ESTIMATES OF SKIPJACK TUNA GROWTH PARAMETERS FROM THE MALDIVIAN POLE-AND-LINE FISHERY USING LENGTH INCREMENT DATA

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ABSTRACT

The major species of tuna caught in the Indian Ocean tuna fishery is the skipjack tuna, Katsuwonus pelamis. Skipjack tuna is being increasingly exploited in the developing high seas purse seine fishery and by the coastal states. An understanding of growth rates of the species is a prerequisite for stock assessment. Estimation of skipjack growth parameters from Maldivian size frequency data is not feasible, due to the prevalence of modal stasis, which results from their year round spawning and migration patterns. Similarly, direct estimation of ages from microincrement deposition on otoliths has also proved impossible, as the increment depositions are irregular and vary greatly between individuals. Length increment and time-at-liberty data from tag-recapture experiments provide direct measurement of growth, provided that tagging procedure itself does not affect the growth of individuals. In this study, five variations of von Bertalanffy growth models are fitted to the tagging data available from the Maldivian pole and line fishery. On the basis of likelihood ratio tests, a model incorporating individual variability in growth through normally distributed variation in L_∞ amongst individuals best described the data. The parameter estimates obtained were mean $L_\infty = 64.3$ cm, $var(L_\infty) = 61.6$ cm^2, and $K = 0.55$ per year. Fitting these models to simulated data sets suggest that biased parameter estimates may result if process error is not explicitly incorporated into the von Bertalanffy models, even if allowance has been made for individual variability in growth. Attempts to obtain comparable parameter estimates by fitting to data from an earlier tagging experiment in the Maldives suggest that biased parameter can also arise if the release lengths approach the average maximum length of the fish. This problem is exacerbated if the data contain apparent negative growth increments.

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