Lec20_1

```r
library(mcprofile)
```

```
## Loading required package: ggplot2
```

```r
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
aba <- read.csv("Abalone.csv")
head(aba)
```

```
##   Sex Length Diameter Height  Whole Shucked Viscera Shell Rings
## 1   1  0.455    0.365  0.095 0.5140  0.2245  0.1010 0.150    15
## 2   1  0.350    0.265  0.090 0.2255  0.0995  0.0485 0.070     7
## 3   2  0.530    0.420  0.135 0.6770  0.2565  0.1415 0.210     9
## 4   1  0.440    0.365  0.125 0.5160  0.2155  0.1140 0.155    10
## 5   0  0.330    0.255  0.080 0.2050  0.0895  0.0395 0.055     7
## 6   0  0.425    0.300  0.095 0.3515  0.1410  0.0775 0.120     8
```

(a)

```r
# Find estimates and their CIs using mcprofile

aba$Sexf <- factor(x=aba$Sex, labels=c("I", "M", "F"))
fit <- glm(Rings ~ Sexf*log(Shell), family = poisson(link = "log"), data = aba)

##Coefficeint matrix for shell weight 0.2
k <- matrix(data = c(1, 0, 0, log(0.2), 0, 0,
                        1, 1, 0, log(0.2), log(0.2), 0,
                        1, 0, 1, log(0.2), 0, log(0.2),
                        1, 0, 0, log(0.3), 0, 0,
                        1, 1, 0, log(0.3), log(0.3), 0,
                        1, 0, 1, log(0.3), 0, log(0.3),
                        1, 0, 0, log(0.4), 0, 0,
                        1, 1, 0, log(0.4), log(0.4), 0,
                        1, 0, 1, log(0.4), 0, log(0.4)), nrow = 9, byrow = TRUE)
```

```r
# Report K matrix
k
```

```
##       [,1] [,2] [,3]       [,4]       [,5]       [,6]
##  [1,]    1    0    0 -1.6094379  0.0000000  0.0000000
##  [2,]    1    1    0 -1.6094379 -1.6094379  0.0000000
##  [3,]    1    0    1 -1.6094379  0.0000000 -1.6094379
##  [4,]    1    0    0 -1.2039728  0.0000000  0.0000000
##  [5,]    1    1    0 -1.2039728 -1.2039728  0.0000000
##  [6,]    1    0    1 -1.2039728  0.0000000 -1.2039728
##  [7,]    1    0    0 -0.9162907  0.0000000  0.0000000
##  [8,]    1    1    0 -0.9162907 -0.9162907  0.0000000
##  [9,]    1    0    1 -0.9162907  0.0000000 -0.9162907
```

```r
##Estimates and corresponding CIs
out <- exp(confint(mcprofile(fit, k)))
out$estimate %>% unlist() -> t
out$confint %>% unlist() -> tt
op.aba <- data.frame(Rings = t, lower = tt[1:9], upper = tt[10:18])
op.aba <- `rownames<-`(op.aba, c("Weight 0.2 Infant", "Weight 0.2 Male", "Weight 0.2 Female", "Weight 0.3 In
fant", "Weight 0.3 Male", "Weight 0.3 Female", "Weight 0.4 Infant", "Weight 0.4 Male", "Weight 0.4 Female"))
op.aba
```

```
##                        Rings     lower     upper
## Weight 0.2 Infant   9.510145  9.214418  9.812297
## Weight 0.2 Male    10.059478  9.827889 10.294141
## Weight 0.2 Female 10.247200  9.960516 10.538569
## Weight 0.3 Infant 10.736233 10.302473 11.184876
## Weight 0.3 Male    11.162776 10.929186 11.399606
## Weight 0.3 Female 11.305404 11.059426 11.554964
## Weight 0.4 Infant 11.700871 11.137904 12.289257
## Weight 0.4 Male    12.018211 11.713208 12.328933
## Weight 0.4 Female 12.121844 11.796765 12.452904
```

```r
# Draw graph
sex.col <- ifelse(aba$Sex==0,y=53,n=
                      ifelse(aba$Sex==1, y=71,n=203))


plot(x = aba[(aba$Sex==0),"Shell"], y = aba[(aba$Sex==0),"Rings"],
     ylab = "Number of Rings", xlab = "Shell Weight",
     main="Abalone Data Poisson Regression Example",
     col=colors()[sex.col], pch=aba$Sex+1)

library(dplyr)
minMax = range(aba$Shell)
# "rep(x,)" repeats x according to "times=" or "each="
# rep(x=c(1,5), times=2)  gives 1,5,1,5
# rep(x=c(1,5), each=2)  gives 1,1,5,5
# Code below creates 100 values between min(Shell) and max(Shell),
#   once for each Sex=0, 1, or 2
xVals = data.frame(Shell=rep(seq(minMax[1], minMax[2], len = 100), times=3),
                  Sex=rep(c(0,1,2), each=100))
xVals$Sexf <-  factor(x=xVals$Sex, labels=c("I", "M", "F"))
yVals = predict(fit, newdata = xVals, type="response")
# Add lines to the previous plot for each sex
lines(x=xVals[xVals$Sex==0, "Shell"], y=yVals[xVals$Sex==0], lwd=2, col=colors()[53], )
lines(x=xVals[xVals$Sex==1, "Shell"], y=yVals[xVals$Sex==1], lwd=2, col=colors()[71], )
lines(x=xVals[xVals$Sex==2, "Shell"], y=yVals[xVals$Sex==2], lwd=2, col=colors()[203], )
legend(x=0.45, y=5, legend=c("I", "M", "F"), lwd=2, col=colors()[c(53, 71, 203)])
```

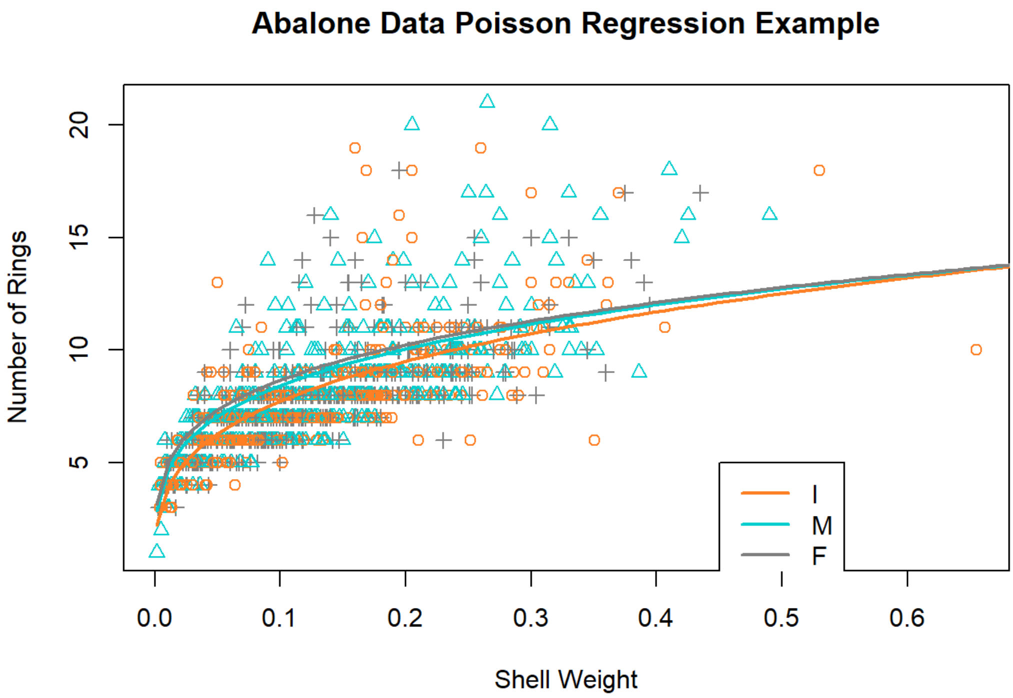

Figure above seems identical to the one in lecture notes.