

STATUS OF HAKE (*MERLUCCIUS MERLUCCIUS*) IN THE MEDITERRANEAN SEA BASED ON CATCH AND RESILIENCE

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Abstract

A newly developed method that combines biomass and landings data was used to assess the current stock status of hake (*Merluccius merluccius*) in the Mediterranean Sea. The results were in line with previous assessments and provide a reasonable basis for sustainable management of hake in the area.

Keywords: Stock assessment, Fisheries, Fishes, Mediterranean Sea

There is a need for simple stock assessment methods for data-poor fisheries and stocks, for which estimates of maximum sustainable yield (MSY) are unavailable [1]. The Mediterranean Sea is among the least studied areas with a limited number of species being routinely assessed [2]. According to these stock assessments, the percentage of overexploited species exceeds 80%, with European hake (*Merluccius merluccius*) being one of the most heavily exploited species [3]. The aim of this work is to re-assess the Mediterranean stocks of hake using a newly developed method (CMSY) [4] and to compare the findings with previous assessments.

CMSY is a Monte Carlo method, which uses catch and productivity to estimate biomass, exploitation rate, MSY, and related fisheries reference points. The CMSY software also includes a Bayesian Schaefer model (BSM), which performs an independent assessment if time series of abundance are available. In this study, results from both methods are combined to use both, the information contained in a long time series of catches and the information contained in a typically shorter time series of abundance estimates.

We used CMSY and BSM to assess stocks of hake in four ecoregions, namely western Mediterranean, Adriatic Sea Ionian Sea and central Mediterranean, and Aegean and Levantine Seas. Hake landings data were extracted for 1970 to 2013 from the GFCM database. Resilience of hake was derived from FishBase [5] and biomass data for 1995 to 2006 were extracted from MEDITS bottom trawl survey data. Priors for stock status of hake, which are needed by CMSY and BSM, were estimated as Low for all stocks.

dots show r-k pairs that are compatible with the 1970-2013 time series of landings used by the CMSY method and the black cross indicates the best estimates of r and k, with 95% confidence limits. The black dots show the r-k pairs that are compatible with the 1995-2006 time series of landings and biomass used by the BSM method, with the white cross indicating the best estimate. The intermediate grey cross is a combination of CMSY and BSM estimates which, should be used by management and which allows a combined estimation of current stock status.

Results of both CMSY and BSM for reference points and stock status were very similar and in line with previous assessments [3]. The combined results of CMSY and BSM provide a reasonable basis for sustainable management of hake in the Mediterranean Sea within the Common Fisheries Policy of the European Union.

References

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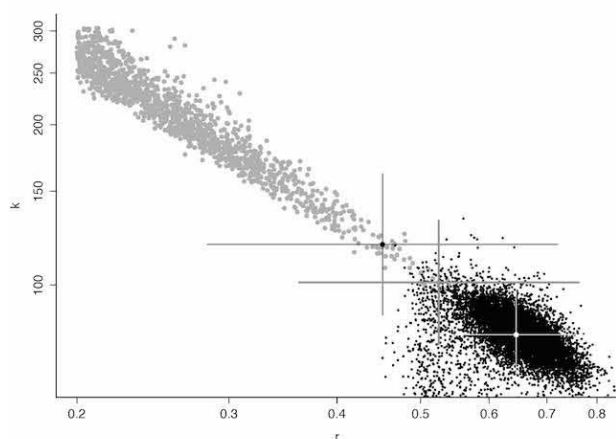


Fig. 1. The estimation of reference points for European hake (*Merluccius merluccius*) in the northern part of the western Mediterranean Sea (k: unexploited stock size, r: the maximum intrinsic rate of population increase).

The estimation of reference points for hake in the northern part of the western Mediterranean is shown in Figure 1, where k is the unexploited stock size and 0.5 k is the stock size than can produce the maximum sustainable yield (MSY), and where r is the maximum intrinsic rate of population increase and 0.5 r equals the maximum fishing mortality rate (F_{msy}) that can produce MSY. The grey