

GSA 03-Southern Alboran Sea (Morocco)

Sardine (*Sardina pilchardus*)

Authors: M.H. Idrissi and J. Setti

Fishery:

The purse seiner fleet active last year (2014) in GSA 03 (Moroccan Mediterranean Sea) was composed by 120 units, characterized by small vessels, average TJB is 38 tx and 230 horse power. 7% of them are smaller than 12 m (operational Unit 1), 86% of them are between 12 m and 24 m (operational Unit 2), and 7% are bigger than 24m (operational Unit 3). This fleet is based mainly in 4 important ports M'diq, Nador, Al Hoceima and Ras Kebdana with high mobility of seiners between ports following the abundance of resources. In addition there are around one hundred of small scale boats fishing in coastal areas that are not considered in this study due to the lack of reliable statistics from this segment.

Landings of small pelagic in the Mediterranean are composed by sardines, sardinella, anchovy, horse mackerel, chub mackerel and others. Sardine and anchovy are the target species of seiners: sardine for its abundance and anchovy for its high commercial value.

On the last decade, the production of sardines in the Mediterranean Moroccan sea, fluctuates between 7000 and 15300 tons/year. Between the years 2005 and 2014, the annual average production of sardines is about 12500 tons.

The analysis of time series of catches of sardines since 2005 highlights significant fluctuations from one year to another. The general trend in sardine catches between 2005 and 2008 tended to decline. Since 2011, catches tended to grow.

The analysis of the evolution of fishing effort (expressed in effective fishing days) exerted on the sardine stock between 2005 and 2014 shows that fishing effort is variable from one year to another. This is linked to climatic conditions and abundance of the resource.

Catch per unit effort CPUE generally varies between 890 and 2090 kg/day with an average of 1360 kg/day.

Data, parameters and assessment method:

The evaluation of situation of sardine stock was conducted with three methods (VIT, BioDyn and CMSY).

We run VIT model for each year separately from 2010 to 2014 and for an average for the five years.

The input data used was catch at age class. Natural mortality vector was calculated by Gislason method. Von-Bertalanffy growth parameters, necessary for the calculation of natural mortality, were estimated by FiSAT II in GSA03 in 2014 and a reference exploitation rate $E=0.4$

following Patterson (1992).

We used also BioDyn and Catch MSY (CMSY) both fitted by the acoustic biomass index.

Results:

The level of exploitation of the stock is determined by analyzing the reference points essentially E (exploitation rate) and the ratio of mortality (F/F0.1).

The separate runs for VIT in the years 2010 to 2014 gave quite stable values of reference points what confirms the validity of the last run with an average of the five years pooled together.

The two methods (VIT and BioDyn) give similar results: Exploitation rate slightly above 0.4 and the ratio Fcur/F0.1 always below 1, indicating that the stock is under a low fishing pressure.

The biomass is close to the biomass at the maximum sustainable yield (Bcur/Bmsy = 0.91), indicating that the stock is close to safe biological limits.

Table 1. Reference points

Model	VIT						BioDyn	CMSY Schaeffer	CMSY bayesian
	2010	2011	2012	2013	2014	2010_2014			
Référence	2010	2011	2012	2013	2014	2010_2014			
E(1-3)	0.44	0.39	0.42	0.41	0.45	0.37	0.49	0.23	0.22
E(1-4)	0.49	0.43	0.48	0.44	0.46	0.42	0.51		
Fcur(1-3)	0.63	0.53	0.59	0.57	0.67	0.49	0.79		
Fcur(1-4)	0.75	0.59	0.69	0.60	0.64	0.55			
F0.1(1-3)	0.66	0.66	0.72	0.88	1.19	0.59	1.02		
F0.1(1-4)	0.78	0.73	0.84	0.92	1.14	0.66			
F/F0.1	0.95	0.81	0.83	0.65	0.56	0.82	0.78	0.57	0.33
B/Bmsy							0.91	1.53	2.75

According to GFCM framework for describing stock status and providing management advice in relation to reference points, the sardine stock in GSA03 would be **overexploited with a low fishing mortality**.

Advices and recommendations:

The advice would be to reduce fishing mortality.