



Preliminary estimation of current state of Chilean Jack Mackerel (*Trachurus murhyi*) stock in the high seas of the South East Pacific

By

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The state of the stock was estimated using the following data:

- catch-at-age (2003-2006), calculated from the total catch data, Vanuatu size structure of catches, the age-length key and average weight-at-age data from Russian surveys (2002-2003);
- age structure of the stock for the beginning of 2003 from Russian surveys;
- the value of instantaneous natural mortality coefficient was assumed equal to 0.23 for all age groups.

Clearly understanding that the amount of available information about the modern state of jack mackerel stock in the high seas of the South East Pacific is close to lower limit for any stock assessment, we nevertheless made an attempt to make use of a separable cohort model of the ISVPA-group, implemented, among many other models, for stock assessment in frames of International Council for the Exploration of the Sea (ICES). The model is based on some principles of robust statistics what helps to extract weak signals from noisy data. The version of the model used for the assessment attributes residuals in cohort part of the model to errors in catch-at-age data, assuming that selection pattern is stable. This version is often more robust for noisy catch-at-age data. Additional robustness of cohort part of the model with respect to outliers in catch-at-age was attained 1) by minimization of the median of the distribution of squared residuals in logarithmic catch-at-age as a measure of closeness of the model fit to catch-at-age data, and 2) by condition of unbiased model description of logarithmic catch-at-age data. An additional signal about the size of the stock is taken from minimization of residuals between age proportions in the stock in 2003 taken

from Russian surveys and from the cohort part of the model. Here the absolute median deviation (AMD) of logarithmic residuals in age proportions is used as a measure of closeness of fit. The AMD is the median of distribution of deviations of absolute logarithmic residual from their median value. The overall objective function of the model is composed as a weighted sum of catch-at-age-based and survey-based components (the weights reflect the efficient number of data points for each source of information).

Profiles of components of the model objective function, as well as profile of the total objective function, are presented on Figure as a function of the effort factor value in the terminal year (the effort factors are relative year-dependent factors in separable representation of fishing mortality coefficients). Although level of noise in the data was found to be rather high, the results of application of the model revealed rather coherent signals about the stock size from catch-at-age and surveys.

According the results of the assessment (estimates of stock biomass (2+) in comparison to catches, recruitment at age 2, average fishing mortality (weighted by age groups abundance), and selection pattern by years) the stock biomass is relatively stable with the average about 7 million tones.

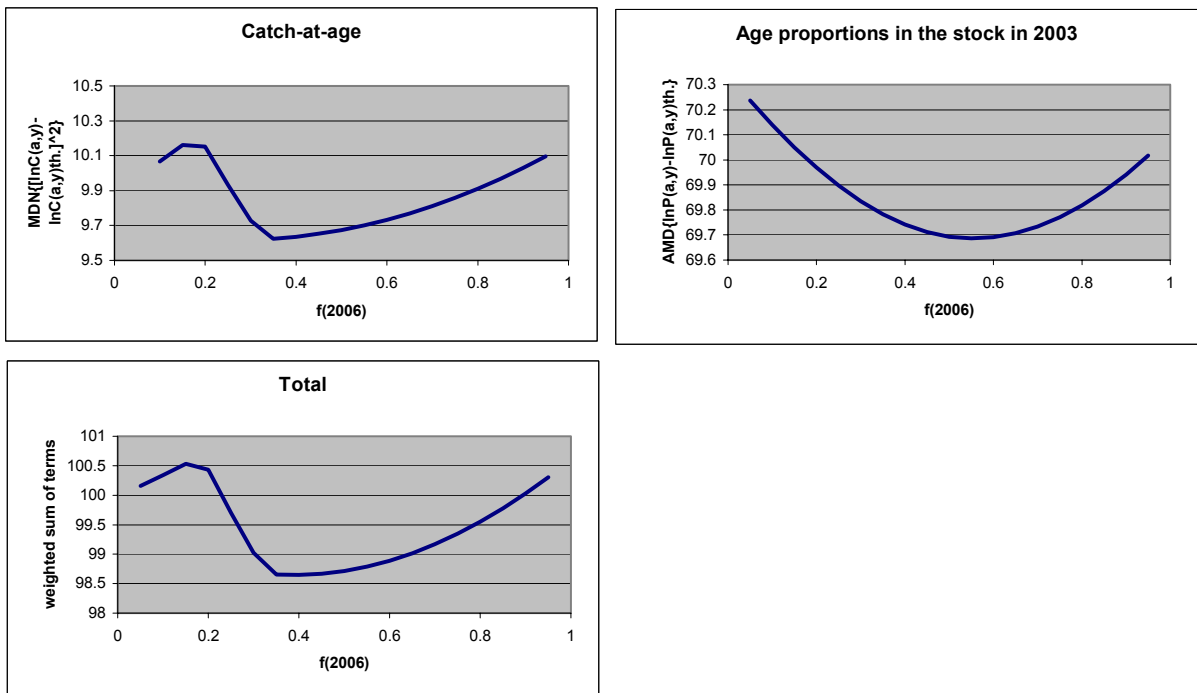


Figure. Profiles of components of the ISVPA objective function.