

Chapter 1 Temperature Differences and Days Exceeding UTLs

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```
library(ggplot2)
library(readxl)
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(plotrix)
library(tinytex)
SpeciesVar4 <- read_excel("C:/Users/jenng/Dropbox/2023_Thesis/06062024_GoffThesisDefense/DataSheets/Chap
  sheet = "UTLs")
attach(SpeciesVar4)
```

```
ttest.DaysNorth <- t.test(SpeciesVar4$"1950North_AvgDaysTempExceedMax",
SpeciesVar4$"2020North_AvgDaysTempExceedMax",paired=T)
```

```
ttest.DaysSouth <- t.test(SpeciesVar4$"1950South_AvgDaysTempExceedMax",
SpeciesVar4$"2020South_AvgDaysTempExceedMax",paired=T)
```

```
DaysToPlot <- as.data.frame(matrix(nrow = 4, ncol= 2))
colnames(DaysToPlot) <- c("Category", "Value")
DaysToPlot[1,1] <- "1950North"
DaysToPlot[2,1] <- "2020North"
DaysToPlot[3,1] <- "1950South"
DaysToPlot[4,1] <- "2020South"
DaysToPlot[1,2] <- mean(SpeciesVar4$"1950North_AvgDaysTempExceedMax")
DaysToPlot[2,2] <- mean(SpeciesVar4$"2020North_AvgDaysTempExceedMax")
DaysToPlot[3,2] <- mean(SpeciesVar4$"1950South_AvgDaysTempExceedMax")
DaysToPlot[4,2] <- mean(SpeciesVar4$"2020South_AvgDaysTempExceedMax")
```

```

#Base R plot
row.names(DaysToPlot) <- DaysToPlot$Category
DaysToPlot2 <- DaysToPlot[,2]
names(DaysToPlot2) <- DaysToPlot$Category
DaysToPlot3 <- matrix(nrow = 2, ncol = 2)
row.names(DaysToPlot3) <- c("1950's", "2020's")
colnames(DaysToPlot3) <- c("North", "South")
DaysToPlot3[1,1] <- as.numeric(DaysToPlot2[1])
DaysToPlot3[1,2] <- as.numeric(DaysToPlot2[3])
DaysToPlot3[2,1] <- as.numeric(DaysToPlot2[2])
DaysToPlot3[2,2] <- as.numeric(DaysToPlot2[4])

```

```

DaySErr <- DaysToPlot3
DaySErr[1,1] <- std.error(SpeciesVar4$`1950North_AvgDaysTempExceedMax`)
DaySErr[1,2] <- std.error(SpeciesVar4$`1950South_AvgDaysTempExceedMax`)
DaySErr[2,1] <- std.error(SpeciesVar4$`2020North_AvgDaysTempExceedMax`)
DaySErr[2,2] <- std.error(SpeciesVar4$`2020South_AvgDaysTempExceedMax`)

```

```

DaysExceed <- data.frame(
  Group = factor(c("1950's", "2010's", "1950's", "2010's")),
  Value = c(5.88, 6.63, 30.09,
            36.58),
  StdError = c(4.31, 4.73, 6.85, 8.08),
  Pair = factor(c("Northern range", "Northern range",
                  "Southern range", "Southern range"))
)

```

```

DaysExceed$Lower <- DaysExceed$Value - DaysExceed$StdError
DaysExceed$Upper <- DaysExceed$Value + DaysExceed$StdError

```

```

DaysExceed$Group <- factor(DaysExceed$Group, levels = unique(DaysExceed$Group))

```

```

Days <- ggplot(DaysExceed, aes(x = Group, y = Value)) +
  geom_bar(stat = "identity", fill = c("blue", "red", "blue", "red"),
           position = position_dodge())+
  geom_errorbar(aes(ymin = Lower, ymax = Upper), width = 0.2,
                position = position_dodge()) +
  facet_wrap(~ Pair, nrow = 1, scales = "free_x")+
  theme_bw()
Days + xlab("") + ylab("Average number of days ambient temperatures
\n exceed species' upper thermal limits")

```

