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
```

```
## 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
```

```
## 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
```

```
## 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
```

```
## 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
```

```
## 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
```

```
## 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
```

```
## 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
```

```
## 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)
```

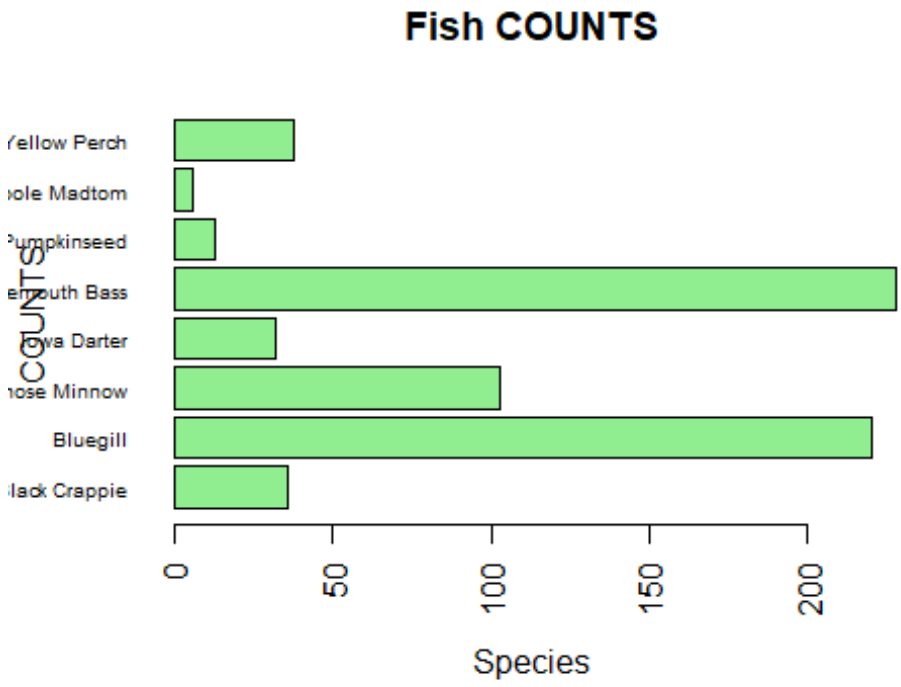
```
## [1] "data.frame"
```

```
u
```

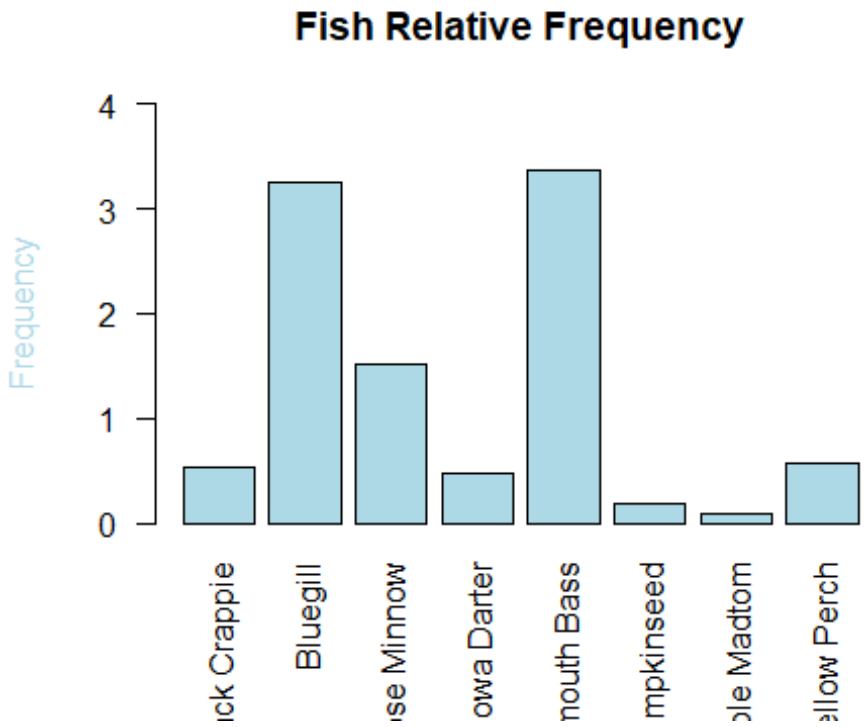
```
##               Var1      Freq
## 1    Black Crappie  5.325444
## 2         Bluegill 32.544379
## 3 Bluntnose Minnow 15.236686
## 4      Iowa Darter  4.733728
## 5  Largemouth Bass 33.727811
## 6      Pumpkinseed  1.923077
## 7   Tadpole Madtom  0.887574
## 8     Yellow Perch  5.621302
```

```
#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
```

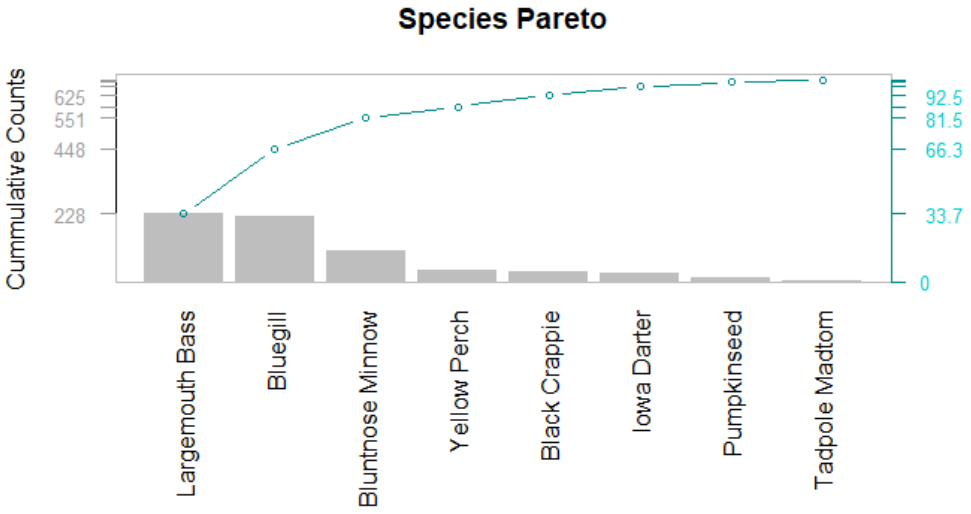
```
##                Var1      Freq
## 5  Largemouth Bass 33.727811
## 2         Bluegill 32.544379
## 3 Bluntnose Minnow 15.236686
## 8     Yellow Perch  5.621302
## 1    Black Crappie  5.325444
## 4      Iowa Darter  4.733728
## 6      Pumpkinseed  1.923077
## 7   Tadpole Madtom  0.887574
```

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

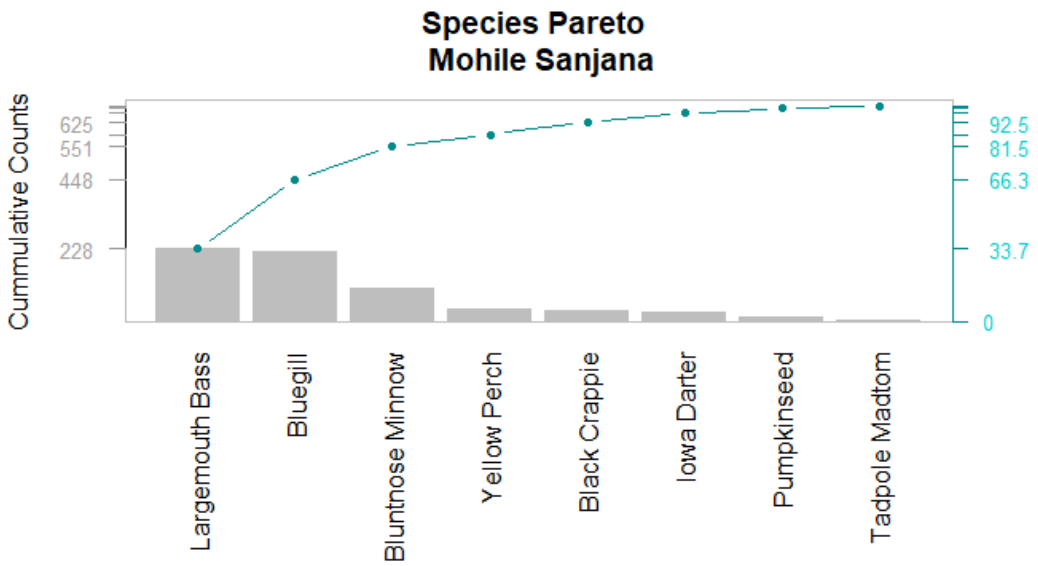
```
##            Species   RelFreq
## 5  Largemouth Bass 33.727811
## 2         Bluegill 32.544379
## 3 Bluntnose Minnow 15.236686
## 8     Yellow Perch  5.621302
## 1    Black Crappie  5.325444
```

```
## 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$counts, width = 1,space = 0.15, border = NA, axes = F, ylim = c(0,3.05*228),
              ylab = "Cummulative Counts", cex.axis = 0.8, names.arg = d$Species,
              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="grey62",
     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
```