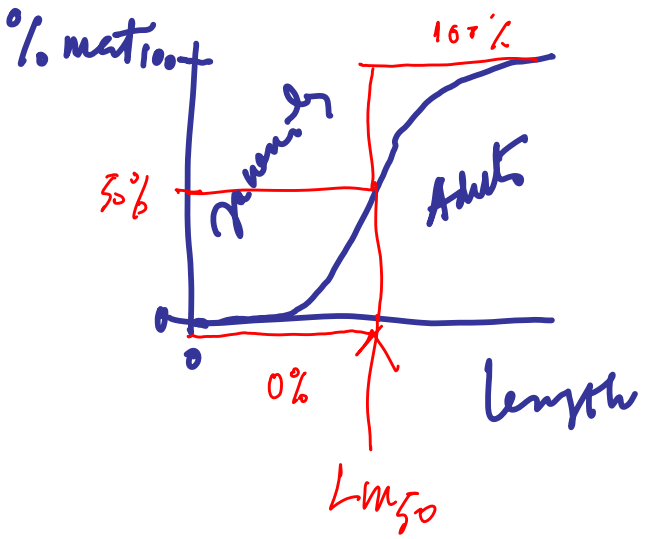
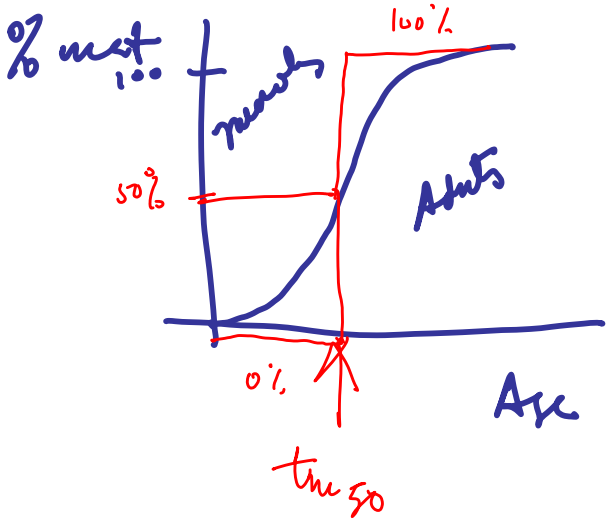
MATURITY OGIVES

% (or proportion) of mature (i.e., adults) individuals by length class or by age in the population



Length at first maturity



Age at first maturity

Approx. $L < L_{m50} \Rightarrow$ juveniles

$L \geq L_{m50} \Rightarrow$ adults

$t < t_{m50} \Rightarrow$ juveniles

$t \geq t_{m50} \Rightarrow$ adults

Logistic function

$$P = \frac{1}{(1 + e^{-r(L - L_{m50})})}$$

$$P = \frac{1}{(1 + e^{-r(t - t_{m50})})}$$

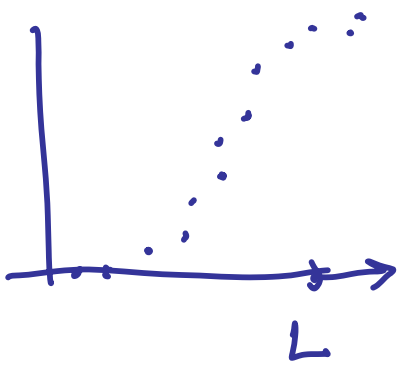
where r and L_{m50} or r and t_{m50} are parameters of the model

Parameter estimation (r and $L_{m_{t_0}}$) and (r and $t_{m_{t_0}}$)

Ex: Data

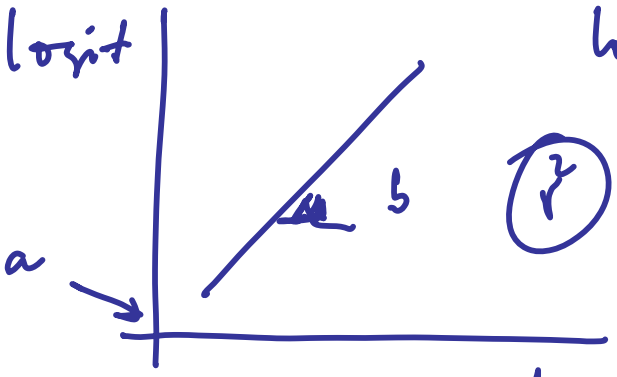
Length	% mort (P)
⋮	⋮
L_i	P_i
⋮	⋮

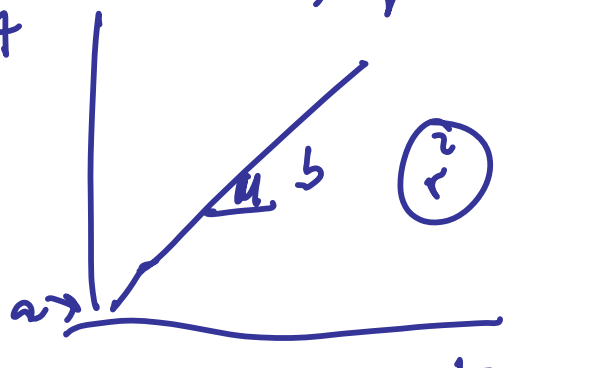
Plot



Initial values

logit transformation of data in order to linearize the logistic





a, b } r, $L_{m_{t_0}}$

a, b } r, $t_{m_{t_0}}$

$$p = \frac{1}{(1 + e^{-r(L - L_{m50})})} \qquad P = \frac{1}{(1 + e^{-r(t - t_{m50})})}$$

Logit transformation

$$\frac{1}{p} = \frac{1 + e^{-r(L - L_{m50})}}{1}$$

by age is the same

$$\frac{1}{p} - 1 = e^{-r(L - L_{m50})}$$

$$\ln\left(\frac{1}{p} - 1\right) = -r(L - L_{m50})$$

$$\ln\left(\frac{1-p}{p}\right) = -rL + rL_{m50}$$

$$\ln\left(\frac{1-p}{p}\right) = rL_{m50} - rL \qquad \ln\left(\frac{1-p}{p}\right) = rt_{m50} - rt$$

logit $y = a + bL$ $y = a + bt$

L: risk points t: risk points

where $a = r\,Lm_{50}$; $b = -r$

$$r = -b$$

$$Lm_{50} = -\frac{a}{b}$$

$a = r\,tm_{50}$; $b = -r$

$$r = -b$$

$$tm_{50} = -\frac{a}{b}$$

Initial values for NON-LINEAR estimation