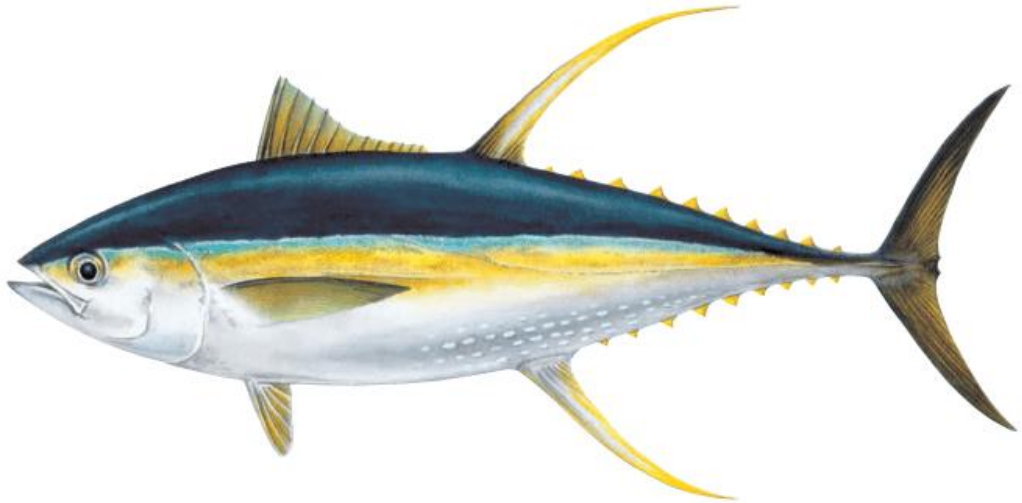
Pacific Community
Communauté du Pacifique

Growth, Natural Mortality, and Maturity of Yellowfin Tuna

P12 – Arni Magnusson



Growth

The YFT 2020 assessment used three approaches to estimate growth:

1. Modal - estimate von Bertalanffy growth curve using size composition data only

2. CondAge - estimate von Bertalanffy curve using otoliths and all other data in the assessment model

3. Otolith - fixed Richards growth curve is input into the stock assessment model, after being externally estimated

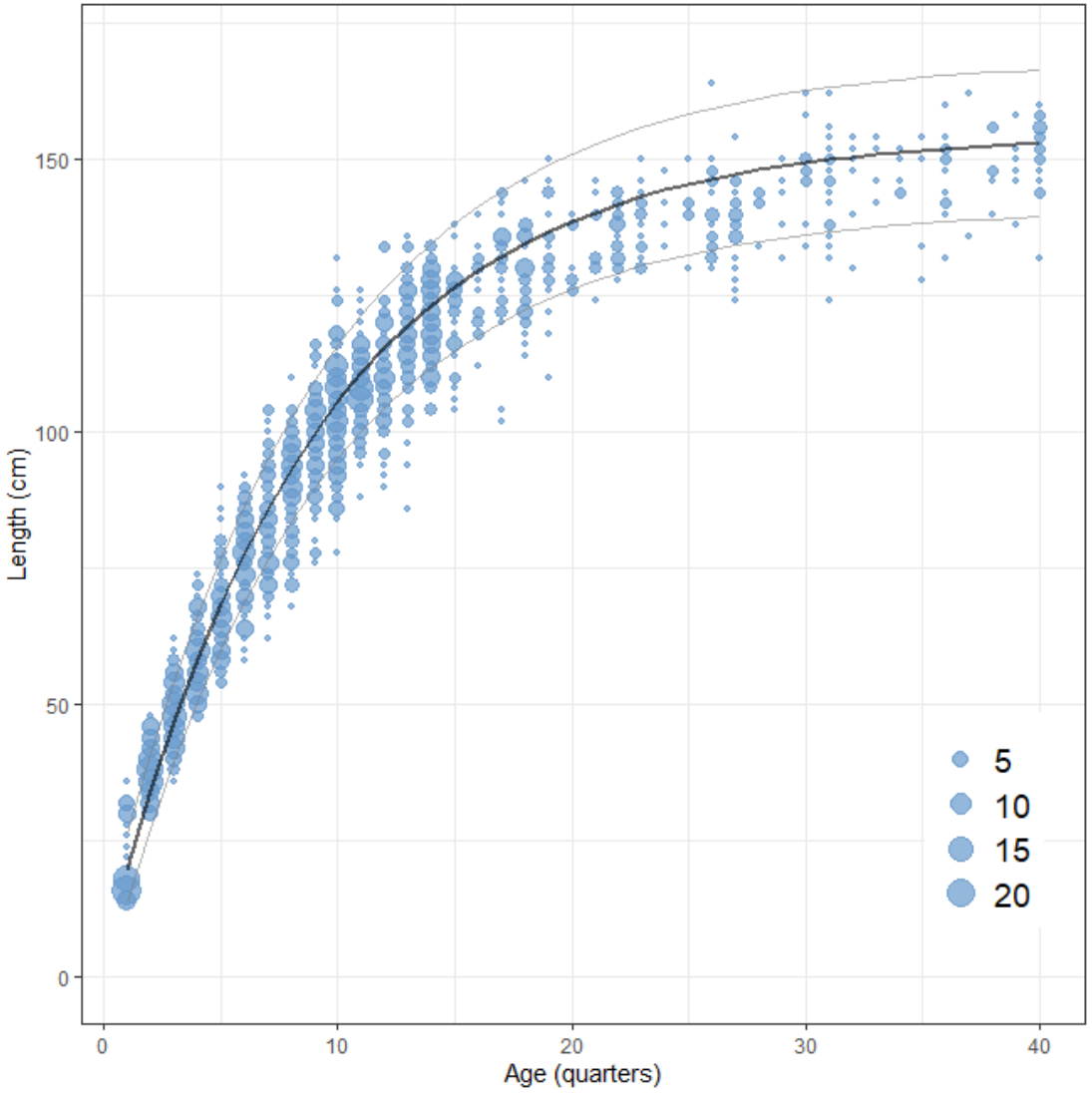
The Peer Review panel recommends estimating the growth curve internally

Growth

MULTIFAN-CL supports von Bertalanffy and Richards growth curves

Internal estimation of a Richards growth curve was explored during the Peer Review, but the initial results were subject to some estimation problems

Growth



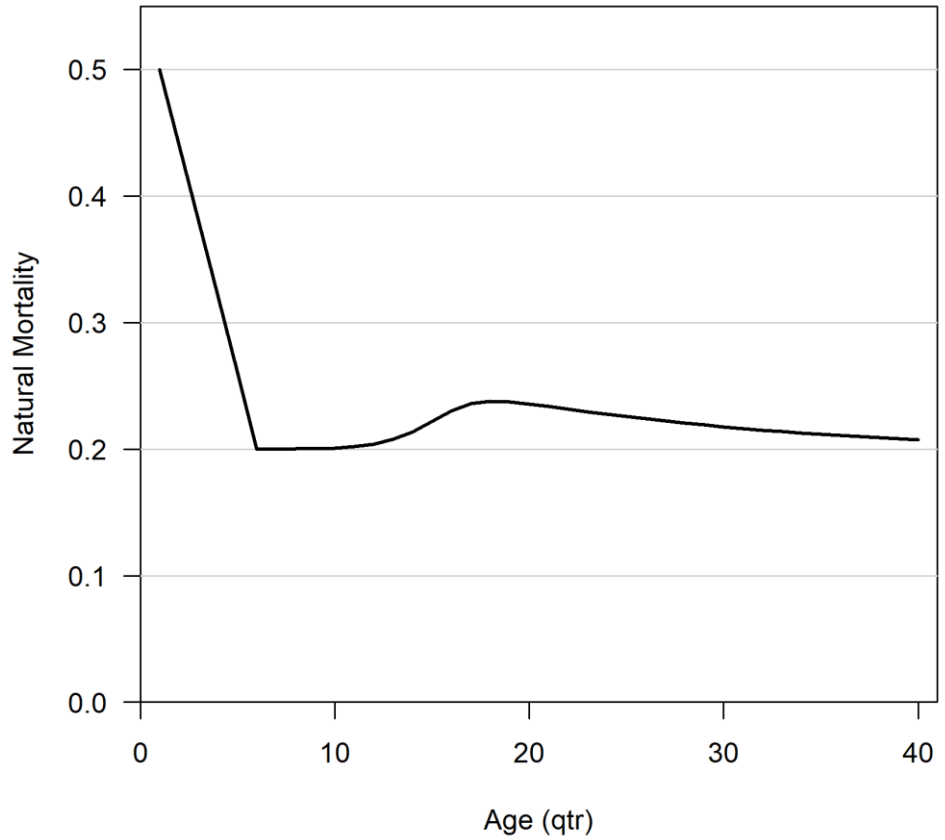
Natural Mortality

The YFT 2020 assessment used a three-phase natural mortality curve to account for the higher mortality of females at older ages

M-at-age was calculated using an approach applied to other tunas in the WCPO and EPO

The generally increasing proportion of males observed in the catch with increasing size is assumed to be due to an increase in the natural mortality of females at larger sizes

Natural Mortality



Natural Mortality

The growth curve and sex-ratio-at-length vector are key inputs for calculating M-at-age

The Review Panel endorsed the general approach for estimating M-at-age

The Review Panel recommends continuing the current approach with the base M set to 0.2 but including alternative values for base M in the uncertainty grid

Reproductive Potential

Reproductive potential is calculated as the product of three length-based processes:

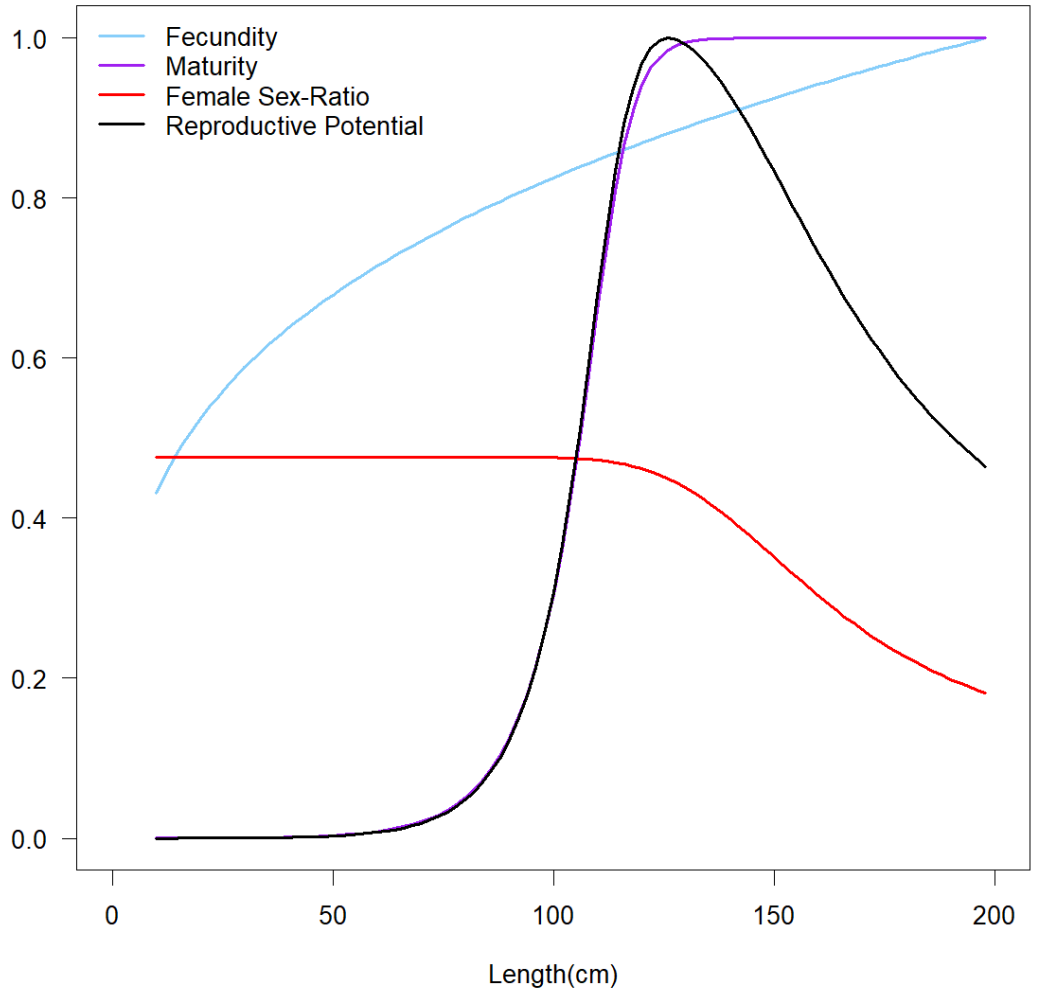
1. Proportion of females at length
2. Maturity at length (of females)
3. Fecundity at length (of mature females)

Sex ratio at length is calculated from Regional Observer Program data in SPC holdings

Maturity and fecundity are calculated as functions of length, using coefficients (Itano 2000)

$$mat_{len} = \left(1-(1-m)\cdot e^{-\kappa(len-x)}\right)^{\frac{1}{1-m}} \qquad fecundity = a \cdot length^{b}$$

Reproductive Potential



The YFT 2020 assessment used a new feature in MFCL, converting maturity-at-length to maturity-at-age within the model, rather than externally

Reproductive Potential

The YFT 2020 assessment used a new feature in MFCL, converting maturity-at-length to maturity-at-age within the model, rather than externally

The Review Panel noted that the YFT 2020 assessment used an updated vector of sex-ratio-at-length for the WCPO, differing substantially from the 2017 assessment

The Review Panel also noted that future assessments of YFT and ideally other species should provide consistent output on how changes in assumptions (e.g., M) affect sex ratios and reproductive output (and vice versa)