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))
```
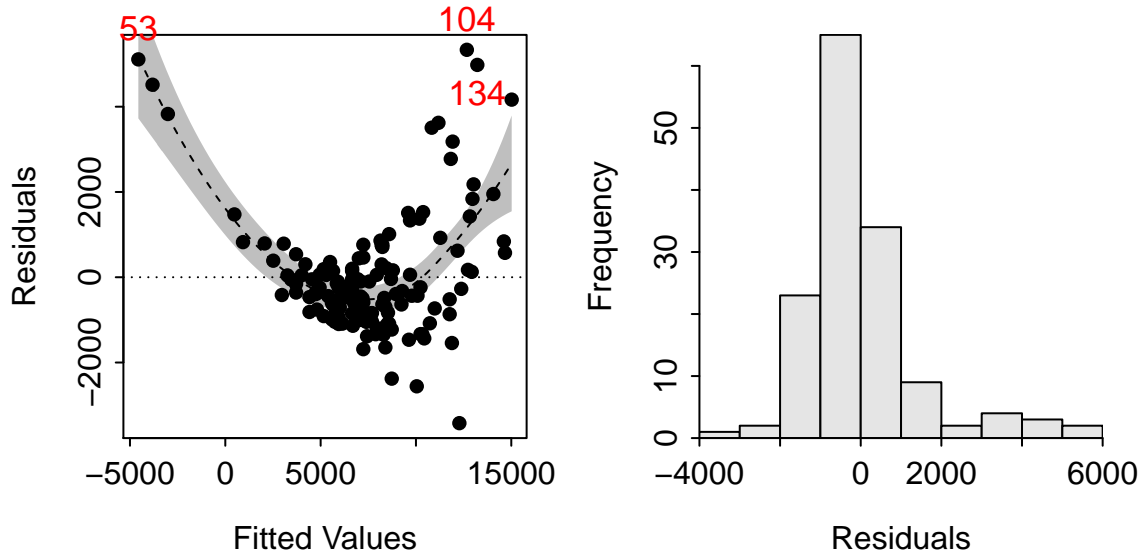
Quick Summaries

```
> plot(weight~len,data=Sturg,pch=19,col=col2rgbt("black",1/3),
      xlab="Length (mm)",ylab="Weight (g)")          # Left
> plot(logwt~loglen,data=Sturg,pch=19,col=col2rgbt("black",1/3),
      xlab="log Length (mm)",ylab="log Weight (g)")    # Right
```
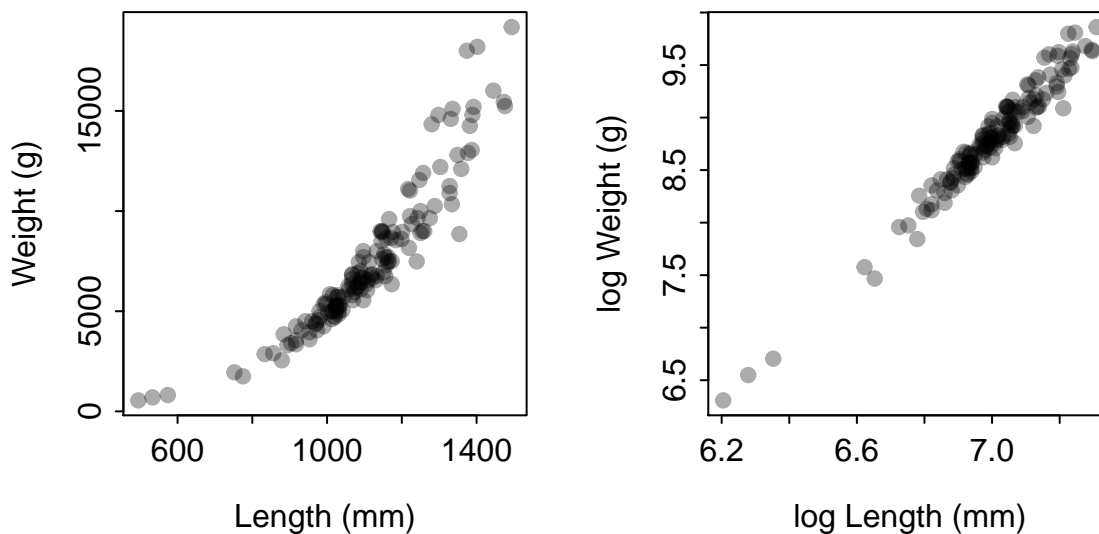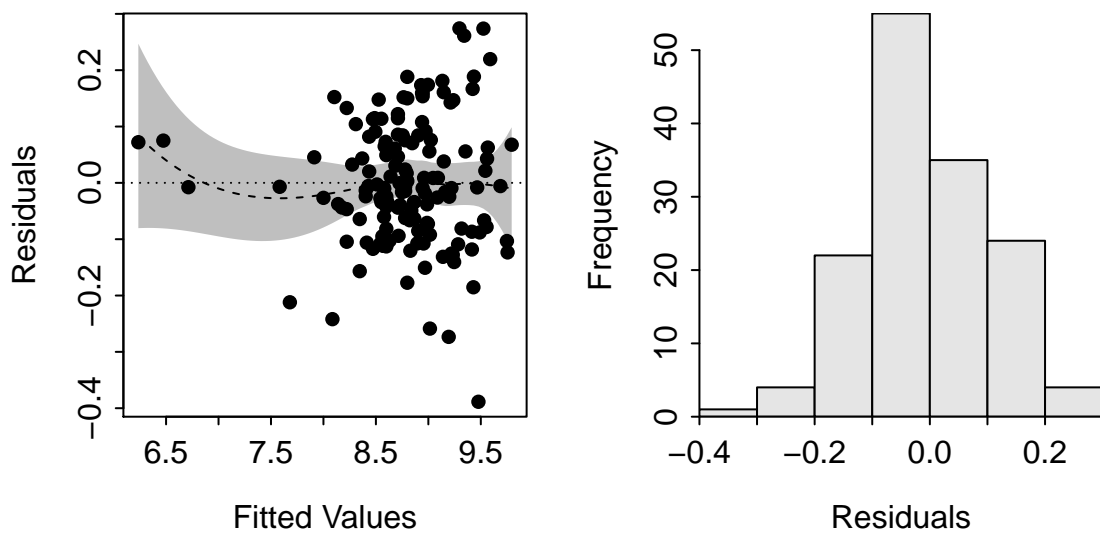
Simple Linear Regression

Fitting the Model

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



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



```
> 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(~loglen,data=Sturg,digits=1)
      n    nvalid     mean       sd      min       Q1   median       Q3      max percZero
  145.0     145.0      7.0      0.2      6.2      6.9      7.0      7.1      7.3      0.0
```

```
> logL <- seq(6.15,7.35,length.out=199)
> logW <- predict(slr2,data.frame(loglen=logL),interval="prediction")
> L <- exp(logL)
> W <- exp(logW)
> headtail(W)
          fit        lwr        upr
1     428.3508    336.4645    545.3308
2     436.7959    343.1866    555.9387
3     445.4075    350.0424    566.7538
197 19664.2951 15691.5544 24642.8424
198 20051.9843 15999.1370 25131.4852
199 20447.3170 16312.7175 25629.8666
```

```
> plot(weight~len,data=Sturg,pch=19,col=col2rgbt("black",1/3),xlab="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)
```