Basic analysis of data

fish5101fishsci Introduction to fish population dynamics

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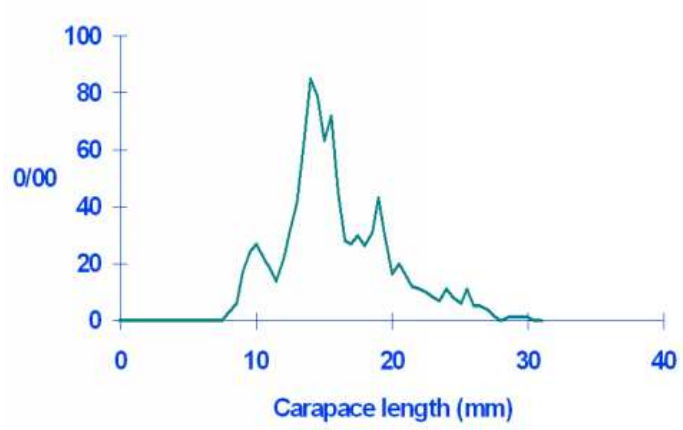
Length distributions

- Basic analysis: Count number in each length cell
- Weight by catch in each stratum - or towing time etc

Always need lengths
Sometimes have nothing else
Can sometimes convert to age
Note underlying yearclasses



Length-weight relationships

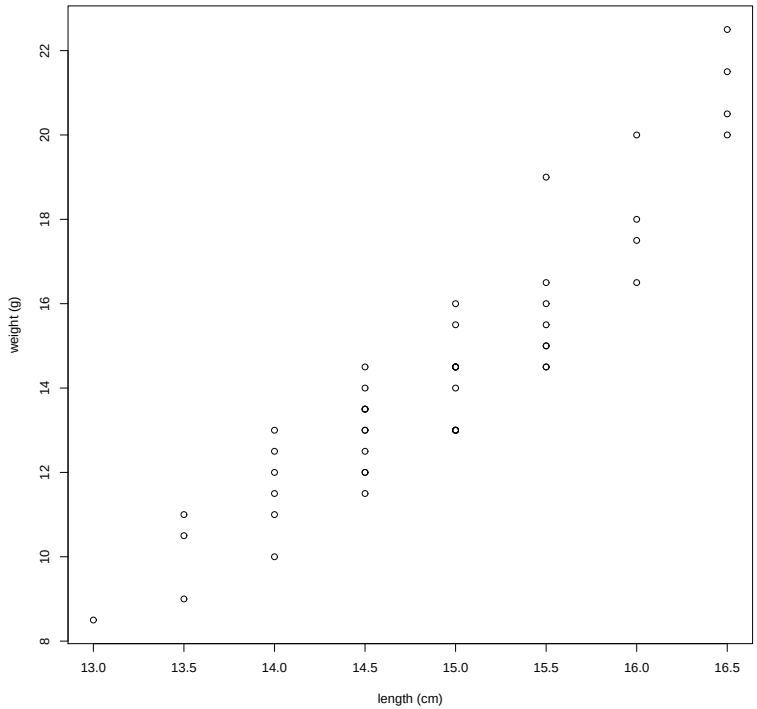
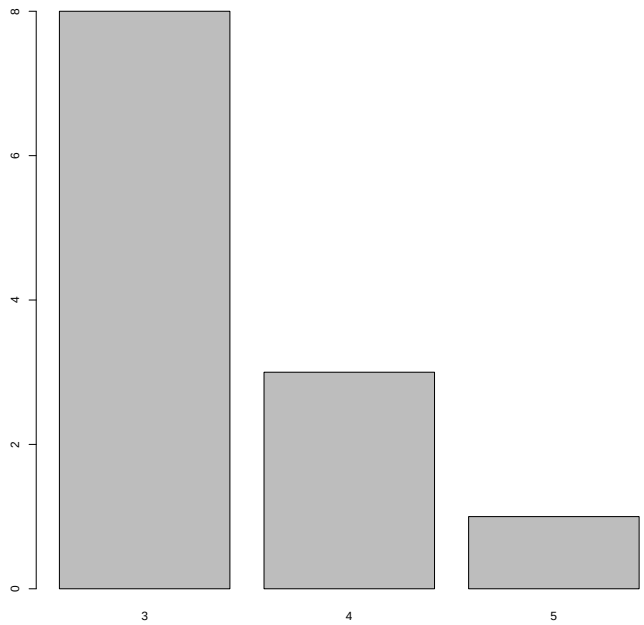


Figure : Weight of capelin plotted against length.

Example: The above capelin example data can be used to plot weight against length on a logarithmic scale.
It is clearly seen that the log-weight increases more-or-less linearly with log-length.

Age composition

- A stock consists of age groups (cohorts)
- Need to think in terms of cohorts which get caught, grow, mature, spawn and die.
- If there are age markers (rings) in hard parts, then can sample randomly from catches to obtain proportion in each age group.
- Need random samples
- Need good coverage in space, time and by gear



May not be able to observe cohorts but they form a fundamental concept
Will therefore put major emphasis on the theory of fish population dynamics with age groups included. Later consider how things get more complex if these need to be estimated without direct measurements.
The hard part in the figure is a slice of a haddock otolith. The otolith is put into resin before

Age composition from age and length data

- May have age samples stratified by length
- Need to use length distribution with ALK

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Catches in numbers at age

Estimating numbers landed Have proportion in each age group from age sampling (p_a)

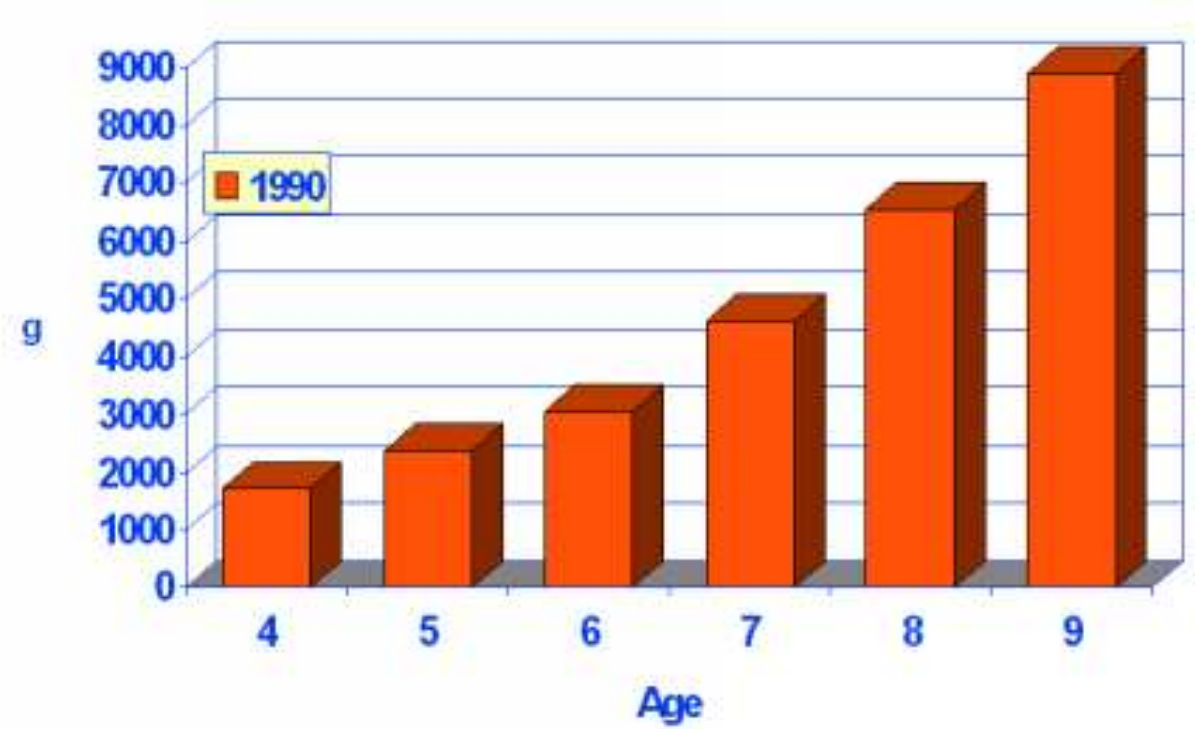
Also have total weight landed (Y)

Weigh some samples also to obtain mean weight of fish in the catches (w)

Then have total number landed ($C = Y/w$)

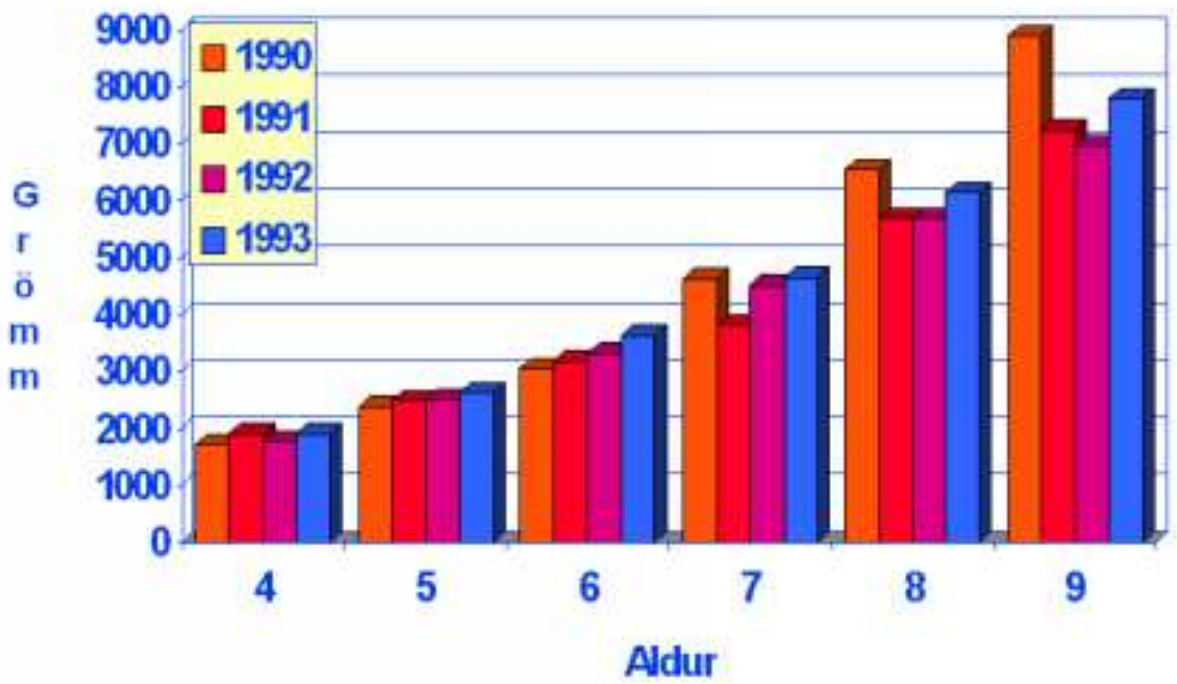
Can use proportion in each age group to compute numbers caught ($C_a = p_a C$)

Other measurements



Want to monitor growth
Can do this if have age and weight for each fish in the sample
The figure indicates the mean weight at age of cod in Icelandic waters, in different age groups in the year 1990, as obtained from sampling commercial catches.

Comparing mean weight at age



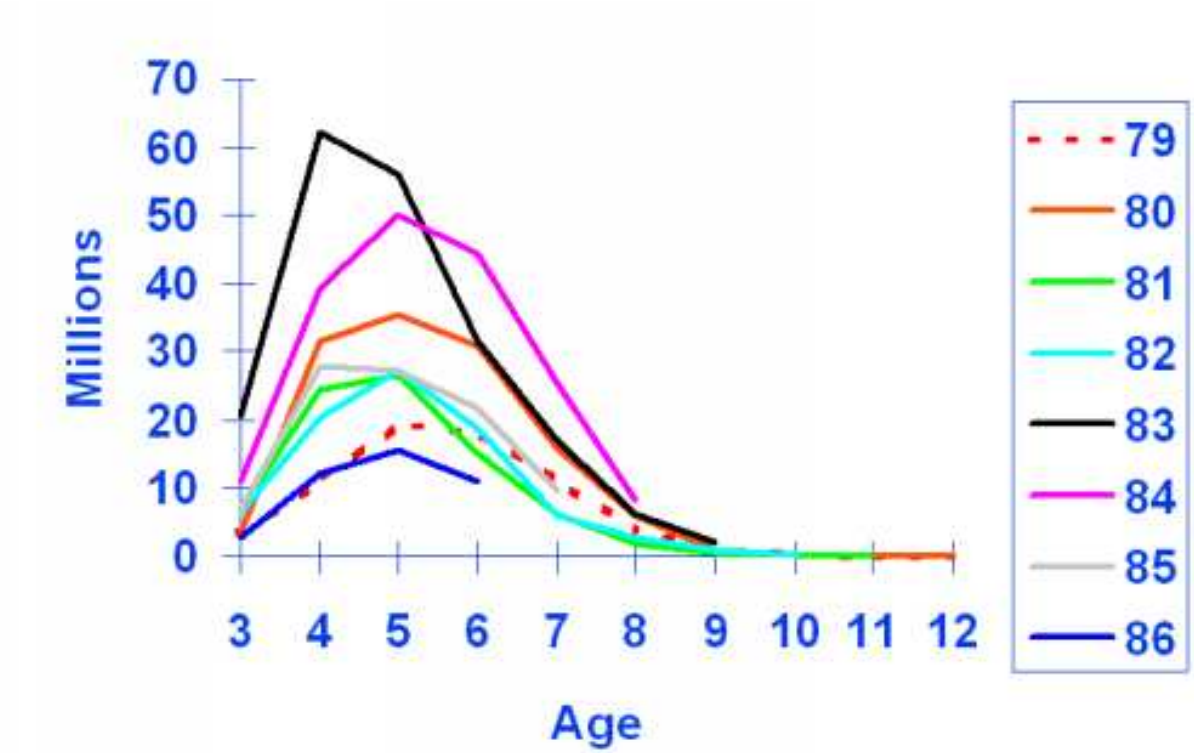
I-Cod: Mean weight at age in catch.
Repeated measurements permit the comparison of weight at age across years and age groups.

Mean length at age

Can compute mean length at age from

- Raw data
- Key and length distribution

Alternate data grouping



The most useful way of grouping the catches in numbers at age, for visualisation, is by cohort. Each line in the above figure corresponds to the catches over time from a single cohort.

Age composition summary

- Age-disaggregated catches are the single most important source of information on the development of the mortality in the stock!
- No other measurements can substitute for good age compositions!
- Hence often try to obtain these through alternate means if there are no annuli
- But if no age readings are available it may be better to use age-based models of length compositions etc