R Handout - R Growth Curve **Dr. Derek Ogle**

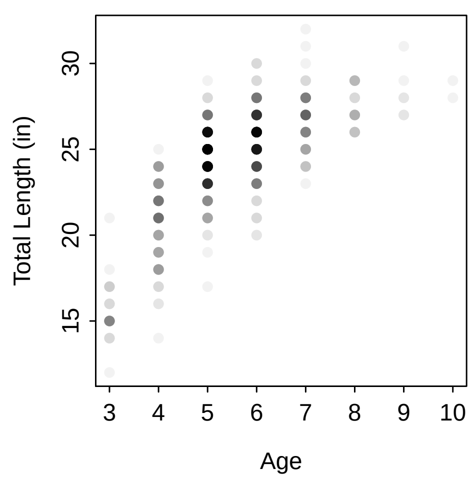
Northland College, Midwest (Wichita) Dec 2013

```
> library(FSA)      # Subset, fitPlot, vbModels, vbStart, vbFuns
> library(nlstools) # overview
```

0.1 Brule River Rainbow Trout

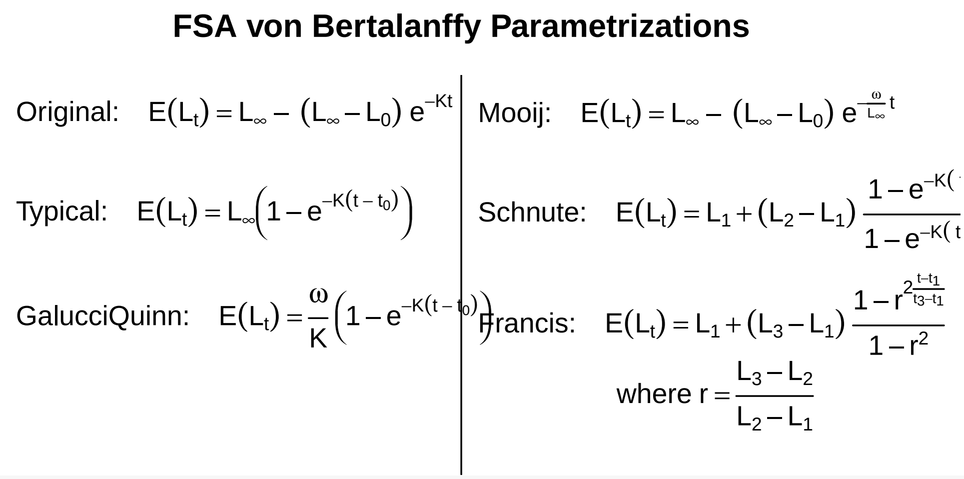
```
> ## setwd("C:/aaaWork/Web/fishR/courses/Midwest2012/CourseMaterial/")
> d <- read.table("TroutBR.txt",header=TRUE)
> str(d)

'data.frame': 851 obs. of  3 variables:
 $ tl     : int  16 16 17 17 17 17 17 17 17 17 ...
 $ age    : int  4 4 2 3 3 3 3 3 3 4 ...
 $ species: Factor w/ 2 levels "Brown","Rainbow": 1 1 1 1 1 1 1 1 1 1 ...

> rbt <- Subset(d,species=="Rainbow")
> str(rbt)

'data.frame': 627 obs. of  3 variables:
 $ tl     : int  12 14 14 14 14 15 15 15 15 15 ...
 $ age    : int  3 3 3 3 4 3 3 3 3 3 ...
 $ species: Factor w/ 1 level "Rainbow": 1 1 1 1 1 1 1 1 1 1 ...
```

```
> clr <- rgb(0,0,0,0.05)
> plot(tl~age,data=rbt,col=clr,pch=16,xlab="Age",ylab="Total Length (in)")
```



0.2 Fit Traditional Model

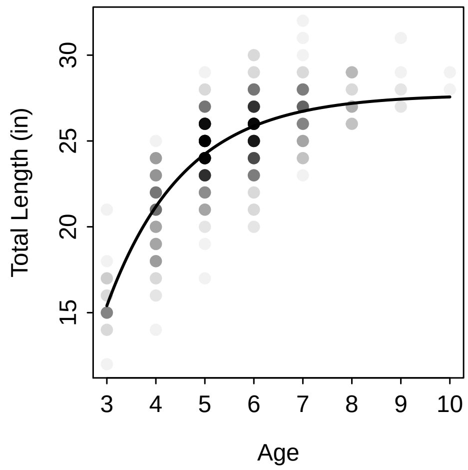
```
> vbModels()
```




```
> ( svb1 <- vbStarts(tl~age,data=rbt,type="typical") )
$Linf
[1] 28.67

$K
[1] 0.5242

$t0
[1] -1.429

> fit1 <- nls(tl~Linf*(1-exp(-K*(age-t0))),data=rbt,start=svb1)
> overview(fit1)

------
Formula: tl ~ Linf * (1 - exp(-K * (age - t0)))

Parameters:
     Estimate Std. Error t value Pr(>|t|)
Linf  27.7118     0.2838    97.6   <2e-16
K      0.6324     0.0425    14.9   <2e-16
t0     1.7169     0.1016    16.9   <2e-16

Residual standard error: 1.78 on 624 degrees of freedom

Number of iterations to convergence: 5
Achieved convergence tolerance: 5.38e-08

------
Residual sum of squares: 1970

------
Asymptotic confidence interval:
       2.5%   97.5%
Linf 27.154 28.2692
K     0.549  0.7159
t0    1.517  1.9164
```

```
------
Correlation matrix:
        Linf       K      t0
Linf  1.0000 -0.9074 -0.7114
K    -0.9074  1.0000  0.9191
t0   -0.7114  0.9191  1.0000
```

```
> fitPlot(fit1,xlab="Age",ylab="Total Length (in)",main="",col.pt=clr,col.mdl="black")
```



0.3 Fit Galucci and Quinn Parameterization

```
> ( svb2 <- vbStarts(tl~age,data=rbt,type="GalucciQuinn") )

$omega
[1] 15.03

$K
[1] 0.5242

$t0
[1] -1.429

> ( vb2 <- vbFuns("GalucciQuinn",simple=TRUE) )

function(t,omega,K,t0) {
        (omega/K)*(1-exp(-K*(t-t0)))
  }
<environment: 0x0529e800>

> fit2 <- nls(tl~vb2(age,omega,K,t0),data=rbt,start=svb2)
> overview(fit2)

------
Formula: tl ~ vb2(age, omega, K, t0)

Parameters:
      Estimate Std. Error t value Pr(>|t|)
omega  17.5259     1.0172    17.2   <2e-16
K       0.6324     0.0425    14.9   <2e-16
t0      1.7169     0.1016    16.9   <2e-16
```

```
Residual standard error: 1.78 on 624 degrees of freedom

Number of iterations to convergence: 5
Achieved convergence tolerance: 9.19e-08

------
Residual sum of squares: 1970

------
Asymptotic confidence interval:
        2.5%   97.5%
omega 15.528 19.5234
K      0.549  0.7159
t0     1.517  1.9164

------
Correlation matrix:
       omega      K     t0
omega 1.0000 0.9972 0.9382
K     0.9972 1.0000 0.9191
t0    0.9382 0.9191 1.0000
> fitPlot(fit2,xlab="Age",ylab="Total Length (in)",main="",col.pt=clr,col.mdl="black")
```