

# Construct Age-Length Keys

*Derek H. Ogle, Northland College*

*20-Aug-2016*

## Preliminaries

```
> library(FSadata)      # for SpotVA2 data
> library(FSA)          # for headtail(), alkPlot()
> library(dplyr)        # for filter(), mutate()
> library(mnet)         # 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 <- filter(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 <- filter(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

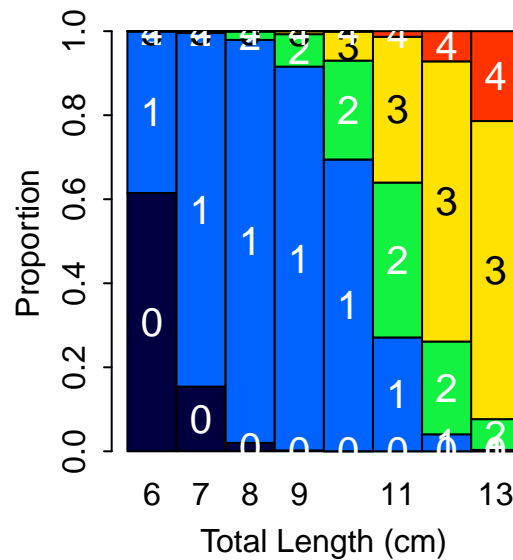
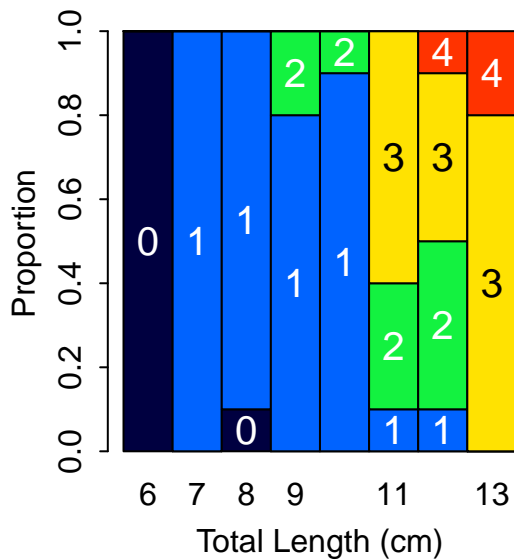
```
> mlr <- multinom(age~lcat,data=sp.age.mod,maxit=500)
# weights: 15 (8 variable)
initial value 115.879530
iter 10 value 59.182854
iter 20 value 47.862700
iter 30 value 47.690923
iter 40 value 47.587817
iter 50 value 47.560383
iter 60 value 47.552660
iter 70 value 47.542159
iter 80 value 47.539583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

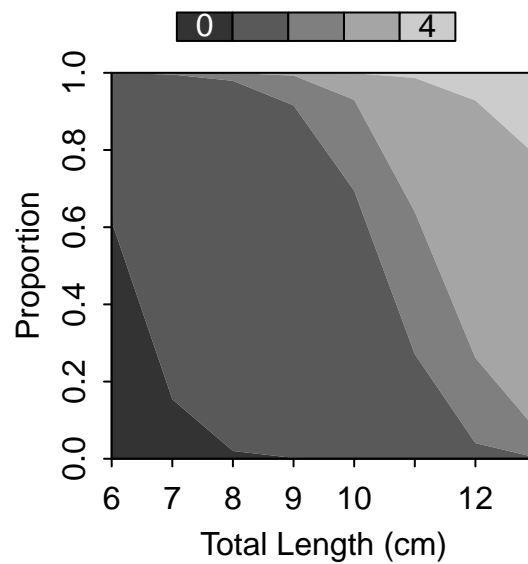
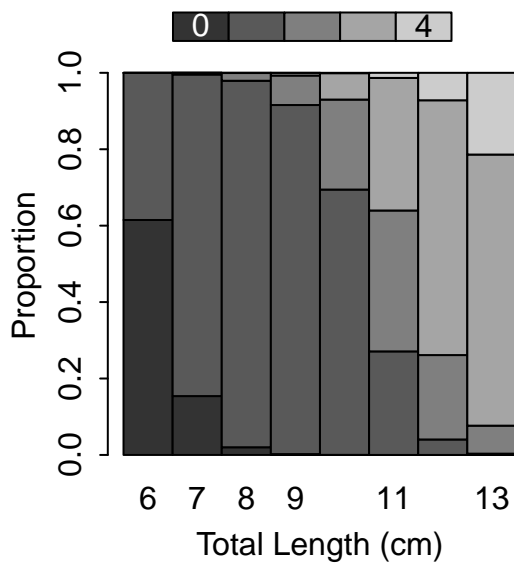
```
12 0.000 0.040 0.221 0.667 0.072
13 0.000 0.003 0.073 0.709 0.214
```

## 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)
```

