

Biomass per recruit model

Introduction

- The model of Beverton and Holt, yield per recruit model could be used to determine annual average biomass of survivors as a function of F .
- The average biomass is related to CPUE.

The equation is

$$YR = F \times \bar{B} / R$$

The formula used to calculate B/R is the same as in equation - 1 (see chapter on Analytic models of fish stocks) divided by the F . The average biomass B/R thus obtained is considered to be the biomass of exploited part of the cohort i.e. the biomass of fish of age T_c or older.

Mean age and size in the yield

When Z is constant from time of recruitment (t_0) and age at first capture (t_c), mean age and mean length in the annual yield could be estimated with the following equation.

$$\bar{T}_y = \frac{1}{Z} + T_c$$

Mean length in annual yield, where \bar{T}_y is the mean age in yield

Similarly mean length in the annual yield is $\bar{L}_y = L_\infty \left[1 - \frac{Z * S}{Z + K} \right]$

$$S = \exp [-K * (T_c - T_0)] = 1 - L_c / L_\infty$$

Mean age and size in the yield

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T_c or L_c can be replaced by any age from which the fish have a constant mortality, so as to give mean length in that part of population.

Mean weight in annual yield

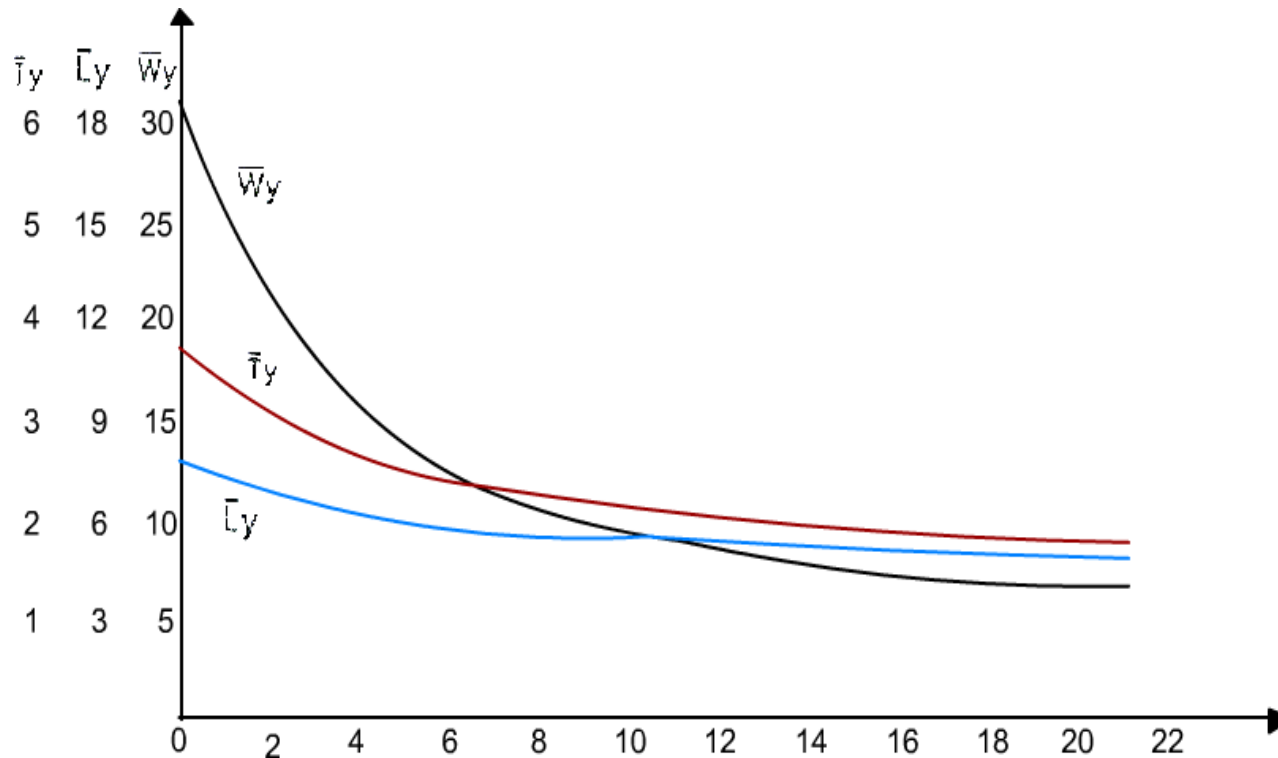
$$\bar{W}_y = Z * W_\infty \left[\frac{1}{Z} - \frac{3 * S}{Z + K} + \frac{3 * S^2}{Z + 2 * K} - \frac{S^3}{Z + 3 * K} \right]$$

The three parameters, \bar{T}_y and \bar{L}_y and \bar{W}_y exploited biomass along with CPUE will decrease by increasing Z i.e. with effort.

Mean age and size in the yield

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In the unexploited fishery, the decrease may be faster for low values of F . In all the three parameters (\bar{T}_y , \bar{L}_y and \bar{W}_y) forms a common input as \bar{T}_y is determined by mesh size. When the mesh size is large, the mean age and size will be higher.



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