Natural mortality rated during life history stages on the Red Gruper on Campeche Bank, Mexico

Enrique Gimenez Hurtado, Francisco Arreguín Sánchez & Salvador Lluch Cota

The objective of this study was to arrive at biologically convincing estimates of the natural mortality rate ($M$) for different life history stages of the red grouper *Epinephelus morio* on Campeche Bank, Mexico. Estimates of $M$ must be compatible with our knowledge of life histories and are essential as input to analytical assessment models for any exploited stock. Because of difficulties in estimating $M$ directly, $M$ has often been incorrectly assumed to be constant with age for a fishery harvesting different age-groups. The gnomonic interval method (GIM) was applied to this long-lived species to estimate a vector of $M$-values for successive life history stages. The GIM estimates the vector of $M$ at age from the duration of successive development stages and the mean annual fecundity. Estimates were calibrated using available independent data. We computed the relationship between $M$ and age ($t$) over a 13-year period as $M_t = 0.8976t$