Executive Summary Report 2

Data Description with R

ALY6000: Introduction to Analytics

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Summary

I think visualizing data is a great help for understanding data at once and could have a big impact on explanation and persuasion. In data 'BullTroutRML2', Harrison Lake Trout grows in length as age adds up. Those from '1997-01' were shorter than those from '1977-80' in the same y (age) variable (Plot 3). When looking at the entire data, the length also gradually increases with age (Plot 4). The median Fork Length of whole data is 352.5, the mean is 326.1, Q1 is 258, and Q3 is 406 (Plot 5).

1-2. Name & Import libraries

```
#Plotting Basics by Heejae Roh#
install.packages("plyr")
install.packages("FSA")
install.packages("FSAdata")
install.packages("magrittr")
install.packages("moments")
install.packages("berryFunctions")
library(plyr)
library(FSA)
library(FSAdata)
library(magrittr)
library(dplyr)
library(plotrix)
library(ggplot2)
library(moments)
```

1-2

3-4. Load BullTroutRML2 & Print 1st and last 3 records

```
> setwd("C:\\Users\\14083\\Desktop\\exacutive summary\\Project 2")
> BullTroutRML2 <- read.csv("BullTroutRML2.csv", header=TRUE)
> head(BullTroutRML2,1)
  age  fl     lake     era
1  14 459 Harrison 1977-80
> tail(BullTroutRML2,3)
   age  fl   lake     era
94   4 298 Osprey 1997-01
95   3 279 Osprey 1997-01
96   3 273 Osprey 1997-01
```

3-4

5-6. Filter out all records except Harrison& Display first and last 3 records (left, below)

```
> filtered.Bull <- BullTroutRML2[BullTroutRML2$lake %in% "Harrison", ]
> head(filtered.Bull,1)
  age  fl     lake     era
1  14 459 Harrison 1977-80
> tail(filtered.Bull,3)
   age  fl     lake     era
59   7 245 Harrison 1997-01
60   7 279 Harrison 1997-01
61   5 245 Harrison 1997-01
```

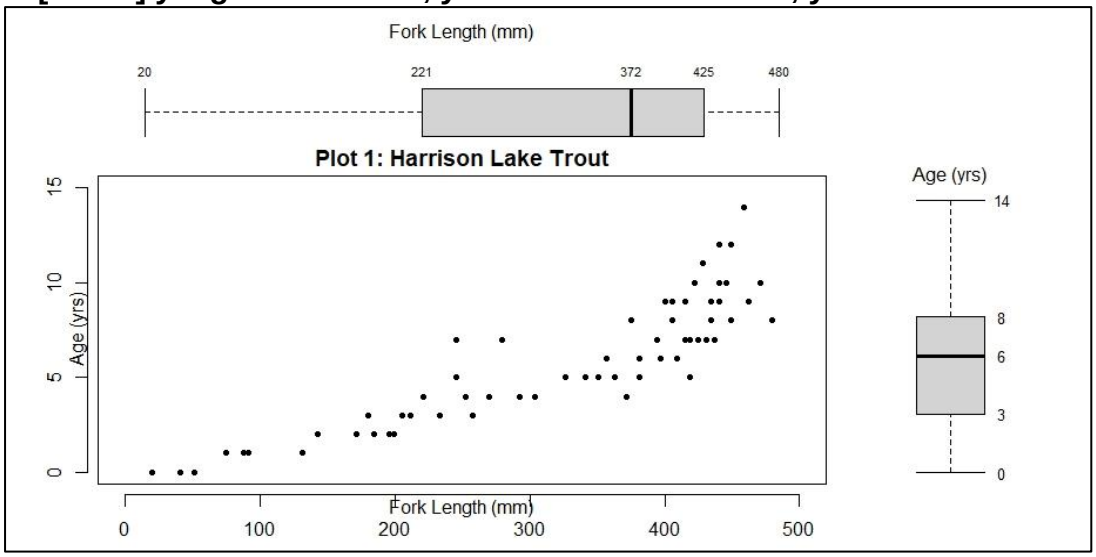
5-6

7-8. Display Structure of Filtered dataset & Summary it as <t> (right)

```
> str(filtered.Bull)
'data.frame':   61 obs. of  4 variables:
 $ age : int  14 12 10 10 9 9 9 8 8 7 ...
 $ fl  : int  459 449 471 446 400 440 462 480 449 437 ...
 $ lake: chr  "Harrison" "Harrison" "Harrison" "Harrison" ...
 $ era : chr  "1977-80" "1977-80" "1977-80" "1977-80" ...
> t <- summary(filtered.Bull)
> t
      age              fl          lake              era
 Min.   : 0.000   Min.   : 20   Length:61          Length:61
 1st Qu.: 3.000   1st Qu.:221   Class :character   Class :character
 Median : 6.000   Median :372   Mode  :character   Mode  :character
 Mean   : 5.754   Mean   :319
 3rd Qu.: 8.000   3rd Qu.:425
 Max.   :14.000   Max.   :480
```

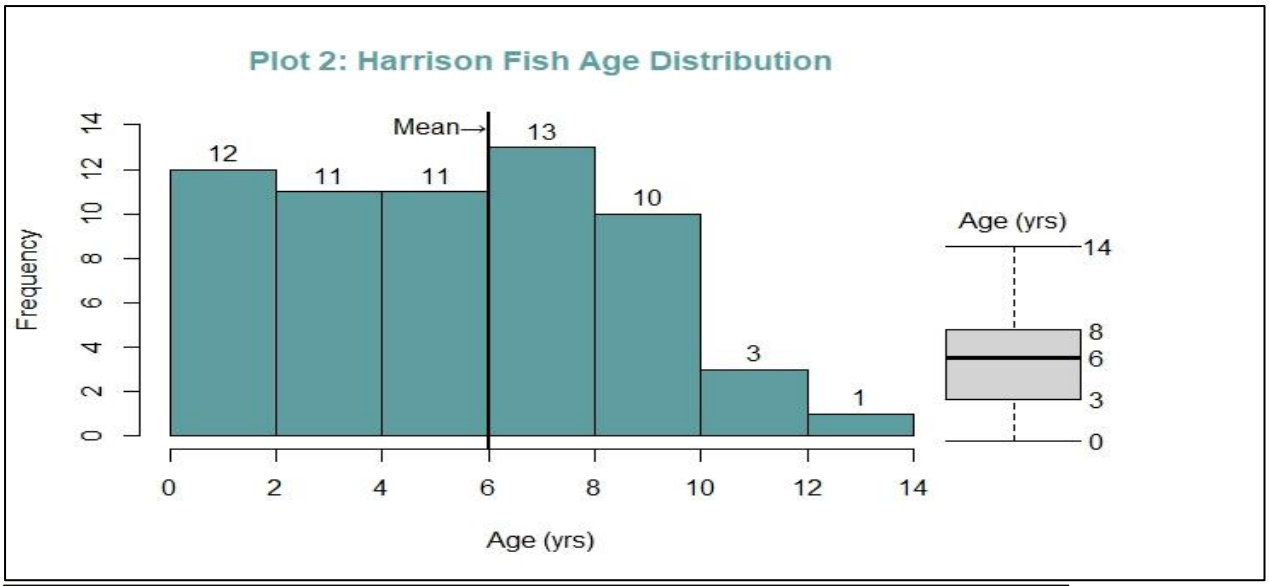
7-8

9. [Plot 1] y=age x=fl. limit x, y/ title/ axis labels for x, y/ small filled circle



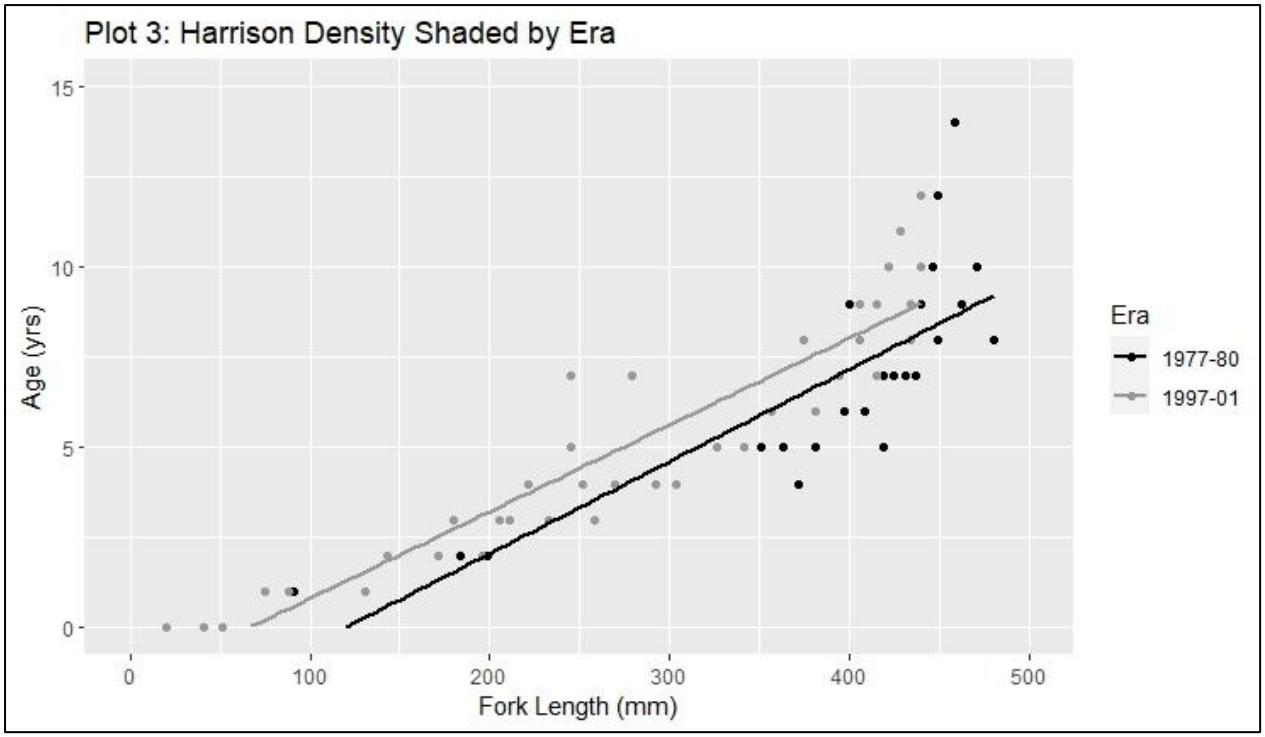
*Add **two Boxplots of Fork Length & Age** for enhancing understand of data*

10. [Plot 2] "Age" histogram. Axis Labels x, y/ Title/ Color frequency, title



*Add **Mean line** on the histogram graph and add **Boxplot of Age***

11. [Overdense Plot 3] Two black shading levels/ Title



*Add **ablines to compare 1977-80 with 1997-01** About Fork Length in the same age (y variable)*

12-13. tmp including 1st and last 3 records of whole/ Display era column (left, below)

```
> library(berryFunctions)
> tmp <- headtail(BullTroutRML2,3)
> tmp
   age  fl     lake     era
1   14 459 Harrison 1977-80
2   12 449 Harrison 1977-80
3   10 471 Harrison 1977-80
94   4 298   Osprey 1997-01
95   3 279   Osprey 1997-01
96   3 273   Osprey 1997-01
> data.frame(tmp$era)
  tmp.era
1 1977-80
2 1977-80
3 1977-80
4 1997-01
5 1997-01
6 1997-01
```

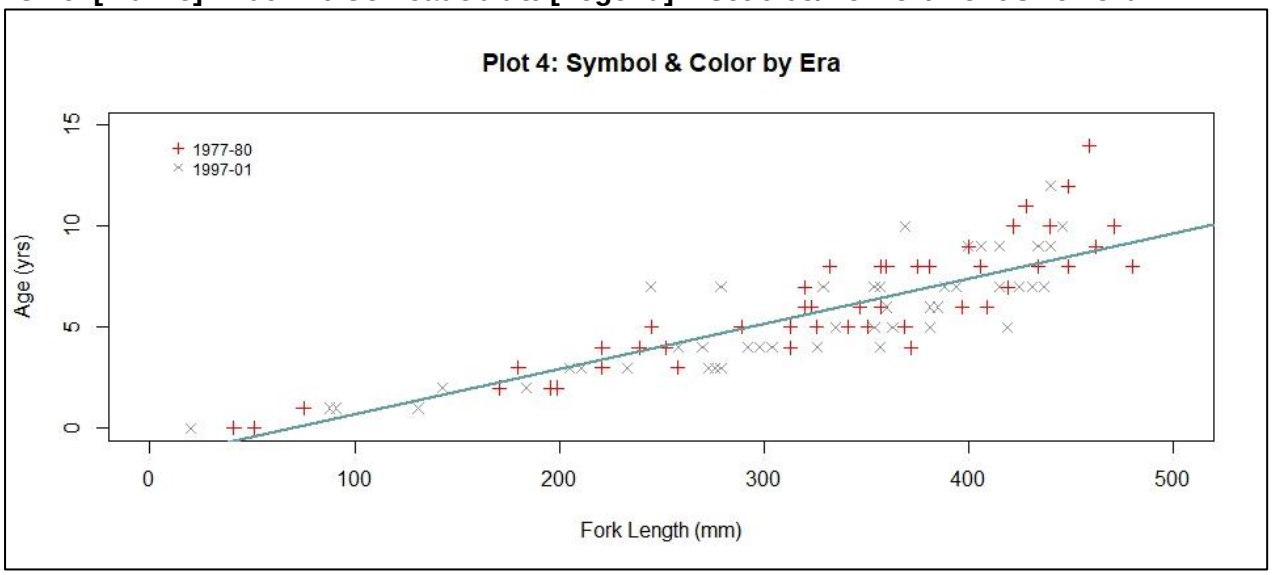
12-13

```
> pchs <- c(3,4)
> cols <- c("red","gray60")
> class(tmp$era)
[1] "character"
> levels(tmp$era)
NULL
> era.tmp <- factor(c("1977-80", "1977-80", "1977-80", "1997-01",
 "1997-01", "1997-01"), levels=c("1977-80", "1997-01"))
> numEra <- as.numeric(era.tmp)
> numEra
[1] 1 1 1 2 2 2
> cols[numEra]
[1] "red"   "red"   "red"   "gray60" "gray60" "gray60"
```

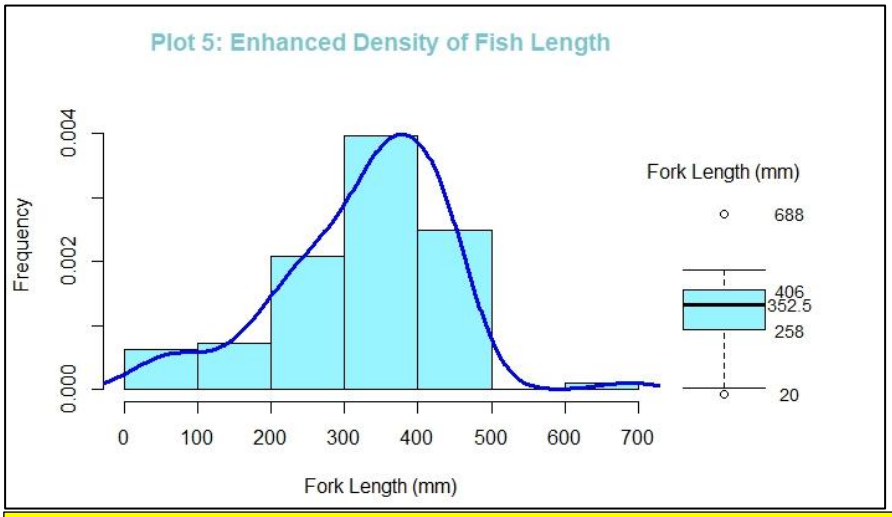
14-16

14-16. Create a pchs values for + & x and create cols vector/ Convert tmp to numeric/ Create numeric numEra from tmp$era/ Associate col vec with tmp$era (right, above)

17. [Plot 4] y=age x=fl/ Limit x, y/ Title/ Axis Label x, y// pch&col = pchs & cols value
18-19. [Abline] Width=2/ Col=cadeblue/ [Legend] Inset 0.05/No Box/ Font size 75%



+ [Plot 5] Add more. Enhanced Density of Fish Length



Shows Density of Fish Length, with lines with Boxplot.
Fork Length ***Median:352.5, Q1: 258, Q3: 406, one outlier at each side***

Bibliography

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Appendix: The R Script

```
#Plotting Basics by Heejae Roh#
install.packages("plyr")
install.packages("FSA")
install.packages("FSAdata")
install.packages("magrittr")
install.packages("moments")
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library(magrittr)
library(dplyr)
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setwd("C:\\Users\\14083\\Desktop\\exacutive summary\\Project 2")
BullTroutRML2 <- read.csv("BullTroutRML2.csv", header=TRUE)
BullTroutRML2
head(BullTroutRML2,1)
tail(BullTroutRML2,3)
filtered.Bull <- BullTroutRML2[BullTroutRML2$lake %in% "Harrison", ]
filtered.Bull
str(filtered.Bull)
t <- summary(filtered.Bull)
t

attach(filtered.Bull)
opar <- par(no.readonly = TRUE)
par(fig=c(0, 0.8, 0, 0.8))
plot(fl, age, main = "Plot 1: Harrison Lake Trout", line=0.5, ylab="Age (yrs)", xlab="Fork
Length (mm)", ylim=c(0,15), xlim=c(0,500), pch=20)
par(fig=c(0.02, 0.78, 0.48, 1), new=TRUE)
boxplot(fl, horizontal = TRUE, axes=FALSE, staplewex=1)
mtext("Fork Length(mm)", side=3, line=0.3)
text(x=fivenum(fl), labels=fivenum(fl), y=1.35, cex=0.7)
par(fig=c(0.7, 1, 0, 0.78), new=TRUE)
boxplot(age, axes=FALSE, staplewex=1)
mtext("Age (yrs)", side=3, line=0.2)
text(y=fivenum(age), labels=fivenum(age), x=1.3, cex=0.8)
par(opar)

opar <- par(no.readonly = TRUE)
par(fig=c(0, 0.8, 0, 1))
hist(age, main="Plot 2: Harrison Fish Age Distribution", col.main="cadetblue",
ylab="Frequency", xlab="Age (yrs)", col="cadetblue", labels=TRUE, ylim=c(0,14))
```

```
abline(v=6, col="black", lwd=2)
text(5.1,14, "Mean→")
par(fig=c(0.55, 1, 0, 0.78), new=TRUE)
boxplot(age, axes=FALSE, staplewex=1)
mtext("Age (yrs)", side=3, line=0.2)
text(y=fivenum(age), labels=fivenum(age), x=1.25, cex=1)
par(opar)

filtered.Bull%>%ggplot(aes(fl,age, color=era))+geom_point(pch=19)+ggtitle("Plot 3: Harrison Density Shaded by Era")+ylab("Age (yrs)")+xlab("Fork Length (mm)")+xlim(0,500)+ylim(0,15)+scale_color_manual(values=c("#000000","#999999"))+labs(color="Era")+geom_smooth(method=lm, se=FALSE)
detach(filtered.Bull)

library(berryFunctions)
tmp <- headtail(BullTroutRML2,3)
tmp

data.frame(tmp$era)
pchs <- c(3,4)
cols <- c("red","gray60")
class(tmp$era)
levels(tmp$era)
era.tmp <- factor(c("1977-80", "1977-80", "1977-80", "1997-01", "1997-01", "1997-01"), levels=c("1977-80", "1997-01"))
numEra <- as.numeric(era.tmp)
numEra
cols[numEra]

attach(BullTroutRML2)
plot(fl,age, main = "Plot 4: Symbol & Color by Era", ylab="Age (yrs)", xlab="Fork Length(mm)", ylim=c(0,15), xlim=c(0,500), pch=pchs[numEra], col=cols[numEra])
abline(lm(age ~ fl), lwd=2, col="cadetblue")
legend("topleft", inset = 0.05, c("1977-80", "1997-01"), col=cols, pch=pchs, box.col="white", cex=0.75)

opar <- par(no.readonly = TRUE)
par(fig=c(0, 0.8, 0, 1))
hist(fl, freq=F, main="Plot 5: Enhanced Density of Fish Length", col.main="cadetblue3", xlab="Fork Length (mm)", ylab="Frequency", col="cadetblue1", ylim=c(0,0.0045))
lines(density(fl), col="blue", lwd=3)
par(fig=c(0.58, 1, 0, 0.78), new=TRUE)
boxplot(fl, axes=FALSE, staplewex=1, col="cadetblue1")
mtext("Fork Length (mm)", side=3, line=1)
text(y=fivenum(fl), labels=fivenum(fl), x=1.32, cex=0.85)
par(opar)
detach(BullTroutRML2)
```