WF4133-Fisheries Science

Class 16: Overfishing

Housekeeping

Lab this afternoon-go over Final Project

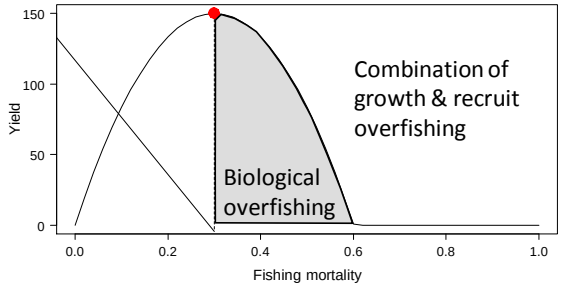
1. Report materials: template, expectations, so on
2. How the data was collected
3. Data!
4. Some analysis & next steps

Exam II-Next Monday 4/3 Anything up to 3/29 is fair game…

Overfishing types

1. Biological
2. Economic

Biological overfishing



Growth overfishing

Harvest fish before they have time to grow

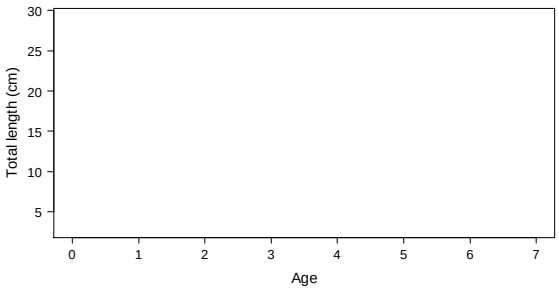
Example:

Growth process in fish

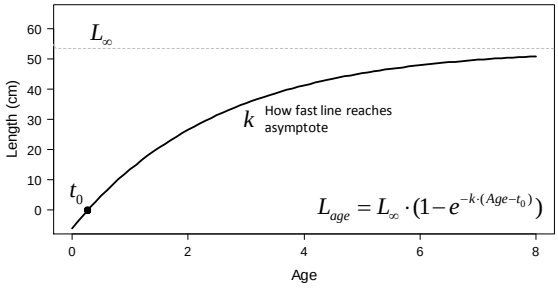
The assimilation of food as biomass (i.e., tissue). Primarily refers to somatic tissue but also includes gonad tissue.

- Fish adding **weight** over **time**
  1. **Relate time (age) to length**
  2. **Relate length to weight**

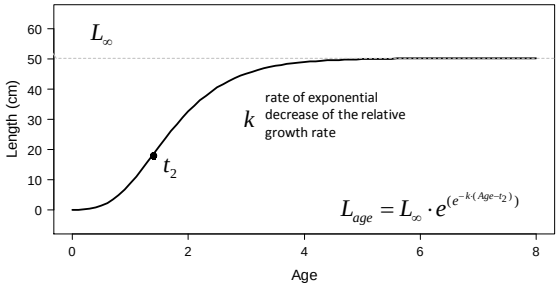
Age-length



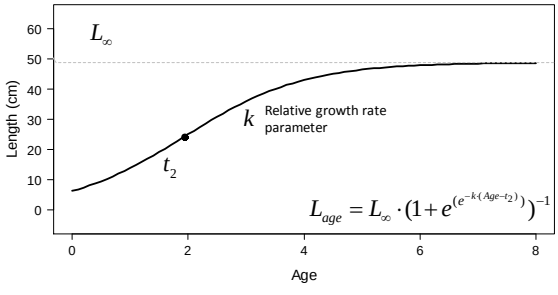
von Bertalanffy Growth Function



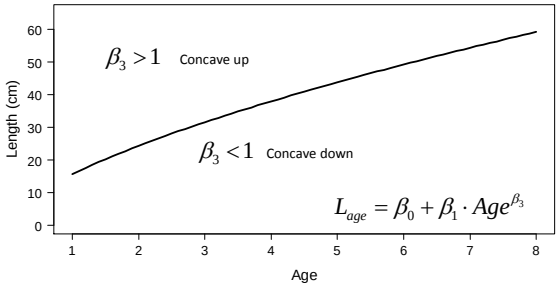
Gompertz



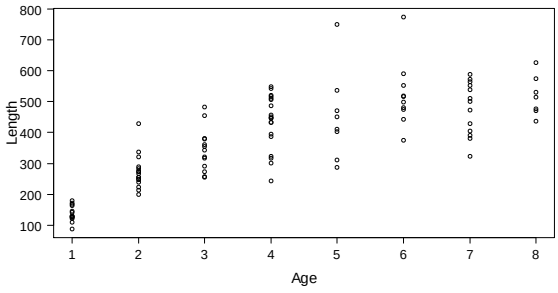
Logistic



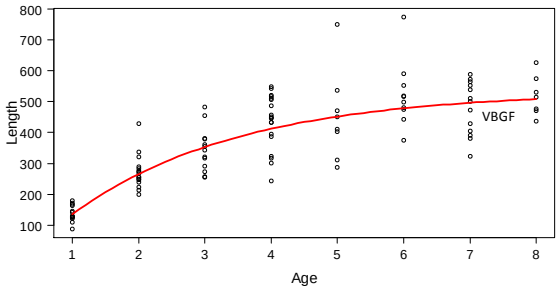
Power



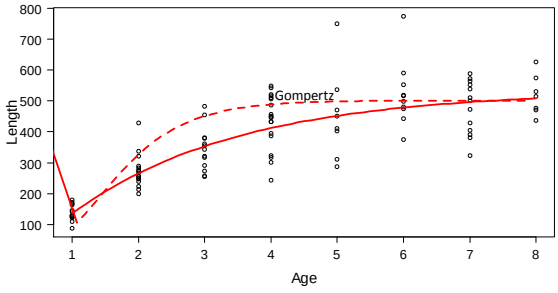
Some Age-Length Data



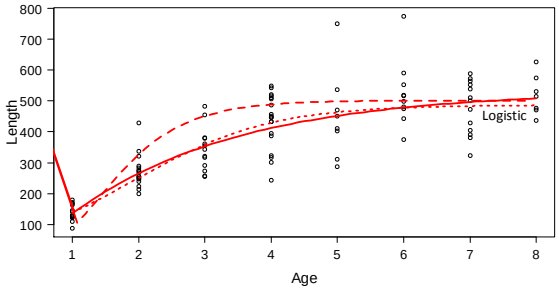
vonBertalanffy



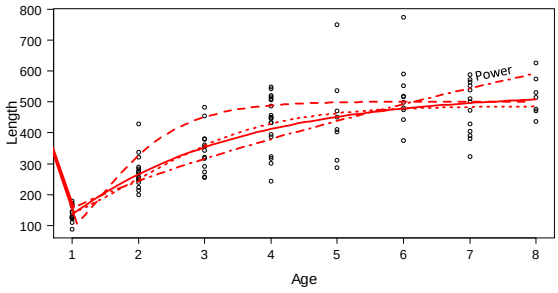
+Gompertz



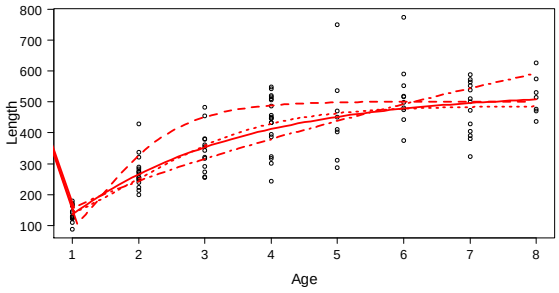
+Logistic



+Power



How to decide?



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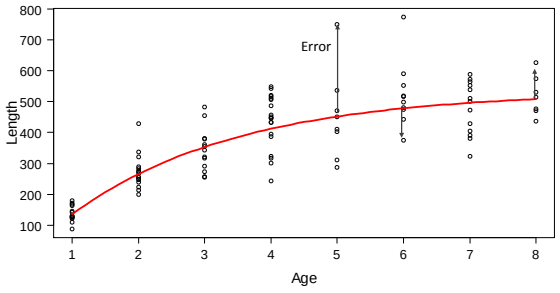

How to decide?

- Best fitting model
  - Mean absolute error (MAE
  - Mean squared error (MSE)

Model	MAE	MSE
VBGF	58.5	**6526.2**
Gompertz	76.1	9306.283
Logistic	**58.3**	6565.2
Power	66.2	8065.2

So which one is Best?

Doing good science…

FISH and FISHERIES, 2008, 9, 178–187

Modelling fish growth: multi-model inference as a better alternative to *a priori* using von Bertalanffy equation

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Take home…

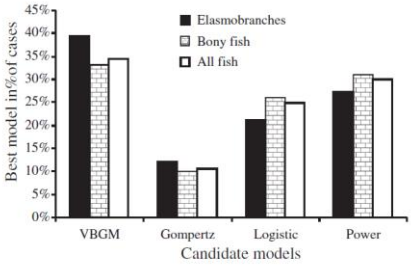


Figure 1 Percentage selection of each of the four candidate models of this study as the 'best' model, separately for elasmobranchs, bony fish and all fish combined.

Multi Model selection

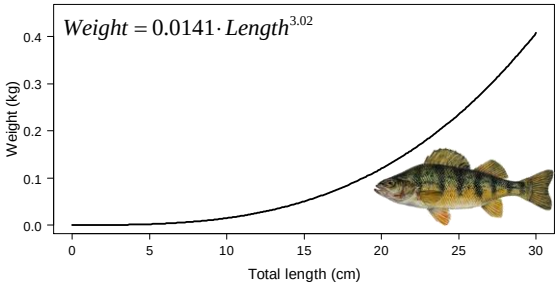
- Likelihood of model given data and penalized for complexity

Model	AIC	ΔAIC	Model weight
VBGF	**1137.9**	**0**	**0.49**
Gompertz	1138.5	0.57	0.37
Logistic	1140.4	2.65	0.132
Power	1160.5	22.57	<0.001

PUTTING THE GROWTH MODEL TO USE

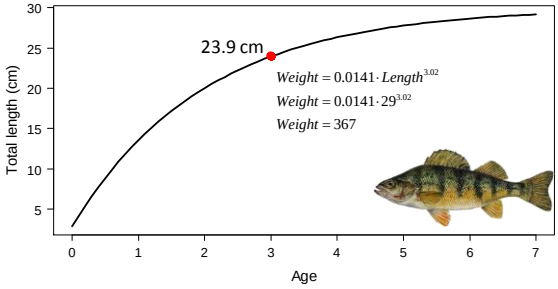
Using the "best model" a von Bertalanffy growth function

Length-weight

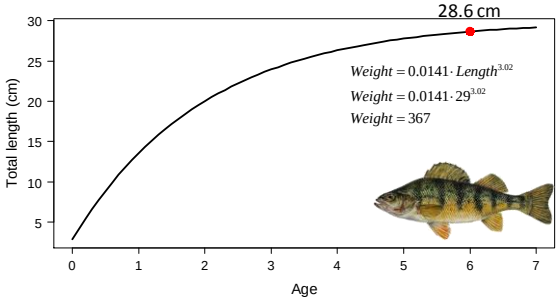


Weight for an age-3 fish

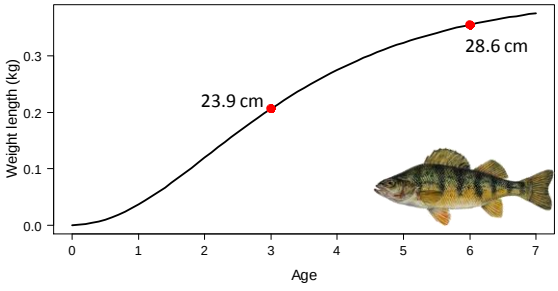
Weight for an age-3 fish



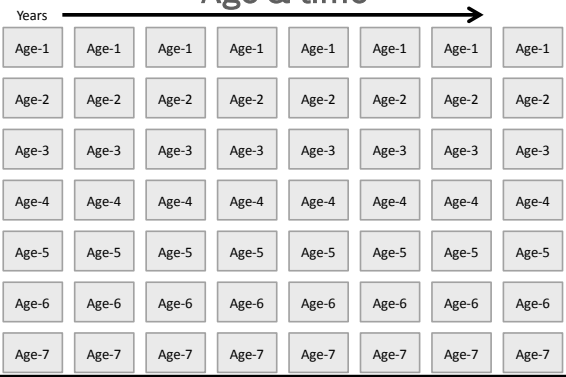
Weight for an age-6 fish



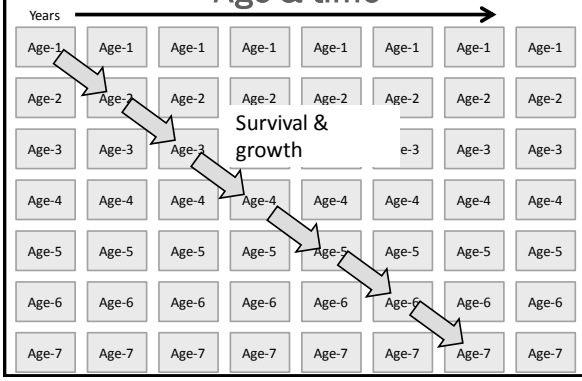
Age-weight



Age & time



Age & time



Trade off

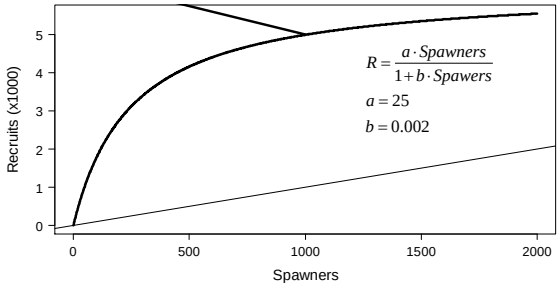
1. Harvesting a lot of fish
2. Harvesting fewer, but larger fish

Lets look at this

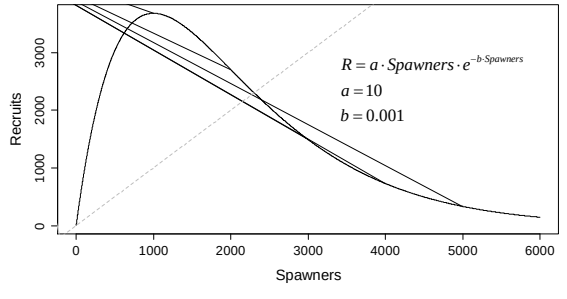
Recruitment overfishing

Harvest induced reductions of the number of young fish entering the fishing grounds by reduction of spawning stock

Spawners-recruits



Spawners-recruits

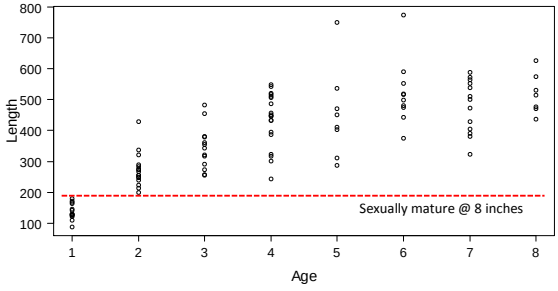


Trade off

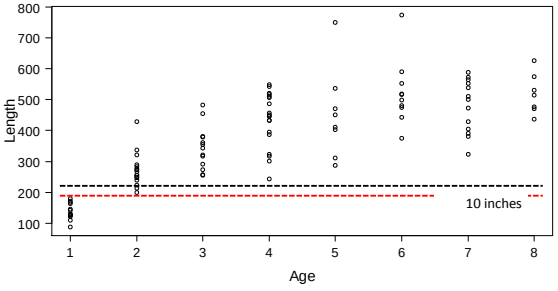
1. Harvesting a lot of fish, including spawners
2. Allowing more fish to get to spawn

Lets look at this

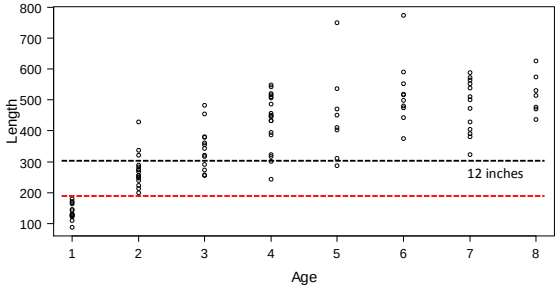
Sexual maturity & harvest



Sexual maturity & harvest



Sexual maturity & harvest



Economic

A fishery at a level of effort greater than that which maximizes the profit