

European hake, *Merluccius merluccius*

GSA: 12-13-14-15-16

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Fishery: European hake, *Merluccius merluccius*, is an important demersal target species for commercial fisheries in the Strait of Sicily (GFCM-GSAs12-16, south-central Mediterranean Sea). In this area, European hake is exploited by 5 main fishing fleet segments: Italian coastal trawlers, Italian distant trawlers, Tunisian trawlers and nets, Maltese trawlers and Italian artisanal vessel but catch from this fleet segment is negligible. Average annual landings of European hake for the period 2012-2013 is about 1500 tons. Trawlers landing hake also exploit diversified wide species assemblage including *inter alia*: Deep-sea rose shrimp, Striped mullet (*Mullus surmuletus*), Red mullet (*Mullus barbatus*), Angler (*Lophius piscatorius*), Black-bellied angler (*Lophius budegassa*), European conger (*Conger conger*). Hake catch comprises a wide size class range, between 8 and 68 cm total length (TL), with an average size of 20cm TL. To assess the state of the stock in MedSudMed area analytical and global models were applied: extended survivors analysis (XSA) and Schaefer and Fox models respectively.

Data and parameters:

- The data used for the stock assessment \ were: i) Catch composition and total catch according to official national data from Tunisia, Italy and Malta; ii) tuning data from Medits surveys from GSA 15 and 16 (2007-2013) and iii) biological parameters (sex combined) estimated by experts from Tunisia, Italy and Malta such as: $L_{\infty} = 100.0$ cm, $k = 0.116$, $t_0 = -0.6$, $a = 0.004$, $b = 3.15$.
- The natural mortality as vector by age group was estimated through the Prodbiom model (Abella et al., 1998).
- General comments - The definition of the most appropriate growth parameters for this species is still a matter of active debate (Bouhlal, 1975; Aldebert 1981; Aldebert and Carries, 1988; Relini Orsi et al., 1989, Oliver, 1991; Recasens, 1992; Aldebert and Morales-Nin, 1992; Morales-Nin and Aldebert, 1997, Morales-Nin et al., 1998; Morales-Nin and Moranta, 2004 Ferraton, 2007; Courbin et al., 2007). The set of biological parameters used for the stock assessment of European hake was chosen in coherence with the previous stock assessment exercises carried out in the area (2010, 2011, 2012, 2013), and according to a precautionary approach.

Assessment method: The assessment was performed using extended survivor analysis (XSA) as implemented in the FLR (fisheries libraries in R) and using Global model for to estimate MSY and FMSY. According to the recommendations of the GFCM WG, current F was estimated as average of the last three years of the time series considered (i.e. 2011-2013) and equal to 0.63. $F_{0.1}$ was estimated through FLR with XSA data and results and considering M and F at age and equal to 0.14. The results obtained through the Global models area further confirm the results of the XSA. The results obtained in terms of stock status are reported in the table below.

Results:

F _{current}	0.63
F _{0.1}	0.14
Current B/R	54.3
F _{curr} /F _{0.1}	4.5
Maximum exploitable production <i>Schaefer Model</i>	4007
Maximum exploitable production <i>Fox Model</i>	3023
Effort at Maximum exploitable production <i>Schaefer Model</i>	36550
Effort at Maximum exploitable production <i>Fox Model</i>	33333

Diagnosis of stock status:

F showed a decreasing trend in the study period (2007-2013). The results of the assessment revealed an overfishing status ($F_{0.1} > F_{curr}$). The survey data (MEDITS) indicated a relative high abundance of the stock.

Advices and recommendation:

Considering the estimated values of F, to reach F_{0.1} the current level of fishing mortality should be reduced by about 77% of current level of F should be put in place. The reduction of fishing mortality to move toward F_{0.1}, should take into account the different contribution to the catch by fleet segment and GSA.

According to the stock assessment performed, the fisheries is essentially oriented to juveniles, resulting in growth overfishing. A reduction of the impact of trawlers exploiting especially the juvenile fraction of the stock, could result in an improved the stock status. In particular, an improvement of the spatial fishing pattern and selectivity of trawlers would result in a reduction of pressure on juveniles, increasing of minimum length of catch and reduction of growth overfishing. Also, it is not excluded that the Hake stock in the Strait of Sicily is exploited also by fisheries from subareas not considered in this stock assessment, so it is advisable to evaluate the possibility to integrate data from adjacent GSAs to integrate the analysis carried out.