

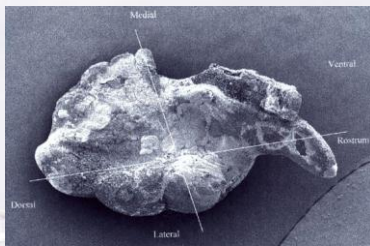
Growth

Age reading from hard part
Growth model
Estimation of growth parameters by FISAT



Tue. 22/03/2016

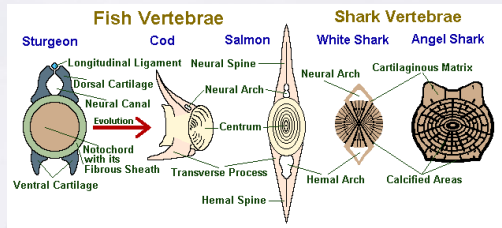
Statolith



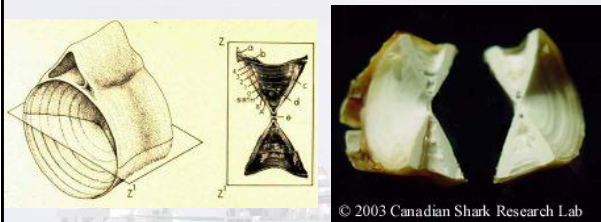
Gladius Lamellae



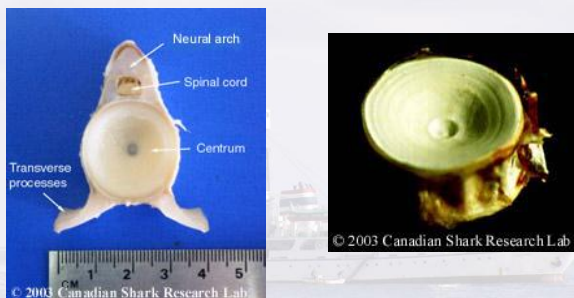
Vertebrae



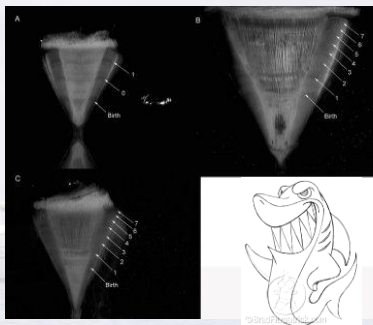
Age Reading in Cartilaginous Fish



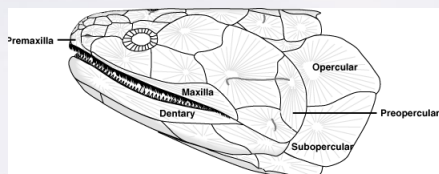
Age Reading in Cartilaginous Fish



Age Reading in Cartilaginous Fish



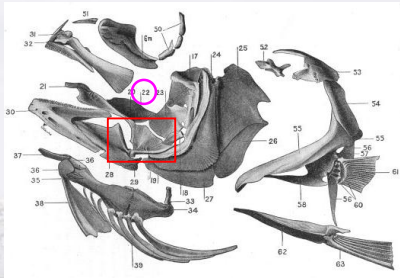
Opercular



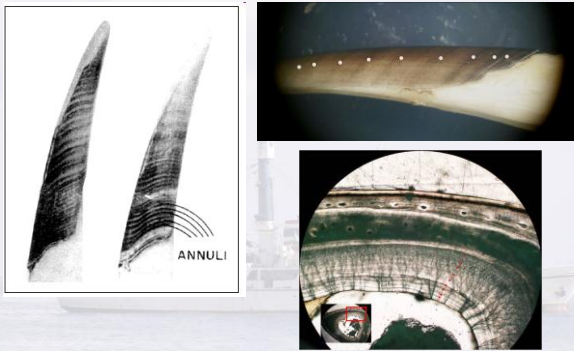
Cleithrum (Northern Pike)



Mesopterygoid or Endopterygoid



Fin Spine



AGE-LENGTH DATA

Length measurement at year t ; L_t


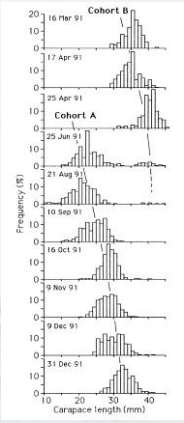
Age reading (t)

VBGF (von Bertalanffy's Growth Function)

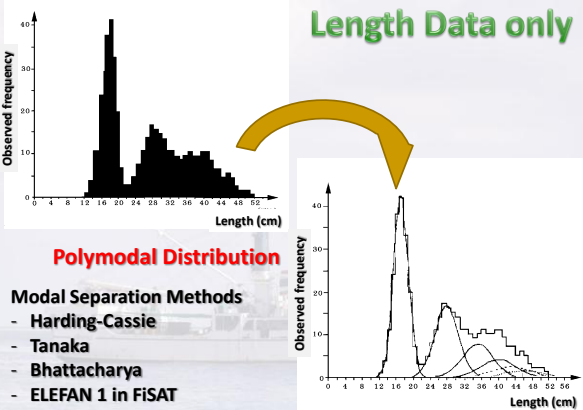
$$L_t = L_\infty (1 - e^{-K(t-t_0)})$$

Length Data only

Petersen's Histogram

Length Data only

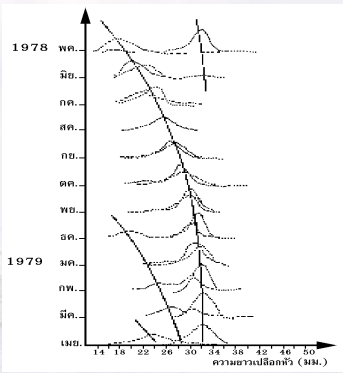


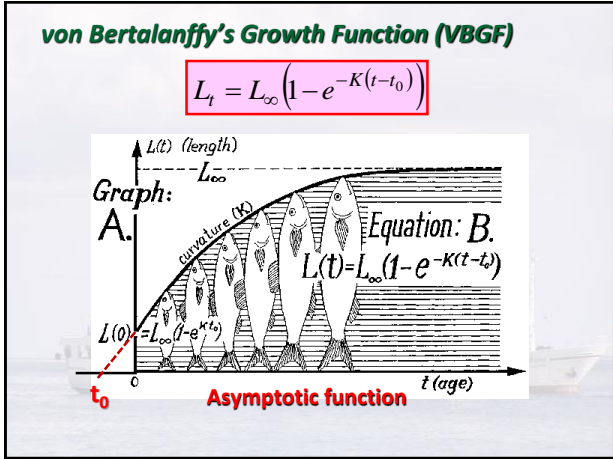
Polymodal Distribution

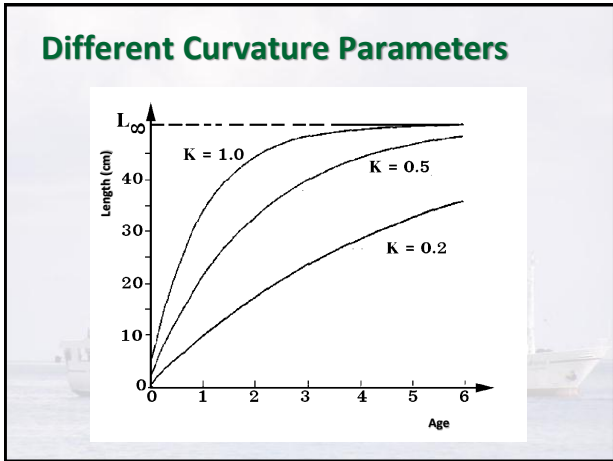
Modal Separation Methods

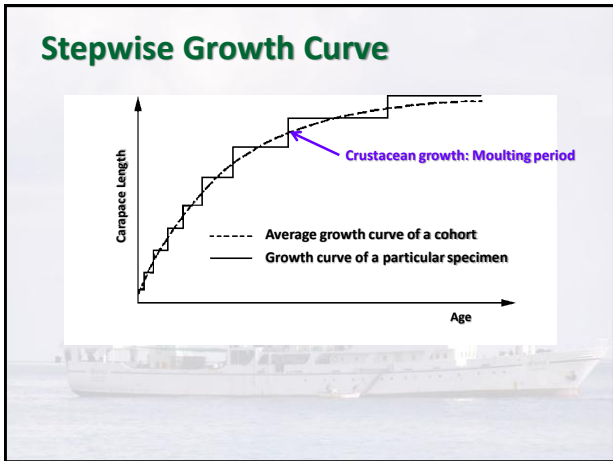
- Harding-Cassie
- Tanaka
- Bhattacharya
- ELEFAN 1 in FISAT

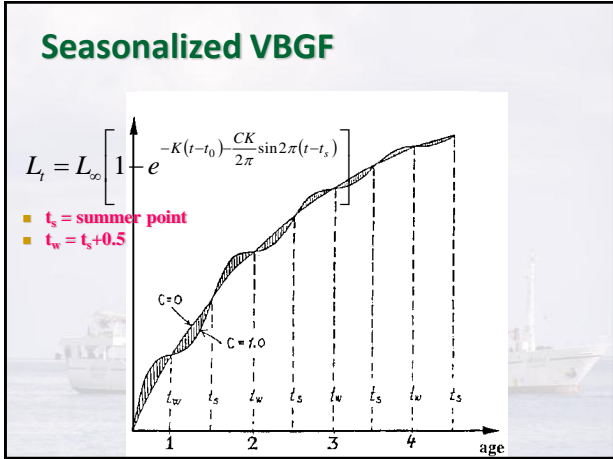
Modal Progression Analysis







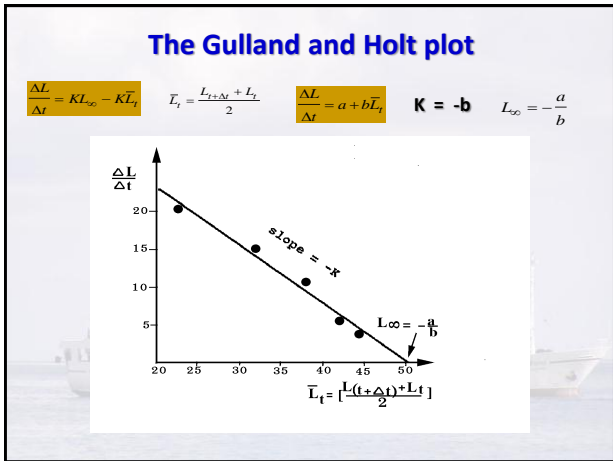




Practice a little bit!

A	B	C	D
t	L_t	$\frac{L_{t+X} - L_t}{X} = \frac{\Delta L}{\Delta t}$	$\frac{L_{t+X} + L_t}{2} = \bar{L}_t$
	Y	X	
1	25.7	10.3	30.9
2	36.0	6.9	39.5
3	42.9	4.6	45.2
4	47.5	3.2	49.1
5	50.7	2.1	51.8
6	52.8	1.4	53.5
7	54.2		

$K = ?$
 $L_\infty = ?$



FISAT (FAO-ICLARM Stock Assessment Tool)