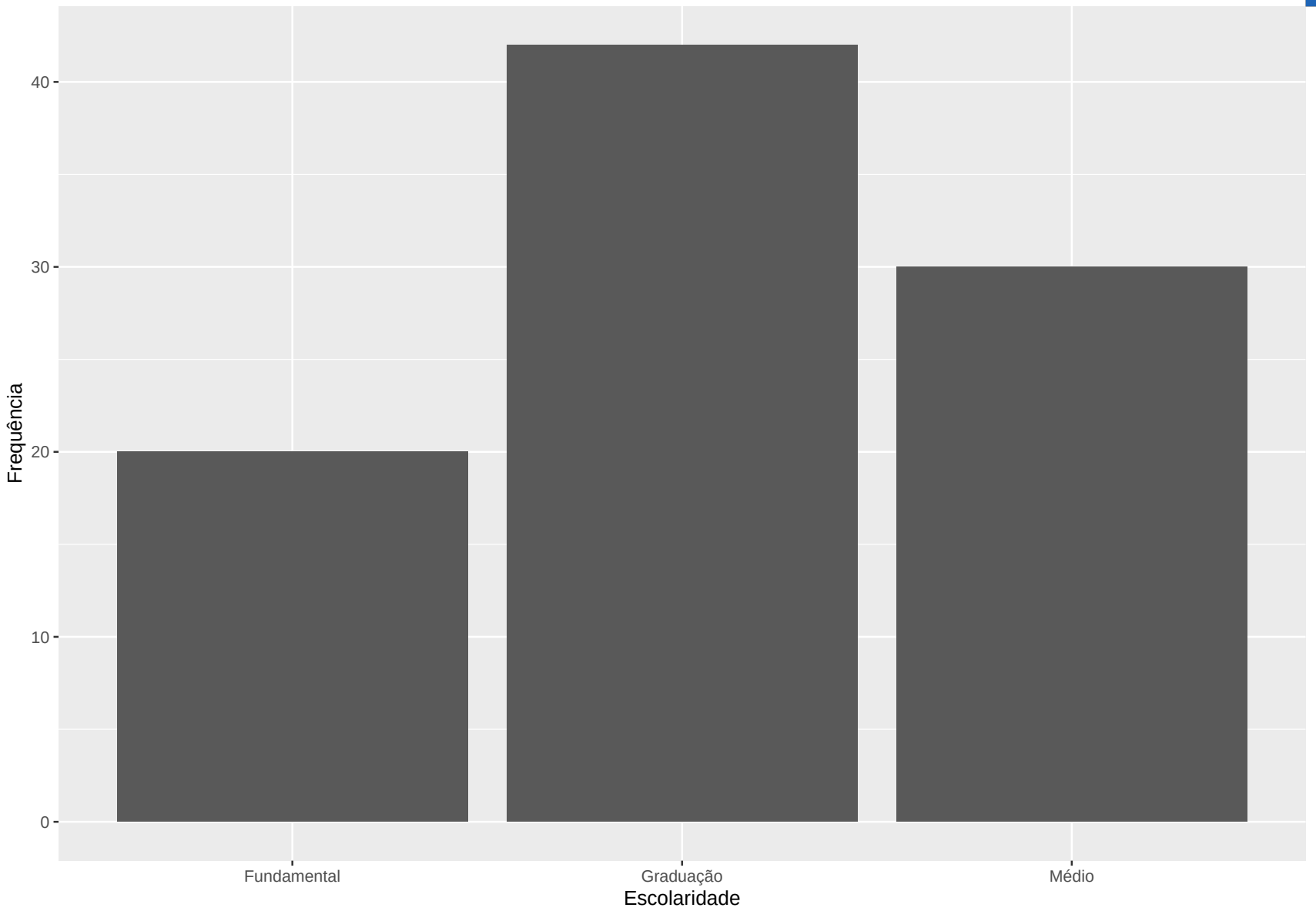
Alterando escalas, cores, fontes e temas

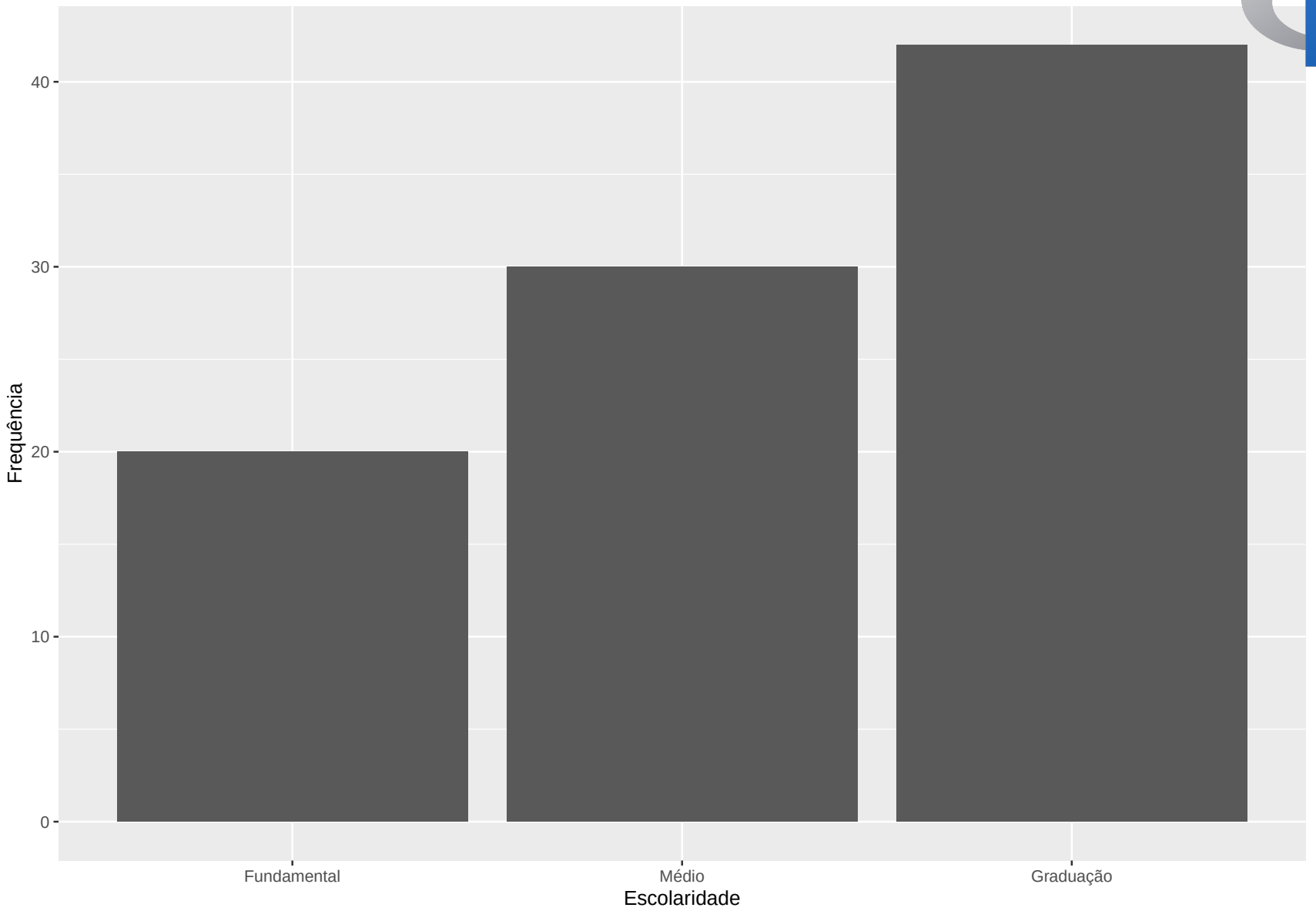
Ajustando escalas no ggplot




20
15
10
5
0
Comprimento da Sepala
setosa
versicolor
virginica
Espécies

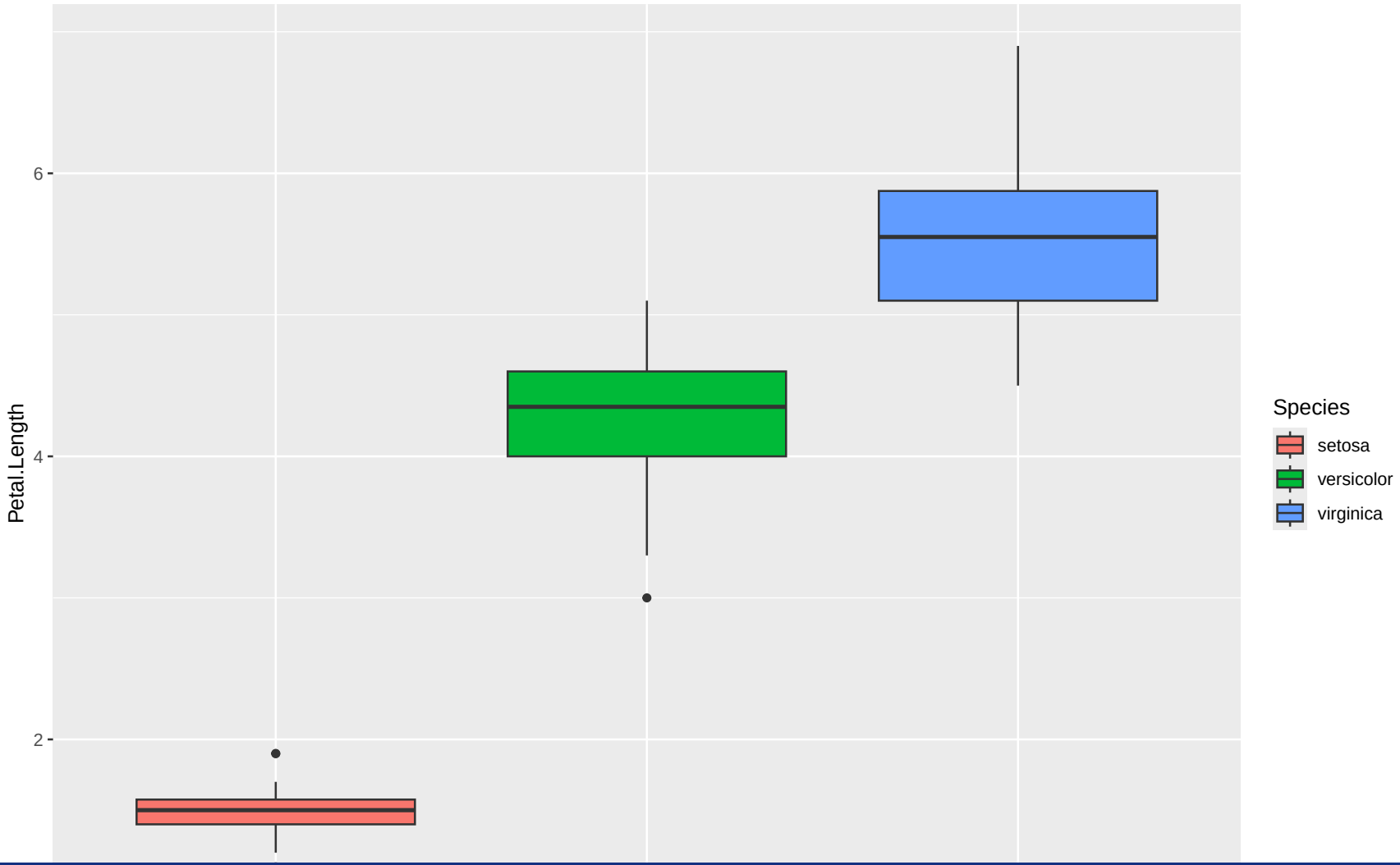
Ordenando variáveis ordinais no ggplot



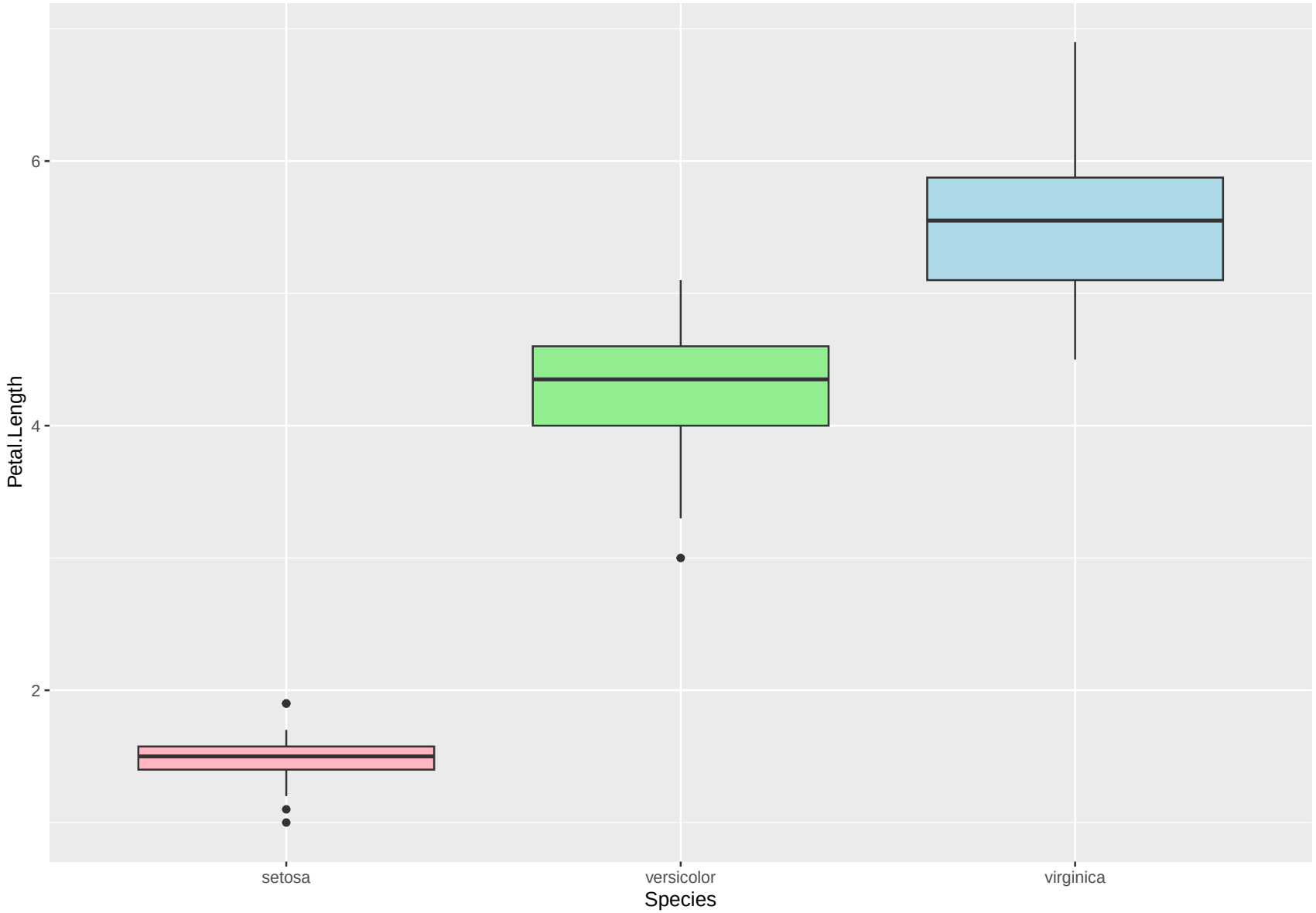

40
30
20
10
0
Frequência
Fundamental
Médio
Graduação
Escolaridade

Mudando cores de preenchimento no ggplo

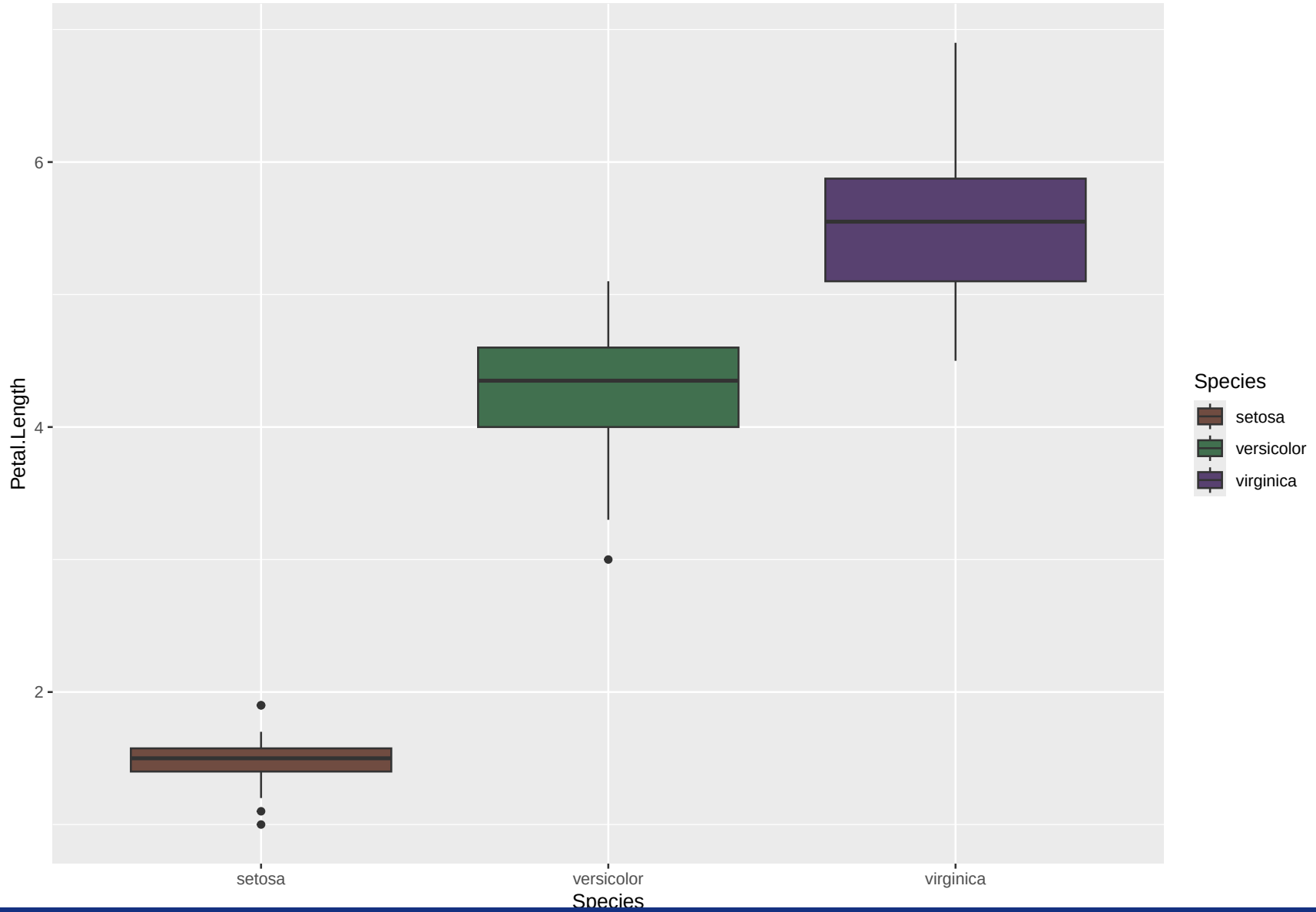
```
iris%>%ggplot(aes(x=Species, y=Petal.Length, fill=Species))+
  geom_boxplot()
```



```
iris%>%ggplot(aes(x=Species, y=Petal.Length))+
  geom_boxplot(fill=c("lightpink","lightgreen","lightblue"))
```

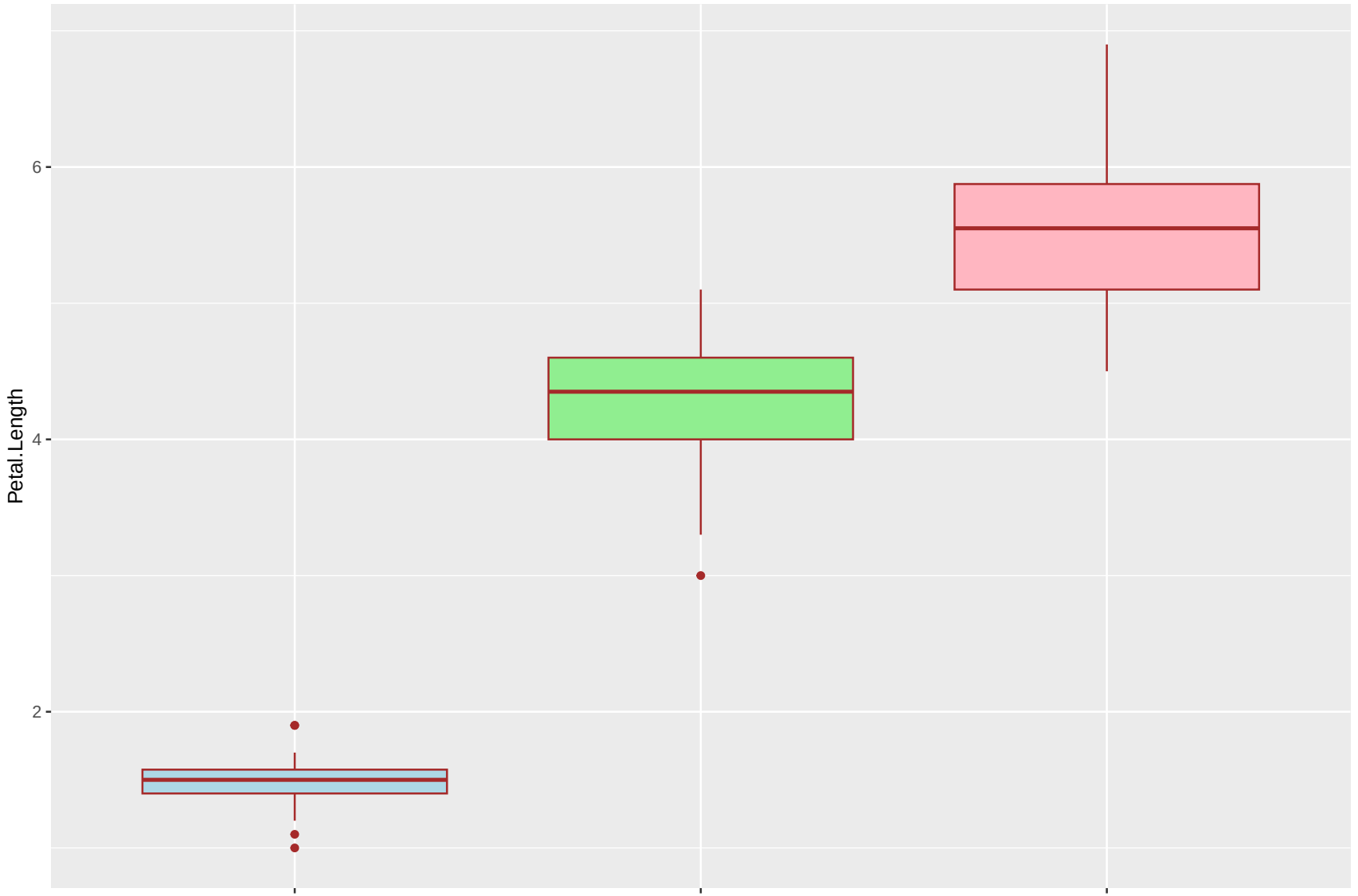


```
iris%>%ggplot(aes(x=Species, y=Petal.Length, fill=Species))+
  geom_boxplot()+scale_fill_manual(values=c("#704c41","#417
```



Mudando cores de contorno no ggplot

```
iris%>%ggplot(aes(x=Species, y=Petal.Length, fill=Species))
```

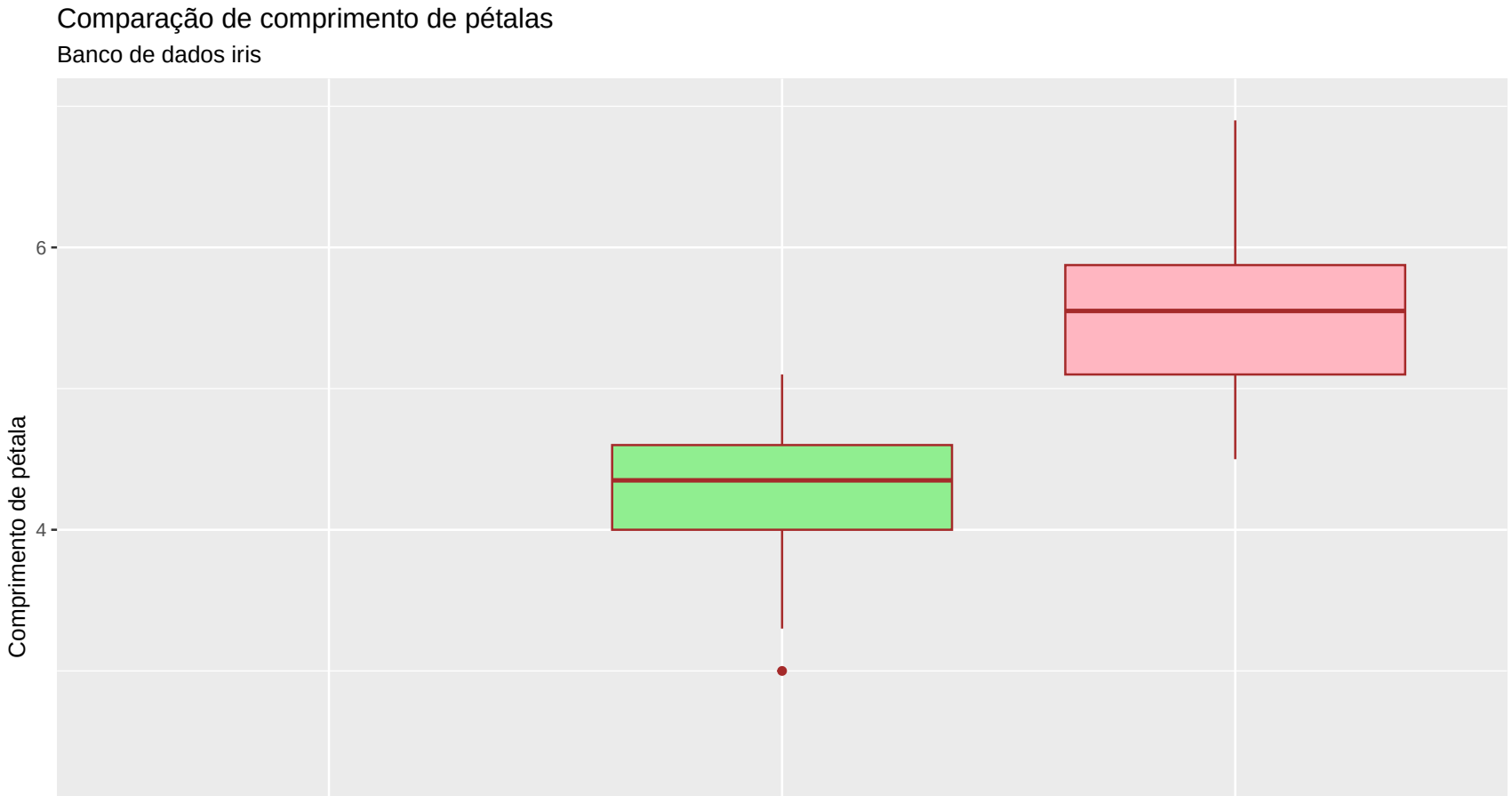


Alterando elementos textuais no ggplot

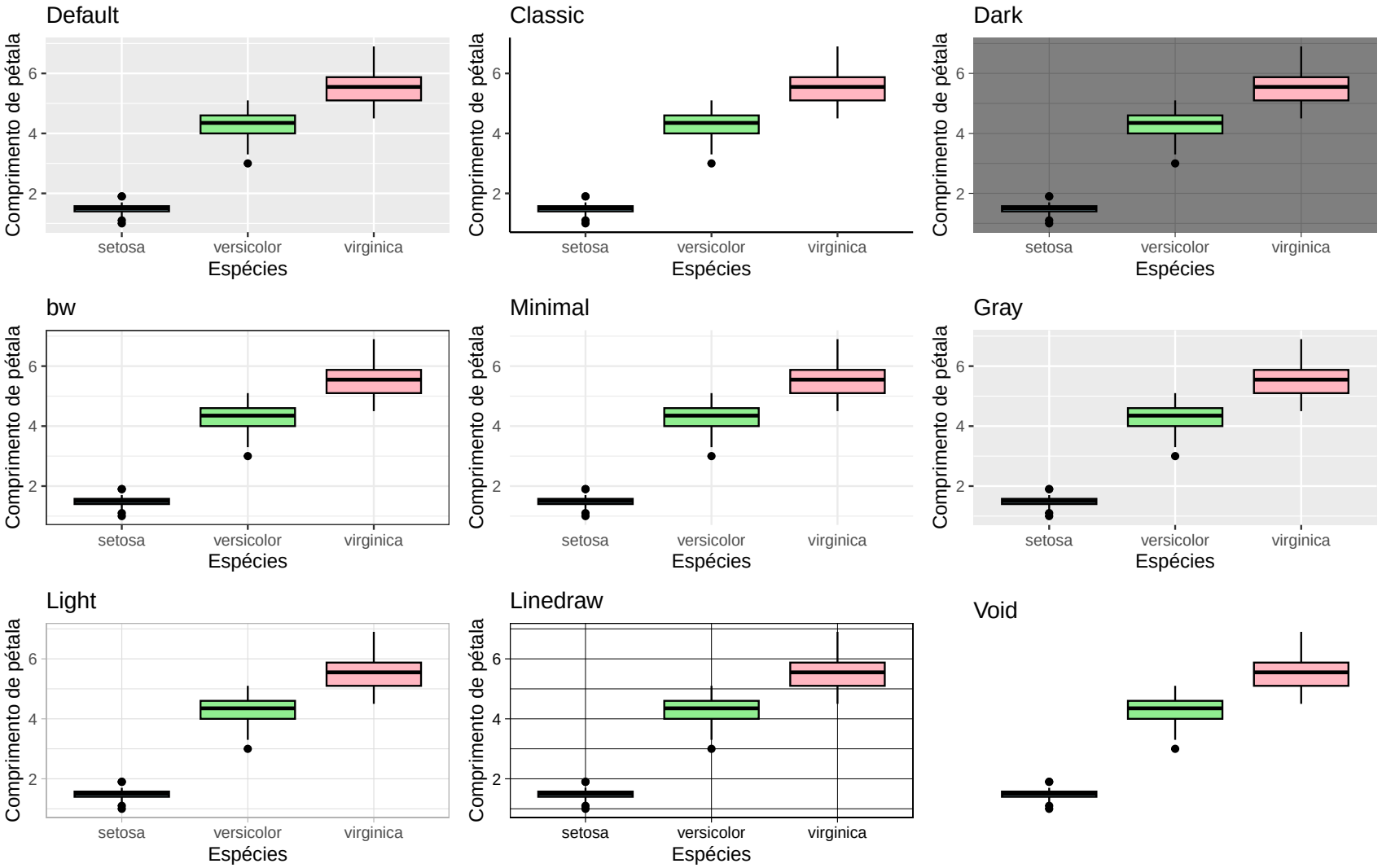
Os nomes dos eixos são alterados pela função labs, onde você indica qual elemento gráfico você quer renomear. Lembre-se: o nome que você quer renomear tem que estar entre aspas ” “.

- **y** para alterar o título do eixo y.
- **x** para alterar o título do eixo x.
- **title** para alterar o título ou acrescentar um título.
- **subtitle** para alterar o subtítulo ou acrescentar um subtítulo.
- **fill** para alterar o título da legenda referente ao fator colocado no fill.
- **color** para alterar o título da legenda referente ao fator colocado no color.
- **shape** para alterar o título da legenda referente ao fator colocado no shape.
- **size** para alterar o título da legenda referente ao fator colocado no size.

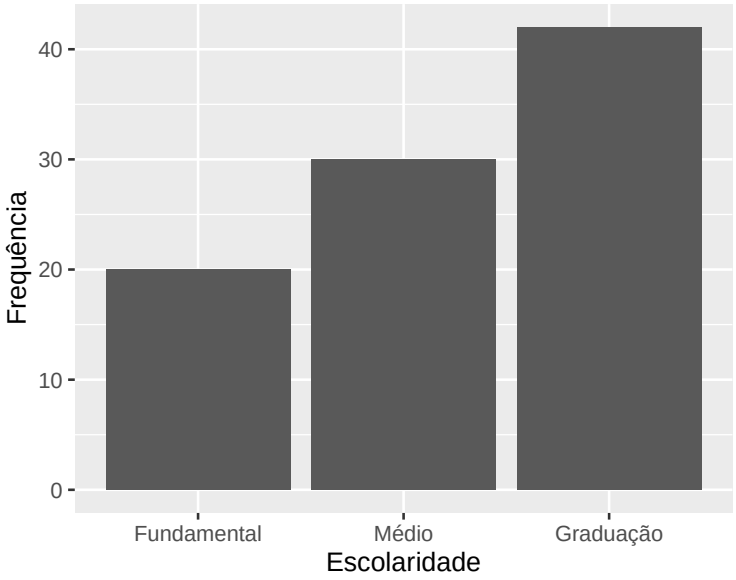
```
iris%>%ggplot(aes(x=Species, y=Petal.Length, fill=Species))+
  geom_boxplot(fill=c("lightblue","lightgreen","lightpink"))+
  labs(y="Comprimento de pétala",
       x="Espécies",
       title="Comparação de comprimento de pétalas",
       subtitle = "Banco de dados iris")
```

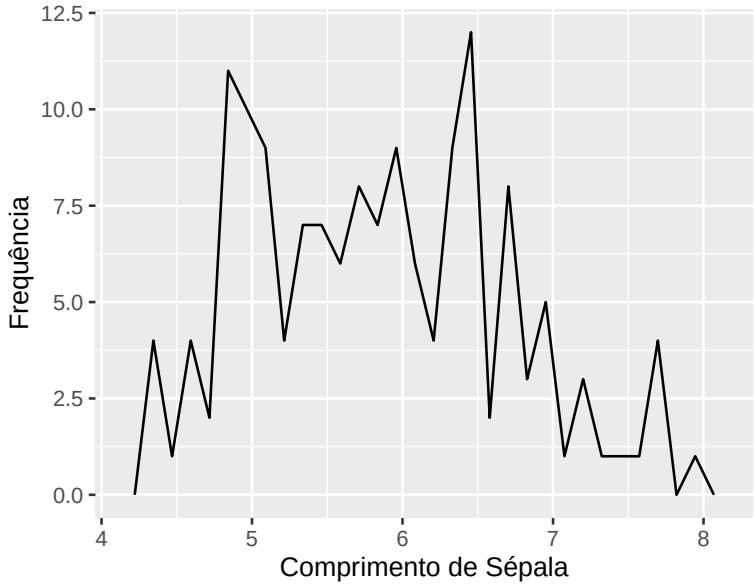


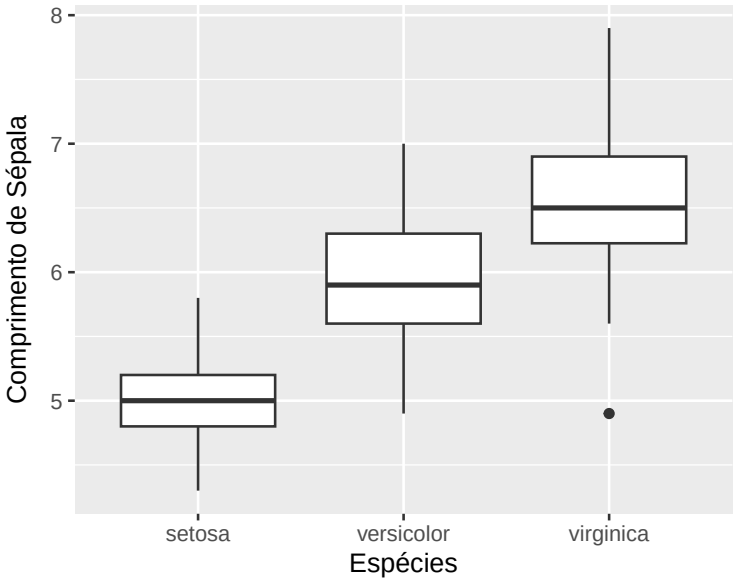
Temas (`theme_*`)

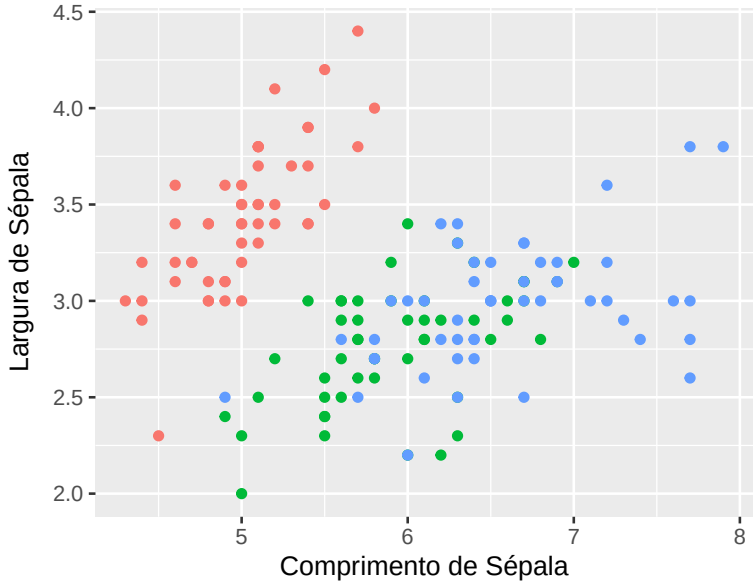

Default
Classic
Dark
bw
Minimal
Gray
Light
Linedraw
Void
Comprimento de pétala
2
4
6
setosa
versicolor
virginica
Espécies

Unindo vários gráficos em uma imagem só









Extra

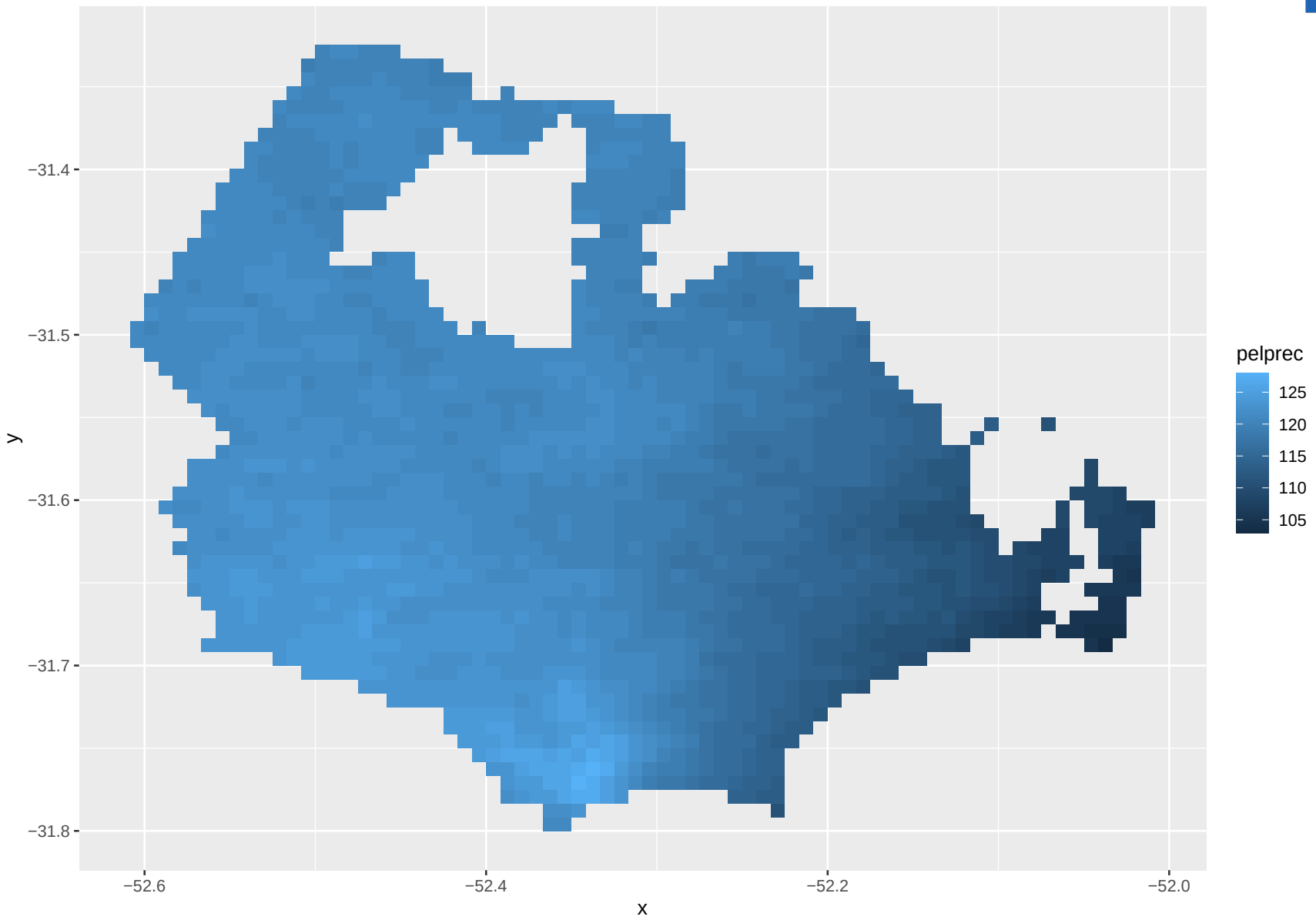
Mapas

```r
#instalando o pacote raster e sf
install.packages("raster")
install.packages("sf")

#carregando o pacote raster e sf
library(raster)
library(sf)
```

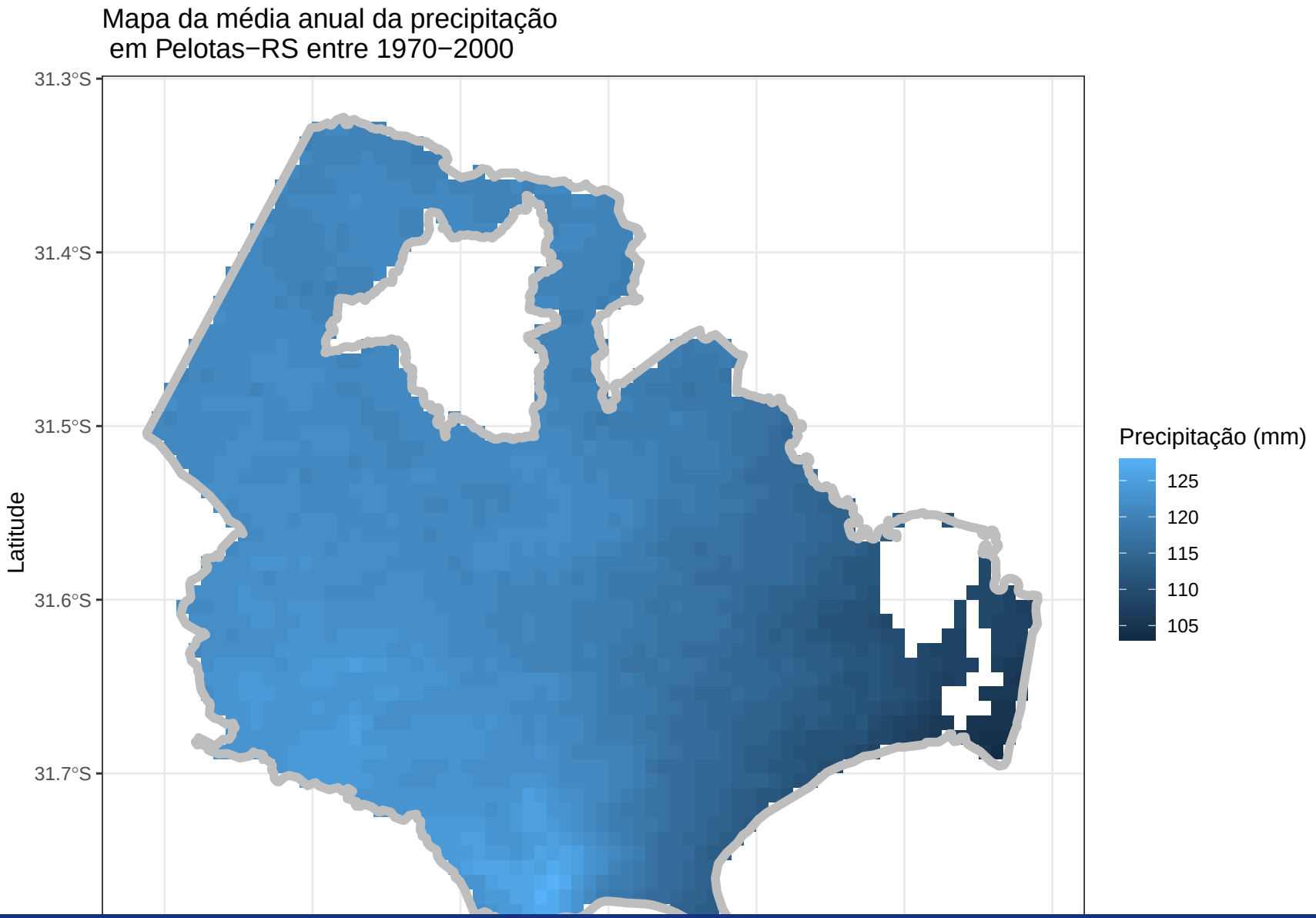
```r
# Importando dados
prec<-raster("pelprec.tiff")

pel<-read_sf("Pelotas/Pelotas.shp")

# Convertendo raster para data frame para o ggplot processo
prec_df<-as.data.frame(prec, xy = TRUE, na.rm = TRUE)

head(prec_df)
```

```
            x         y pelprec
14 -52.49583 -31.32917     120
15 -52.48750 -31.32917     121
16 -52.47917 -31.32917     121
17 -52.47083 -31.32917     120
18 -52.46250 -31.32917     120
19 -52.45417 -31.32917     120
```

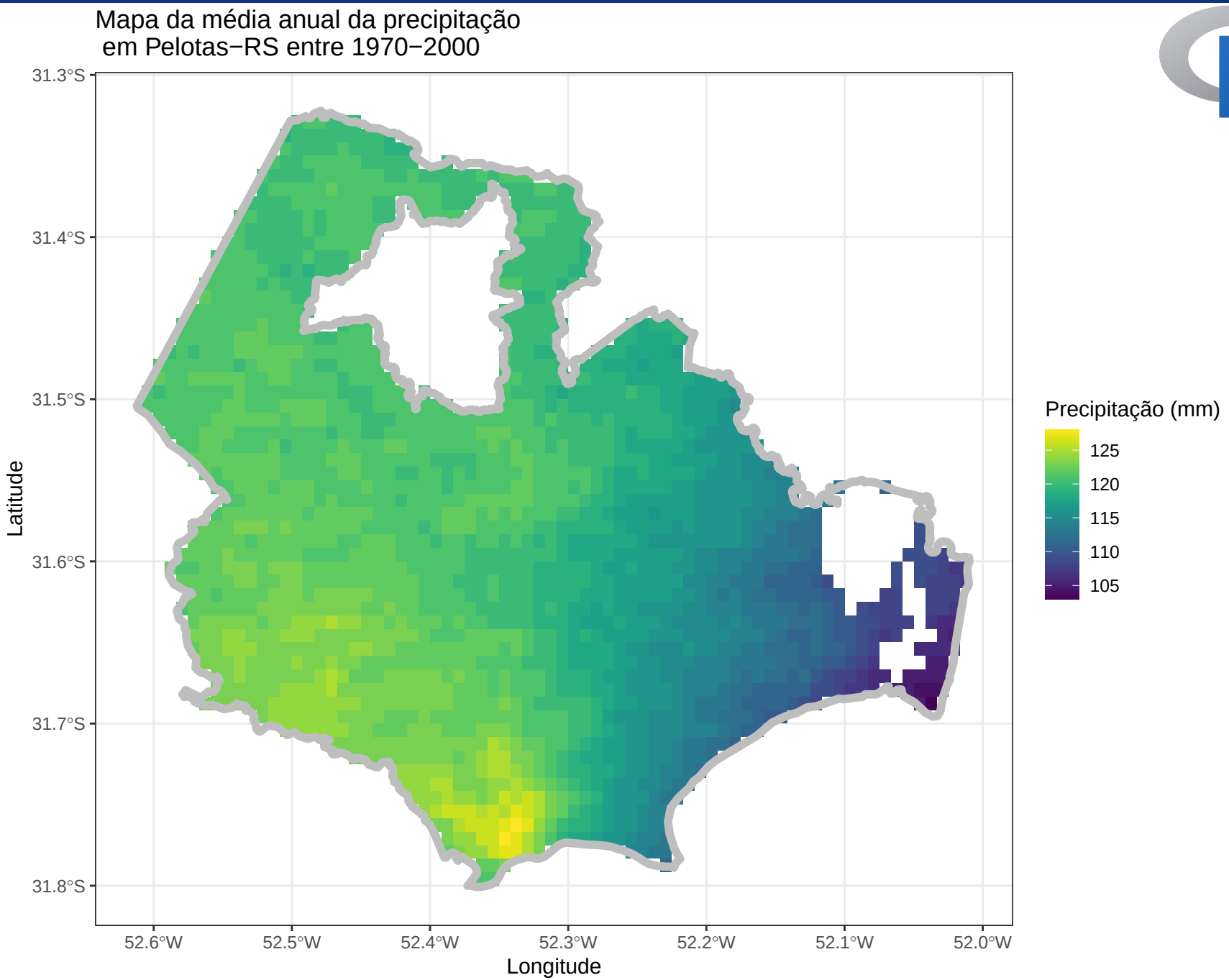
```
ggplot(prec_df,aes(x=x,y=y,fill=pelprec))+geom_rast r(
```



```
# Cores padrão
ggplot()+geom_raster(data=prec_df,aes(x=x,y=y,fill=pel_prec)
```



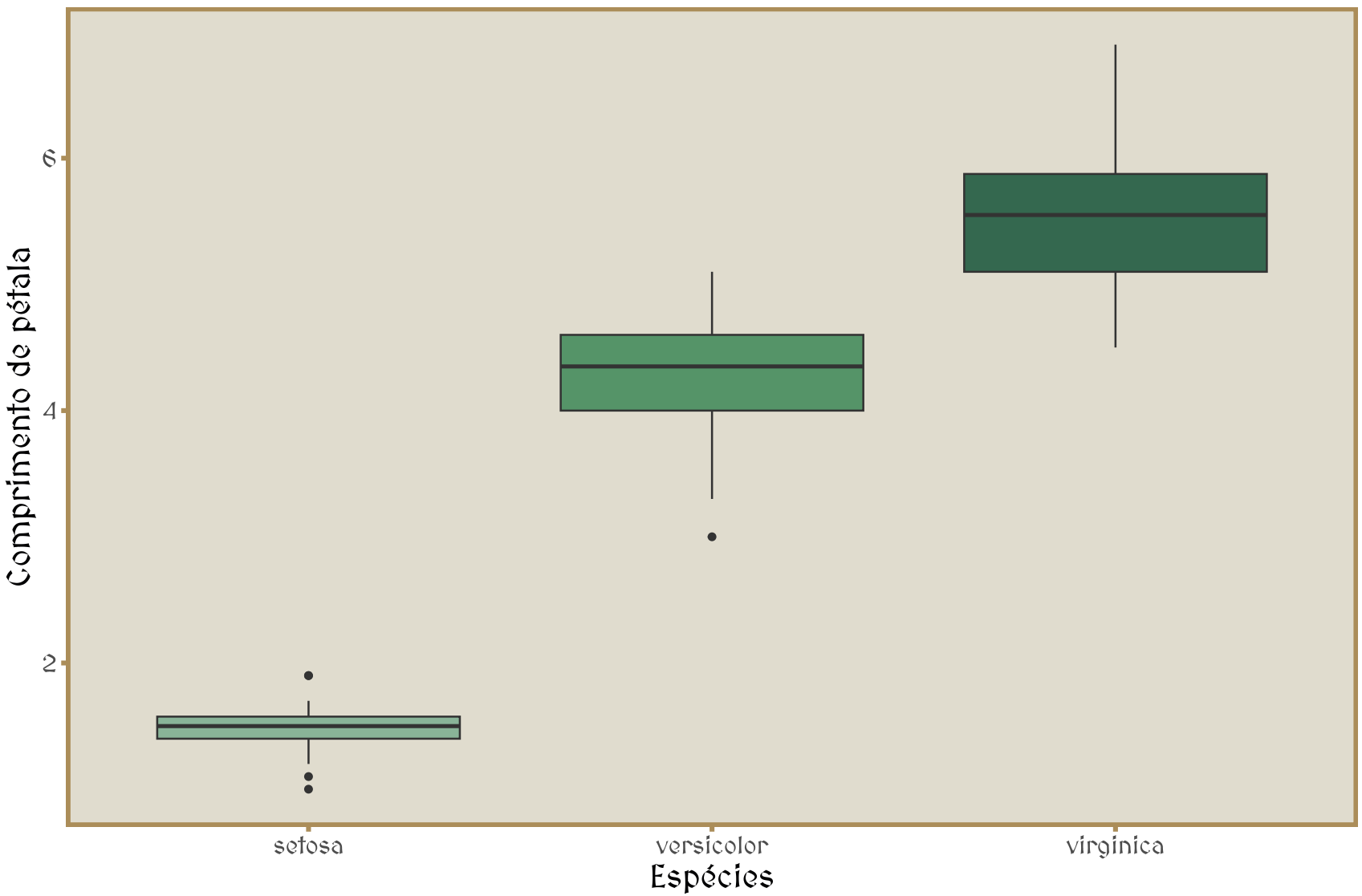
```r
#intalando pacote viridis
install.packages("viridis")
#carregando pacote viridis
library(viridis)
```


Mapa da média anual da precipitação
em Pelotas−RS entre 1970−2000
31.3°S
31.4°S
31.5°S
31.6°S
31.7°S
31.8°S
Latitude
52.6°W
52.5°W
52.4°W
52.3°W
52.2°W
52.1°W
52.0°W
Longitude
Precipitação (mm)
125
120
115
110
105

Temas divertidos

```
install.packages("remotes")
remotes::install_github("MatthewBJane/ThemePark")
library(ThemePark)
```

```
iris%>%ggplot(aes(x=Species, y=Petal.Length, fill=S
```



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Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org.

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Wickham, Hadley, Romain François, Lionel Henry, Kirill Müller, and Davis Vaughan. 2023. *Dplyr: A Grammar of Data Manipulation*. https://dplyr.tidyverse.org.

Wilkinson, Leland. 2011. "The Grammar of Graphics." In *Handbook of Computational Statistics: Concepts and Methods*, 375–414. Springer.