Stock Assessment Form of *Mullus surmuletus* (Demersal sp.) in GSA 26.

Reference years: 2011-2013, 2016, 2017 and 2019

Reporting year: 2021

Five species (*Mullus surmuletus, Mullus barbatus, Upeneus moluccensis, Upeneus pori, Parupeneus forsskali*) of the family Mullidae were recorded in the catch of Egyptian Mediterranean (GSA 26). *Mullus surmuletus* is one of the important commercial species in the Mediterranean waters of Egypt (GSA 26). Its landings were 779 tonnes during 2014, 529 tonnes during 2015, 479 tonnes during 2017 and 380 tonnes in 2019. The landed catch of *Mullus surmuletus* came mainly from the trawl vessels and it constituted about 33% of the goatfishes in GSA 26.

The size of the samples in 2019 ranged between 8 and 26 cm and the information used for the assessment of the stock consisted of catch length structure, length weight relationship, Von Bertalanffy growth parameters, Sex ratio, the values of total (Z) and fishing (F) mortalities, length at first sexual maturity, yield per recruit, biomass per recruit and biological reference points. ProdBiom was used to estimate natural mortalities. Length cohort analysis and Beverton & Holt Yield per recruit analysis were performed in order to estimate the limit and target reference points using different models such as LFDA & VIT4WIN. LBSPR and LIME were used as additional methods to support the findings of VIT. According to the obtained results, the current fishing level of *M. surmuletus* is higher than the biological reference point ($F_{0.1}$) that shows a state of high overfishing in GSA 26 (according to GFCM recommendations 2012).

Stock Assessment Form version 1.0 (January 2014)

Uploader: Reda Magdy Fahim

Stock assessment form

1 Basic Identification Data

Scientific name:	Common name:	ISCAAP Group:
Mullus surmuletus	Striped Red Mullet	
1st Geographical sub-area:	2nd Geographical sub-area:	3rd Geographical sub-area:
[GSA_26]		
1st Country	2nd Country	3rd Country
Egypt		
Stock assessment method: (direct, indirect, combined, none)		
Indirect Methods (VPA with VIT and yield per recruit model)		
Authors:		
Reda M. Fahim[1], Hatem H. Mahmoud[1], Stefano Lelli[2] and Marcelo Vasconcellos[2]		
Affiliation:		
[1] College of Fisheries Technology and Aquaculture- Arab Academy for Science, Technology and Maritime transport – Alexandria, Egypt. [2] FAO-EastMed Project. Rome, Italy.		

Description of the fisheries

The fishing grounds along the Egyptian Mediterranean coast are divided into four regions; Western region (from Alexandria to El-Salloum), Nile Delta region, Damietta region and Eastern region (From Port Said to Rafah).

The continental shelf is narrow in the western region comparable to the wider delta and Damietta and eastern regions. Fish production in this area is low due to the nature of the bottom (mostly rocky) and the limited fishing grounds for trawling.

The main fishing grounds used by the Egyptian vessels are on the continental shelf off the Nile delta; recently extend to the eastern side off Sinai Peninsula and seasonally to the western side of Alexandria. The seabed along the middle and eastern area is flat, mostly muddy to sandy and is suitable for trawling.

There are nine official main landing centers (Fishing ports) most of them are located along the Nile River Delta region.

Data and parameters:

Sampling process was within a fisheries data collection system supported by the FAO EastMed project. Monthly samples were collected from landings during the period from the beginning of 2011 to the end of 2012, and during 2016. In 2013-2015, 2017 and 2019, sampling was in bimonthly basis. The monthly length frequency distributions were raised to the monthly landings and analyzed by ELEFAN program incorporated in LFDA software for the estimation of growth parameters for the sexes combined. The length-weight relationship, the length at first maturity (L50) and the sex ratio were also studied. ProdBiom was used to estimate natural mortalities.

Assessment method:

VIT software was used for pseudo cohort analysis. In addition, the Y/R analysis

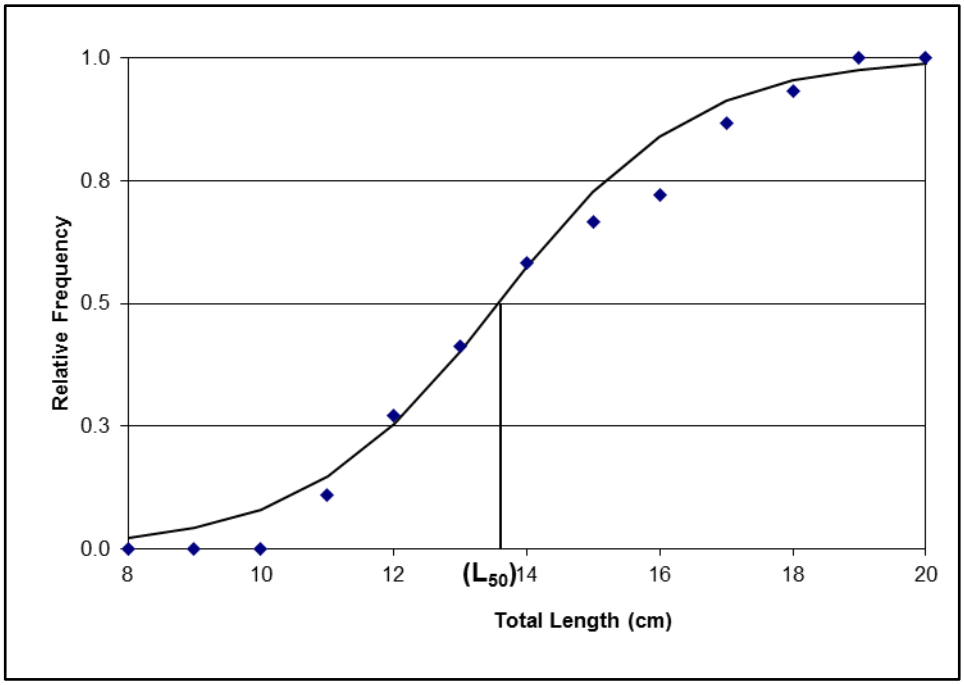
implemented in the VIT was applied for the calculation of the reference point $F_{0.1}$. LBSPR and LIME were used as additional methods to support the findings of VIT.

Stock unit

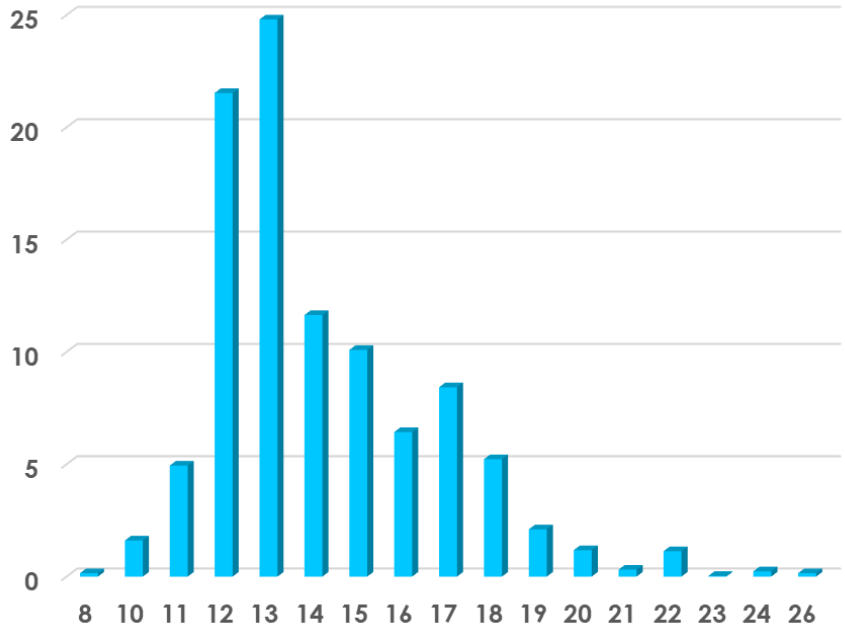
Growth and maturity

Table 0.2-1: Maximum size, size at first maturity and size at recruitment.

Somatic magnitude measured (LT, LC, etc)				**Units**	
Sex	**Fem**	**Mal**	**Combined**	**Reproduction season**	**From April to June**
Maximum size observed			**26 cm**	**Recruitment season**	
Size at first maturity			**13.57 cm**	**Spawning area**	
Recruitment size to the fishery			**6.51 cm**	**Nursery area**	



Length at first sexual maturity of *Mullus surmuletus*



Length frequency of 2019 of *Mullus surmuletus* in GSA 26.

Table 0-2.2: M vector and proportion of matures by length class

Length Class	Proportion of matures	Natural mortality
8	0.00	1.102
9	0.00	1.102
10	0.00	1.102
11	0.11	1.102
12	0.27	1.102
13	0.41	0.287
14	0.58	0.287
15	0.67	0.287
16	0.72	0.287
17	0.87	0.152
18	0.93	0.152
19	1.00	0.152
20	1.00	0.152
21	1.00	0.106
22	1.00	0.106
23	1.00	0.106
24	1.00	0.084
25	1.00	0.084
26	1.00	0.070

Table 0-3: Growth and length weight model parameters

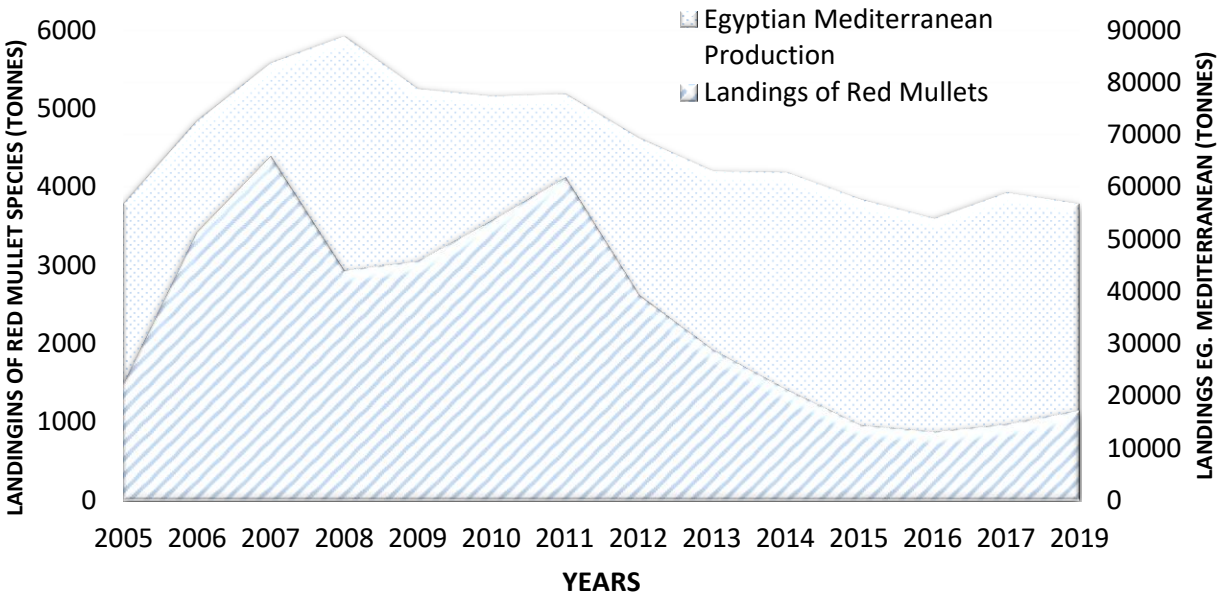
			Sex			
		Units	female	male	Combined	Years
Growth model	L_∞				34.44	2019
	K				0.23	
	t_0				-0.80	
	Data source	Length frequency				
Length weight relationship	A				0.0084	
	B				2.9739	
	sex ratio (% females/total)	% 43				

Fisheries information

Table 0.1-1: Catch, bycatch, discards and effort by operational unit in the reference year

Operational Units*	Fleet (n° of boats)*	Catch per ton (species assessed)	Effort units
Trawlers	1006	633.6 Tons (2019)	No. of fishing vessels
Purse seiners	241		
Longline	1211		
Trammel Net	700		

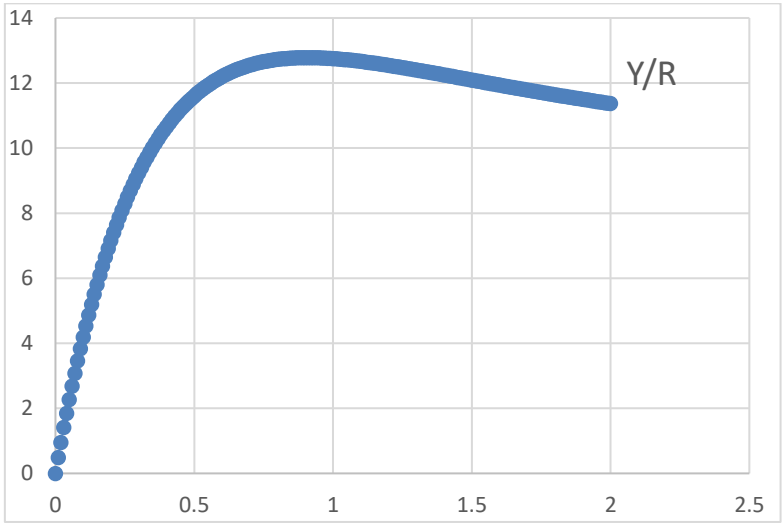
Historical trends



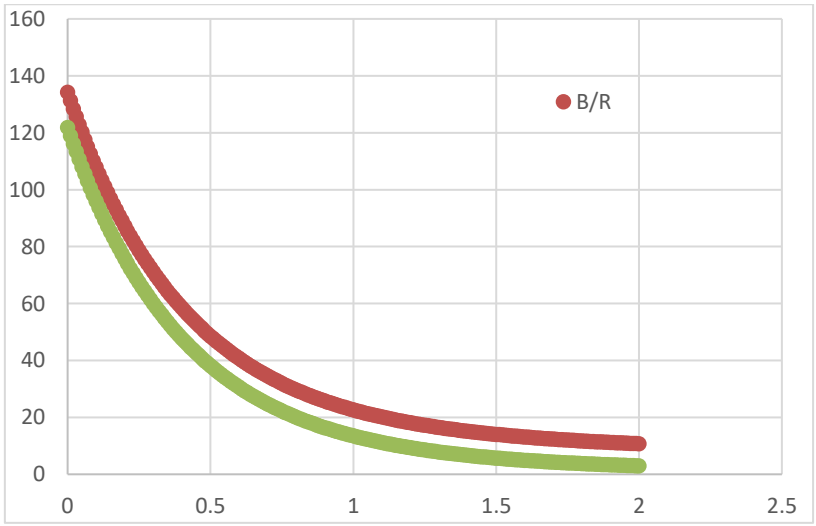
Management regulations

The fisheries management tools for the Egyptian Mediterranean coast are limited (for example, there is no implementation for the recommended minimum landing sizes and the closed season is barely implemented). The only used management tool is to freeze the fishing licenses.

Biological reference point:



Yield per recruit of *Mullus surmuletus* in 2019, GSA 26.



Biomass per recruit and SSB of *Mullus surmuletus* in 2019, GSA 26.

Reference points

VIT

Year	F_{curr}	$F_{0.1}$	F_{max}	F_{curr} / $F_{0.1}$
2011	**0.395**	**0.217**	**0.31**	**1.82**
2012	**0.464**	**0.223**	**0.32**	**2.08**
2013	**0.485**	**0.228**	**0.33**	**2.13**
2011-2013 (Merged data)	**0.482**	**0.188**	**0.27**	**2.56**
2016	**0.556**	**0.217**	**0.32**	**2.56**
2017	**0.401**	**0.225**	**0.33**	**1.79**
2019	**0.497**	**0.293**	**0.46**	**1.69**
2016-2017-2019	**0.612**	**0.196**	**0.29**	**3.13**

LBSPR & LIME

Method	Year	RawSL50	RawSL95	RawFM	RawSPR
LBSPR	**2016**	**118.4400**	**137.4800**	**2.4900**	**0.1045**
	2017	**128.5000**	**182.0300**	**2.0800**	**0.1481**
	2019	**123.5800**	**143.1100**	**3.2200**	**0.0860**
LIME	**2016**	**131.0237**	**159.5546**	**1.9579**	**0.2110**
	2017	**131.0237**	**159.5546**	**1.9579**	**0.2110**
	2019	**131.0237**	**159.5546**	**2.0825**	**0.2006**

Final Diagnosis	According to the results obtained in (2011, 2012, 2013, 2016, 2017, 2019), the current fishing level of the striped red mullet is higher than the biological reference points ($F_{0.1}$) which shows that *Mullus surmuletus* resources in GSA 26 is in overexploitation (according to GFCM recommendations 2012).
Recommendations	It is recommended to maintain the fishing mortality of the striped red mullet in GSA 26 in line (equal or less) with the agreed reference point. It is also recommended to improve the selection pattern of the trawl fishery.

1.1 Explanation of codes

Trend categories

1) N - No trend
2) I - Increasing
3) D – Decreasing
4) C - Cyclic

Stock Status

Based on Fishing mortality related indicators

1) **N - Not known or uncertain** – Not much information is available to make a judgment;
2) **U - undeveloped or new fishery** - Believed to have a significant potential for expansion in total production;
3) **S - Sustainable exploitation**- fishing mortality or effort below an agreed fishing mortality or effort based Reference Point;
4) **IO –In Overfishing status**– fishing mortality or effort above the value of the agreed fishing mortality or effort based Reference Point. An agreed range of overfishing levels is provided;

Range of Overfishing levels based on fishery reference points

In order to assess the level of overfishing status when $F_{0.1}$ from a Y/R model is used as LRP, the following operational approach is proposed:

- If $Fc^*/F_{0.1}$ is below or equal to 1.33 the stock is in **(O_L): Low overfishing**
- If the $Fc/F_{0.1}$ is between 1.33 and 1.66 the stock is in **(O_I): Intermediate overfishing**
- If the $Fc/F_{0.1}$ is equal or above to 1.66 the stock is in **(O_H): High overfishing**

*Fc is current level of F

5) **C- Collapsed**- no or very few catches;

Based on Stock related indicators

1) **N - Not known or uncertain:** Not much information is available to make a judgment
2) **S - Sustainably exploited:** Standing stock above an agreed biomass based Reference Point;
3) **O - Overexploited**: Standing stock below the value of the agreed biomass based Reference Point. An agreed range of overexploited status is provided;

Empirical Reference framework for the relative level of stock biomass index

- **Relative low biomass:** Values lower than or equal to 33rd percentile of biomass index in the time series **(O_L)**
- **Relative intermediate biomass:** Values falling within this limit and 66th percentile **(O_I)**

- **Relative high biomass:** Values higher than the 66th percentile **(O_H)**

4) **D – Depleted**: Standing stock is at lowest historical levels, irrespective of the amount of fishing effort exerted;
5) **R –Recovering:** Biomass are increasing after having been depleted from a previous period;

Agreed definitions as per SAC Glossary

Overfished (or overexploited) *- A stock is considered to be overfished when its abundance is below an agreed biomass based reference target point, like B0.1 or BMSY. To apply this denomination, it should be assumed that the current state of the stock (in biomass) arises from the application of excessive fishing pressure in previous years. This classification is independent of the current level of fishing mortality.*

Stock subjected to overfishing (or overexploitation) *- A stock is subjected to overfishing if the fishing mortality applied to it exceeds the one it can sustainably stand, for a longer period. In other words, the current fishing mortality exceeds the fishing mortality that, if applied during a long period, under stable conditions, would lead the stock abundance to the reference point of the target abundance (either in terms of biomass or numbers)*