DVR Weight-Length Relation

Preliminaries

Load Necessary Packages

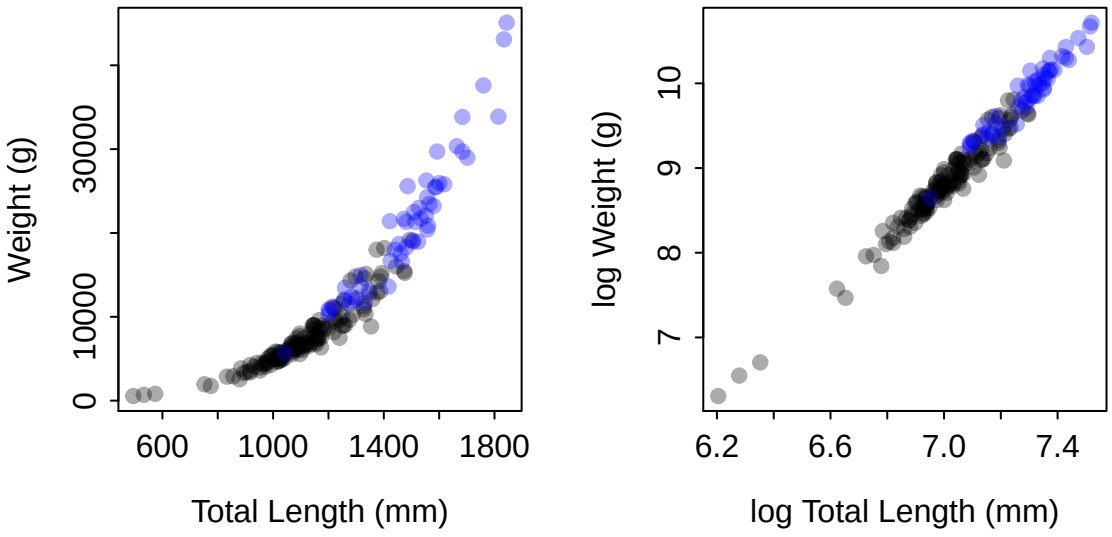
```
> library(FSA)      # for filterD(), col2rgbt(), hist(), Summarize(), lwCompPred()
> library(dplyr)    # for mutate()
```

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 %in% c("CHIPPEWA RIVER","HUNTER LAKE"),
                   species=="Lake Sturgeon",!is.na(len),!is.na(weight))
```

Quick Summaries

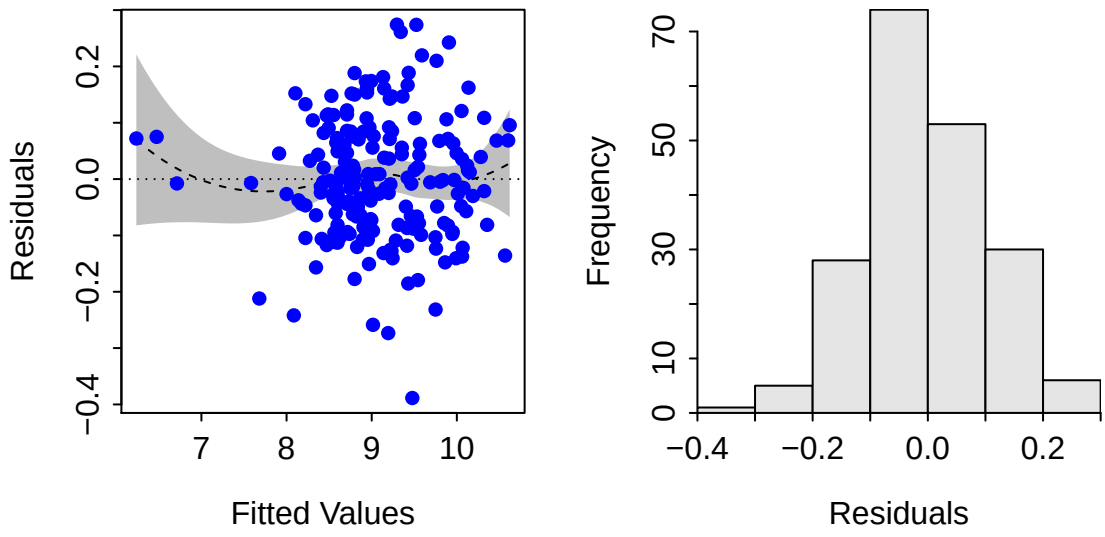
```
> clr1 <- c("black","blue")
> clr2 <- col2rgbt(clr1,1/3)
> plot(weight~len,data=Sturg,pch=19,col=clr2[waterbody],
       xlab="Total Length (mm)",ylab="Weight (g)")            # Left
> plot(logwt~loglen,data=Sturg,pch=19,col=clr2[waterbody],
       xlab="log Total Length (mm)",ylab="log Weight (g)")    # Right
```



Dummy Variable Regression

Checking Assumptions

```
> dvr1 <- lm(logwt~loglen*waterbody,data=Sturg)
> residPlot(dvr1,legend=FALSE)
```



Model Fitting, Reduction, and Summary

```
> anova(dvr1)
Analysis of Variance Table

Response: logwt
                  Df Sum Sq Mean Sq   F value    Pr(>F)
loglen             1 94.398  94.398 7879.7860 < 2.2e-16
waterbody          1  0.356   0.356   29.7194 1.514e-07
loglen:waterbody   1  0.004   0.004    0.3712    0.5431
Residuals        193  2.312   0.012
```

```
> dvr2 <- lm(logwt~loglen+waterbody,data=Sturg)
> anova(dvr2)
Analysis of Variance Table

Response: logwt
           Df Sum Sq Mean Sq  F value    Pr(>F)
loglen      1 94.398  94.398 7905.408 < 2.2e-16
waterbody   1  0.356   0.356   29.816 1.443e-07
Residuals 194  2.317   0.012
```

```
> summary(dvr2)

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

Residuals:
     Min       1Q   Median       3Q      Max
-0.39137 -0.07853 -0.00828  0.07521  0.27213

Coefficients:
                      Estimate Std. Error t value Pr(>|t|)
(Intercept)          -13.84283    0.34946  -39.61  < 2e-16
loglen                 3.23442    0.04991   64.80  < 2e-16
waterbodyHUNTER LAKE   0.12556    0.02299    5.46 1.44e-07

Residual standard error: 0.1093 on 194 degrees of freedom
Multiple R-squared:  0.9761,    Adjusted R-squared:  0.9759
F-statistic:  3968 on 2 and 194 DF,  p-value: < 2.2e-16
```

```
> round(cbind(ests=coef(dvr2),confint(dvr2)),3)
                        ests   2.5 %  97.5 %
(Intercept)          -13.843 -14.532 -13.154
loglen                 3.234   3.136   3.333
waterbodyHUNTER LAKE   0.126   0.080   0.171
```

Making Predictions

```
> L <- c(1000,1000,1500,1500)
> wb <- c("CHIPPEWA RIVER","HUNTER LAKE","CHIPPEWA RIVER","HUNTER LAKE")
> p1 <- predict(dvr2,data.frame(loglen=log(L),waterbody=wb),interval="confidence")
> data.frame(L,wb,p1)
     L             wb      fit      lwr      upr
1 1000 CHIPPEWA RIVER 8.499773 8.479738 8.519809
2 1000    HUNTER LAKE 8.625331 8.576953 8.673708
3 1500 CHIPPEWA RIVER 9.811219 9.775502 9.846936
4 1500    HUNTER LAKE 9.936776 9.906831 9.966722
```

```
> data.frame(L,wb,round(exp(p1)/1000,2))
     L             wb   fit   lwr   upr
1 1000 CHIPPEWA RIVER  4.91  4.82  5.01
2 1000    HUNTER LAKE  5.57  5.31  5.85
3 1500 CHIPPEWA RIVER 18.24 17.60 18.90
4 1500    HUNTER LAKE 20.68 20.07 21.31
```

```
> cf <- coef(dvr2)
> cf[3]
waterbodyHUNTER LAKE
           0.1255577
```

```
> cf[[3]]
[1] 0.1255577
```

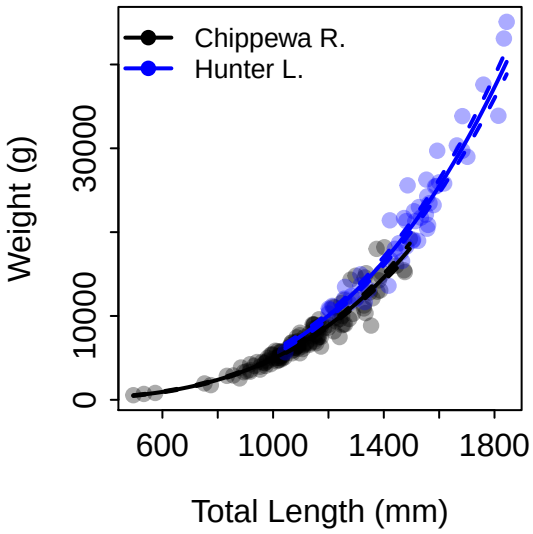
```
> exp(cf[[3]])
[1] 1.133781
```

Summary Plot

```
> Summarize(len~waterbody,data=Sturg,digits=1)
       waterbody   n nvalid   mean    sd  min   Q1 median   Q3  max percZero
1 CHIPPEWA RIVER 145    145 1110.0 168.8  495 1021   1097 1217 1494        0
2    HUNTER LAKE  52     52 1482.1 174.4 1044 1342   1505 1581 1844        0
```

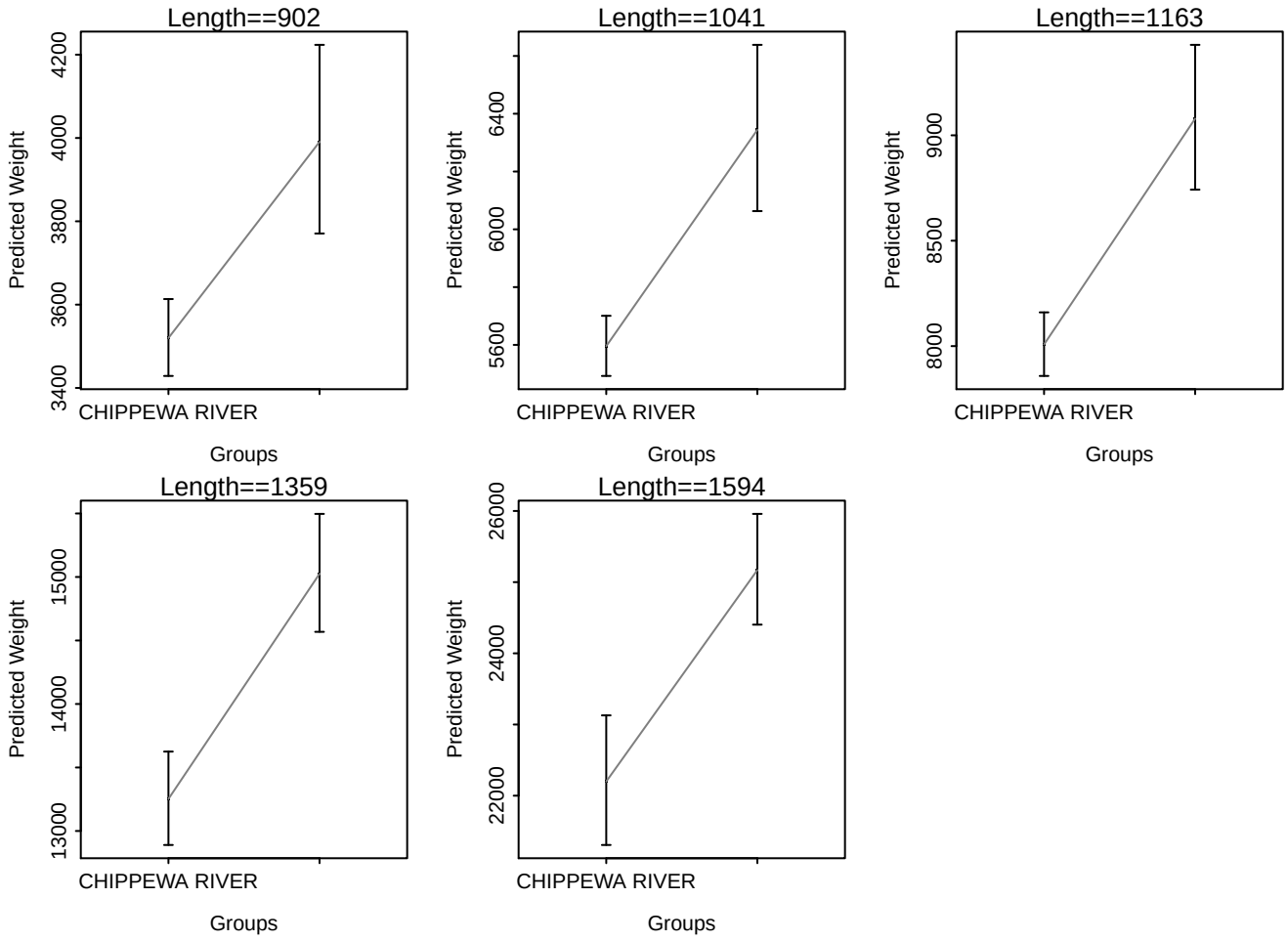
```
> cL <- seq(495,1494,length.out=199)
> hL <- seq(1044,1844,length.out=199)
> cW <- exp(predict(dvr2,data.frame(loglen=log(cL),waterbody="CHIPPEWA RIVER"),interval="confidence"))
> hW <- exp(predict(dvr2,data.frame(loglen=log(hL),waterbody="HUNTER LAKE"),interval="confidence"))
```

```
> plot(weight~len,data=Sturg,pch=19,col=clr2[waterbody],xlab="Total Length (mm)",ylab="Weight (g)")
> lines(cL,cW[,"fit"],lwd=2,col=clr1[1])
> lines(cL,cW[,"lwr"],lwd=2,lty=2,col=clr1[1])
> lines(cL,cW[,"upr"],lwd=2,lty=2,col=clr1[1])
> lines(hL,hW[,"fit"],lwd=2,col=clr1[2])
> lines(hL,hW[,"lwr"],lwd=2,lty=2,col=clr1[2])
> lines(hL,hW[,"upr"],lwd=2,lty=2,col=clr1[2])
> legend("topleft",legend=c("Chippewa R.","Hunter L."),lwd=2,col=clr1,pch=19,bty="n",cex=0.8)
```



Different Summary

```
> lwCompPreds(dvr2,qlens.dec=0)
```




```
> ## lwCompPreds(dvr2,lens=c(700,900,1100,1300,1500,1700))  # demo only
```