

# STEELHEAD TROUT JOURNEY LENGTH BY BODY SIZE

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# INTRODUCTION

- THE POPULATION FOR THIS PROJECT IS ALL STEELHEAD TROUT IN THE COLUMBIA RIVER BASIN. THIS SAMPLE WAS COLLECTED IN ORDER TO STUDY THEIR MOVEMENTS BETWEEN THEIR NATAL STREAMS AND THE OCEAN. TROUT TYPICALLY JOURNEY OUT TO THE OCEAN AFTER BIRTH, THEN RETURN AS ADULTS TO SPAWN.
- THE SAMPLE IS A GROUP OF 131 JUVENILE TROUT CAPTURED, TAGGED, AND RELEASED BY FISHERIES BIOLOGISTS IN 2015.
- THE RESEARCH QUESTION IS “DOES BODY SIZE OF STEELHEAD TROUT AFFECT LENGTH OF TIME TO TRAVEL BETWEEN DAMS?”



# SAMPLING DESIGN

- ELEMENTS: INDIVIDUAL STEELHEAD TAGGED AND OBSERVED
- POPULATION: ALL JUVENILE STEELHEAD TROUT (*O. MYKISS*) IN COLUMBIA RIVER BASIN
- SAMPLING UNITS: INDIVIDUAL STEELHEAD TAGGED AND OBSERVED
- FRAME: NO FRAME; POPULATIONS OF WILDLIFE DO NOT PROVIDE FOR A SPECIFIC FRAME

# SAMPLING DESIGN DECISION PROCESS



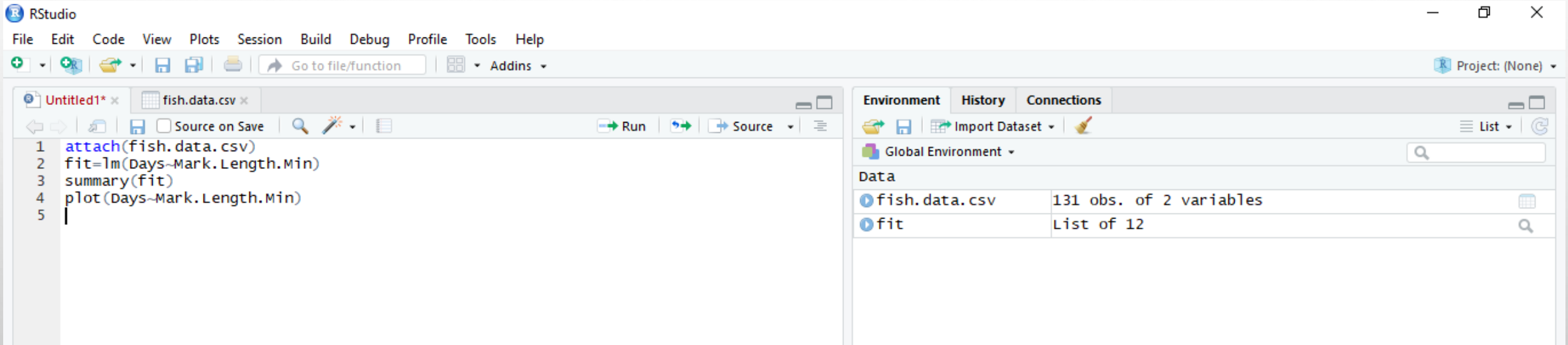
- POSSIBLE SAMPLING DESIGN: SYSTEMATIC RANDOM SAMPLE
- DESIGN CHOSEN: SIMPLE RANDOM SAMPLE
- RATIONALE: RESEARCHERS COULD HAVE USED A SYSTEMATIC RANDOM SAMPLE BY CAPTURING AND TAGGING EVERY 20<sup>TH</sup> FISH, FOR EXAMPLE. HOWEVER, THIS WOULD BE VERY DIFFICULT AND LIKELY EVEN IMPOSSIBLE DUE TO THE NATURE OF FISH AND THE LARGE GROUPS IN WHICH THEY SWIM. A RANDOM SAMPLE WAS THE MOST REALISTIC AND ALSO MAKES SENSE FOR THE DATA ANALYSIS TO BE PERFORMED ON IT.

# METHODS AND IMPLEMENTATION

- SAMPLE WAS TAKEN BY FISHERIES BIOLOGISTS. SAMPLE CONSISTED OF EVERY STEELHEAD CAUGHT FOR TAGGING. FISH WERE THEN TAGGED WITH PIT TAGS WHICH TRANSMIT SIGNALS TO A RECEIVER AUTOMATICALLY AT CERTAIN DAMS. AT THE DAMS, THE UNIQUE TAG NUMBER OF THE FISH IS RECORDED ALONG WITH THE DATE IT PASSED THROUGH THAT DAM, ALLOWING ME TO CALCULATE TIME TAKEN TO TRAVEL BETWEEN THE BONNEVILLE DAM AFTER BEING RELEASED AT BIG BEAR CREEK.



# R CODE INPUT



The screenshot displays the RStudio interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. The toolbar contains icons for file operations and a search bar. The main editor window shows the following R code:

```
1 attach(fish.data.csv)
2 fit=lm(Days~Mark.Length.Min)
3 summary(fit)
4 plot(Days~Mark.Length.Min)
5 |
```

The Environment pane on the right shows the Global Environment with the following data:

Data	
fish.data.csv	131 obs. of 2 variables
fit	List of 12



## DATA ANALYSIS: R REGRESSION OUTPUT

```
➤ fish.data.csv <- read.csv("~/Spring 2018/STAT 251 (HON)/fish data csv.csv")
➤ > view(fish.data.csv) > attach(fish.data.csv) > fit=lm(Days~Mark.Length.Min)
➤ > summary(fit)
➤ Call: lm(formula = Days ~ Mark.Length.Min)
➤ Residuals: Min 1Q Median 3Q Max -9.766 -3.013 -0.282 2.510 32.796
➤ Coefficients: Estimate Std. Error t value Pr(>|t|)
➤ (Intercept) 35.64358 4.31708 8.256 1.54e-13
➤ *** Mark.Length.Min -0.07866 0.02410 -3.264 0.00141 ** --- signif. codes: 0
  '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
➤ Residual standard error: 5.277 on 129 degrees of freedom
➤ Multiple R-squared: 0.07628,
➤ Adjusted R-squared: 0.06912
➤ F-statistic: 10.65 on 1 and 129 DF, p-value: 0.001407
```

# TIME TAKEN TO RETURN TO HOME STREAM BY BODY SIZE

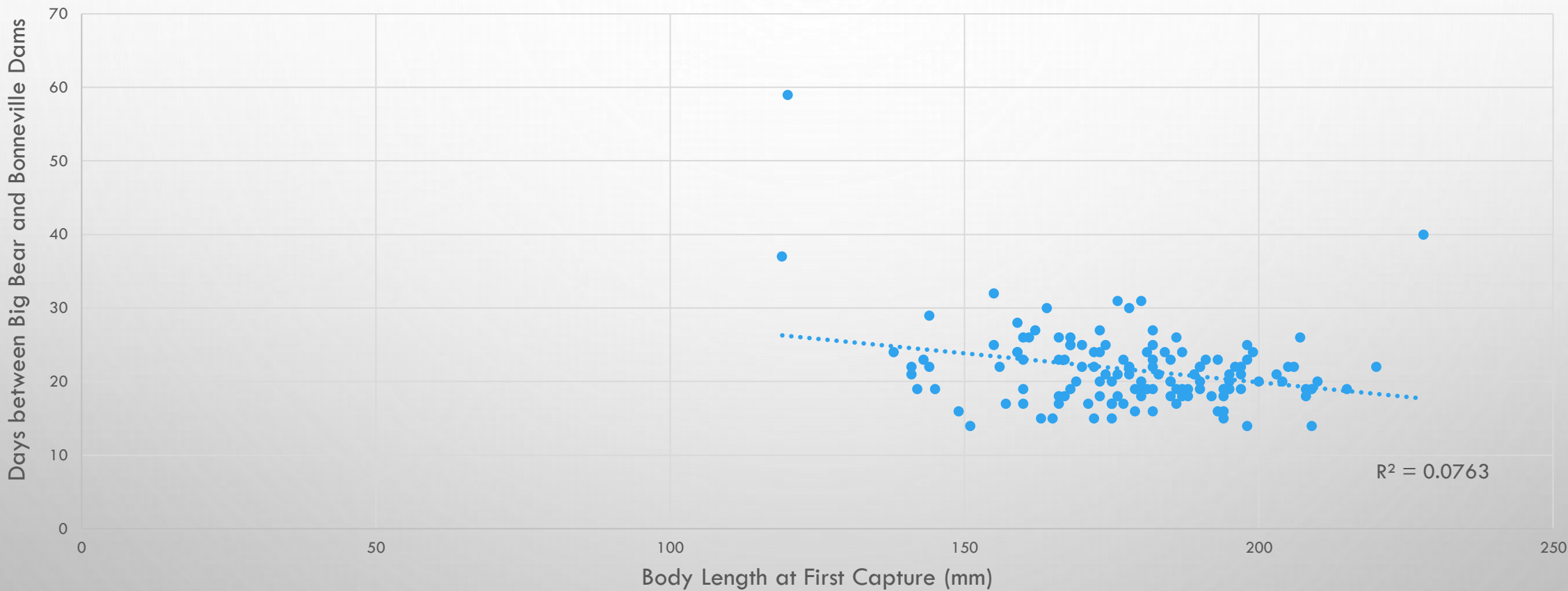
- I PERFORMED A REGRESSION TEST ON R
- $H_0: \beta_1 = 0$  AND  $H_a: \beta_1 \neq 0$
- $p$  value = 0.00141, PERFORMED WITH 129 DEGREES OF FREEDOM
- $\alpha = 0.05$
- $0.00141 \leq 0.05$
- THEREFORE, WE REJECT THE NULL HYPOTHESIS AND CONCLUDE THAT THERE IS A SIGNIFICANT RELATIONSHIP BETWEEN BODY SIZE AND TIME TAKEN TO SWIM FROM THE FIRST DAM TO THE NEXT







Days taken to reach Bonneville compared to Body Length at first measurement



# RESULTS AND DISCUSSION

- WE REJECT THE NULL HYPOTHESIS AND CONCLUDE THAT THERE IS A SIGNIFICANT RELATIONSHIP BETWEEN BODY LENGTH AT FIRST CAPTURE AND TIME TAKEN TO TRAVEL BETWEEN THE TWO DAMS.
- THE RELATIONSHIP IS NEGATIVE AND LINEAR (THE SLOPE OF THE REGRESSION LINE IS NEGATIVE); LARGER FISH TEND TO TAKE A SHORTER AMOUNT OF TIME TO REACH THE SECOND DAM. THIS MAKES SENSE LOGICALLY AND IS BACKED BY THE TEST.
- ALTHOUGH THE RELATIONSHIP IS SOMEWHAT WEAK, IT IS SIGNIFICANT.

