Age-Length Key Construction

Preliminaries

```
> library(FSAdata)        # for SpotVA2 data
> library(FSA)            # for headtail(), filterD(), lencat(), alkPlot()
> library(dplyr)          # for mutate()
> library(nnet)           # for multinom()
```

Loading and Preparing Data

```
> data(SpotVA2)
> headtail(SpotVA2)
      tl age
1   10.6   1
2    7.1   1
3   12.3   3
401  9.6  NA
402  7.5  NA
403  7.4  NA
```

```
> sp.len <- filterD(SpotVA2,is.na(age))
> headtail(sp.len)
     tl age
1   9.6  NA
2   9.4  NA
3   9.1  NA
329 9.6  NA
330 7.5  NA
331 7.4  NA
```

```
> sp.age <- filterD(SpotVA2,!is.na(age))
> headtail(sp.age)
     tl age
1  10.6   1
2   7.1   1
3  12.3   3
70 13.7   3
71 13.9   3
72  6.3   0
```

```
> sp.age.mod <- mutate(sp.age,lcat=lencat(tl,w=1))
> headtail(sp.age.mod)
     tl age lcat
1  10.6   1   10
2   7.1   1    7
3  12.3   3   12
70 13.7   3   13
71 13.9   3   13
72  6.3   0    6
```

Observed Age-Length Key

```
> ( raw <- xtabs(~lcat+age,data=sp.age.mod) )
    age
lcat  0  1  2  3  4
  6   2  0  0  0  0
  7   0 10  0  0  0
  8   1  9  0  0  0
  9   0  8  2  0  0
  10  0  9  1  0  0
  11  0  1  3  6  0
  12  0  1  4  4  1
  13  0  0  0  8  2
```

```
> ( ALK.obs <- prop.table(raw,margin=1) )
    age
lcat   0   1   2   3   4
  6  1.0 0.0 0.0 0.0 0.0
  7  0.0 1.0 0.0 0.0 0.0
  8  0.1 0.9 0.0 0.0 0.0
  9  0.0 0.8 0.2 0.0 0.0
  10 0.0 0.9 0.1 0.0 0.0
  11 0.0 0.1 0.3 0.6 0.0
  12 0.0 0.1 0.4 0.4 0.1
  13 0.0 0.0 0.0 0.8 0.2
```

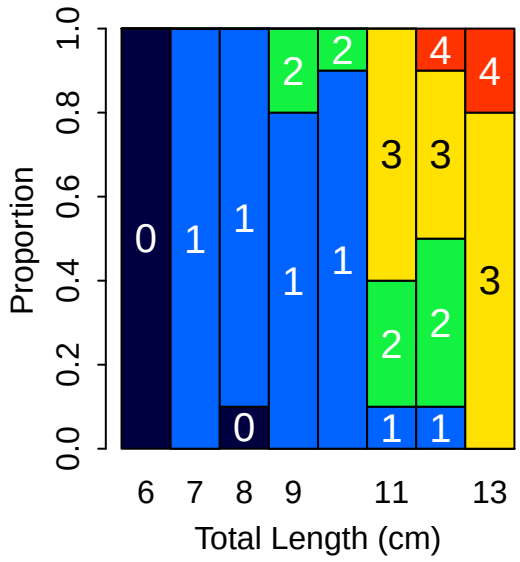
Smoothed Age-Length Key

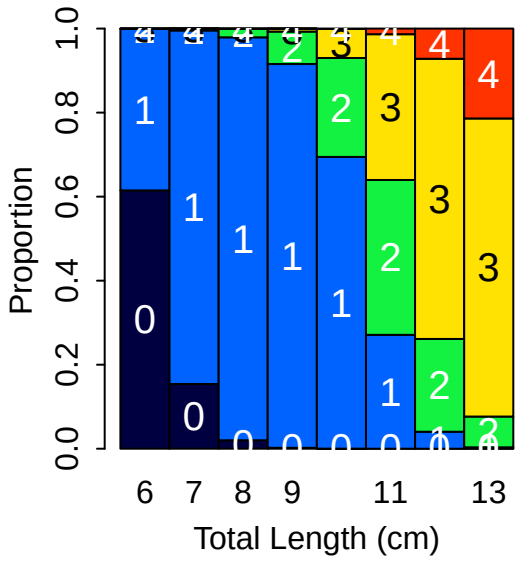
```
> mlr <- multinom(age~lcat,data=sp.age.mod,maxit=500)
# weights:  15 (8 variable)
initial  value 115.879530
iter  10 value 59.182854
iter  20 value 47.862700
iter  30 value 47.690923
iter  40 value 47.587817
iter  50 value 47.560383
iter  60 value 47.552660
iter  70 value 47.542159
iter  80 value 47.539583
iter  90 value 47.539245
iter  90 value 47.539245
final  value 47.539239
converged
```

```
> lens <- seq(6,13,1)
> ALK.sm <- predict(mlr,data.frame(lcat=lens),type="probs")
> row.names(ALK.sm) <- lens
> round(ALK.sm,3)
       0     1     2     3     4
6  0.615 0.385 0.001 0.000 0.000
7  0.154 0.842 0.004 0.000 0.000
8  0.020 0.959 0.020 0.001 0.000
9  0.002 0.913 0.077 0.007 0.000
10 0.000 0.694 0.235 0.069 0.001
11 0.000 0.271 0.369 0.347 0.013
12 0.000 0.040 0.221 0.667 0.072
13 0.000 0.003 0.073 0.709 0.214
```

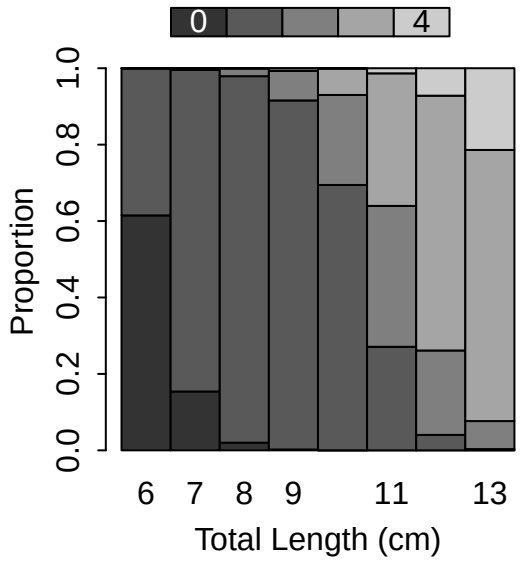
Visualizing an Age-Length Key

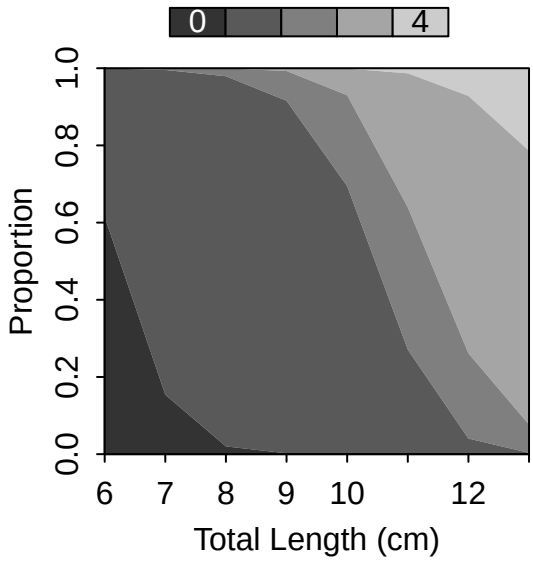
```
> lblTL <- "Total Length (cm)"
> alkPlot(ALK.obs,xlab=lblTL)
> alkPlot(ALK.sm,xlab=lblTL)
```






```
> alkPlot(ALK.sm,pal="gray",showLegend=TRUE,xlab=lblTL)
> alkPlot(ALK.sm,type="area",pal="gray",showLegend=TRUE,xlab=lblTL)
```





```
> alkPlot(ALK.sm,type="lines",pal="gray",xlab=lblTL)
> alkPlot(ALK.sm,type="bubble",xlab=lblTL)
```