Adaptation to Figure of the Day

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ADAPTATION OVERVIEW This adaptation was implemented in a General Ecology course with the main goal of facilitating brief discussions on data visualization. The adaptation focuses on presenting students figures with all the information in their axes. However, such figures will present a medium level of quality to encourage students to discuss conceptually in groups and come up with suggestions on how to make them better visualizations. Here, I provide the R codes for these new figures so that instructors can manipulate them accordingly to their course activity.

Resources:

- Flemming-Davies and Wojdak (2018). Figure of the Day
- CAST The UDL Guidelines

Student Learning Outcomes:

- Describe patterns in data using figures
- Identify appropriate data visualization practices for different variable types

Universal Design for Learning Guidelines:

This adaptation was framed under UDL guidelines to facilitate the module to a diverse audience and reinforce the learning outcomes. Because I envisioned the activity as an engagement "ice-breaking" tool during the first minutes of each class section, I focused on UDL guidelines for engagement and representation:

- Minimize threats and distractions - all students are participants with no risk of being wrong and there is still surprise in the routinized activity.
- Foster collaboration and community - discussions are in group.
- Highlight patterns, critical features, big ideas, and relationships - multiple examples and non-examples are provided to emphasize critical features.
- Maximize transfer and generalization - multiple opportunities for review and practice are provided during the semester.

Teaching notes and R codes

Goal of Figure 1: Identify potential data misinterpretation when a line is drawn between two data points of a discrete variable.

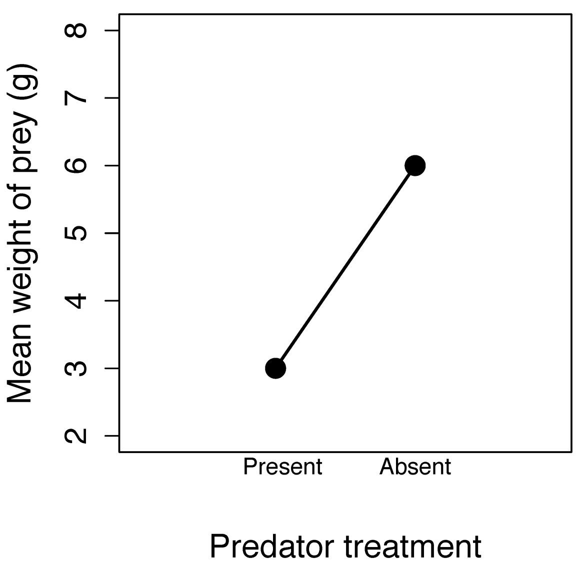
Teaching notes:

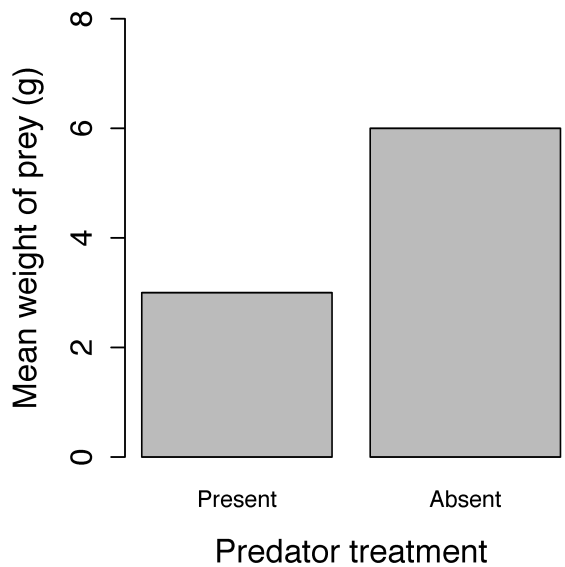
```r
# Independent and dependent variables
x <- c("Present","Absent")
y <-c(mean(seq(1,5,1)),mean(seq(3,9,2)))

# Version 1A
plot(y,
     xaxt="n",pch=16,typ="o",
     xlab="Predator treatment",
     ylab = "Mean weight of prey (g)",
     lwd=2,cex.axis=1.3,cex.lab=1.5,ylim=c(2,8),xlim=c(0,3))

mtext(x, side=c(1,1), line=c(0,0), at=c(1.05,2))

# Version 1B
barplot(y,
        names.arg=x,
        xlab="Predator treatment",
        ylab = "Mean weight of prey (g)",
        cex.axis=1.3,cex.lab=1.5,ylim=c(0,8))
```





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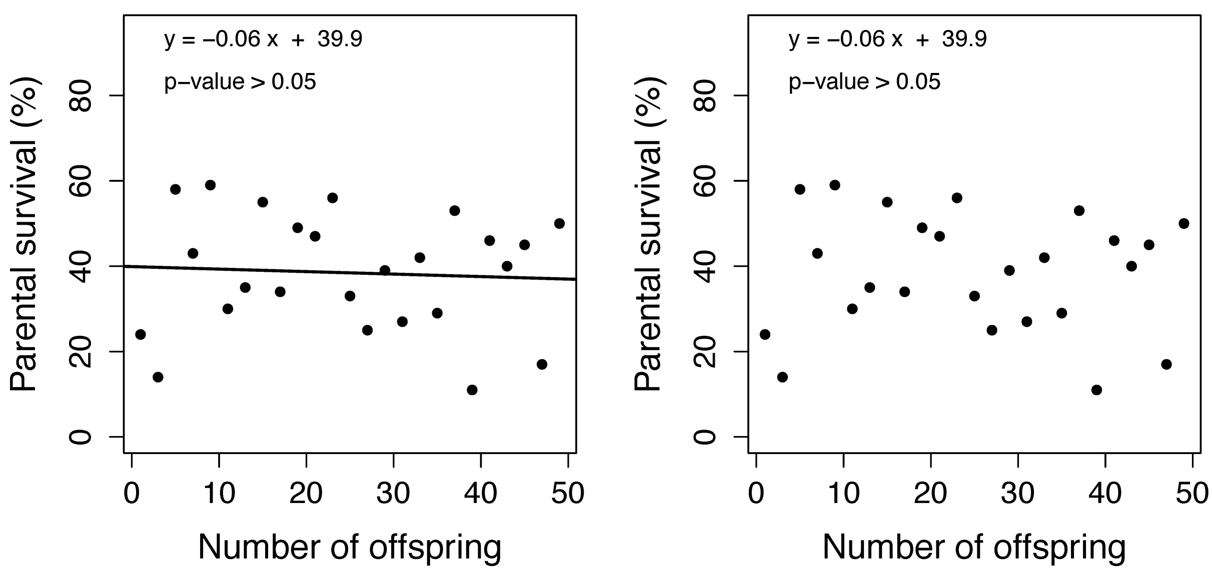
Goal of Figure 2: Interpret the linear regression analysis and question whether drawing a line is appropriate.

Teaching notes:

```r
# Independent and dependent variables
x <- seq(1,50,2)
y <-sample(10:60,25)

# Version 2A
```

```
lm1 <- lm(y~x)
lm2 <- lm1$coefficients

plot(x,y,
     xlab="Number of offspring",
     ylab="Parental survival (%)",
     pch=16,ylim=c(0,95),cex.axis=1.3,cex.lab=1.5)

abline(coef(lm1))

# extracting model coefficients
eqn <- paste("y =",paste(round(lm2[-1],2),names(lm2[-1])," + "),paste(round(lm2[1],2)))
legend(-3,100,legend=eqn,bty="n")
legend(-3,90,legend="p-value > 0.05",bty="n")

# Version 2B
plot(x,y,
     xlab="Number of offspring",
     ylab="Parental survival (%)",
     pch=16,ylim=c(0,80),cex.axis=1.3,cex.lab=1.5)
```

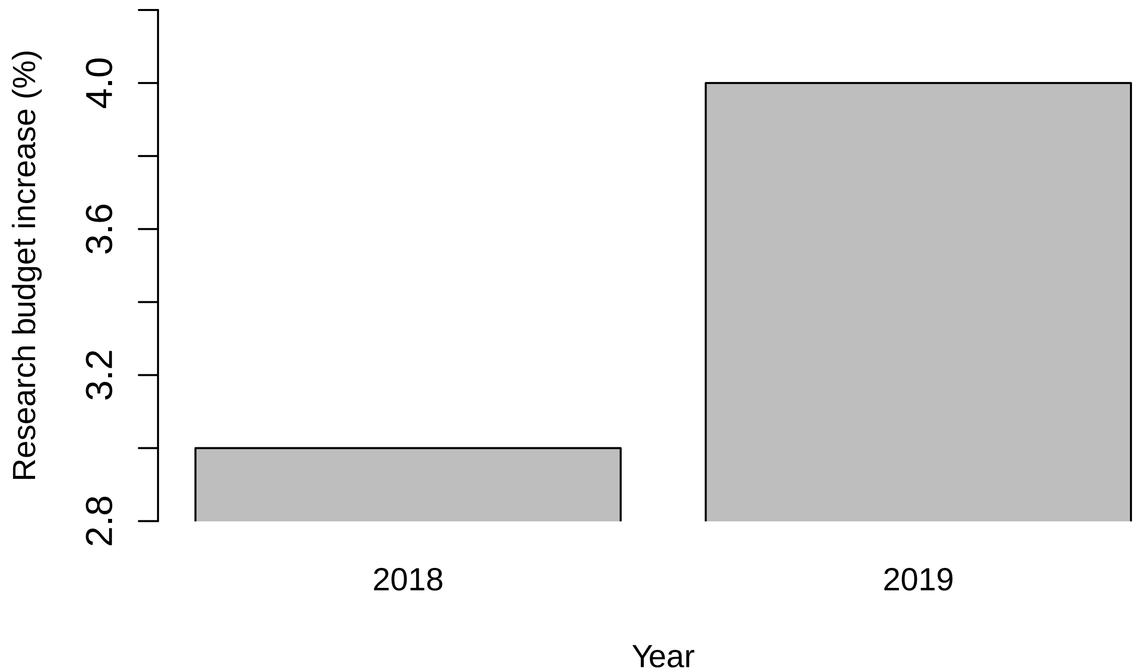


Goal of Figure 3:

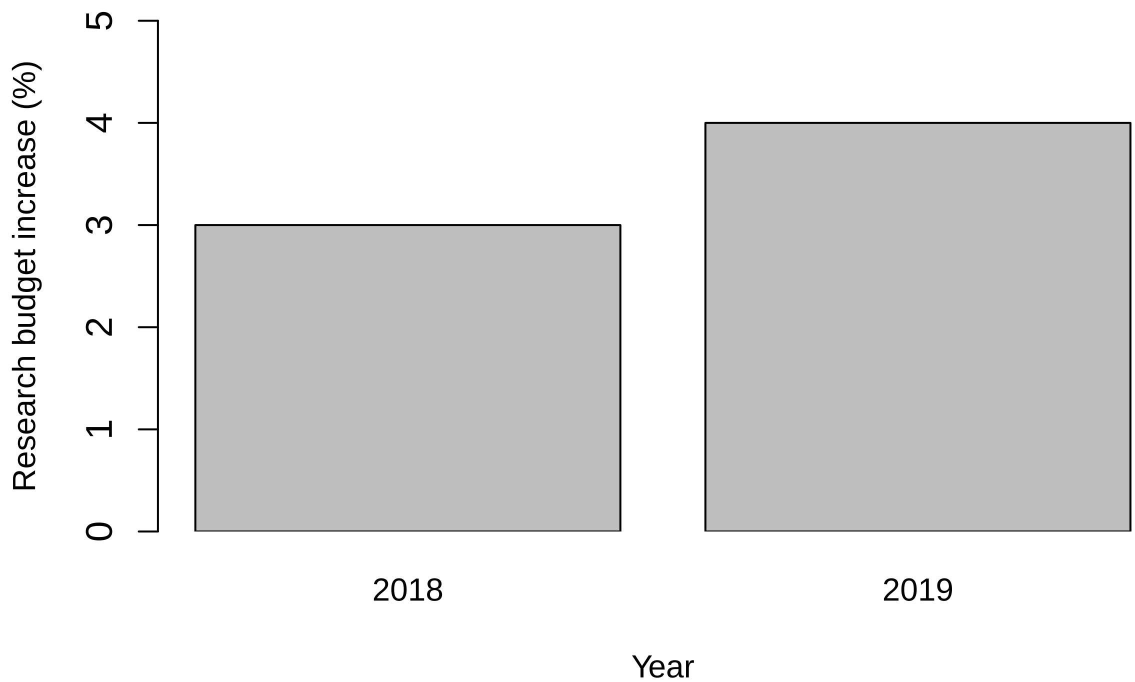
Teaching notes:

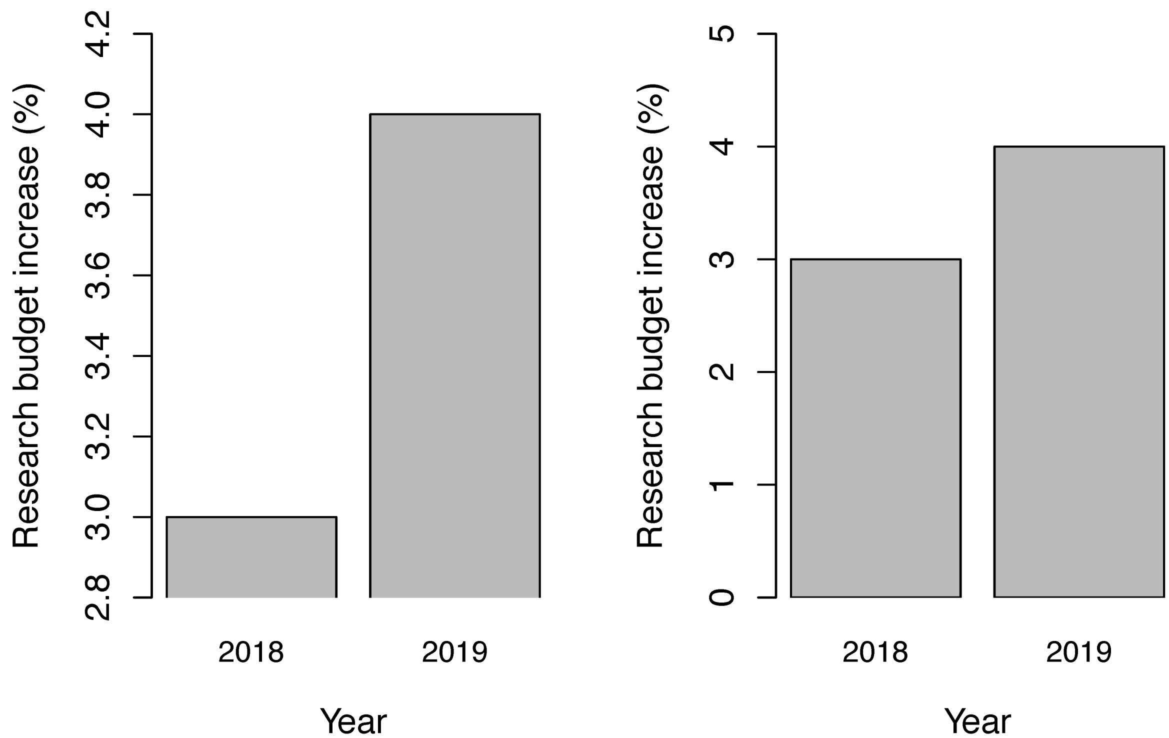
```
# Independent and dependent variables
x <- c("2018","2019")
y <-c(mean(seq(1,5,1)),mean(seq(2,6,2)))

# Version 3A
barplot(y,
```

```
        names.arg=x,
        xlab="Year",
        ylab = "Research budget increase (%)",
        ylim=c(2.8,4.2),xpd=FALSE,cex.axis=1.2)
```




```
# Version 3B
barplot(y,
        names.arg=x,
        xlab="Year",
        ylab = "Research budget increase (%)",
        ylim=c(0,5),xpd=FALSE,cex.axis=1.2)
```


Research budget increase (%)
0
1
2
3
4
5
2018
2019
Year


Research budget increase (%)
2.8
3.0
3.2
3.4
3.6
3.8
4.0
4.2
2018
2019
Year
Research budget increase (%)
0
1
2
3
4
5
2018
2019
Year

#==================================== # Figure 4

Variables

dist1 <- rnorm(100,mean=30) dist2 <- rnorm(100,mean=27)

Version 4A

par(mfrow=c(2,1),mai=c(.8,.8,.5,.5))

hist(dist1, xlab=“Tail length (mm)”, main="“, breaks=”Scott", xlim = c(22,34))

hist(dist2, xlab=“Tail length (mm)”, main = "", xlim = c(22,34))

Version 4B

par(mfrow=c(1,1))

hist(dist1, ylim=c(0,30), xlim = c(22,34), xlab=“Tail length (mm)”, main="", breaks=10, col=rgb(0, 0, 1, 0.5))

hist(dist2, ylim=c(0,30), xlab=“Tail length (mm)”, main="", breaks=10, xlim = c(22,34), add=T,col=rgb(0, 1, 0, .1))

“‘

Step 1: Identify a terrestrial biome given its climate diagram

To visualize the patterns of temperature and precipitation that are associated with particular biomes, we can use climate diagrams. Since climate is the primary abiotic force shaping plant forms in different terrestrial biomes, you can expect locations around the world that are from a particular biome to have similar climate diagrams.

> **Question 1:** How many variables and what type of variables (e.g., categorical, continuous) each figure has?

> **Question 2:** If plant growth occurs when temperature > 0°C, how long is the plant growing season in biomes A, B and C?

> **Question 3:** According to these climate diagrams, plant growth is limited by what factor in each scenario?