A model for changes in length frequencies

1 Data

Read in length data and modify some column names and variable labels for use below.

```
library(gdata)

setwd("../data")

neph.dat <- read.xls("Celtic Warrior Diamond mesh July 2014 Celtic Sea.xls",
    sheet = "Nephrops Lengths", stringsAsFactors = FALSE)

## Show the first 2 rows
head(neph.dat, 2)


##           Vessel       DATE HAUL COMPARTMENT Mesh.Size  SPECIES
## 1 Celtic Warrior 2014-07-19    1     Control      70mm Nephrops
## 2 Celtic Warrior 2014-07-19    1     Control      70mm Nephrops
##   Carapace.Length..mm.. COUNT SUBSRATIO
## 1                    16     1         1
## 2                    17    11         1


## Change the carapace length name
names(neph.dat)[names(neph.dat) == "Carapace.Length..mm.."] <- "Carapace.Length"

## Make the 'HAUL' variable character
neph.dat$HAUL <- paste("H", neph.dat$HAUL, sep = "")
```

Make one row per length measurement assuming, for example, that a sub-sampling ratio of 0.1 corresponds to 10% of the catch sampled (CHECK).

```
## get a row per length measurement (raise them also)
n <- nrow(neph.dat)

neph.dat2 <- neph.dat[rep(1:n, times = round(neph.dat$COUNT/neph.dat$SUBSRATIO,
    0)), ]
```

Read in the haul weights

```
setwd("../data")

weight.dat <- read.xls("Celtic Warrior Diamond mesh July 2014 Celtic Sea.xls",
    sheet = "Weights", stringsAsFactors = FALSE)

## Show the first 2 rows
head(weight.dat, 2)


##         Date Haul.. Compartment Mesh.Size Species Total.weight..kg.
## 1 2014-07-19      1       TEST1      90mm    Bulk             26.28
## 2 2014-07-19      1       TEST1      90mm Haddock              0.38
##   Sbsample.weight..kg.
## 1
## 2


## create a new 'HAUL' variable for the merge
weight.dat$HAUL <- paste("H", weight.dat$Haul.., sep = "")

## re-name total weight column
names(weight.dat)[names(weight.dat) == "Total.weight..kg."] <- "Total.Weight"
```

Merge the bulk weights with the length data

```
neph.dat3 <- merge(neph.dat2, subset(weight.dat, Species == "Bulk")[, c("Mesh.Size",
    "HAUL", "Total.Weight")], by = c("Mesh.Size", "HAUL"))

## subset the data by mesh size
neph.70mm <- subset(neph.dat3, Mesh.Size == "70mm")
neph.80mm <- subset(neph.dat3, Mesh.Size == "80mm")
neph.90mm <- subset(neph.dat3, Mesh.Size == "90mm")
neph.100mm <- subset(neph.dat3, Mesh.Size == "100mm")

## convert HAUL to factor with levels depending on the haul weight
neph.70mm$HAUL <- factor(neph.70mm$HAUL, levels = unique(neph.70mm$HAUL[order(neph.70mm$Tot
neph.80mm$HAUL <- factor(neph.80mm$HAUL, levels = unique(neph.80mm$HAUL[order(neph.80mm$Tot
neph.90mm$HAUL <- factor(neph.90mm$HAUL, levels = unique(neph.90mm$HAUL[order(neph.90mm$Tot
neph.100mm$HAUL <- factor(neph.100mm$HAUL, levels = unique(neph.100mm$HAUL[order(neph.100mm
```

Produce a summary plot of the data by length, haul and catch weight.

```
library(ggplot2)
library(gridExtra)

## quick function for plot
plot.lfreq <- function(data, title.string){
  p <- ggplot(data, aes(x = Carapace.Length, group = HAUL)) +
    geom_density(position = "stack", aes(fill = Total.Weight), colour = 1, lwd = 0.01) +
```

```
      xlim(10, 45) + scale_fill_gradient2(low = "white", high = "blue", limits = c(0, max(
        theme(axis.text.x=element_blank())
  return(p)
}

p70mm <- plot.lfreq(neph.70mm, "70mm")
p80mm <- plot.lfreq(neph.80mm, "80mm")
p90mm <- plot.lfreq(neph.90mm, "90mm")
p100mm <- plot.lfreq(neph.100mm, "100mm")

grid.arrange(p70mm, p80mm, p90mm, p100mm, ncol = 1)
```

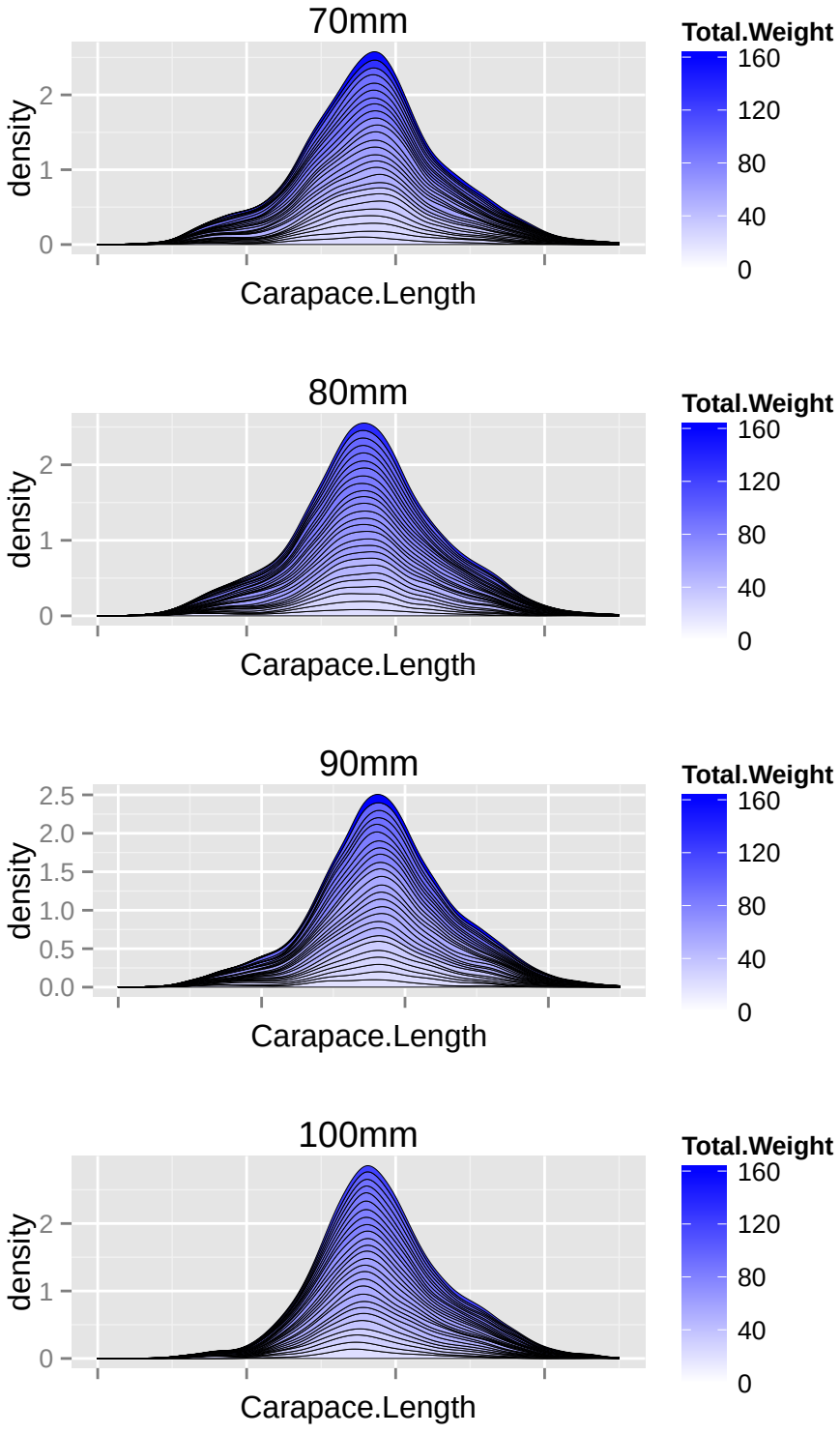

Figure 1: Stacked carapace length densities. Each haul is coloured according to the total bulk weight in that haul.