

SLR Weight-Length Relation

Preliminaries

Load Necessary Packages

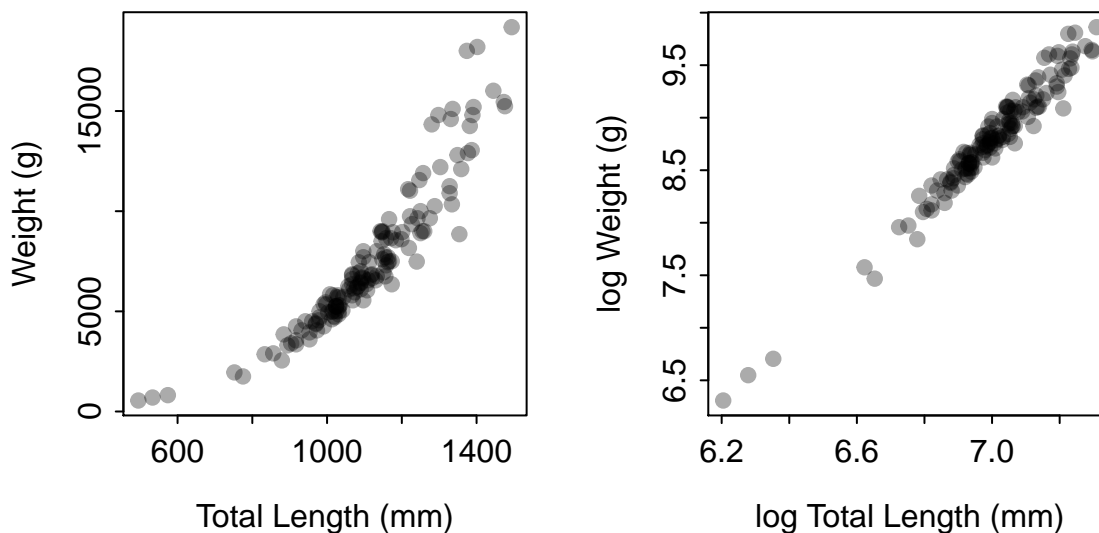
```
> library(FSA)      # for filterD(), hist(), Summarize()
> library(dplyr)     # for mutate(), select()
```

Load Data

```
> # Set your working directory to where your external data files (and scripts) are located.
> setwd("C:/aaaWork/Web/GitHub/RcourseNunavut2016/Handouts")
> dSC <- read.csv("SawyerCo_reduced.csv")
> dSC <- mutate(dSC, loglen=log(len), logwt=log(weight))
> Sturg <- filterD(dSC, waterbody=="CHIPPEWA RIVER", species=="Lake Sturgeon", !is.na(len), !is.na(weight))
```

Quick Summaries

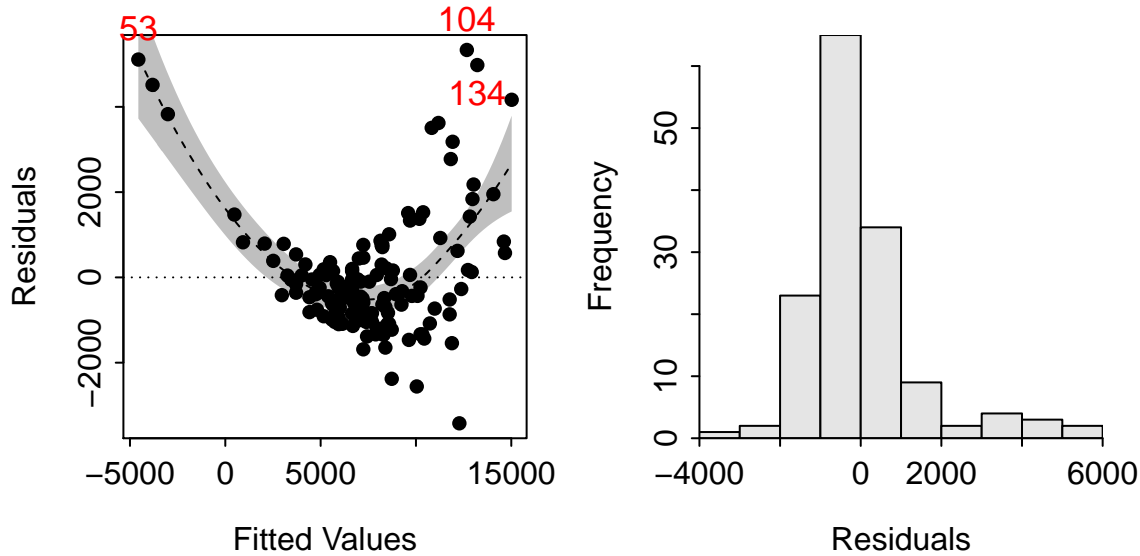
```
> clr <- col2rgb("black", 1/3)
> plot(weight~len, data=Sturg, pch=19, col=clr, xlab="Total Length (mm)", ylab="Weight (g)") # Left
> plot(logwt~loglen, data=Sturg, pch=19, col=clr, xlab="log Total Length (mm)", ylab="log Weight (g)") # Right
```



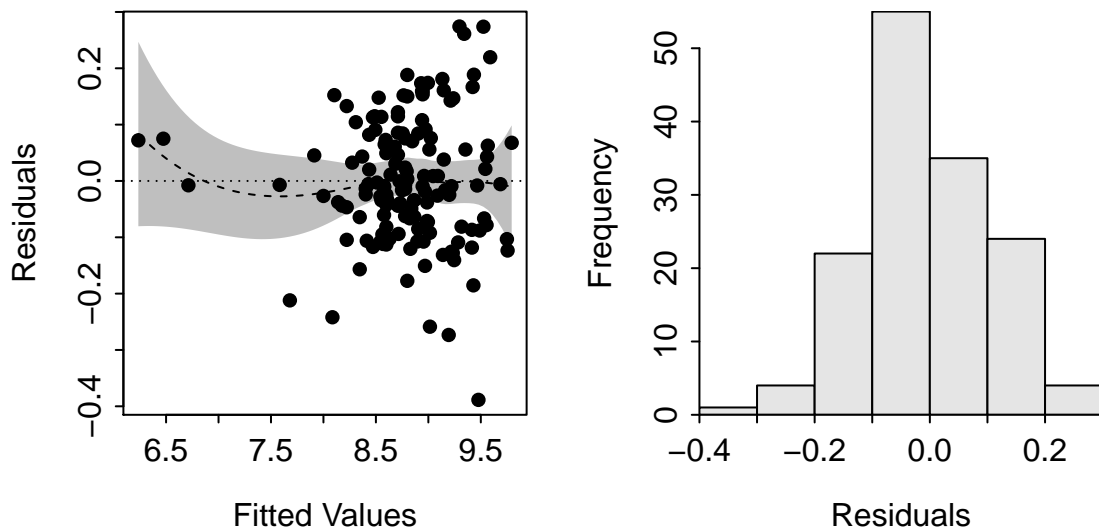
Simple Linear Regression

Checking Assumptions

```
> slr1 <- lm(weight~len,data=Sturg)
> residPlot(slr1)
```



```
> slr2 <- lm(logwt~loglen,data=Sturg)
> residPlot(slr2)
```



Model Results

```
> summary(slr2)

Call:
lm(formula = logwt ~ loglen, data = Sturg)

Residuals:
    Min       1Q   Median       3Q      Max
-0.38861 -0.07813 -0.00929  0.07502  0.27416

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -13.75159   0.39032  -35.23  <2e-16
loglen       3.22139   0.05575   57.78  <2e-16

Residual standard error: 0.1122 on 143 degrees of freedom
Multiple R-squared:  0.9589,    Adjusted R-squared:  0.9586
F-statistic: 3339 on 1 and 143 DF,  p-value: < 2.2e-16
```

```
> cbind(ests=coef(slr2),confint(slr2))
              ests      2.5 %      97.5 %
(Intercept) -13.751588 -14.523137 -12.980038
loglen       3.221387  3.111185  3.331589
```

Making Predictions

```
> ( p1 <- predict(slr2,data.frame(loglen=log(500)),interval="confidence") )
      fit      lwr      upr
1 6.26807 6.179663 6.356478
```

```
> exp(p1)
      fit      lwr      upr
1 527.4585 482.8292 576.2131
```

```
> ( p2 <- predict(slr2,data.frame(loglen=log(c(500,800))),interval="prediction") )
      fit      lwr      upr
1 6.268070 6.029290 6.506851
2 7.782134 7.556875 8.007393
```

```
> exp(p2)
      fit      lwr      upr
1 527.4585 415.4199 669.714
2 2397.3849 1913.8547 3003.078
```

Summary Plot

```
> Summarize(~len,data=Sturg,digits=1)
      n  nvalid   mean    sd   min    Q1  median    Q3   max percZero
145.0  145.0  1110.0  168.8  495.0 1021.0 1097.0 1217.0 1494.0    0.0
```

```
> L <- seq(495,1494,length.out=199)
> W <- exp(predict(slr2,data.frame(loglen=log(L)),interval="prediction"))
> headtail(W)
      fit      lwr      upr
1   510.6550  402.0235  648.6401
2   527.6130  415.5430  669.9077
3   544.9554  429.3728  691.6517
197 17542.5073 14007.0102 21970.3961
198 17735.3783 14160.2195 22213.1898
199 17929.7065 14314.5691 22457.8451
```

```
> plot(weight~len,data=Sturg,pch=19,col=clr,xlab="Total Length (mm)",ylab="Weight (g)")
> lines(L,W[, "fit"],lwd=2)
> lines(L,W[, "lwr"],lwd=2,lty=2)
> lines(L,W[, "upr"],lwd=2,lty=2)
```

