Executive Summary Report 3

Course Name: ALY6000 Introduction to Analytics

CRN 22279

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A] Following an introduction, provide an analysis of descriptive characteristics of the data set provided by your instructor. This includes pertinent statistics including counts, cumulative counts, frequency, percentages, etc. Include R console screen snippets to support your observations and conclusions. Below is a sample excerpt.

INTRODUCTION:

The following project aims at providing you a comprehensive understanding of how to use statistics in R as well as a thorough understanding of various key RStudio visualizations.

The objective of the project is to learn:

- ➔ How to load and install several libraries.
- ➔ How to apply different functions on the table i.e. create, convert, extract values'.
- ➔ With a given set of instructions, how to create different visualizations like Bar plots and a Pareto chart.
- ➔ How to display unique elements of a column.

Implementation:

```
> str(bio)
'data.frame':   676 obs. of  7 variables:
 $ netID  : int  12 12 12 12 12 12 12 13 13 13 ...
 $ fishID : int  16 23 30 44 50 65 66 68 69 70 ...
 $ species: chr  "Bluegill" "Bluegill" "Bluegill" "Bluegill" ...
 $ tl     : int  61 66 70 38 42 54 27 36 59 39 ...
 $ w      : num  2.9 4.5 5.2 0.5 1 2.1 NA 0.5 2 0.5 ...
 $ tag    : chr  "" "" "" "" ...
 $ scale  : logi  FALSE FALSE FALSE FALSE FALSE FALSE ...
>
```

Explanation:

- ➔ The inchBio.cv file contains the unique net identification number, unique fish identification number, species, total length (mm), weight (g), tag "number," and whether scales were sampled or not for individual fish captured.
- ➔ The structure of the data.frame is seen with str0, as shown above. The structure shows the number of observations or rows (676) and variables or columns (7) in the

data.frame and the names (following $), data type (or class), and the first few values of each variable. For example, netID is the first variable, it is an integer type, and the first three values are 12, 12, and 12 .

➔ The Data frame has 676 observations and 7 variables.

Implementation :

```
> summary(bio)
     netID           fishID        species              tl               w         
 Min.   :  1.00   Min.   :  7.0   Length:676         Min.   : 27.0   Min.   :   0.2  
 1st Qu.: 13.00   1st Qu.:175.8   Class :character   1st Qu.: 66.0   1st Qu.:   2.0  
 Median : 37.00   Median :345.5   Mode  :character   Median :189.5   Median :  54.5  
 Mean   : 67.65   Mean   :434.2                      Mean   :186.5   Mean   : 126.8  
 3rd Qu.:109.00   3rd Qu.:695.5                      3rd Qu.:295.0   3rd Qu.: 190.5  
 Max.   :206.00   Max.   :915.0                      Max.   :429.0   Max.   :1070.0  
                                                                     NA's   :165     
     tag                scale          
 Length:676         Mode :logical  
 Class :character   FALSE:213      
 Mode  :character   TRUE :463      
```

Explanation :

➔ The summary() function produces a numerical summary of each variable in the dataset.

➔ From the above summary, we can see that the lightest fish weighs around 0.2 g whereas the heaviest weight 1070.0 g. Similarly the largest fish lengths 429.0 mm while, the shortest is just 27.0 mm.

➔ The mean weight of fishes is seen as 126.8 g and the median weight as 54.5 g.

➔ The mean total length of the fishes is 186.5 mm and the median length is 189.5 mm.

➔ 1st Quartile and 3rd Quartile weights are found to be 2.0 g and 190.5 g respectively for the fishes.

➔ 1st Quartile and 3rd Quartile for total length are 66.0 mm and 295.0 mm.

➔ Since species, tag and scale are not numerical, hence it does not give the mean, median, or quartile of data. It gives the count of a number of values in it. So we get to know that there are 676 entries in the species table, the tag also has 676 entries and the scale has 213 entries of false and 463 entries of true.

Implementation :

```
> table(counts)
counts
   Black Crappie         Bluegill Bluntnose Minnow      Iowa Darter  Largemouth Bass
              36              220              103               32              228
     Pumpkinseed   Tadpole Madtom     Yellow Perch
              13                6               38
>
```

Explanation:

- ➔ In order to know a unique number of species in the dataset and their count, we use the count () function on the species entries.
- ➔ We get to know that the dataset contains 8 different species those are, Black Crappie, Bluegill, Bluntnose Minnow, Iowa Darter, Largemouth Bass, Pumpkinseed, Tadpole Madtom, and Yellow Perch.
- ➔ We also got to know that Largemouth Bass is the most with a count of 228 and Tadpole Madtom least with a count of 6.
- ➔ The second most are the Bluegill with a count of 220 and the second least with a count of 12 is the Pumpkinseed.

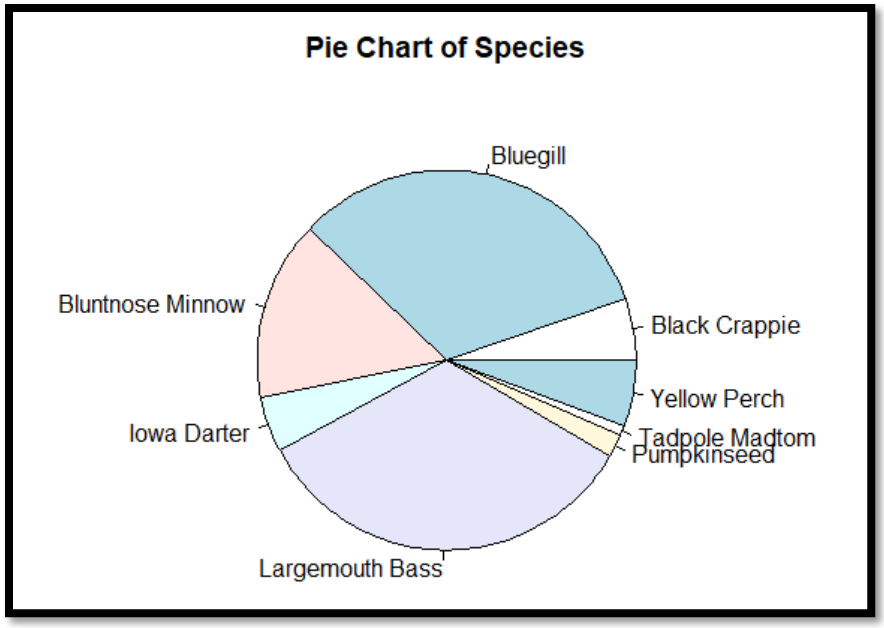
Implementation:

```
> cSpecPct

   Black Crappie         Bluegill Bluntnose Minnow      Iowa Darter  Largemouth Bass
        5.325444        32.544379        15.236686         4.733728        33.727811
     Pumpkinseed   Tadpole Madtom     Yellow Perch
        1.923077         0.887574         5.621302
>
```

Explanation:

- ➔ To get the percentage of records for each species we divide the total length of species and multiply by 100.
- ➔ We store it in a new table cSpectPct.
- ➔ From the results, we can see that Largemouth Bass comprises 33.72% of the total species which is mostly occupied by a species.
- ➔ Bluegill is the second-largest occupying species with 32.54% of the total.
- ➔ The least occupancy is of Tadpole Madtom with just 0.88% of the total.
- ➔ Below is the pie chart representation of the above analysis.



Implementation:

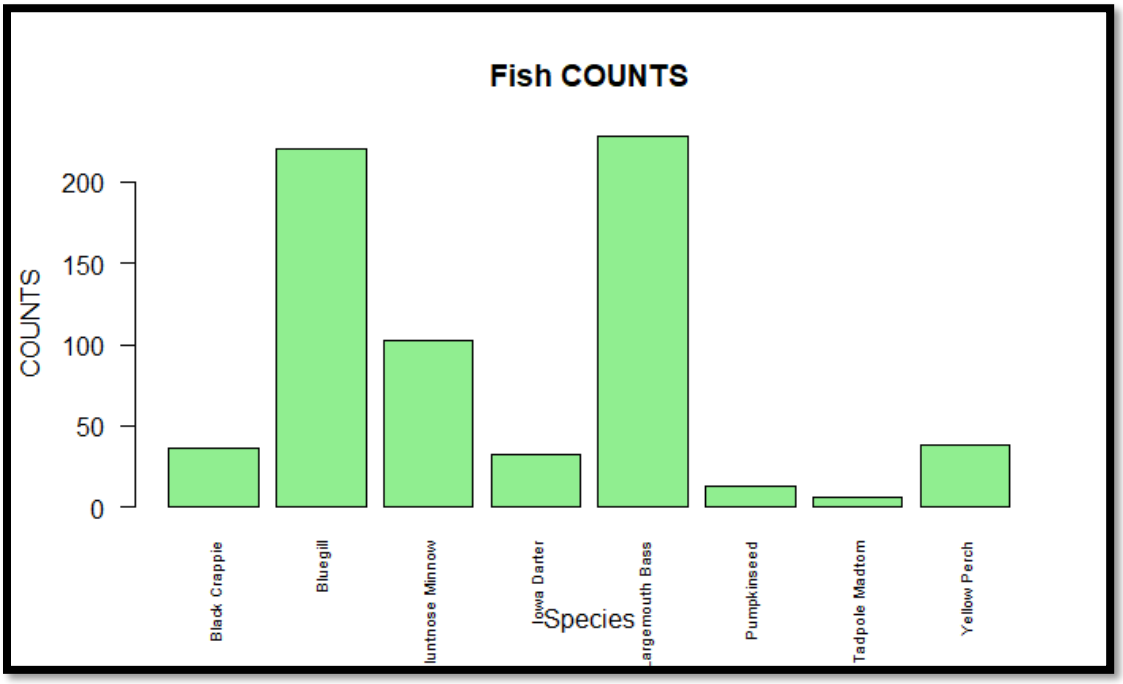
```
> t$Freq
[1]  36 220 103  32 228  13   6  38
> desc <- t[order(-t$Freq),]
> desc$Freq
[1] 228 220 103  38  36  32  13   6
> d <- d %>% mutate(cumfreq=cumsum(d$RelFreq),counts=desc$Freq, cumcounts = cumsum(desc$Freq))
> d
           Species   RelFreq   cumfreq counts cumcounts
5  Largemouth Bass 33.727811  33.72781    228       228
2         Bluegill 32.544379  66.27219    220       448
3 Bluntnose Minnow 15.236686  81.50888    103       551
8      Yellow Perch  5.621302  87.13018     38       589
1     Black Crappie  5.325444  92.45562     36       625
4       Iowa Darter  4.733728  97.18935     32       657
6       Pumpkinseed  1.923077  99.11243     13       670
7   Tadpole Madtom  0.887574 100.00000      6       676
```

Explanation:

- ➔ To get a Pareto chart, we first have to find the count and then the cumulative count for all the species.
- ➔ We identified the counts of each species in the above output and then calculated cumulative counts (cumcounts) by adding the next count to the preceding.
- ➔ This is further used for a Pareto Chart.

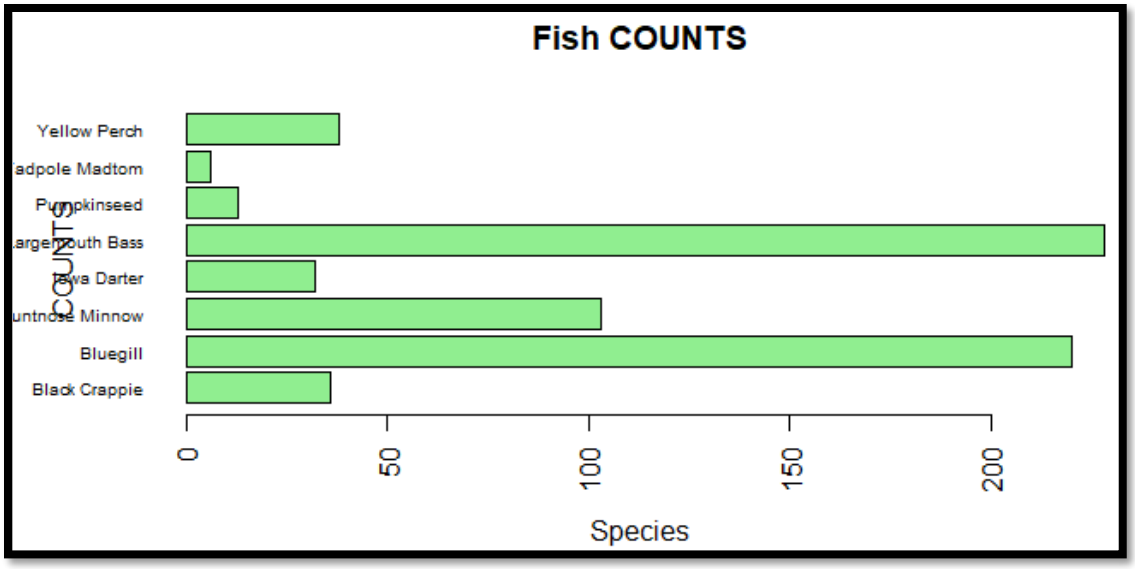
B] Provide the executive with visualizations (at least 3) that help them see the key characteristics you want to highlight. They can be boxplots, histograms, frequency and probability distributions, or bar plots (bar charts). A Pareto plot as illustrated below must be included in this part of your report. Include screen snippets of your plots to support your findings and conclusions. The goal is not only to present your visual results but also to explain their significance of them.

Implementation of Plot 1



Explanation:

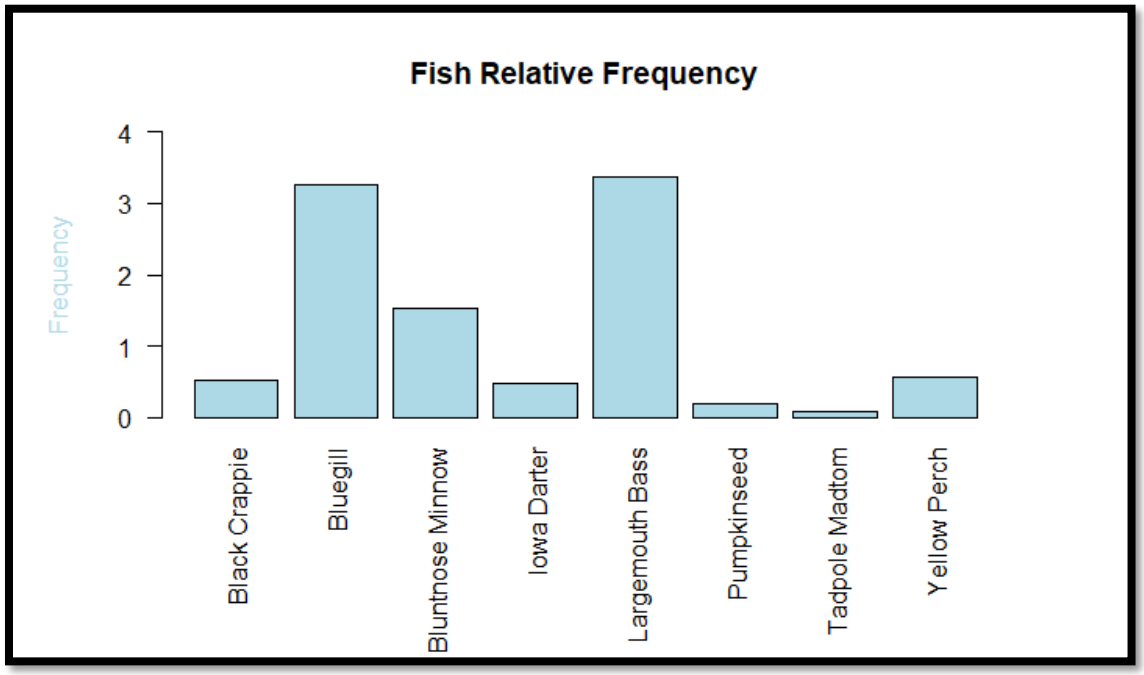
- ➔ The above graph is of the counts of species.
- ➔ From the bar, we can see that Largemouth Bass and Bluegill has more count as compared to others.
- ➔ Tadpole Madtom and Pumpkinseed have the least count than others.
- ➔ We can say that Tadpole Madtom and Pumpkinseed are extinct species whereas Largemouth Bass and Bluegill are dormant species.



➔ This is the graph that was required as per the question.

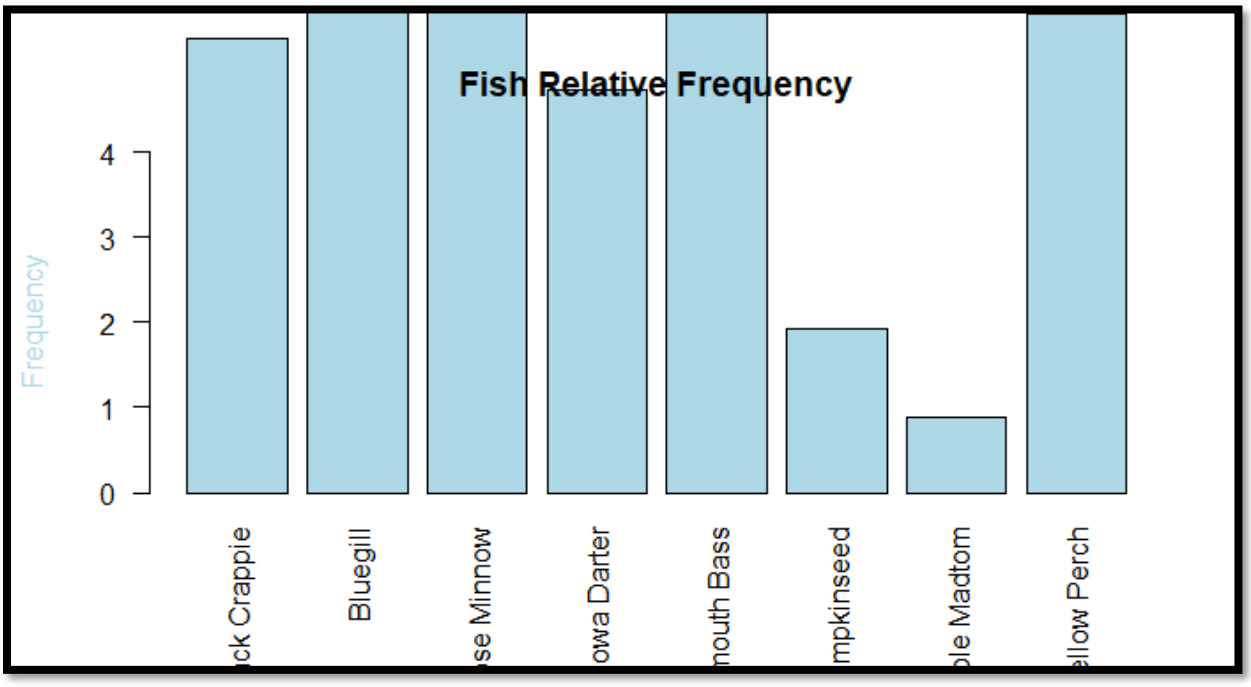
➔ But this graph might be wrong due to various reasons. Hence I am submitting both the graphs.

Plot 2-



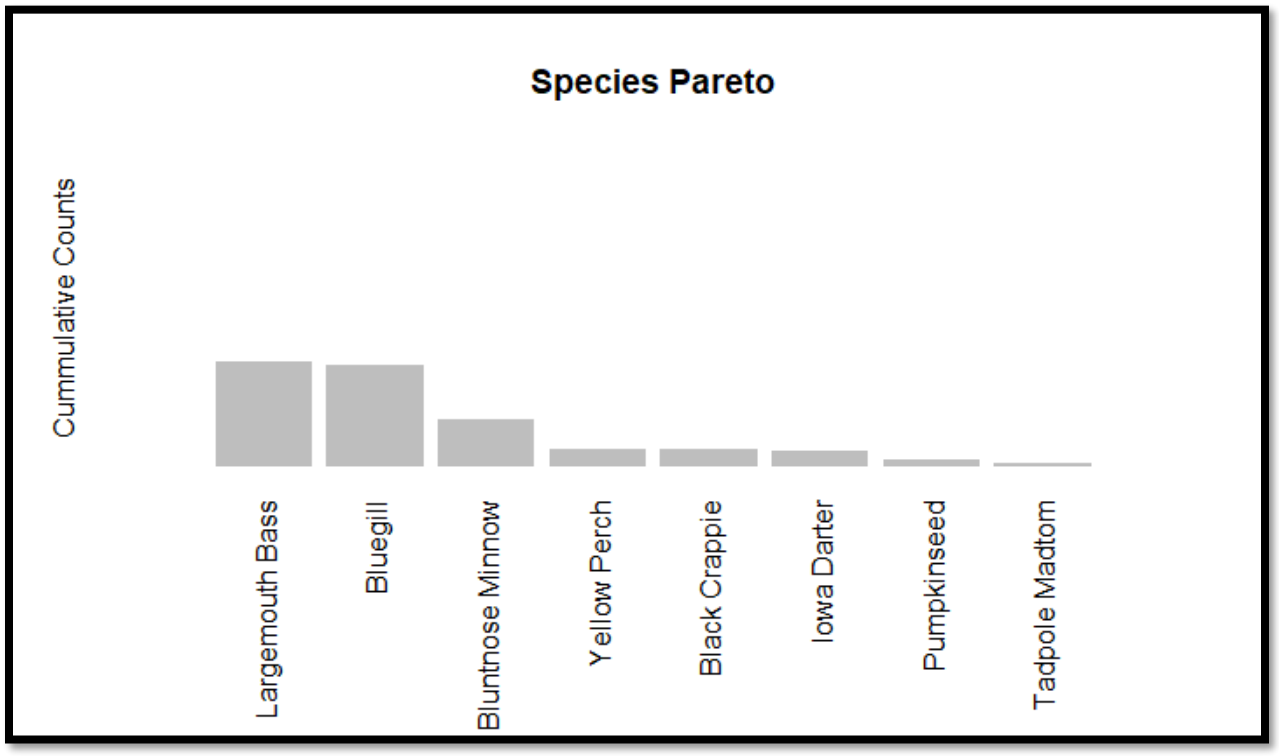
Explanation:

- ➔ The above graph is of the relative frequency of the fish.
- ➔ From the bar, we can see that Largemouth Bass and Bluegill have a high relative frequency.
- ➔ The chances we will see Largemouth Bass or Bluegill species is much higher than the others.
- ➔ Tadpole Madtom and Pumpkinseed have a less relative frequency.
- ➔ We have a significantly lower likelihood of seeing Tadpole Madtom or Pumpkinseed than the others.
- ➔ Apart from the above Bluntnose Minnow too have a good relative frequency.
- ➔ Since the question demanded the Y-axis limit to be from 0 to 4, we had to divide the dataset by 10 in order to meet the requirements.
- ➔ On not dividing the dataset by 10, we get the output shown below.



Implementation:

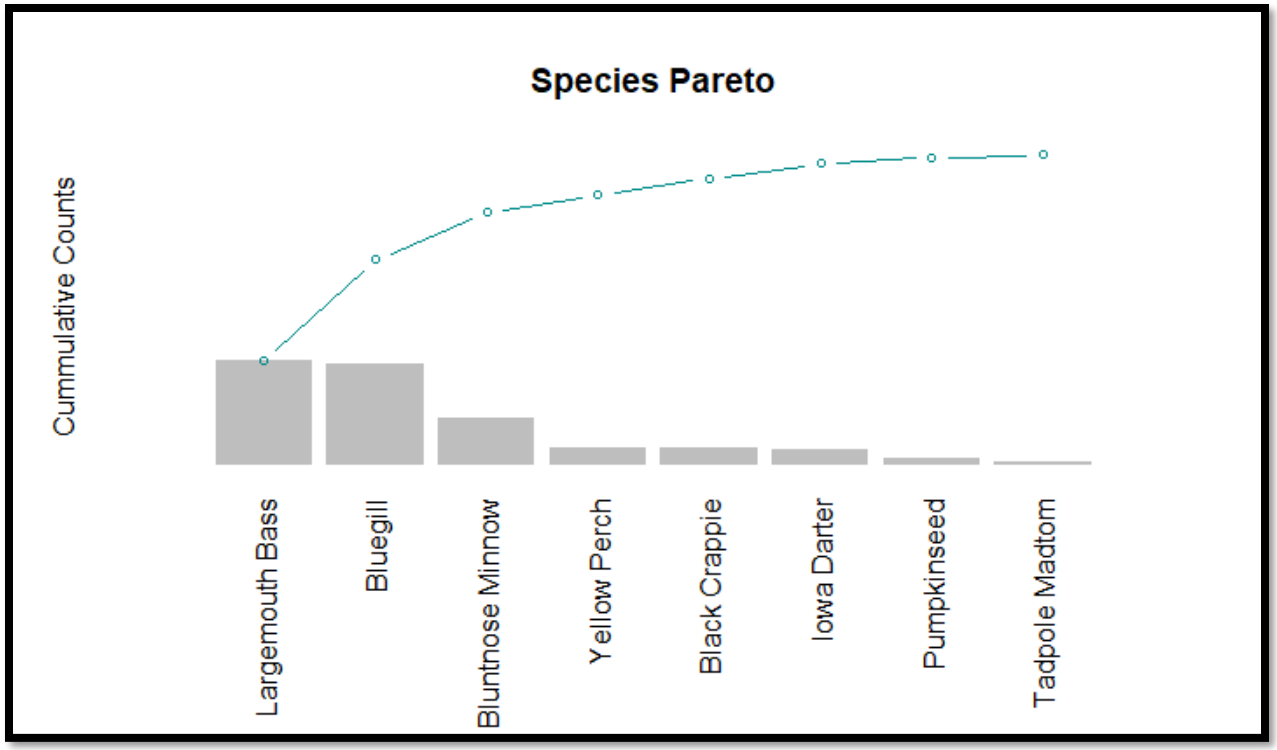
A stepwise procedure for representing a Pareto Chart is represented below.



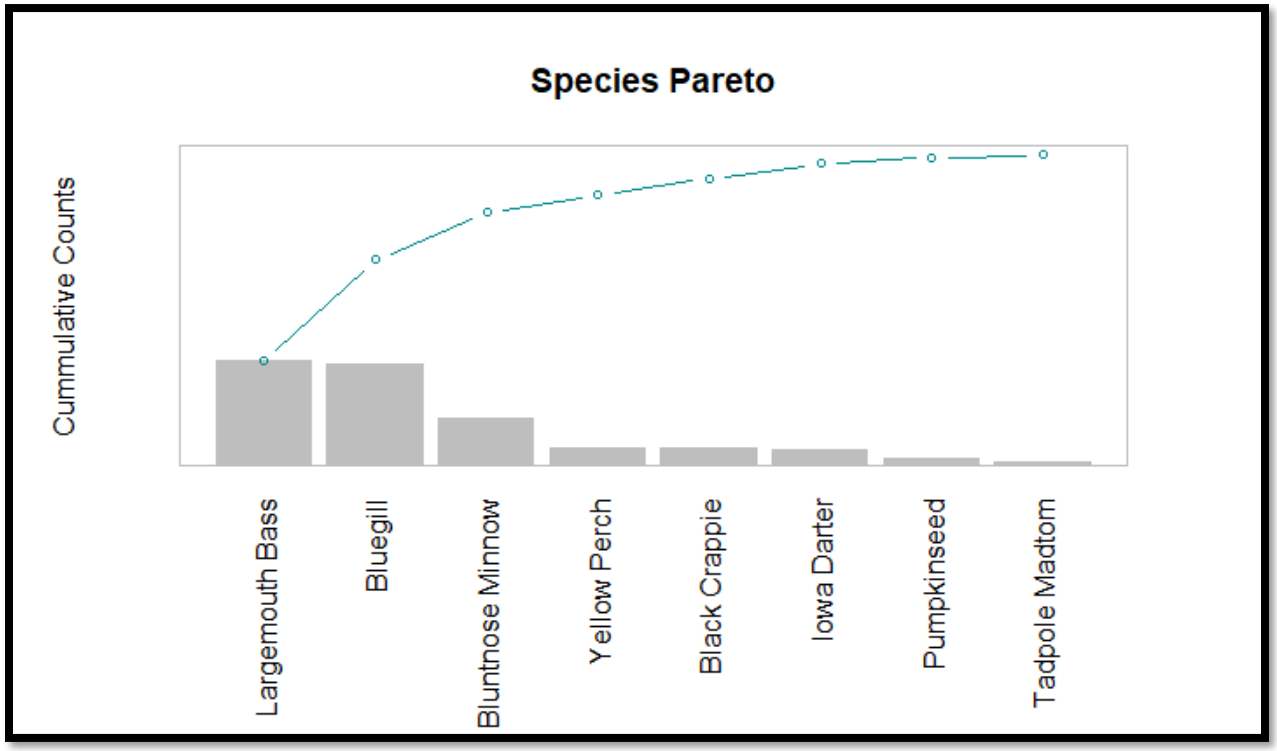
➔ This is a normal bar graph that has only 2 axes as of now i.e. X-axis and the Y-axis.

➔ The X-axis is represented by the name of the species and on the Y-axis is the cumulative count.

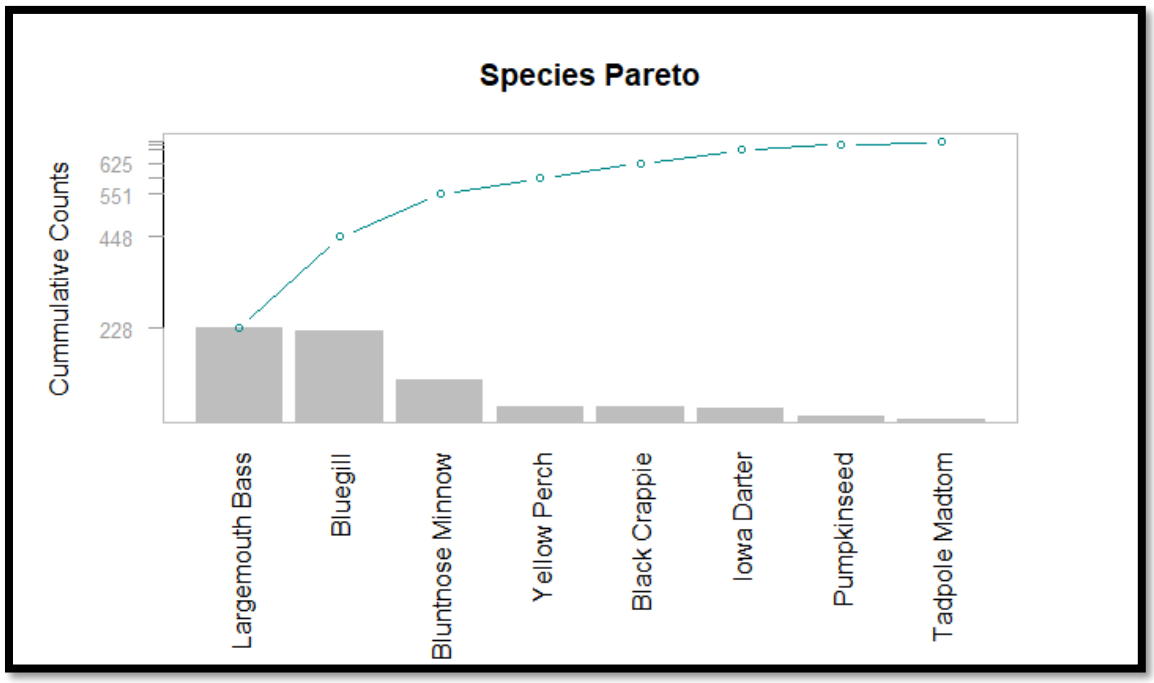
➔ To make it a Pareto chart, the bars are arranged in descending order.



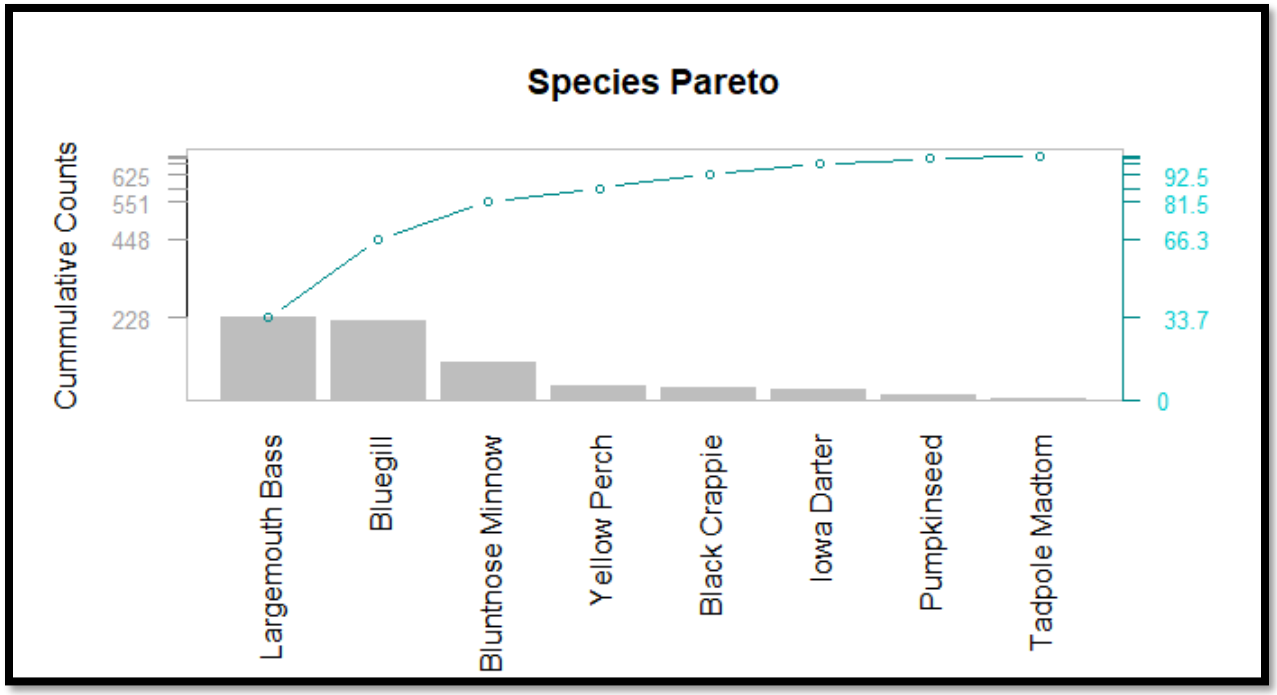
➔ A line graph is plotted here along with the bar graph.



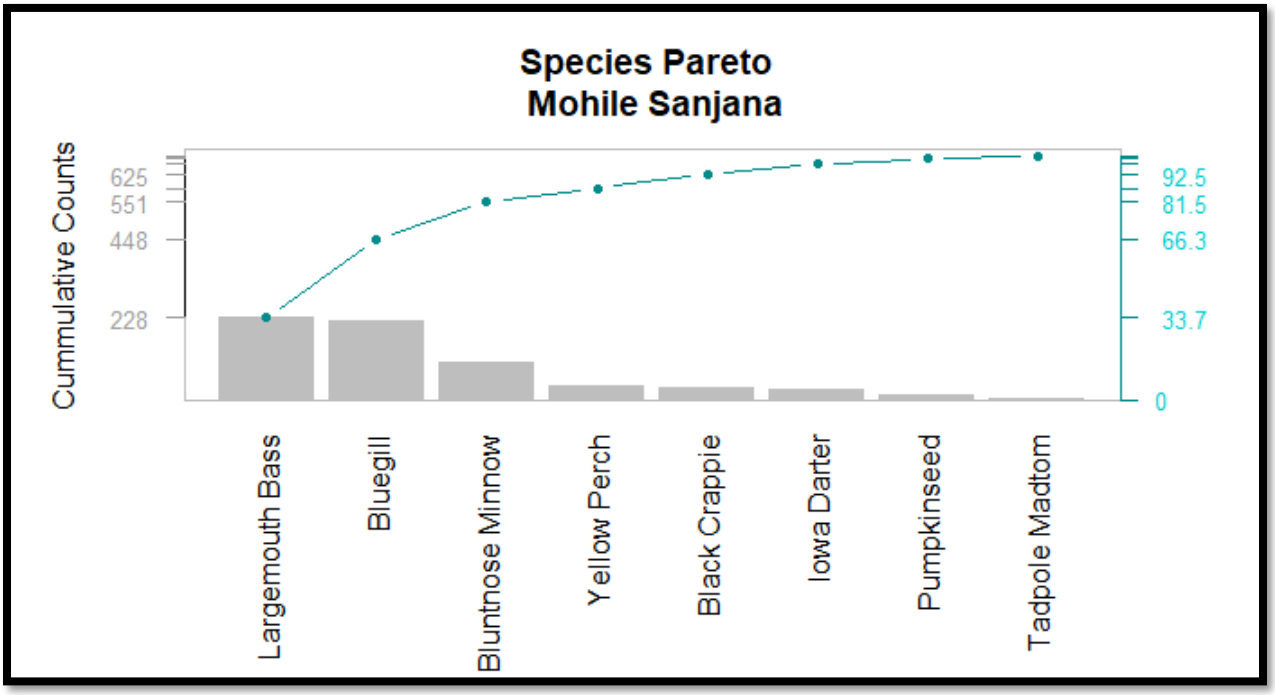
➔ Here, only a box is plotted around the graph to give it a border.



➔ The cumulative counts is shown on the Y-axis on the graph above.



➔ The right-side Y-axis is shown in this graph and it indicates the cumulative frequency.



➔ Pareto Charts are basically bar graphs whose lengths represent frequency and are arranged with longest bars on the left and shortest on the right. These graphs give statistical information on a bulk of information for each category.

➔ Fundamental properties of a Pareto Chart –

1. The Pareto distribution chart is a very long right-hand tail.
2. The Pareto chart is plotted on three axes, two y-axes, and one x-axis.
3. Pareto consists of a Bar and line chart.
4. The Bar Chart is plotted in the order of most frequent to least frequent occurrences.

➔ The X-axis stands for the 'Species' in the graph which is arranged from dominant to extinct species in numbers.

➔ From the Pareto chart, we see that the Largemouth Bass, Bluegill, and Bluntnose Minnow are the most dominant of all the species.

➔ As seen from the chart, Largemouth Bass comprises 33.72% of the total species, followed by Bluegill (32.54%) and Bluntnose Minnow (15.23%).

➔ The remaining species constitute 18.51% of the total species which is less than 20%.

- ➔ This means that three species constitute over 80% of the total species. Hence these three are the dominant species.
- ➔ From the research, we get to know that Largemouth Bass, Bluegill, and Bluntnose Minnow are carnivorous in nature and prey on fishes and their eggs.
- ➔ And on the other hand, Pumpkinseed and Tadpole Madtom survive on algae and insects.
- ➔ By this, we can conclude the dominance of these fishes(that Largemouth Bass, Bluegill, and Bluntnose Minnow) and the extinction of the others.

C. Finally, provide a clear two to three-sentence paragraph summary of the key points that you want the audience to walk away with regarding your analysis. This summary should present accurate analysis and be supported by the data presented in the rest of the report.

The inchBio dataset gave quite a few insights. The dataset showed that Largemouth Bass, Bluegill, and Bluntnose Minnow are widely found and are dominant species. Largemouth Bass, Bluegill, and Bluntnose Minnow round out the top three and account for over 80% of the total species. The remaining species account for less than 20% of the total species. Largemouth Bass and Bluegill alone constituted 66.26% of the total species. Apart from this, the maximum length of the fish is 429.0 mm and most weighted fish is 1070.0 g.

Bibliography

1. **Finding unique values in a column in R (Nizamuddin Siddiqui, August 2020)**
   https://www.tutorialspoint.com/how-to-find-the-unique-values-in-a-column-of-an-r-data-frame
   Last accessed: 4th February,2022
2. **Extracting first n-rows in R (Statistics globe)**
   https://statisticsglobe.com/extract-first-n-rows-of-data-frame-in-r
   Last accessed: 4th February,2022
3. **Percentage of the column in R (DataScience made simple)**
   https://www.datasciencemadesimple.com/percentage-of-the-column-in-r-2
   Last accessed: 4th February,2022
4. **How to convert table to data frame (Statology, December 2021)**
   https://www.statology.org/convert-table-to-data-frame-in-r
   Last accessed: 4th February,2022
5. **Barplot in R (Tutorial Gateway)**
   https://www.tutorialgateway.org/barplot-in-r-programming
   Last accessed: 4th February,2022
6. **Sort Data Frame in R (Statistics Globe)**
   https://statisticsglobe.com/sort-data-frame-in-r-example
   Last accessed: 4th February,2022

Mohile_RScipt_Module3.R

mohil

2022-02-05

```
r = getOption("repos")
r["CRAN"]="http://cran.us.r-project.org"
options(repos=r)

#Q1.Print your name at the top of the script and load these libraries: FSA,FS
Adata,magrittr,
#dplyr,tidyr plyr and tidyverse
print("Sanjana Mohile")

## [1] "Sanjana Mohile"

install.packages("FSA")

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'FSA' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpGW003O\downloaded_packages

install.packages("FSAdata")

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'FSAdata' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpGW003O\downloaded_packages

install.packages("magrittr")

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'magrittr' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'magrittr'

## Warning in file.copy(savedcopy, lib, recursive = TRUE):
## problem copying C:\Users\mohil\OneDrive\Documents\R\win-
## library\4.1\00LOCK\magrittr\libs\x64\magrittr.dll
```

```
## to C:\Users\mohil\OneDrive\Documents\R\win-
## library\4.1\magrittr\libs\x64\magrittr.dll: Permission denied

## Warning: restored 'magrittr'

##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpGW003O\downloaded_packages

install.packages("dplyr")

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'dplyr' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'dplyr'

## Warning in file.copy(savedcopy, lib, recursive = TRUE):
## problem copying C:\Users\mohil\OneDrive\Documents\R\win-
## library\4.1\00LOCK\dplyr\libs\x64\dplyr.dll to C:
## \Users\mohil\OneDrive\Documents\R\win-library\4.1\dplyr\libs\x64\dplyr.dll
:
## Permission denied

## Warning: restored 'dplyr'

##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpGW003O\downloaded_packages

install.packages("tidyr")

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'tidyr' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'tidyr'

## Warning in file.copy(savedcopy, lib, recursive = TRUE):
## problem copying C:\Users\mohil\OneDrive\Documents\R\win-
## library\4.1\00LOCK\tidyr\libs\x64\tidyr.dll to C:
## \Users\mohil\OneDrive\Documents\R\win-library\4.1\tidyr\libs\x64\tidyr.dll
:
## Permission denied

## Warning: restored 'tidyr'
```

```
##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpGW003O\downloaded_packages

install.packages("plyr")

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'plyr' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'plyr'

## Warning in file.copy(savedcopy, lib, recursive = TRUE): problem copying C:
## \Users\mohil\OneDrive\Documents\R\win-library\4.1\00LOCK\plyr\libs\x64\ply
r.dll
## to C:\Users\mohil\OneDrive\Documents\R\win-library\4.1\plyr\libs\x64\plyr.
dll:
## Permission denied

## Warning: restored 'plyr'

##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpGW003O\downloaded_packages

install.packages("tidyverse")

## Installing package into 'C:/Users/mohil/OneDrive/Documents/R/win-library/4
.1'
## (as 'lib' is unspecified)

## package 'tidyverse' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\mohil\AppData\Local\Temp\RtmpGW003O\downloaded_packages

library("FSA")

## ## FSA v0.9.1. See citation('FSA') if used in publication.
## ## Run fishR() for related website and fishR('IFAR') for related book.

library("FSAdata")

## ## FSAdata v0.3.8. See ?FSAdata to find data for specific fisheries analys
es.

library("magrittr")
library("dplyr")

##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

library("tidyr")

##
## Attaching package: 'tidyr'

## The following object is masked from 'package:magrittr':
##
##     extract

library("plyr")

## ------------------------------------------------------------------------
----

## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, th
en dplyr:
## library(plyr); library(dplyr)

## ------------------------------------------------------------------------
----

##
## Attaching package: 'plyr'

## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize

## The following object is masked from 'package:FSA':
##
##     mapvalues

library("tidyverse")

## -- Attaching packages --------------------------------------- tidyverse 1.
3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.6     v stringr 1.4.0
## v readr   2.1.1     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflict
s() --
```

```
## x plyr::arrange()    masks dplyr::arrange()
## x purrr::compact()   masks plyr::compact()
## x plyr::count()      masks dplyr::count()
## x tidyr::extract()   masks magrittr::extract()
## x plyr::failwith()   masks dplyr::failwith()
## x dplyr::filter()    masks stats::filter()
## x plyr::id()         masks dplyr::id()
## x dplyr::lag()       masks stats::lag()
## x plyr::mutate()     masks dplyr::mutate()
## x plyr::rename()     masks dplyr::rename()
## x purrr::set_names() masks magrittr::set_names()
## x plyr::summarise()  masks dplyr::summarise()
## x plyr::summarize()  masks dplyr::summarize()

#Q2. Import the inchBio.csv and name the table <bio>
bio <- read.csv("C:/Users/mohil/OneDrive/Desktop/Studies/ALY-6000 Introductio
n to Analytics/Module 3/inchBio.csv")
bio

##     netID fishID          species  tl      w      tag scale
## 1      12     16         Bluegill  61    2.9          FALSE
## 2      12     23         Bluegill  66    4.5          FALSE
## 3      12     30         Bluegill  70    5.2          FALSE
## 4      12     44         Bluegill  38    0.5          FALSE
## 5      12     50         Bluegill  42    1.0          FALSE
## 6      12     65         Bluegill  54    2.1          FALSE
## 7      12     66         Bluegill  27     NA          FALSE
## 8      13     68         Bluegill  36    0.5          FALSE
## 9      13     69         Bluegill  59    2.0          FALSE
## 10     13     70         Bluegill  39    0.5          FALSE
## 11     13     71         Bluegill  34    0.5          FALSE
## 12     13     73         Bluegill  40    1.0          FALSE
## 13     13     74         Bluegill  35    0.5          FALSE
## 14     13     75         Bluegill  32    1.0          FALSE
## 15     13     76         Bluegill  37    0.5          FALSE
## 16     13     77         Bluegill  38    1.0          FALSE
## 17     13     78         Bluegill  69    7.0          FALSE
## 18     13     80         Bluegill  39    1.0          FALSE
## 19     13     81         Bluegill  37    0.5          FALSE
## 20     13     82         Bluegill  38    1.0          FALSE
## 21     13     83         Bluegill  47     NA          FALSE
## 22     14     86         Bluegill  33    0.5          FALSE
## 23     14     87         Bluegill  31    1.5          FALSE
## 24     14     88         Bluegill  36    1.5          FALSE
## 25      4    118         Bluegill 150   60.0           TRUE
## 26      4    119         Bluegill 193  145.0           TRUE
## 27      4    120         Bluegill 185  123.0           TRUE
## 28      4    121         Bluegill 152   67.0           TRUE
## 29      4    122         Bluegill 160   75.0           TRUE
## 30      4    123         Bluegill 185  118.0           TRUE
```

```
## 31      4    124         Bluegill 170  100.0           TRUE
## 32      4    125         Bluegill 135   35.0           TRUE
## 33      4    126         Bluegill 183  120.0           TRUE
## 34      4    127         Bluegill 168   90.0           TRUE
## 35      4    128         Bluegill 165   85.0           TRUE
## 36      4    129         Bluegill 178  100.0           TRUE
## 37      4    130         Bluegill 193  155.0           TRUE
## 38      4    131         Bluegill 193  140.0           TRUE
## 39      4    132         Bluegill 201  180.0           TRUE
## 40      4    133         Bluegill 203  185.0           TRUE
## 41      4    134         Bluegill  99   15.0           TRUE
## 42      5    138         Bluegill 135   42.0           TRUE
## 43      5    139         Bluegill  38    2.0          FALSE
## 44      5    140         Bluegill  41     NA          FALSE
## 45      5    141         Bluegill  41     NA          FALSE
## 46      5    142         Bluegill  46     NA          FALSE
## 47      5    143         Bluegill 165   68.0           TRUE
## 48      5    144         Bluegill  43     NA          FALSE
## 49      5    145         Bluegill  51    4.0          FALSE
## 50      5    146         Bluegill 203  184.0           TRUE
## 51      5    147         Bluegill 168   98.0           TRUE
## 52      5    148         Bluegill 152   62.0           TRUE
## 53      5    149         Bluegill  64     NA          FALSE
## 54      5    150         Bluegill 157   76.0           TRUE
## 55     10    151         Bluegill 173  100.0           TRUE
## 56     10    152         Bluegill 173   95.0           TRUE
## 57     10    153         Bluegill 185  130.0           TRUE
## 58     10    154         Bluegill 218  250.0           TRUE
## 59     10    155         Bluegill 206  197.0           TRUE
## 60     10    156         Bluegill 165   78.0           TRUE
## 61     10    157         Bluegill 152   72.0           TRUE
## 62     10    158         Bluegill 170   98.0           TRUE
## 63      9    161         Bluegill 206  175.0           TRUE
## 64      9    162         Bluegill 191  144.0           TRUE
## 65      9    163         Bluegill 193  148.0           TRUE
## 66      9    164         Bluegill 183  130.0           TRUE
## 67      9    165         Bluegill 201  185.0           TRUE
## 68      9    166         Bluegill 221  225.0           TRUE
## 69      9    167         Bluegill 165   80.0          FALSE
## 70      9    168         Bluegill 206  180.0           TRUE
## 71      9    169         Bluegill 203  175.0           TRUE
## 72      9    170         Bluegill 165     NA           TRUE
## 73      9    171         Bluegill 193  160.0          FALSE
## 74      9    172         Bluegill 173     NA          FALSE
## 75      6    176         Bluegill 213  200.0           TRUE
## 76      6    177         Bluegill 155   74.0           TRUE
## 77      6    178         Bluegill 157   62.0           TRUE
## 78      6    179         Bluegill 211  220.0           TRUE
## 79      6    180         Bluegill 188  149.0           TRUE
## 80      6    181         Bluegill 188  139.0           TRUE
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## 81      6    182          Bluegill 196  132.0           TRUE
## 82      6    183          Bluegill 188  139.0           TRUE
## 83      6    184          Bluegill 160   73.0           TRUE
## 84      6    185          Bluegill 196  120.0           TRUE
## 85      6    186          Bluegill 221  242.0           TRUE
## 86      6    187          Bluegill 180  130.0           TRUE
## 87      6    188          Bluegill 152   70.0           TRUE
## 88      6    189          Bluegill 140   40.0           TRUE
## 89      6    190          Bluegill 203  170.0           TRUE
## 90      6    191          Bluegill 145   52.0           TRUE
## 91      6    192          Bluegill 147   32.0           TRUE
## 92     11    193          Bluegill 211  218.0           TRUE
## 93     11    194          Bluegill 147   60.0           TRUE
## 94     11    195          Bluegill 152   70.0           TRUE
## 95     17    196          Bluegill 203  192.0           TRUE
## 96     17    197          Bluegill 132   31.0           TRUE
## 97     17    199          Bluegill 142   59.0           TRUE
## 98     20    201          Bluegill 140   54.0           TRUE
## 99     15    203          Bluegill 142   40.0           TRUE
## 100    15    206          Bluegill 147   30.0           TRUE
## 101    15    207          Bluegill 119   20.0           TRUE
## 102    16    210          Bluegill 229  280.0           TRUE
## 103    16    211          Bluegill 224  260.0           TRUE
## 104    16    212          Bluegill 224  260.0           TRUE
## 105    16    213          Bluegill 224  240.0           TRUE
## 106    16    214          Bluegill 150   60.0           TRUE
## 107    16    215          Bluegill 137   60.0           TRUE
## 108    21    217          Bluegill  94   14.0           TRUE
## 109    21    219          Bluegill 130   38.0           TRUE
## 110    26    220          Bluegill 132   49.0           TRUE
## 111    26    221          Bluegill 137   41.0           TRUE
## 112    23    224          Bluegill 114   20.0           TRUE
## 113    27    226          Bluegill 127   20.0           TRUE
## 114    27    228          Bluegill 122   20.0           TRUE
## 115    28    230          Bluegill 137   50.0           TRUE
## 116    28    231          Bluegill 234  280.0           TRUE
## 117    37    322          Bluegill 152     NA           TRUE
## 118    37    356          Bluegill 201     NA           TRUE
## 119   206    501          Bluegill  38    0.7          FALSE
## 120   205    502          Bluegill  43    1.4          FALSE
## 121   205    503          Bluegill  56    1.5          FALSE
## 122   205    504          Bluegill  53    1.4          FALSE
## 123   205    505          Bluegill  38    1.0          FALSE
## 124   205    506          Bluegill  48    1.8          FALSE
## 125   205    507          Bluegill  48    1.4          FALSE
## 126   205    508          Bluegill  36    0.6          FALSE
## 127   205    509          Bluegill  30    0.3          FALSE
## 128   205    510          Bluegill  36    0.8          FALSE
## 129   205    511          Bluegill  51    1.3          FALSE
## 130   205    512          Bluegill  58    2.4          FALSE
```

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## 131   205    513         Bluegill  33    0.7          FALSE
## 132   205    514         Bluegill  38    1.0          FALSE
## 133   205    515         Bluegill  33    0.6          FALSE
## 134   205    516         Bluegill  56    2.8          FALSE
## 135   205    517         Bluegill  33    1.1          FALSE
## 136   205    518         Bluegill  53    2.0          FALSE
## 137   205    519         Bluegill  66    4.5          FALSE
## 138   205    520         Bluegill  71    4.9          FALSE
## 139   101    533         Bluegill 213  190.0           TRUE
## 140   101    538         Bluegill 216  198.0     1021  TRUE
## 141   101    539         Bluegill 216  210.0     1022  TRUE
## 142   101    540         Bluegill 231  258.0     1023  TRUE
## 143   101    541         Bluegill 193  138.0           TRUE
## 144   101    542         Bluegill 226  236.0     1024  TRUE
## 145   101    543         Bluegill 163   75.0           TRUE
## 146   101    544         Bluegill 224  229.0     1025  TRUE
## 147   101    545         Bluegill 178  101.0           TRUE
## 148   101    546         Bluegill 180  110.0           TRUE
## 149   101    547         Bluegill 239  295.0     1015  TRUE
## 150   101    548         Bluegill 183  113.0           TRUE
## 151   101    549         Bluegill 211  191.0     1018  TRUE
## 152   101    550         Bluegill 191  139.0           TRUE
## 153   101    552         Bluegill 191  137.0           TRUE
## 154   101    553         Bluegill 201  165.0           TRUE
## 155   101    554         Bluegill 178  103.0           TRUE
## 156   101    555         Bluegill 201  166.0           TRUE
## 157   101    556         Bluegill 180  115.0           TRUE
## 158   101    557         Bluegill 165   89.0           TRUE
## 159   101    558         Bluegill 191  121.0           TRUE
## 160   101    559         Bluegill 157   78.0           TRUE
## 161   101    560         Bluegill 152   63.0           TRUE
## 162   101    561         Bluegill 206  181.0     1075  TRUE
## 163   101    562         Bluegill 147   60.0           TRUE
## 164   101    563         Bluegill 163   74.0           TRUE
## 165   101    564         Bluegill 180  101.0           TRUE
## 166   101    565         Bluegill 193  141.0           TRUE
## 167   101    566         Bluegill 216  228.0     1074  TRUE
## 168   101    567         Bluegill 229  266.0     1073  TRUE
## 169   101    568         Bluegill 168   93.0           TRUE
## 170   101    569         Bluegill 163   74.0           TRUE
## 171   101    570         Bluegill 165   82.0           TRUE
## 172   101    571         Bluegill 231  274.0     1072  TRUE
## 173   101    572         Bluegill 201  151.0           TRUE
## 174   101    573         Bluegill 188  129.0           TRUE
## 175   101    574         Bluegill 175   98.0           TRUE
## 176   101    575         Bluegill 145   57.0           TRUE
## 177   101    576         Bluegill 152   62.0           TRUE
## 178   101    577         Bluegill 175  107.0           TRUE
## 179   101    578         Bluegill 221  240.0     1071  TRUE
## 180   101    580         Bluegill 178  110.0           TRUE
```

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## 181   101    581          Bluegill 211  208.0     1069  TRUE
## 182   101    583          Bluegill 140   48.0           TRUE
## 183   101    585          Bluegill 173   96.0           TRUE
## 184   101    586          Bluegill 152   73.0           TRUE
## 185   101    587          Bluegill 213  198.0     1066  TRUE
## 186   107    621          Bluegill 203  156.0     1065  TRUE
## 187   107    622          Bluegill 221  242.0     1064  TRUE
## 188   107    623          Bluegill 203  187.0     1063  TRUE
## 189   107    624          Bluegill 229  242.0     1062  TRUE
## 190   107    625          Bluegill 170   83.0           TRUE
## 191   104    658          Bluegill 213  197.0     1099  TRUE
## 192   104    659          Bluegill 229  255.0     1098  TRUE
## 193   104    660          Bluegill 185  111.0           TRUE
## 194   103    689          Bluegill 206     NA     1107  TRUE
## 195   103    695          Bluegill 137   45.3           TRUE
## 196   103    697          Bluegill 147   50.9           TRUE
## 197   103    699          Bluegill  66    3.4           TRUE
## 198   103    700          Bluegill 150   54.5           TRUE
## 199   103    701          Bluegill 142   48.8           TRUE
## 200   103    703          Bluegill 150   50.9           TRUE
## 201   111    717          Bluegill 130   35.0           TRUE
## 202   111    718          Bluegill 137   45.0           TRUE
## 203   111    719          Bluegill 132   39.0           TRUE
## 204   111    722          Bluegill 137   43.0           TRUE
## 205   111    726          Bluegill 137   50.0           TRUE
## 206   113    742          Bluegill 135   39.0           TRUE
## 207   114    755          Bluegill  66    3.1          FALSE
## 208   116    761          Bluegill  97   10.9          FALSE
## 209   116    762          Bluegill  91   10.6          FALSE
## 210   112    774          Bluegill 203  171.0     1045  TRUE
## 211   112    780          Bluegill  76    6.1          FALSE
## 212   112    781          Bluegill 109   19.0          FALSE
## 213   120    802          Bluegill  94   10.7           TRUE
## 214   120    803          Bluegill  84    8.9           TRUE
## 215   120    804          Bluegill  91   10.6           TRUE
## 216   120    805          Bluegill  84    8.7           TRUE
## 217   120    806          Bluegill  86    9.3           TRUE
## 218   120    807          Bluegill  69    4.0           TRUE
## 219   119    824          Bluegill 119   25.0           TRUE
## 220   122    826          Bluegill 132   33.0           TRUE
## 221    12      7 Bluntnose Minnow  59    2.0          FALSE
## 222    12      8 Bluntnose Minnow  58    1.7          FALSE
## 223    12     10 Bluntnose Minnow  54    1.5          FALSE
## 224    12     11 Bluntnose Minnow  60    1.7          FALSE
## 225    12     12 Bluntnose Minnow  78    2.3          FALSE
## 226    12     14 Bluntnose Minnow  62    2.2          FALSE
## 227    12     17 Bluntnose Minnow  59    2.0          FALSE
## 228    12     18 Bluntnose Minnow  63    2.5          FALSE
## 229    12     19 Bluntnose Minnow  58    2.0          FALSE
## 230    12     21 Bluntnose Minnow  71    3.8          FALSE
```

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## 231    12     22 Bluntnose Minnow  55    2.5          FALSE
## 232    12     24 Bluntnose Minnow  60    2.2          FALSE
## 233    12     25 Bluntnose Minnow  51    2.0          FALSE
## 234    12     26 Bluntnose Minnow  52    1.8          FALSE
## 235    12     27 Bluntnose Minnow  64    2.5          FALSE
## 236    12     28 Bluntnose Minnow  67    4.0          FALSE
## 237    12     29 Bluntnose Minnow  63    2.0          FALSE
## 238    12     31 Bluntnose Minnow  65    2.0          FALSE
## 239    12     32 Bluntnose Minnow  67    3.0          FALSE
## 240    12     33 Bluntnose Minnow  71    4.8          FALSE
## 241    12     34 Bluntnose Minnow  66    3.0          FALSE
## 242    12     35 Bluntnose Minnow  73    4.0          FALSE
## 243    12     36 Bluntnose Minnow  67    4.0          FALSE
## 244    12     37 Bluntnose Minnow  51    2.5          FALSE
## 245    12     38 Bluntnose Minnow  58    1.5          FALSE
## 246    12     39 Bluntnose Minnow  71    3.8          FALSE
## 247    12     40 Bluntnose Minnow  52    1.5          FALSE
## 248    12     41 Bluntnose Minnow  61    1.5          FALSE
## 249    12     42 Bluntnose Minnow  58    1.5          FALSE
## 250    12     43 Bluntnose Minnow  72    3.0          FALSE
## 251    12     45 Bluntnose Minnow  68     NA          FALSE
## 252    12     46 Bluntnose Minnow  57    1.5          FALSE
## 253    12     47 Bluntnose Minnow  58    1.5          FALSE
## 254    12     48 Bluntnose Minnow  58    2.0          FALSE
## 255    12     49 Bluntnose Minnow  58    2.5          FALSE
## 256    12     51 Bluntnose Minnow  61    3.0          FALSE
## 257    12     52 Bluntnose Minnow  57    1.0          FALSE
## 258    12     53 Bluntnose Minnow  70    2.0          FALSE
## 259    12     54 Bluntnose Minnow  64    2.5          FALSE
## 260    12     55 Bluntnose Minnow  61    1.0          FALSE
## 261    12     56 Bluntnose Minnow  56    1.0          FALSE
## 262    12     57 Bluntnose Minnow  58     NA          FALSE
## 263    12     58 Bluntnose Minnow  66    4.0          FALSE
## 264    12     59 Bluntnose Minnow  59    2.0          FALSE
## 265    12     60 Bluntnose Minnow  62    1.5          FALSE
## 266    12     61 Bluntnose Minnow  64    2.5          FALSE
## 267    12     62 Bluntnose Minnow  63    1.5          FALSE
## 268    12     63 Bluntnose Minnow  61    1.8          FALSE
## 269    12     64 Bluntnose Minnow  64    3.0          FALSE
## 270    13     79 Bluntnose Minnow  72    5.0          FALSE
## 271    13     84 Bluntnose Minnow  71    4.0          FALSE
## 272   205    522 Bluntnose Minnow  61    2.1          FALSE
## 273   201    523 Bluntnose Minnow  56     NA          FALSE
## 274   101    589 Bluntnose Minnow  64    1.4          FALSE
## 275   101    590 Bluntnose Minnow  46    0.5          FALSE
## 276   101    591 Bluntnose Minnow  53    1.0          FALSE
## 277   101    592 Bluntnose Minnow  58    1.7          FALSE
## 278   101    593 Bluntnose Minnow  56    1.0          FALSE
## 279   101    594 Bluntnose Minnow  58    1.1          FALSE
## 280   101    595 Bluntnose Minnow  58    1.0          FALSE
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## 281   101    596 Bluntnose Minnow  56    1.0          FALSE
## 282   101    597 Bluntnose Minnow  53    1.0          FALSE
## 283   101    598 Bluntnose Minnow  51    0.8          FALSE
## 284   101    599 Bluntnose Minnow  56    0.8          FALSE
## 285   101    600 Bluntnose Minnow  56    1.0          FALSE
## 286   101    601 Bluntnose Minnow  58    1.0          FALSE
## 287   101    603 Bluntnose Minnow  64    1.4          FALSE
## 288   101    605 Bluntnose Minnow  58    1.2          FALSE
## 289   101    606 Bluntnose Minnow  61    1.3          FALSE
## 290   101    607 Bluntnose Minnow  69    1.8          FALSE
## 291   101    608 Bluntnose Minnow  64    1.4          FALSE
## 292   101    609 Bluntnose Minnow  53    0.8          FALSE
## 293   101    610 Bluntnose Minnow  64    1.4          FALSE
## 294   101    611 Bluntnose Minnow  61    1.2          FALSE
## 295   101    612 Bluntnose Minnow  51    0.7          FALSE
## 296   101    613 Bluntnose Minnow  56    1.1          FALSE
## 297   101    614 Bluntnose Minnow  56    1.0          FALSE
## 298   101    615 Bluntnose Minnow  53    0.9          FALSE
## 299   101    616 Bluntnose Minnow  58    1.2          FALSE
## 300   101    617 Bluntnose Minnow  53    0.8          FALSE
## 301   101    618 Bluntnose Minnow  53    0.9          FALSE
## 302   101    619 Bluntnose Minnow  66    1.5          FALSE
## 303   101    620 Bluntnose Minnow  61    1.3          FALSE
## 304   102    638 Bluntnose Minnow  74    3.9          FALSE
## 305   102    639 Bluntnose Minnow  61    2.2          FALSE
## 306   102    640 Bluntnose Minnow  84    1.3          FALSE
## 307   102    642 Bluntnose Minnow  53    1.3          FALSE
## 308   102    643 Bluntnose Minnow  56    2.1          FALSE
## 309   102    644 Bluntnose Minnow  56    1.4          FALSE
## 310   102    645 Bluntnose Minnow  61    2.0          FALSE
## 311   111    727 Bluntnose Minnow  79    3.8          FALSE
## 312   116    763 Bluntnose Minnow  74    3.4          FALSE
## 313   121    816 Bluntnose Minnow  51    1.2          FALSE
## 314   121    817 Bluntnose Minnow  79    3.9          FALSE
## 315   121    818 Bluntnose Minnow  74    3.8          FALSE
## 316   121    819 Bluntnose Minnow  64    1.9          FALSE
## 317   121    820 Bluntnose Minnow  51    1.0          FALSE
## 318   121    821 Bluntnose Minnow  51    1.1          FALSE
## 319   121    822 Bluntnose Minnow  64    2.1          FALSE
## 320   121    823 Bluntnose Minnow  51    1.2          FALSE
## 321   125    832 Bluntnose Minnow  81    2.8          FALSE
## 322   125    833 Bluntnose Minnow  81    3.2          FALSE
## 323   125    834 Bluntnose Minnow  79    4.1          FALSE
## 324    13     72      Iowa Darter  61     NA          FALSE
## 325   205    521      Iowa Darter  53    1.1          FALSE
## 326   203    524      Iowa Darter  46    0.6          FALSE
## 327   203    525      Iowa Darter  44    0.6          FALSE
## 328   203    526      Iowa Darter  46    0.6          FALSE
## 329   203    527      Iowa Darter  43    0.4          FALSE
## 330   101    602      Iowa Darter  56    0.9          FALSE
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## 331   101    604      Iowa Darter  51    0.8          FALSE
## 332   102    641      Iowa Darter  48    1.0          FALSE
## 333   106    646      Iowa Darter  38    0.6          FALSE
## 334   106    647      Iowa Darter  46    0.9          FALSE
## 335   106    648      Iowa Darter  43    0.8          FALSE
## 336   106    649      Iowa Darter  48    1.0          FALSE
## 337   106    650      Iowa Darter  41    0.5          FALSE
## 338   106    651      Iowa Darter  41    0.7          FALSE
## 339   106    652      Iowa Darter  43    0.6          FALSE
## 340   106    653      Iowa Darter  43    0.6          FALSE
## 341   106    654      Iowa Darter  46    0.9          FALSE
## 342   105    711      Iowa Darter  48    0.7          FALSE
## 343   105    712      Iowa Darter  46    0.7          FALSE
## 344   115    730      Iowa Darter  48    0.8          FALSE
## 345   115    731      Iowa Darter  48    0.8          FALSE
## 346   115    732      Iowa Darter  51    1.0          FALSE
## 347   115    733      Iowa Darter  51    1.1          FALSE
## 348   116    764      Iowa Darter  51    1.2          FALSE
## 349   116    765      Iowa Darter  48    0.9          FALSE
## 350   116    766      Iowa Darter  51    0.9          FALSE
## 351   116    767      Iowa Darter  43    0.5          FALSE
## 352   116    768      Iowa Darter  51    1.2          FALSE
## 353   116    769      Iowa Darter  56    1.2          FALSE
## 354   116    770      Iowa Darter  53    1.1          FALSE
## 355   116    771      Iowa Darter  43    0.9          FALSE
## 356    14     85  Largemouth Bass  68    3.5           TRUE
## 357     3     89  Largemouth Bass 338     NA   g0996  TRUE
## 358     1     90  Largemouth Bass 356     NA  y06073  TRUE
## 359     1     91  Largemouth Bass 328     NA   o0449  TRUE
## 360     1     92  Largemouth Bass 305     NA   o0448  TRUE
## 361     1     93  Largemouth Bass 386     NA   o0447  TRUE
## 362     1     94  Largemouth Bass 310     NA   g0985  TRUE
## 363     1     95  Largemouth Bass 262     NA          TRUE
## 364     1     96  Largemouth Bass 305     NA   g0986  TRUE
## 365     1     97  Largemouth Bass 315     NA   g0987  TRUE
## 366     1     98  Largemouth Bass 371     NA   g1000  TRUE
## 367     1     99  Largemouth Bass 338     NA   g0999  TRUE
## 368     1    100  Largemouth Bass 239     NA          TRUE
## 369     1    101  Largemouth Bass 236     NA          TRUE
## 370     1    102  Largemouth Bass 348     NA   g0997  TRUE
## 371     2    104  Largemouth Bass 307     NA   o0501  TRUE
## 372     2    105  Largemouth Bass 323     NA   o0506  TRUE
## 373     2    106  Largemouth Bass 231     NA          TRUE
## 374     2    107  Largemouth Bass 216     NA          TRUE
## 375     2    108  Largemouth Bass 325     NA   o0507  TRUE
## 376     2    109  Largemouth Bass 399     NA   o0510  TRUE
## 377     2    110  Largemouth Bass 333     NA   o0511  TRUE
## 378     2    111  Largemouth Bass 356     NA   o0512  TRUE
## 379     2    112  Largemouth Bass 274     NA          TRUE
## 380    17    198  Largemouth Bass 259  190.0          TRUE
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## 381    27    227  Largemouth Bass 137   20.0          TRUE
## 382    29    232  Largemouth Bass 279     NA    o0516  TRUE
## 383    29    233  Largemouth Bass 351     NA    o0517  TRUE
## 384    29    234  Largemouth Bass 307     NA    o0518  TRUE
## 385    29    235  Largemouth Bass 325     NA    o0520  TRUE
## 386    29    237  Largemouth Bass 330     NA    o0521  TRUE
## 387    29    239  Largemouth Bass 282     NA    o0523  TRUE
## 388    29    240  Largemouth Bass 262     NA           TRUE
## 389    29    241  Largemouth Bass 391     NA    o0524  TRUE
## 390    29    242  Largemouth Bass 262     NA           TRUE
## 391    29    243  Largemouth Bass 295     NA    o0525  TRUE
## 392    30    244  Largemouth Bass 305     NA    o0550  TRUE
## 393    30    245  Largemouth Bass 193     NA           TRUE
## 394    30    246  Largemouth Bass 254     NA           TRUE
## 395    30    247  Largemouth Bass 246     NA           TRUE
## 396    30    248  Largemouth Bass 330     NA    o0549  TRUE
## 397    30    249  Largemouth Bass 300     NA           TRUE
## 398    30    250  Largemouth Bass 284     NA           TRUE
## 399    30    251  Largemouth Bass 371     NA    o0548  TRUE
## 400    30    252  Largemouth Bass 335     NA    o0547  TRUE
## 401    30    253  Largemouth Bass 305     NA    o0546  TRUE
## 402    30    254  Largemouth Bass 254     NA           TRUE
## 403    30    255  Largemouth Bass 318     NA    o0545  TRUE
## 404    30    256  Largemouth Bass 348     NA    o0544  TRUE
## 405    30    257  Largemouth Bass 343     NA    o0543  TRUE
## 406    30    258  Largemouth Bass 325     NA    o0542  TRUE
## 407    30    259  Largemouth Bass 333     NA    o0541  TRUE
## 408    30    260  Largemouth Bass 330     NA    o0540  TRUE
## 409    30    261  Largemouth Bass 381     NA    o0539  TRUE
## 410    30    262  Largemouth Bass 320     NA    o0538  TRUE
## 411    30    263  Largemouth Bass 272     NA           TRUE
## 412    30    264  Largemouth Bass 312     NA    o0536  TRUE
## 413    30    265  Largemouth Bass 310     NA    o0535  TRUE
## 414    30    266  Largemouth Bass 297     NA           TRUE
## 415    31    270  Largemouth Bass 307     NA    o0533  TRUE
## 416    31    271  Largemouth Bass 310     NA    o0532  TRUE
## 417    31    272  Largemouth Bass 277     NA           TRUE
## 418    33    273  Largemouth Bass 130     NA           TRUE
## 419    32    274  Largemouth Bass 140     NA           TRUE
## 420    35    275  Largemouth Bass 239     NA           TRUE
## 421    35    276  Largemouth Bass 236     NA           TRUE
## 422    35    277  Largemouth Bass 320     NA    o0519  TRUE
## 423    35    278  Largemouth Bass 241     NA           TRUE
## 424    35    279  Largemouth Bass 343     NA    g0988  TRUE
## 425    35    280  Largemouth Bass 226     NA           TRUE
## 426    35    281  Largemouth Bass 211     NA           TRUE
## 427    35    282  Largemouth Bass 409     NA    g0990  TRUE
## 428    35    284  Largemouth Bass 371     NA    o0991  TRUE
## 429    35    285  Largemouth Bass 312     NA    o0989  TRUE
## 430    35    286  Largemouth Bass 333     NA   y00003  TRUE
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## 431    35    287  Largemouth Bass 338     NA   y00228  TRUE
## 432    35    288  Largemouth Bass 282     NA           TRUE
## 433    35    289  Largemouth Bass 302     NA           TRUE
## 434    35    290  Largemouth Bass 305     NA  y160016  TRUE
## 435    35    291  Largemouth Bass 376     NA    o0534  TRUE
## 436    35    292  Largemouth Bass 251     NA           TRUE
## 437    35    293  Largemouth Bass 338     NA    y2519  TRUE
## 438    35    294  Largemouth Bass 318     NA   y00034  TRUE
## 439    35    295  Largemouth Bass 312     NA   y00123  TRUE
## 440    35    296  Largemouth Bass 272     NA           TRUE
## 441    35    297  Largemouth Bass 394     NA    o0531  TRUE
## 442    35    298  Largemouth Bass 363     NA    o0530  TRUE
## 443    35    299  Largemouth Bass 320     NA   y01525 FALSE
## 444    36    300  Largemouth Bass 307     NA    o0529  TRUE
## 445    36    301  Largemouth Bass 330     NA    o0528  TRUE
## 446    36    302  Largemouth Bass 318     NA    o0527  TRUE
## 447    36    303  Largemouth Bass 302     NA           TRUE
## 448    36    304  Largemouth Bass 277     NA           TRUE
## 449    36    305  Largemouth Bass 241     NA           TRUE
## 450    36    306  Largemouth Bass 318     NA    o0526  TRUE
## 451    36    307  Largemouth Bass 297     NA           TRUE
## 452    36    308  Largemouth Bass 318     NA   y01598  TRUE
## 453    36    309  Largemouth Bass 373     NA   y01600  TRUE
## 454    36    310  Largemouth Bass 290     NA           TRUE
## 455    36    311  Largemouth Bass 300     NA           TRUE
## 456    36    312  Largemouth Bass 318     NA   y01603  TRUE
## 457    36    313  Largemouth Bass 333     NA   y01604  TRUE
## 458    36    314  Largemouth Bass 356     NA   y01605  TRUE
## 459    36    315  Largemouth Bass 180     NA           TRUE
## 460    36    316  Largemouth Bass 305     NA   y01606  TRUE
## 461    37    317  Largemouth Bass 211     NA           TRUE
## 462    37    318  Largemouth Bass 320     NA   y00385  TRUE
## 463    37    320  Largemouth Bass 236     NA           TRUE
## 464    37    321  Largemouth Bass 193     NA           TRUE
## 465    37    323  Largemouth Bass 249     NA           TRUE
## 466    37    324  Largemouth Bass 318     NA   y01601  TRUE
## 467    37    325  Largemouth Bass 211     NA           TRUE
## 468    37    326  Largemouth Bass 254     NA           TRUE
## 469    37    327  Largemouth Bass 318     NA   y00023  TRUE
## 470    37    328  Largemouth Bass 427     NA   y00316  TRUE
## 471    37    329  Largemouth Bass 345     NA   y00220  TRUE
## 472    37    330  Largemouth Bass 330     NA   y00011  TRUE
## 473    37    331  Largemouth Bass 320     NA   y01534  TRUE
## 474    37    332  Largemouth Bass 356     NA   y00028  TRUE
## 475    37    333  Largemouth Bass 325     NA   y00009  TRUE
## 476    37    336  Largemouth Bass 297     NA           TRUE
## 477    37    337  Largemouth Bass 201     NA           TRUE
## 478    37    338  Largemouth Bass 257     NA           TRUE
## 479    37    339  Largemouth Bass 206     NA           TRUE
## 480    37    340  Largemouth Bass 201     NA           TRUE
```

```
## 481    37    341  Largemouth Bass 251     NA          TRUE
## 482    37    342  Largemouth Bass 239     NA          TRUE
## 483    37    343  Largemouth Bass 203     NA          TRUE
## 484    37    344  Largemouth Bass 262     NA          TRUE
## 485    37    345  Largemouth Bass 272     NA          TRUE
## 486    37    346  Largemouth Bass 353     NA   y00025 TRUE
## 487    37    347  Largemouth Bass 318     NA   y00229 TRUE
## 488    37    348  Largemouth Bass 330     NA   y00409 TRUE
## 489    37    349  Largemouth Bass 292     NA          TRUE
## 490    37    352  Largemouth Bass 318     NA   y00006 TRUE
## 491    37    353  Largemouth Bass 335     NA   y00015 TRUE
## 492    37    354  Largemouth Bass 295     NA          TRUE
## 493    37    355  Largemouth Bass 323     NA   y00027 TRUE
## 494   101    536  Largemouth Bass 318  407.0     1019 TRUE
## 495   101    551  Largemouth Bass 178   60.0          TRUE
## 496   101    588  Largemouth Bass 221  117.0          TRUE
## 497   102    630  Largemouth Bass 429 1070.0     1058 TRUE
## 498   102    631  Largemouth Bass 394  737.0     1057 TRUE
## 499   102    632  Largemouth Bass 361  548.0     1056 TRUE
## 500   104    656  Largemouth Bass 251  172.0          TRUE
## 501   104    657  Largemouth Bass 386  688.0     1100 TRUE
## 502   103    702  Largemouth Bass 361  579.0     1115 TRUE
## 503   111    713  Largemouth Bass 348  556.0     1117 TRUE
## 504   114    759  Largemouth Bass 168   48.0          TRUE
## 505   116    760  Largemouth Bass  71    3.1         FALSE
## 506   112    801  Largemouth Bass 168   52.0         FALSE
## 507   109    836  Largemouth Bass 424  864.0     1518 TRUE
## 508   109    837  Largemouth Bass 328  410.0     1519 TRUE
## 509   109    838  Largemouth Bass 315  385.0     1520 TRUE
## 510   109    839  Largemouth Bass 325  338.0     1521 TRUE
## 511   109    840  Largemouth Bass 274  235.0          TRUE
## 512   109    841  Largemouth Bass 348     NA     1522 TRUE
## 513   109    842  Largemouth Bass 318  386.0    o6860 TRUE
## 514   109    843  Largemouth Bass 333  460.0     1523 TRUE
## 515   109    844  Largemouth Bass 386  547.0     1524 TRUE
## 516   109    845  Largemouth Bass 384  540.0     1525 TRUE
## 517   109    846  Largemouth Bass 249     NA          TRUE
## 518   109    847  Largemouth Bass 307  320.0     1532 TRUE
## 519   109    848  Largemouth Bass 323  420.0     1776 TRUE
## 520   109    849  Largemouth Bass 315  406.0     1777 TRUE
## 521   109    850  Largemouth Bass 351  486.0     1778 TRUE
## 522   109    851  Largemouth Bass 249  274.0          TRUE
## 523   109    852  Largemouth Bass 287  265.0          TRUE
## 524   109    853  Largemouth Bass 307  338.0     1779 TRUE
## 525   109    854  Largemouth Bass 302  358.0          TRUE
## 526   109    855  Largemouth Bass 297  333.0          TRUE
## 527   109    856  Largemouth Bass 320  386.0    o0526 TRUE
## 528   109    857  Largemouth Bass 333  483.0     1780 TRUE
## 529   109    858  Largemouth Bass 333  426.0     1781 TRUE
## 530   109    859  Largemouth Bass 307  295.0     1782 TRUE
```

```
## 531   109    860  Largemouth Bass 229  132.0          TRUE
## 532   109    861  Largemouth Bass 201   92.0          TRUE
## 533   109    862  Largemouth Bass 201   88.0          TRUE
## 534   110    864  Largemouth Bass 325  436.0     1784  TRUE
## 535   110    865  Largemouth Bass 325  412.0     1785  TRUE
## 536   110    866  Largemouth Bass 323  444.0     1786  TRUE
## 537   110    867  Largemouth Bass 272  233.0          TRUE
## 538   129    868  Largemouth Bass 363  624.0     1787  TRUE
## 539   129    869  Largemouth Bass 353  561.0     1788  TRUE
## 540   129    871  Largemouth Bass 264  211.0          TRUE
## 541   129    872  Largemouth Bass 315  367.0     1790  TRUE
## 542   129    873  Largemouth Bass 239  157.0          TRUE
## 543   129    874  Largemouth Bass 330  433.0     1791  TRUE
## 544   129    875  Largemouth Bass 239  154.0          TRUE
## 545   129    876  Largemouth Bass 300  292.0          TRUE
## 546   129    877  Largemouth Bass 310  351.0          TRUE
## 547   129    878  Largemouth Bass 330  436.0    o0507  TRUE
## 548   129    880  Largemouth Bass 267  244.0          TRUE
## 549   129    881  Largemouth Bass 330  437.0     1793  TRUE
## 550   129    882  Largemouth Bass 234  133.0          TRUE
## 551   129    883  Largemouth Bass 315  409.0     1794  TRUE
## 552   129    884  Largemouth Bass 310  330.0     1795  TRUE
## 553   129    885  Largemouth Bass 251  187.0          TRUE
## 554   129    886  Largemouth Bass 226  132.0          TRUE
## 555   129    887  Largemouth Bass 254  168.0          TRUE
## 556   129    888  Largemouth Bass 320  385.0     1796  TRUE
## 557   129    889  Largemouth Bass 305  324.0     1797  TRUE
## 558   129    890  Largemouth Bass 333  461.0     1798  TRUE
## 559   129    891  Largemouth Bass 224  110.0          TRUE
## 560   130    892  Largemouth Bass 310  346.0     1799  TRUE
## 561   130    893  Largemouth Bass 345  450.0     1800  TRUE
## 562   130    894  Largemouth Bass 333  443.0     1701  TRUE
## 563   130    895  Largemouth Bass 348  537.0     1702  TRUE
## 564   130    896  Largemouth Bass 305  306.0     1703  TRUE
## 565   130    897  Largemouth Bass 343  485.0    o0997  TRUE
## 566   130    898  Largemouth Bass 318  383.0     1019 FALSE
## 567   130    899  Largemouth Bass 310  348.0     1704  TRUE
## 568   130    900  Largemouth Bass 292     NA          TRUE
## 569   130    901  Largemouth Bass 272  242.0          TRUE
## 570   130    902  Largemouth Bass 257  173.0          TRUE
## 571   130    903  Largemouth Bass 312  371.0   y00229  TRUE
## 572   130    904  Largemouth Bass 257  207.0          TRUE
## 573   130    905  Largemouth Bass 305  320.0     1705  TRUE
## 574   130    906  Largemouth Bass 312  349.0    o0529  TRUE
## 575   130    907  Largemouth Bass 378  723.0     1706  TRUE
## 576   130    908  Largemouth Bass 348  571.0     1707  TRUE
## 577   130    909  Largemouth Bass 295  315.0          TRUE
## 578   130    910  Largemouth Bass 338  462.0     1708  TRUE
## 579   131    911  Largemouth Bass 300  342.0          TRUE
## 580   131    912  Largemouth Bass 264  215.0          TRUE
```

```
## 581   131    913  Largemouth Bass 251  180.0           TRUE
## 582   131    914  Largemouth Bass 378  646.0     1709  TRUE
## 583   131    915  Largemouth Bass 325  377.0     1785 FALSE
## 584    12      9      Pumpkinseed  75    6.5          FALSE
## 585    12     13      Pumpkinseed  53    2.2          FALSE
## 586    12     15      Pumpkinseed  28    1.0          FALSE
## 587    12     20      Pumpkinseed  51    1.5          FALSE
## 588    12     67      Pumpkinseed  61    4.0          FALSE
## 589     9    159      Pumpkinseed 188  120.0           TRUE
## 590     9    160      Pumpkinseed 191  185.0           TRUE
## 591    20    200      Pumpkinseed 191  200.0           TRUE
## 592    21    216      Pumpkinseed 152   80.0           TRUE
## 593    23    223      Pumpkinseed 201  210.0           TRUE
## 594    27    225      Pumpkinseed 130   20.0           TRUE
## 595    24    229      Pumpkinseed 229  320.0           TRUE
## 596   124    835      Pumpkinseed 175  130.0           TRUE
## 597   203    528   Tadpole Madtom  41    0.5          FALSE
## 598   203    529   Tadpole Madtom  33    0.2          FALSE
## 599   203    530   Tadpole Madtom  30    0.2          FALSE
## 600   203    531   Tadpole Madtom  30    0.3          FALSE
## 601   106    655   Tadpole Madtom  46    1.3          FALSE
## 602   115    734   Tadpole Madtom  38    1.0          FALSE
## 603     4    113     Yellow Perch 239  150.0           TRUE
## 604     4    114     Yellow Perch 267  170.0           TRUE
## 605     4    115     Yellow Perch 262  175.0           TRUE
## 606     4    116     Yellow Perch 257  157.0           TRUE
## 607     4    117     Yellow Perch 257  160.0           TRUE
## 608     9    173     Yellow Perch 221  105.0           TRUE
## 609     9    174     Yellow Perch 226  150.0           TRUE
## 610     9    175     Yellow Perch 282  230.0           TRUE
## 611    20    202     Yellow Perch 226  122.0           TRUE
## 612    15    204     Yellow Perch 244  130.0           TRUE
## 613    15    205     Yellow Perch 272  200.0           TRUE
## 614    23    222     Yellow Perch 229  110.0           TRUE
## 615   102    633     Yellow Perch 249  164.0     1055  TRUE
## 616   102    634     Yellow Perch 264  208.0     1054  TRUE
## 617   102    635     Yellow Perch 254  173.0     1053  TRUE
## 618   102    636     Yellow Perch 249  158.0     1052  TRUE
## 619   105    704     Yellow Perch 114   14.1          TRUE
## 620   105    705     Yellow Perch 102    9.7          TRUE
## 621   105    706     Yellow Perch 119   13.6          TRUE
## 622   105    707     Yellow Perch  79    4.0           TRUE
## 623   105    708     Yellow Perch  81    4.3           TRUE
## 624   105    709     Yellow Perch  79    4.1           TRUE
## 625   105    710     Yellow Perch  74    3.4           TRUE
## 626   111    714     Yellow Perch 307  340.0     1118  TRUE
## 627   115    728     Yellow Perch  94    6.3          FALSE
## 628   115    729     Yellow Perch  79    4.2          FALSE
## 629   113    735     Yellow Perch 267  201.0     1026  TRUE
## 630   114    756     Yellow Perch 297  327.0     1043  TRUE
```

```
## 631   116    772     Yellow Perch  91    6.8           TRUE
## 632   116    773     Yellow Perch  84    4.5           TRUE
## 633   112    796     Yellow Perch 229  123.0     1046  TRUE
## 634   112    797     Yellow Perch 239  135.0     1047  TRUE
## 635   122    825     Yellow Perch 249  152.0     1156  TRUE
## 636   125    827     Yellow Perch 221  113.0     1696  TRUE
## 637   125    828     Yellow Perch  84    4.6           TRUE
## 638   125    829     Yellow Perch  91    7.1           TRUE
## 639   125    830     Yellow Perch  81    4.1           TRUE
## 640   125    831     Yellow Perch  71    2.1           TRUE
## 641     1    103    Black Crappie 284     NA    g0998  TRUE
## 642     5    135    Black Crappie 305     NA    o0513  TRUE
## 643     5    136    Black Crappie 305     NA    o0514  TRUE
## 644     5    137    Black Crappie 267  275.0    o0515  TRUE
## 645    16    208    Black Crappie 295  380.0    g0995  TRUE
## 646    16    209    Black Crappie 274  260.0    g0994  TRUE
## 647    21    218    Black Crappie 152   46.0          TRUE
## 648    29    238    Black Crappie 279     NA    o0522  TRUE
## 649    30    267    Black Crappie 290     NA    o0537  TRUE
## 650    24    268    Black Crappie 330  580.0          TRUE
## 651    24    269    Black Crappie 307  440.0          TRUE
## 652    35    283    Black Crappie 290     NA    o0408  TRUE
## 653    37    319    Black Crappie 300     NA   y00384  TRUE
## 654    37    334    Black Crappie 297     NA   y00020  TRUE
## 655    37    335    Black Crappie 297     NA   y00318  TRUE
## 656    37    350    Black Crappie 297     NA yunknown  TRUE
## 657    37    351    Black Crappie 290     NA   y09000  TRUE
## 658   101    532    Black Crappie 320  508.0     1014  TRUE
## 659   101    534    Black Crappie 305  443.0     1016  TRUE
## 660   101    535    Black Crappie 307  440.0     1017  TRUE
## 661   101    537    Black Crappie 287  379.0     1020  TRUE
## 662   102    626    Black Crappie 307  461.0   y00318  TRUE
## 663   102    627    Black Crappie 310  466.0     1061  TRUE
## 664   102    628    Black Crappie 315  536.0     1060  TRUE
## 665   102    629    Black Crappie 323  565.0     1059  TRUE
## 666   113    753    Black Crappie 155   47.0          TRUE
## 667   113    754    Black Crappie 147   37.0          TRUE
## 668   112    798    Black Crappie 188  102.0         FALSE
## 669   112    799    Black Crappie 330  606.0     1048  TRUE
## 670   112    800    Black Crappie 292  362.0     1049  TRUE
## 671   121    808    Black Crappie 323  509.0     1050  TRUE
## 672   121    809    Black Crappie 282  352.0     1700  TRUE
## 673   121    812    Black Crappie 142   37.0          TRUE
## 674   110    863    Black Crappie 307  415.0     1783  TRUE
## 675   129    870    Black Crappie 279  344.0     1789  TRUE
## 676   129    879    Black Crappie 302  397.0     1792  TRUE
```

```
#Q3. Display the head, tail and structure of <bio>
head(bio)
```

```
##   netID fishID  species tl   w tag scale
## 1    12     16 Bluegill 61 2.9     FALSE
## 2    12     23 Bluegill 66 4.5     FALSE
## 3    12     30 Bluegill 70 5.2     FALSE
## 4    12     44 Bluegill 38 0.5     FALSE
## 5    12     50 Bluegill 42 1.0     FALSE
## 6    12     65 Bluegill 54 2.1     FALSE

tail(bio)

##     netID fishID       species  tl   w  tag scale
## 671   121    808 Black Crappie 323 509 1050  TRUE
## 672   121    809 Black Crappie 282 352 1700  TRUE
## 673   121    812 Black Crappie 142  37       TRUE
## 674   110    863 Black Crappie 307 415 1783  TRUE
## 675   129    870 Black Crappie 279 344 1789  TRUE
## 676   129    879 Black Crappie 302 397 1792  TRUE

str(bio)

## 'data.frame':    676 obs. of  7 variables:
##  $ netID  : int  12 12 12 12 12 12 12 13 13 13 ...
##  $ fishID : int  16 23 30 44 50 65 66 68 69 70 ...
##  $ species: chr  "Bluegill" "Bluegill" "Bluegill" "Bluegill" ...
##  $ tl     : int  61 66 70 38 42 54 27 36 59 39 ...
##  $ w      : num  2.9 4.5 5.2 0.5 1 2.1 NA 0.5 2 0.5 ...
##  $ tag    : chr  "" "" "" "" ...
##  $ scale  : logi  FALSE FALSE FALSE FALSE FALSE FALSE ...

#Q4. Create an object, <counts>, that counts and lists all the species record
s
counts <- bio$species
table(counts)

## counts
##    Black Crappie         Bluegill Bluntnose Minnow      Iowa Darter
##               36              220              103               32
##  Largemouth Bass      Pumpkinseed   Tadpole Madtom     Yellow Perch
##              228               13                6               38

#Q5. Dsiplay just the 8 levels (names) of the species
unique(bio$species)

## [1] "Bluegill"         "Bluntnose Minnow" "Iowa Darter"      "Largemouth B
ass"
## [5] "Pumpkinseed"      "Tadpole Madtom"   "Yellow Perch"     "Black Crappi
e"

#Q6. Create a <tmp> object that displays the different species and the number
of record of
#each species in the dataset. Include this information in your report.
```

```
tmp <- table(counts)
tmp
```

```
## counts
##    Black Crappie         Bluegill Bluntnose Minnow      Iowa Darter
##               36              220              103               32
##  Largemouth Bass      Pumpkinseed   Tadpole Madtom     Yellow Perch
##              228               13                6               38
```

```
#Q7. Create a subset, <tmp2>, of just the species variable and display the fi
rst five records
tmp2 <- bio$species
head(tmp2,5)
```

```
## [1] "Bluegill" "Bluegill" "Bluegill" "Bluegill" "Bluegill"
```

```
#Q8. Create a table, <w>, of the species variable. Display the class of w
w <- table(bio$species)
class(w)
```

```
## [1] "table"
```

```
#Q9. Convert <w> to a data frame named <t> and display the results
t <- data.frame(w)
t
```

```
##               Var1 Freq
## 1    Black Crappie   36
## 2         Bluegill  220
## 3 Bluntnose Minnow  103
## 4      Iowa Darter   32
## 5  Largemouth Bass  228
## 6      Pumpkinseed   13
## 7   Tadpole Madtom    6
## 8     Yellow Perch   38
```

```
class(t)
```

```
## [1] "data.frame"
```

```
#Q10. Extract and display the frequency values from the <t> data frame
## lpyr package used for this
t$Freq
```

```
## [1]  36 220 103  32 228  13   6  38
```

```
#Q11. Create a table named <cSpec> from the bio species attribute (variable)
and confirm that
#you created a table which displays the number of species in the dataset <bio
>
cSpec <- table(bio$species)
cSpec
```

```
##
##    Black Crappie         Bluegill Bluntnose Minnow      Iowa Darter
##               36              220              103               32
##  Largemouth Bass      Pumpkinseed   Tadpole Madtom     Yellow Perch
##              228               13                6               38
```

```
#Q12. Create a table named <cSpecPct> that displays the species and percentag
e of records for
#each species. Confirm you created a table class.
cSpecPct <- (table(bio$species)*100)/length(bio$species)
cSpecPct
```

```
##
##    Black Crappie         Bluegill Bluntnose Minnow      Iowa Darter
##         5.325444        32.544379        15.236686         4.733728
##  Largemouth Bass      Pumpkinseed   Tadpole Madtom     Yellow Perch
##        33.727811         1.923077         0.887574         5.621302
```

```
class(cSpecPct)
```

```
## [1] "table"
```

```
#Q13. Convert the table, <cSpecPct>, to a data frame named <u> and confirm th
at <u> is a data
#frame
u <- as.data.frame(cSpecPct)
class(u)
```

```
## [1] "data.frame"
```

```
u
```

```
##               Var1      Freq
## 1    Black Crappie  5.325444
## 2         Bluegill 32.544379
## 3 Bluntnose Minnow 15.236686
## 4      Iowa Darter  4.733728
## 5  Largemouth Bass 33.727811
## 6      Pumpkinseed  1.923077
## 7   Tadpole Madtom  0.887574
## 8     Yellow Perch  5.621302
```

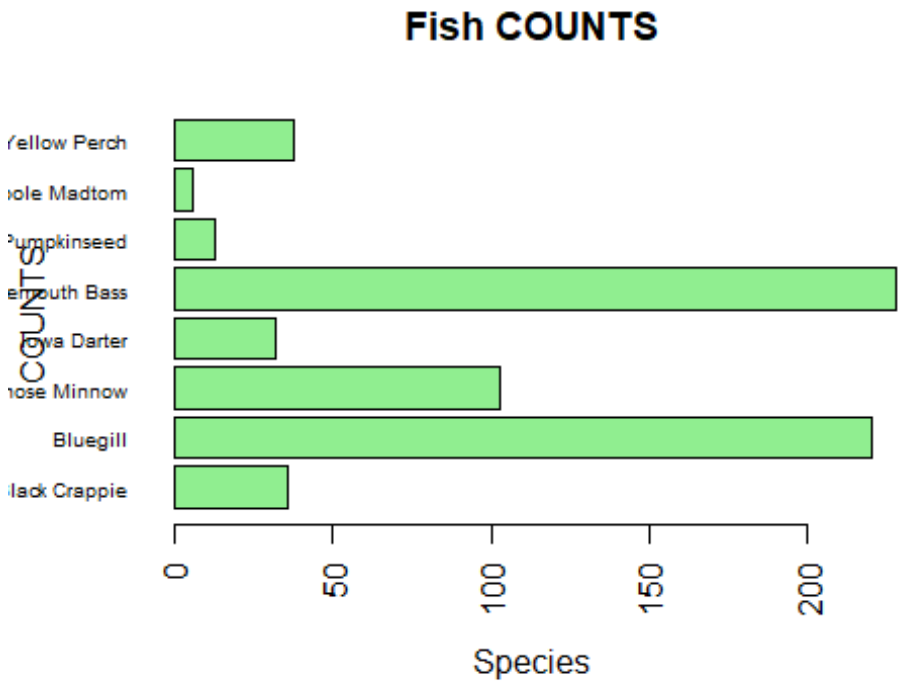
```
#Q14. Create a barplot of <cSpec> with the following: titled Fish Count with
the following
#specifications:
#  ??? Title: Fish Count
#??? Y axis is labeled "COUNTS"
#??? Color the bars Light Green
#??? Rotate Y axis to be horizontal
#??? Set the X axis font magnification to 60% of nominal
```

```
?barplot
```

```
## starting httpd help server ...

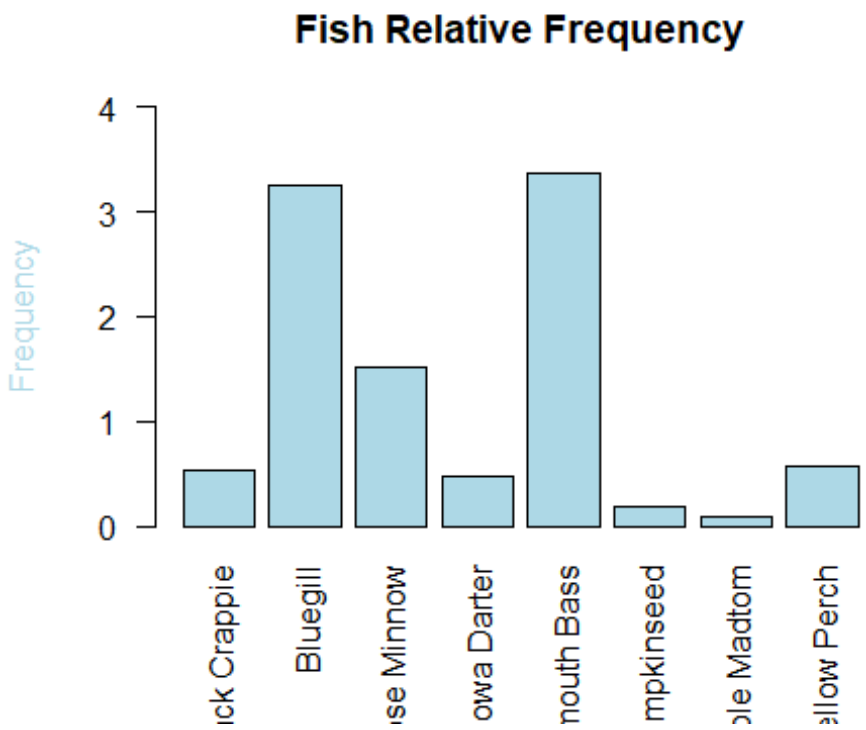
##  done

plot1 <- barplot(cSpec,main = "Fish COUNTS",ylab = "COUNTS",xlab = "Species",
col = "Light Green",
                 cex.names = 0.60, horiz = TRUE, las = 2)
```




```
#Q15. Create a barplot of <cSpecPct>, with the following specifications:
#??? Y axis limits of 0 to 4
#??? Y axis label color of Light Blue
#??? Title of  "Fish Relative Frequency"

plot2 <- barplot(cSpecPct/10,main = "Fish Relative Frequency", ylab = "Freque
ncy", col.lab = "Light Blue",
                 ylim = c(0,4), las = 2,col = "Light Blue")
```




```
#Q16. Rearrange the <u> cSpec Pct data frame in descending order of relative
frequency. Save
#the rearranged data frame as the object <d>
d <- u[order(u$Freq, decreasing = TRUE),]
d

##                Var1      Freq
## 5  Largemouth Bass 33.727811
## 2         Bluegill 32.544379
## 3 Bluntnose Minnow 15.236686
## 8     Yellow Perch  5.621302
## 1    Black Crappie  5.325444
## 4      Iowa Darter  4.733728
## 6      Pumpkinseed  1.923077
## 7   Tadpole Madtom  0.887574

#Q17. Rename the <d> columns Var 1 to Species, and Freq to RelFreq
colnames(d)[1] <- "Species"
colnames(d)[2] <- "RelFreq"
d

##             Species   RelFreq
## 5  Largemouth Bass 33.727811
## 2         Bluegill 32.544379
## 3 Bluntnose Minnow 15.236686
## 8     Yellow Perch  5.621302
## 1    Black Crappie  5.325444
```

```
## 4      Iowa Darter  4.733728
## 6      Pumpkinseed  1.923077
## 7   Tadpole Madtom  0.887574

#Q18. Add new variables to <d> and call them cumfreq, counts, and cumcounts
t$Freq

## [1]  36 220 103  32 228  13   6  38

desc <- t[order(-t$Freq),]
desc$Freq

## [1] 228 220 103  38  36  32  13   6

d <- d %>% mutate(cumfreq=cumsum(d$RelFreq),counts=desc$Freq, cumcounts = cum
sum(desc$Freq))
d

##            Species   RelFreq   cumfreq counts cumcounts
## 5  Largemouth Bass 33.727811  33.72781    228       228
## 2         Bluegill 32.544379  66.27219    220       448
## 3 Bluntnose Minnow 15.236686  81.50888    103       551
## 8     Yellow Perch  5.621302  87.13018     38       589
## 1    Black Crappie  5.325444  92.45562     36       625
## 4      Iowa Darter  4.733728  97.18935     32       657
## 6      Pumpkinseed  1.923077  99.11243     13       670
## 7   Tadpole Madtom  0.887574 100.00000      6       676

#Q19.Create a parameter variable <def_par> to store parameter variables
def_par <- as.data.frame(names(d))
def_par

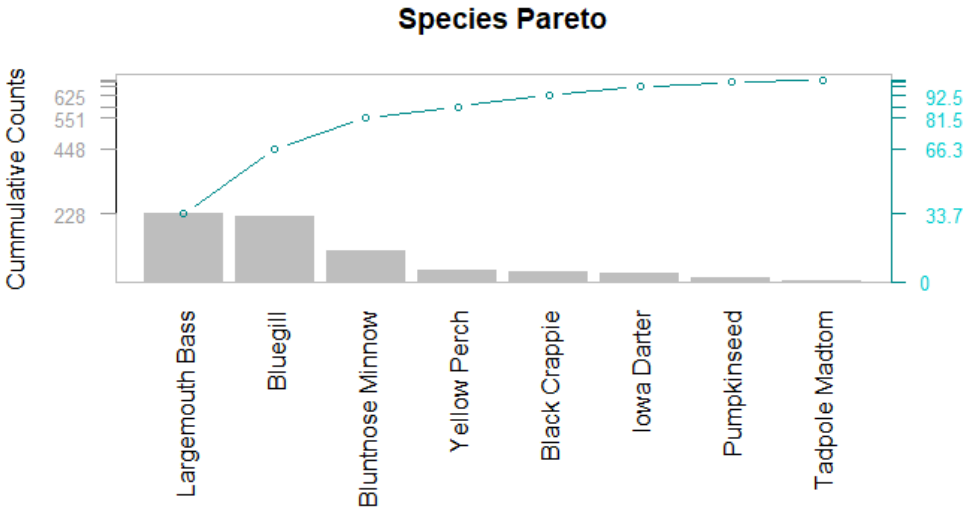
##    names(d)
## 1   Species
## 2   RelFreq
## 3   cumfreq
## 4    counts
## 5 cumcounts

colnames(def_par) <- c('Parameters')
class(def_par)

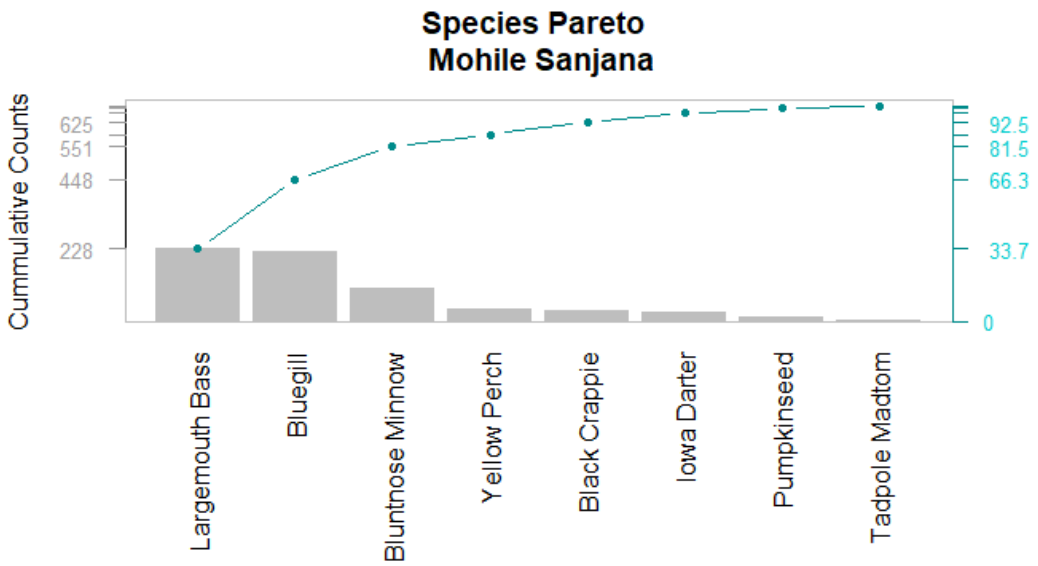
## [1] "data.frame"

#Q20. Create a barplot, <pc>, with the following specifications:
#???d$counts of width 1, spacing of .15
#???no boarder
#???Axes: F
#???Yaxis limit 0,3.05*max
#???d$counts na.rm is true
#???y label is Cummulative Counts
#???scale x axis to 70%
```

```r
#???names.arg: d$Species
#???Title of the barplot is "Species Pareto"
#???las: 2)

pc <- barplot(d$counts, width = 1,space = 0.15, border = NA, axes = F, ylim =
c(0,3.05*228),
              ylab = "Cummulative Counts", cex.axis = 0.7, names.arg = d$Spec
ies,
              main = "Species Pareto", las = 2)

#Q21.Add a cumulative counts line to the <pc> plot with the following:
#??? Spec line type is b
#??? Scale plotting text at 70%
#??? Data values are solid circles with color cyan4

lines(pc, d$cumcounts, type = "b", cex = 0.7, col = "cyan4")

#Q22. Place a grey box around the pareto plot
box(which = "plot",lty = "solid",col = "grey",par(mar = c(8,5,4,4)))

#Q23. Add a left side axis with the following specifications
#??? Horizontal values at tick marks at cumcounts on side 2
#??? Tickmark color of grey62
#??? Color of axis is grey62
#??? Axis scaled to 80% of normal

axis(side = 2, at = d$cumcounts, labels = d$cumcounts, las = 2, col.axis="gre
y62",
     col.ticks="grey62", tick = TRUE, cex.axis=0.8,par(mar = c(8,5,4,4)))


#Q24. Add axis details on right side of box with the specifications:
#??? Spec: Side 4
#??? Tickmarks at cumcounts with labels from 0 to cumfreq with %,
#??? Axis color of cyan5 and label color of cyan4
#??? Axis font scaled to 80% of nominal
axis(side = 4, at = c(0,d$cumcounts),
     labels = c(0,d$cumfreq),
     las = 1, col.axis = 'cyan3', col = 'cyan4',
     cex.axis = 0.8,par(mar = c(8,5,4,4)))
```




```
#Q25. Display the finished Species Pareto Plot (without the star watermarks).
Have your last
#name on the plot

pc <- barplot(d$counts, width = 1,space = 0.15, border = NA, axes = F, ylim =
c(0,3.05*228),
              ylab = "Cummulative Counts", cex.axis = 0.8, names.arg = d$Spec
ies,
              main = "Species Pareto \n Mohile Sanjana", las = 2)

lines(pc, d$cumcounts, type = "b", pch = 19, cex = 0.7, col = "cyan4")

box(which = "plot",lty = "solid",col = "grey")

axis(side = 2, at = d$cumcounts, labels = d$cumcounts, las = 2, col.axis="gre
y62",
     col.ticks="grey62", tick = TRUE, cex.axis=0.8)

d$cumfreq <- format(round(d$cumfreq, 3), nsmall = 1)
d$cumfreq

## [1] " 33.728" " 66.272" " 81.509" " 87.130" " 92.456" " 97.189" " 99.112"
## [8] "100.000"

axis(side = 4, at = c(0,d$cumcounts),
     labels = c(0,d$cumfreq),
     las = 1, col.axis = 'cyan3', col = 'cyan4',
     cex.axis = 0.8, par(mar = c(8,5,4,4)))
```




```
###### Explantory supplements
str(bio)

## 'data.frame':    676 obs. of  7 variables:
##  $ netID  : int  12 12 12 12 12 12 12 13 13 13 ...
##  $ fishID : int  16 23 30 44 50 65 66 68 69 70 ...
##  $ species: chr  "Bluegill" "Bluegill" "Bluegill" "Bluegill" ...
##  $ tl     : int  61 66 70 38 42 54 27 36 59 39 ...
##  $ w      : num  2.9 4.5 5.2 0.5 1 2.1 NA 0.5 2 0.5 ...
##  $ tag    : chr  "" "" "" "" ...
##  $ scale  : logi  FALSE FALSE FALSE FALSE FALSE FALSE ...

summary(bio)

##      netID           fishID        species               tl
##  Min.   :  1.00   Min.   :  7.0   Length:676         Min.   : 27.0
##  1st Qu.: 13.00   1st Qu.:175.8   Class :character   1st Qu.: 66.0
##  Median : 37.00   Median :345.5   Mode  :character   Median :189.5
##  Mean   : 67.65   Mean   :434.2                      Mean   :186.5
##  3rd Qu.:109.00   3rd Qu.:695.5                      3rd Qu.:295.0
##  Max.   :206.00   Max.   :915.0                      Max.   :429.0
##
##        w              tag              scale
##  Min.   :   0.2   Length:676         Mode :logical
##  1st Qu.:   2.0   Class :character   FALSE:213
##  Median :  54.5   Mode  :character   TRUE :463
##  Mean   : 126.8
##  3rd Qu.: 190.5
##  Max.   :1070.0
##  NA's   :165
```

```r
#A pie chart for better visual representation

pie(cSpecPct,hole = 0, values = "%", main = "Pie Chart of Species")

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "hole" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "values" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "hole" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "values" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "hole" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "values" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "hole" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "values" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "hole" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "values" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "hole" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "values" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "hole" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "values" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "hole" is not a graphical parameter

## Warning in text.default(1.1 * P$x, 1.1 * P$y, labels[i], xpd = TRUE, adj =
## ifelse(P$x < : "values" is not a graphical parameter

## Warning in title(main = main, ...): "hole" is not a graphical parameter
```

```
## Warning in title(main = main, ...): "values" is not a graphical parameter
```