Thermal habitat index

The thermal habitat index H_t is assumed to be normal distributed, with an average temperature linked to the size-dependent body temperature:

$$H_t(l) = e^{-\frac{(T-T^*(l))^2}{2\sigma^2(l)}}$$

where *T*(l)* is the decreasing optimal temperature (Figure 1), which for a given age class a is:

$$T_a^* = T^*(l_a) = T_0^* + \left(T_K^* - T_0^*\right)\frac{l_a}{l_K}$$

where l_a is the mean fork length at age, T_0^* is the average temperature of the first age class and T_K^* is the optimal temperature for the last age class. Similarly, the corresponding standard error is:

$$\sigma_a = \sigma_0 + \left(\sigma_K - \sigma_0\right)\frac{w_a}{w_K}$$

where w is the weight at age; to facilitate the parameter estimation, last equation can be simplified to:

$$\sigma_a = \sigma_T + \delta\frac{w_a}{w_k}$$

Where σ_T could be statistically estimated and δ could be fixed at different values.

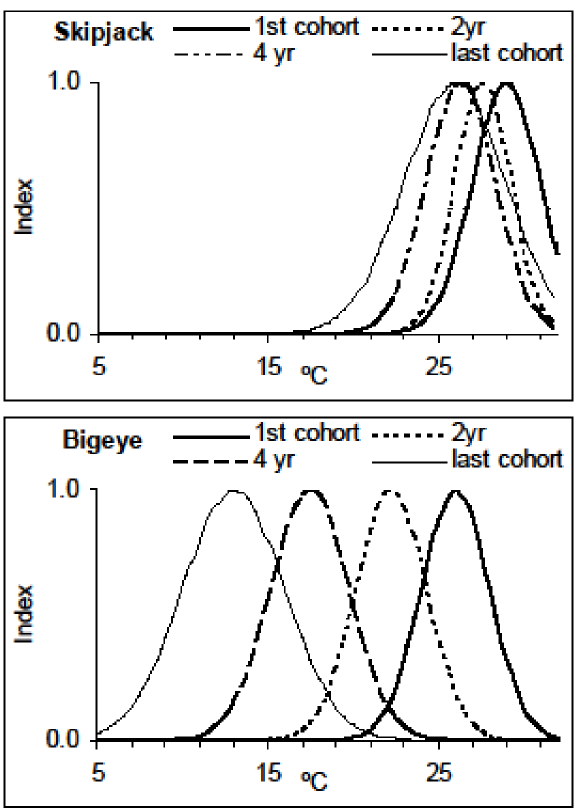

Figure 1. Thermal habitat index with normal distribution as function of a decreasing mean depending on size and an increasing standard error depending on weight. Example shown for skipjack and bigeye. Modified from Lehodey et al. (2008).

References

Lehodey, P, Senina I and Murtugudde R. 2008. A spatial ecosystem and populations dynamics model (SEAPODYM) – Modeling of tuna and tuna-like populations. Progress in Oceanography 78 (2008) 304–318.