Fitting criteria

fish5108statass Statistical stock assessment methods

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The issue of fitting to data

Have some internal model of stock development
Model may be bulk or age-based
Need to compare to data-not contort the data!
Data may be bulk or age-based
Note several possible combinations: model or data may be complex or simple

Linking biomass to an index

Annual index of total abundance:

$$I_y = qB_y e^{\epsilon_y}$$

Assume ϵ comes from Gaussian distribution
q is catchability

Fitting in a VPA setting

- VPA/cohort analysis gives historical information
- Survey indices provide time series proportional to abundance
- Effort data provide time series proportional to F_y
- Can connect through regression (i.e. revise the terminal year)
- Can reduce to single parameter (F_{term})
- Better to formally estimate using a statistical approach, e.g. minimize

$$\sum (E_y - (1/q)F_y)^2$$

  over the terminal F_{term}.
- Can also write up formal methods (e.g. ADAPT) for estimating an entire parameter set, including selection pattern s_a.

ADAPT

Simplified ADAPT:

- Start with VPA or cohort analysis
- Use regression to predict indices - get SSE
- Find the best possible regression by varying F_{term}
- NB: The index-values are on the y-axis!!

$$SSE = \sum_{a,y} w_a \left[\ln U_{ay} - (\alpha_a + \beta_a \ln N_{ay})\right]^2$$

Often we set $w_a = 1$ for most ages. Usually we set $\beta_a = 1$ for most ages.

Full ADAPT: Use nonlinear minimization and estimate initial age composition, annual F_y and recruitment along with q_a.

Abundance index (research or log-books)

- Log-books: catch per towing hour
  - use mean weight to get number of fish per towing hour
  - use age determination to get number per age group
- Groundfish survey: direct count
  - use age determination to get number per age group
  - Other research cruises...

Nature of relationships

- Poor relationship between N and U
  - Is VPA bad?
  - Uncertain indices?
  - Variable M?
- Good relationship between N and U
  - VPA and indices OK
  - M stable
- $N - U$ bad but $U - U$ good
  - Variable M and/or VPA bad