Week 5 Lab Report

E

3/8/2021

Interacting with Migrants

Goal: Recommend habitat purchases of either anthro or natural sites for migrant birds.

Write a brief summary describing findings and recommendations describing your findings and recommendations (no more than 2 pages of single spaced writing, not including code or figures). Summary should include your process and results, including 1-2 supporting figures for model interpretation/prediction, and 1-2 figures for evaluating model assumptions.

```
migrants <- read.csv(file = "Data/migrants.csv", header = TRUE)
str(migrants)
```

```
## 'data.frame':    84 obs. of  4 variables:
##  $ site   : chr  "01.Gill" "01.Gill" "02.Colrain" "02.Colrain" ...
##  $ migstat: chr  "mig" "resi" "mig" "resi" ...
##  $ urb.cat: chr  "anthro" "anthro" "natural" "natural" ...
##  $ n.obs  : int  25 17 31 17 34 15 28 29 17 12 ...
```

```
head(migrants)
```

```
##           site migstat urb.cat n.obs
## 1      01.Gill     mig  anthro    25
## 2      01.Gill    resi  anthro    17
## 3   02.Colrain     mig natural    31
## 4   02.Colrain    resi natural    17
## 5 03.Green GTD     mig natural    34
## 6 03.Green GTD    resi natural    15
```

```
# We notice that our data includes both migrants and resident birds. Lets subsect for only the migrants
migrants <- subset(migrants, migrants$migstat == "mig", c('migstat','urb.cat', 'n.obs'))
table(migrants$migstat)
```

```
##
## mig
##  42
```

```
summary(migrants)
```

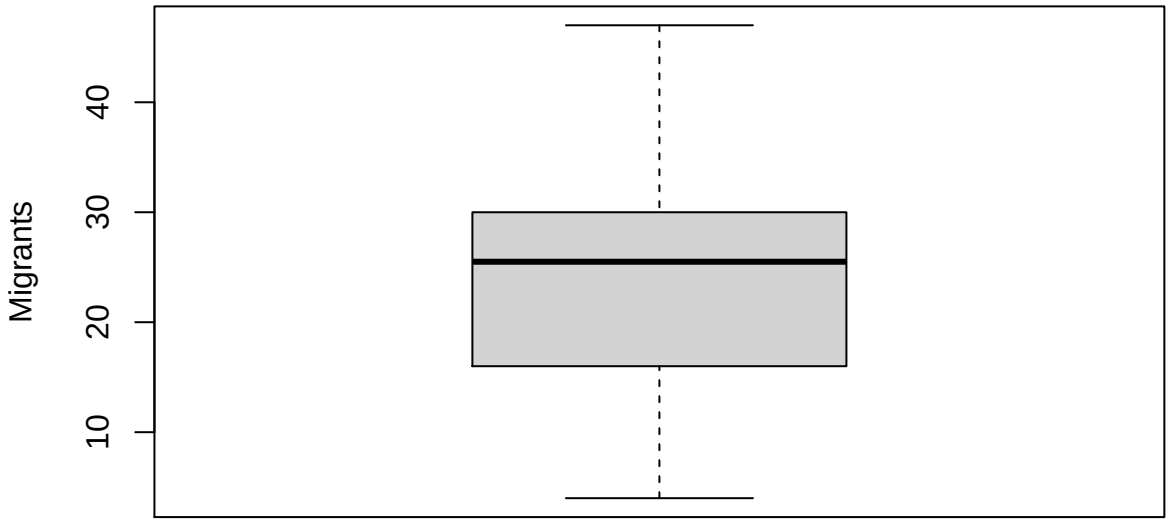
```
##    migstat            urb.cat             n.obs
##  Length:42          Length:42          Min.   : 4.00
##  Class :character   Class :character   1st Qu.:16.25
##  Mode  :character   Mode  :character   Median :25.50
##                                        Mean   :23.98
##                                        3rd Qu.:30.00
##                                        Max.   :47.00
```

STEPS

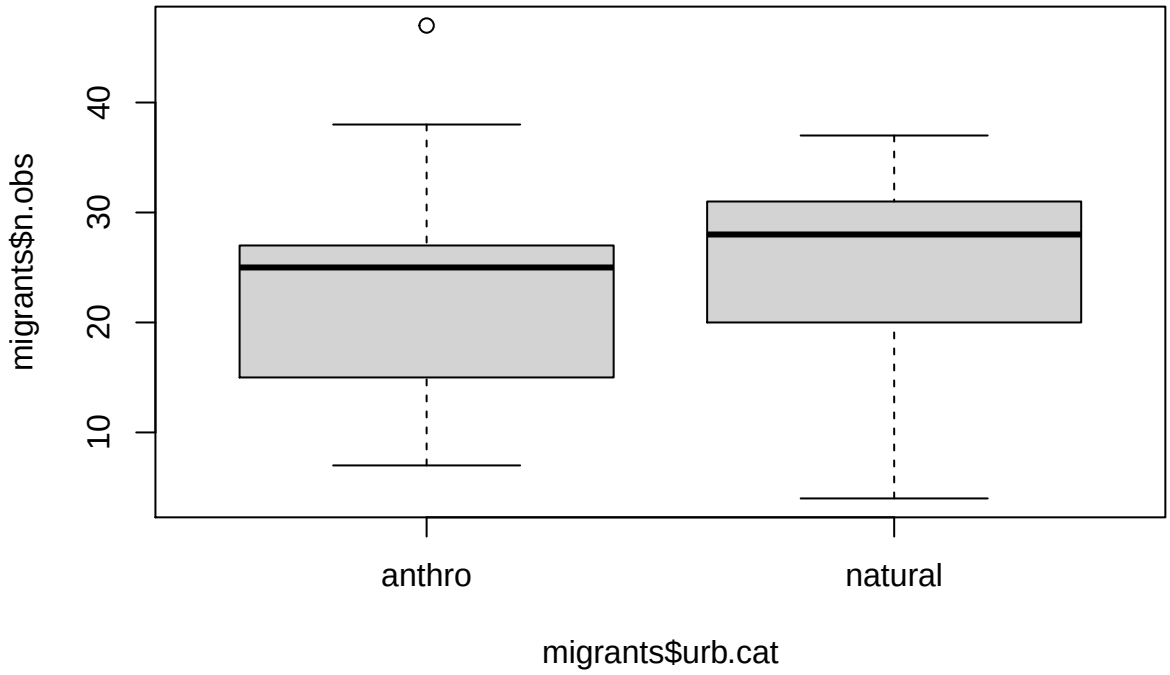
Develop a set of hypotheses (null and alternative) based on project goals

1. State the question
   - Is there a significant difference in number of migrant birds among antho and natural sites?
   - Response:
     - Number of birds observed
   - Explanatory:
     - sites - `anthro` or `nat`
2. Data Exploration

```
boxplot(migrants$n.obs, ylab = "Migrants")
```



```
boxplot(migrants$n.obs ~ migrants$urb.cat)
```




```
tapply(migrants$n.obs, migrants$urb.cat, mean) # Raw means
```

```
##   anthro  natural
## 22.33333 25.61905
```

So we see a difference in the raw means but is it significant???

Describe all relevant statisical model(s) in words and algebra

3. Describe the model:

   In words: Is there a difference between the habitat means of migrants observed? * H_0: There is no difference

   - In Mathematical form
     - $y_i = beta_0 + beta_{1(g)}Site_{1i(g)} + e_i$
     - y_i is number of migrants observed
   - Model assumptions are:
     - Residuals are normally distributed
     - Contant variance (homogeneity)
     - Observations are independent
     - Predictors measured without error (fixed X)

Fit candidate models and evaluate using AIC to select best candidate model

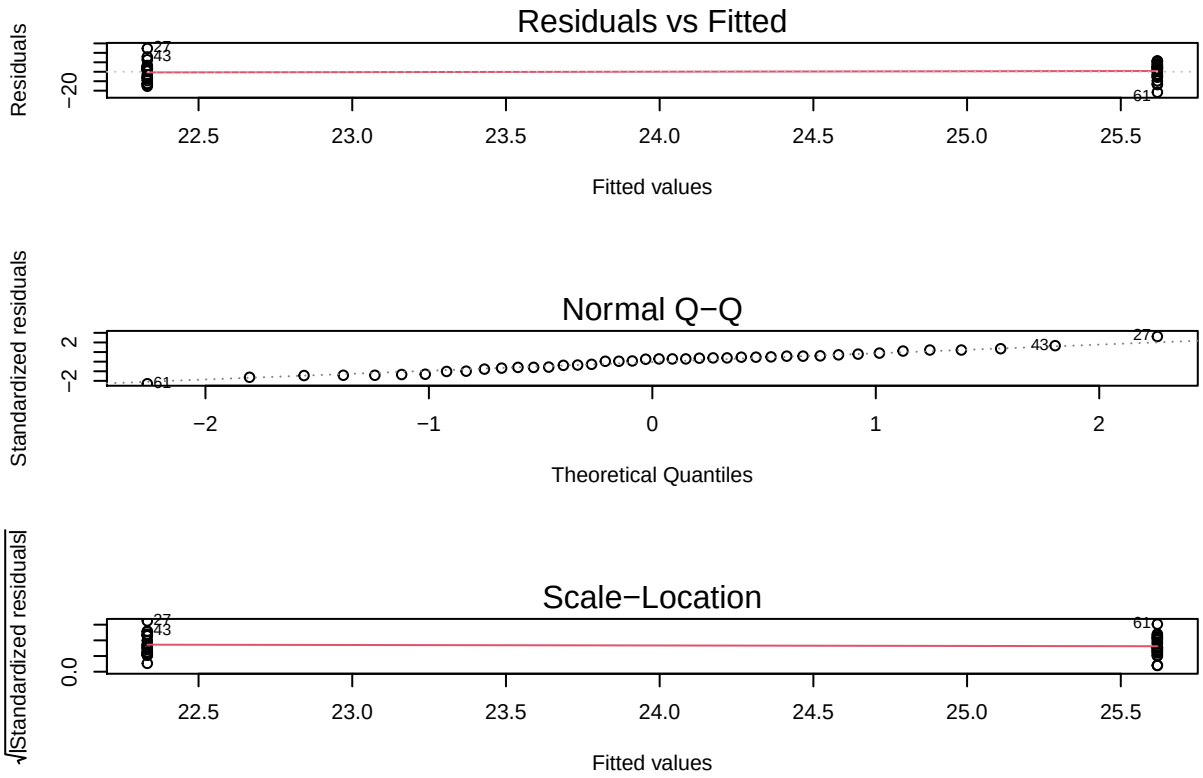
```
m0 <- lm(n.obs ~ urb.cat, data = migrants)
summary(m0)
```

```
##
## Call:
## lm(formula = n.obs ~ urb.cat, data = migrants)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -21.619  -6.155   2.524   5.381  24.667
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)      22.333      2.104  10.616 3.35e-13 ***
## urb.catnatural    3.286      2.975   1.104    0.276
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9.641 on 40 degrees of freedom
## Multiple R-squared:  0.02959,    Adjusted R-squared:  0.005329
## F-statistic:  1.22 on 1 and 40 DF,  p-value: 0.276
```

Evaluate and validate the top model(s)

```
par(mfrow = c(3,1))
plot(m0)
```

```
## hat values (leverages) are all = 0.04761905
##  and there are no factor predictors; no plot no. 5
```


Residuals vs Fitted
Residuals
−20
27
43
61
22.5
23.0
23.5
24.0
24.5
25.0
25.5
Fitted values
Normal Q−Q
Standardized residuals
−2
2
61
43
27
−2
−1
0
1
2
Theoretical Quantiles
Scale−Location
√|Standardized residuals|
0.0
27
43
61
22.5
23.0
23.5
24.0
24.5
25.0
25.5
Fitted values

Interpret results, including description of all model parameters and what estimates mean including graphical and verbal summaries of the model predictions

```
summary(m0)
```

```
##
## Call:
## lm(formula = n.obs ~ urb.cat, data = migrants)
##
## Residuals:
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```

Include an annotated R script or do this as an R Markdowon file