Stock Assessment Form

Upeneus moluccensis

Reference years: 2013-2014-2016

Reporting year: 2017

The goldband goatfish, *Upeneus moluccensis*, is a species belonging to the Mullidae family of Indo-Pacific origin. It is widespread in the warmer waters of the Indian and Pacific Oceans as far east as New Caledonia and has colonised the eastern Mediterranean Sea from the Red Sea via the Suez Canal.

In Palestine, data has been collected along the coast of the Gaza Strip in four landing sites (Gaza City, Dar al Balah, Khan Yunes and Rafah). The first pilot study was completed at the end of 2013, with a second, third and fourth routine sampling which covered the years 2014 and 2016. The pilot survey is carrying on in 2017.

Stock assessment using VPA method was performed using VIT. Yield per recruit analyses was implemented and F 0.1 and F current were estimated.

Stock Assessment Form version 1.0 (January 2014)

Uploader: *Stefano Lelli*

Stock assessment form

1 Basic Identification Data

Scientific name:	Common name:	ISCAAP Group:
Upeneus moluccensis	Goldband goatfish	39
1st Geographical sub-area:	**2nd Geographical sub-area:**	**3rd Geographical sub-area:**
GSA_27		
4th Geographical sub-area:	**5th Geographical sub-area:**	**6th Geographical sub-area:**
1st Country	**2nd Country**	**3rd Country**
PALESTINE		
4th Country	**5th Country**	**6th Country**
Stock assessment method: (direct, indirect, combined, none)		
Indirect (VPA with VIT and yield per recruit model)		
Authors:		
Stefano Lelli[1], Abdelnasser Madi [2], Francesco Colloca[3], Mark Dimech[1]		
Affiliation:		
1 Food and agricultural organization (FAO)-EastMed project 2 Ministry of Agriculture - Department of Fisheries 3 CNR-Institute for coastal marine environment (IAMC)		

The ISSCAAP code is assigned according to the FAO 'International Standard Statistical Classification for Aquatic Animals and Plants' (ISSCAAP) which divides commercial species into 50 groups on the basis of their taxonomic, ecological and economic characteristics. This can be provided by the GFCM secretariat if needed. A list of groups can be found here:

http://www.fao.org/fishery/collection/asfis/en

Direct methods (you can choose more than one):

- Acoustics survey
- Egg production survey
- Trawl survey
- SURBA
- Other (please specify)

Indirect method (you can choose more than one):

- ICA
- **VPA**
- LCA
- AMCI
- XSA
- Biomass models
- Length based models
- Other (please specify)

Combined method: you can choose both a direct and an indirect method and the name of the combined method (please specify)

2 Stock identification and biological information

We are reporting data on *Upeneus moluccensis* collected over the Gaza Strip in GSA 27. Hence geographical coverage includes a limited part of GSA 27. The length frequency distributions for the years 2013 to 2016 are shown here below. The year 2015 was not considered for the present stock assessment as data were too limited.

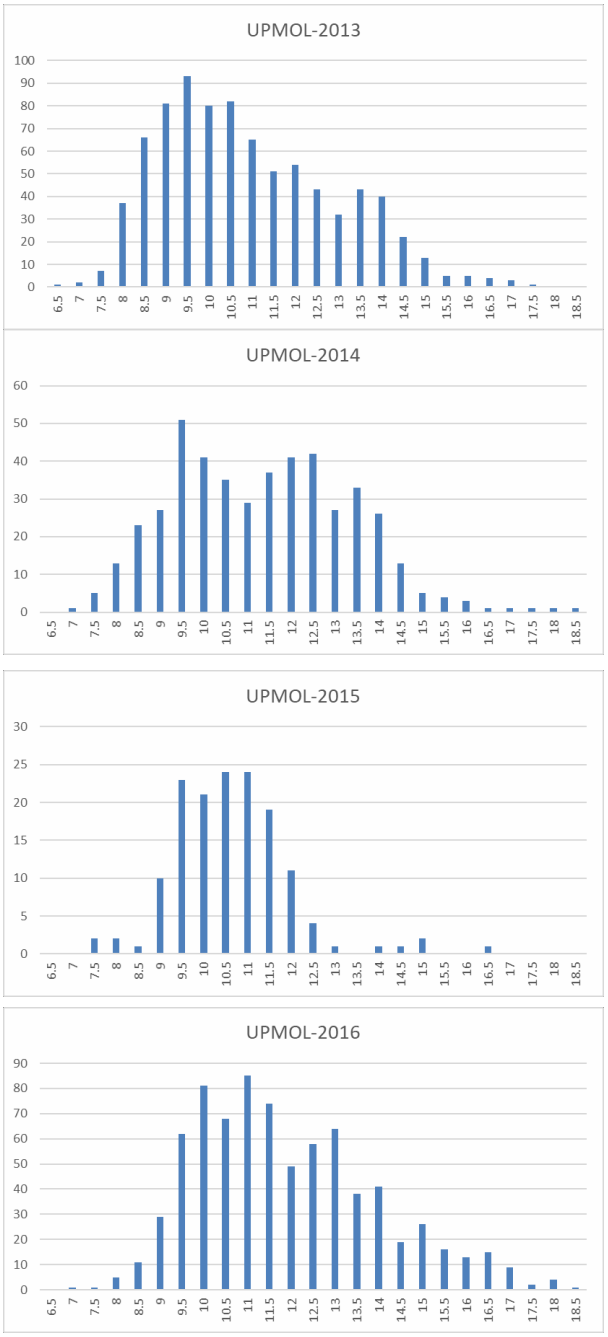

Figure 2-1: Length frequency distributions of the U. moluccensis catches in the period 2013-2016.

2.1 Growth and maturity

Incorporate different tables if there are different maturity ogives (e.g. catch and survey). Also incorporate figures with the ogives if appropriate. Modify the table caption to identify the origin of the data (catches, survey). Incorporate names of spawning and nursery areas and maps if available.

Table 2.1-1: Maximum size, size at first maturity and size at recruitment.

Somatic magnitude measured (LT, LC, etc)				**Units**	
Sex	**Fem**	**Mal**	**Combined**	**Reproduction season**	
Maximum size observed			18.5 cm	**Recruitment season**	
Size at first maturity			11 cm	**Spawning area**	
Recruitment size to the fishery				**Nursery area**	

Table 2.1-2: M vector and proportion of matures by size or age (sex combined), using Prodbiom.

Size/Age	Natural mortality	Proportion of matures
0	*0.45*	*0*
1	*0.29*	*0*
2	*0.21*	*0.01*
3	*0.18*	*0.35*
4	*0.17*	*0.65*
5	*0.16*	*1*
6	*0.16*	*1*

Natural mortality calculated with Prodbiom appeared excessively low. For this reason, we have estimated the M vector from Gislason et al (2010) and Chen & Watanabe (1989) equations also.

Table 2-2.2: M vector using Gislason et al. (2010).

Size/Age	Natural mortality
0	*1.69*
1	*0.93*
2	*0.61*
3	*0.45*
4	*0.39*
5	*0.35*
6	*0.32*

Table 2-2.3: M vector using Chen & Watanabe (1989).

Size/Age	Natural mortality
0	*1.69*
1	*0.93*
2	*0.61*
3	*0.45*
4	*0.39*
5	*0.35*
6	*0.32*

Table 2-3: Growth and length weight model parameters

			Sex			
		Units	**female**	**male**	**Combined**	**Years**
Growth model	**L_∞**	cm			24.3	2005
	K	$Year^{-1}$			0.22	2005
	t_0	Year			-0.92	2005
	Data source	Gundogdu, S. and M. Makbule Baylan, 2016. Analyzing growth studies of four Mullidae species distributed in Mediterranean Sea and Black Sea. *Pakistan J. Zool.* 48(2):435 -446				
Length weight relationship	**a**				0.0102	
	b				3.054	
	M (scalar)					
	sex ratio (% females/total)	70.37				

3 Fisheries information

3.1 Description of the fleet

Fisheries sector in Palestine is basically restricted to a small fishing area (the coastal line extends over 40 Km) in the waters off the Gaza Strip. Presently, the annual catch is estimated to be around 3,000 tons and approximately 3,000 persons work in the sector as active fishermen, with 500 people employed in associated industries (repair, marketing, mechanical workshops, boat building, etc.). Whilst the fisheries sector in Gaza is relatively small compared to those of neighbouring countries, with respect to its economy, which lacks significant natural resources, has high unemployment and a shortage of job opportunities, the fishery sector provides significant employment, income and is an important source of high protein food.

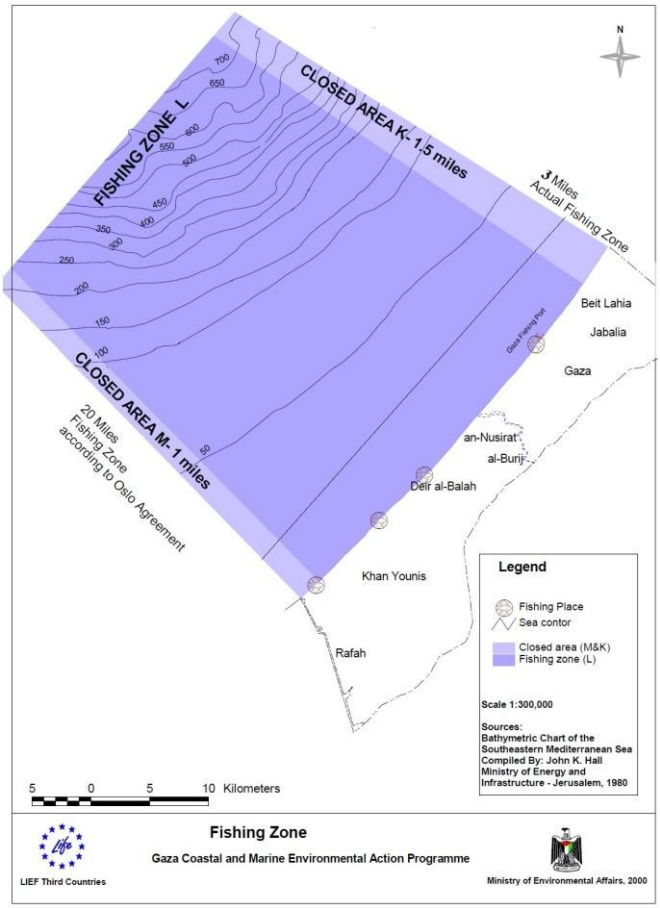

Figure 3.1-1: Fishing ports and fishing grounds exploited by Palestinian fishers in the Gaza Strip.

Gaza Strip Fishing Fleet in 2013 was composed of 1282 vessels with 3097 registered fishermen operating out of the four ports. Among above-mentioned vessels, 19 were trawlers, 12 to 24 m LOA.

Table 3-1: Description of operational units exploiting the stock

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	Palestine	GSA27	Trawlers 12-24 m	Trawlers	[ISCAAP Group]	*Upeneus moluccensis*

Table 3.1-2: Catch, bycatch, discards and effort by operational unit in the reference year

Operational Units*	Fleet (n° of boats)*	Catch (T or kg of the species assessed)	Other species caught (names and weight)	Discards (species assessed)	Discards (other species caught)	Effort (units)
Trawlers 12-24 m - 2013		43,831 Kg				
Trawlers 12-24 m - 2014		24,215 Kg				
Trawlers 12-24 m - 2016		36,000 Kg				
Total		104,046 Kg				

3.2 Historical trends

Landings of the goldband goatfish in Palestine is recorded since year 2000.

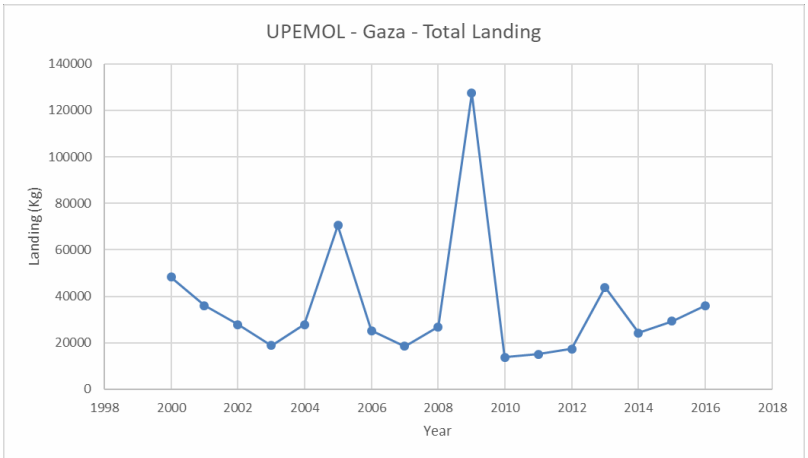

Figure 3.2-1. Landings of Upeneus moluccensis in Palestine over the period 2000-2016.

3.3 Management regulations

Fishing effort in Gaza Strip is affected by political circumstances affecting the area such as open hostilities, ceasefires, etc. This results in relevant variations in the landings as shown in the following image.

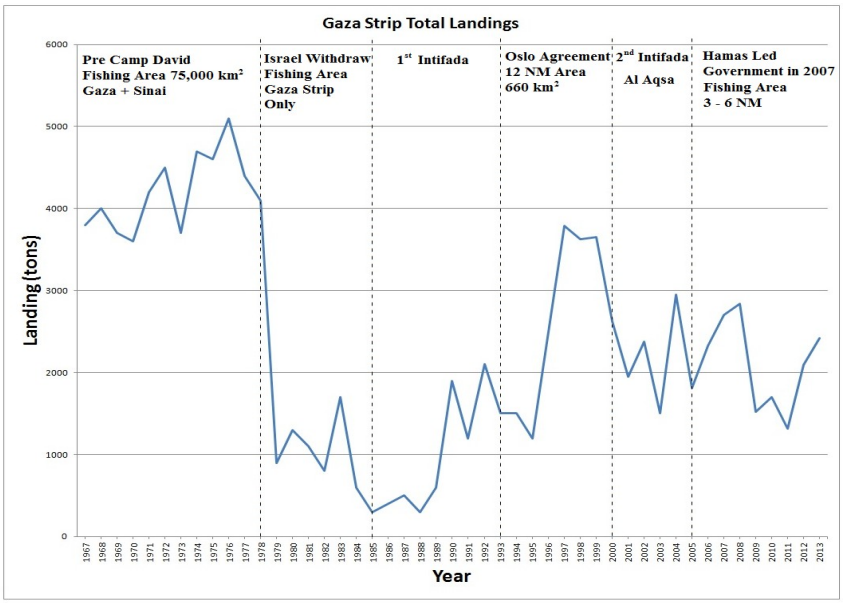

Figure 3.3-1. Gaza Strip Landings over the period 1967-2013.

3.4 Reference points

No reference points are available for Palestine

4 Fisheries independent information

4.1 {TYPE OF SURVEY}

Fill in one section for each of the direct methods used. The name of the section should be the name of the TYPE OF SURVEY.

4.1.1 Brief description of the direct method used

Description of the survey and method applied. One of several tables would have to be chosen: Egg Production Method, Acoustic survey, Trawl.

Direct methods: trawl based abundance indices

Table 4.1-1: Trawl survey basic information

Survey		**Trawler/RV**	
Sampling season			
Sampling design			
Sampler (gear used)			
Cod –end mesh size as opening in mm			
Investigated depth range (m)			

Table 4.1-2: Trawl survey sampling area and number of hauls

Stratum	**Total surface (km^2)**	**Trawlable surface (km^2)**	**Swept area (km^2)**	**Number of hauls**
Total (… – … m)				

Map of hauls positions

Table 4.1-3: Trawl survey abundance and biomass results

Depth Stratum	Years	kg per km^2	CV or other	N per km^2	CV or other
	……				
	……				
	……				
	……				
	……				
Total (… – … m)	……				

*

Comments

- Specify CV or other index of variability of mean
- Specify sampling design (for example random stratified with number of haul by stratum proportional to stratum surface; or systematic on transect;…)
- Specify if catchability coefficient is assumed =1 or other

Direct methods: trawl based length/age structure of population at sea

Slicing method

Report the maturity scale and age slicing method used

Table 4.1-4: Trawl survey results by length or age class

N (Total or sex combined) by Length or Age class	**Year**		
	….	**….**	**…..**
Total			

Sex ratio by Length or Age class	**Year**		
	….	**….**	**…..**
Total			

Comments

- Specify if numbers are per km^2 or raised to the area, assuming the same catchability.
- In case maturity ogive has not been estimated by year, report information for groups of years.
- Possibility to insert graphs and trends

Direct methods: trawl based Recruitment analysis

Table 4.1-5: Trawl surveys; recruitment analysis summary

Survey		**Trawler/RV**	
Survey season			
Cod –end mesh size as opening in mm			
Investigated depth range (m)			
Recruitment season and peak (months)			
Age at fishing-grounds recruitment			
Length at fishing-grounds recruitment			

Table 4.1-6: Trawl surveys; recruitment analysis results

Years	**Area in km^2**	**N of recruit per km^2**	**CV or other**

Comments

- Specify type of recruitment:
  - continuous and diffuse
  - discrete and diffuse
  - discrete and localised
  - continuous and localised.
- Specify the method used to estimate recruit indices
- Specify if the area is the total or theswept one
- Possibility to insert graphs and trends

Direct methods: trawl based Spawner analysis

Table 4.1-7: Trawl surveys; spawners analysis summary

Survey		**Trawler/RV**	
Survey season			
Investigated depth range (m)			
Spawning season and peak (months)			

Table 4.1-8: Trawl surveys; spawners analysis results

Surveys	**Area in km^2**	**N (N of individuals) of spawners per km^2**	**CV or other**	**SSB per km^2**	**CV or other**

Comments

- Specify type of spawner:
  - total spawner
  - sequential spawner
  - presence of spawner aggregations
- Specify if the area is the total or theswept one
- Possibility to insert graphs e trends

4.1.2 Spatial distribution of the resources

Include maps with distribution of total abundance, spawners and recruits (if available)

4.1.3 Historical trends

Time series analysis (if available) and graph of the observed trends in abundance, abundance by age class, etc. for each of the directed methods used.

5 Ecological information

5.1 Protected species potentially affected by the fisheries

A list of protected species that can be potentially affected by the fishery should be incorporated here. This should also be completed with the potential effect and if available an associated value (e.g. bycatch of these species in T)

5.2 Environmental indexes

If any environmental index is used as i) a proxy for recruitment strength, ii) a proxy for carrying capacity, or any other index that is incorporated in the assessment, then it should be included here.

Other environmental indexes that are considered important for the fishery (e.g. Chl a or other that may affect catchability, etc.) can be reported here.

6 Stock Assessment

VPA was performed for *Upeneus moluccensis*.

6.1 VPA using VIT

6.1.1 Model assumptions

The program VIT (Lleonart and Salat, 1992) was designed to analyze exploited marine populations based on catch data, structured by ages or sizes, from one or several gears, especially for data poor situations when age structured information or long time series of important stock parameters are lacking. From the catch data with some auxiliary parameters and using Virtual Population Analysis (VPA) the program rebuilds the population and mortality vectors. The main assumption is that of steady state because the program works with annual data only and interprets the length or age structure of the catches as 'pseudo-cohorts'. Like any other VPA approach to fish stock assessments, the model results and their interpretation will depend on the quality and quantity of all data input.

6.1.2 Scripts

If a script is available which incorporates the stock assessment run (e.g. if using FLR in R) it should be provided here in order to create a library of scripts.

6.1.3 Input data and Parameters

The catch per age in the year 2013, 2014, 2016 was estimated by age slicing on Excel using the growth parameters from Gundogdu, S. and M. Makbule Baylan, 2016. Analyzing growth studies of four Mullidae species distributed in Mediterranean Sea and Black Sea. Pakistan J. Zool. 48(2):435-446.

6.1.4 Results

Tables and graphs of Total biomass, SSB, Recruitment, F or other outcomes of the stock assessment model with comments on trends in stock size, recruitment and exploitation.

Virtual population analysis was run on VIT. Yield per recruit models were analysed by year and according the three different natural mortalities shown on paragraph 2.1.

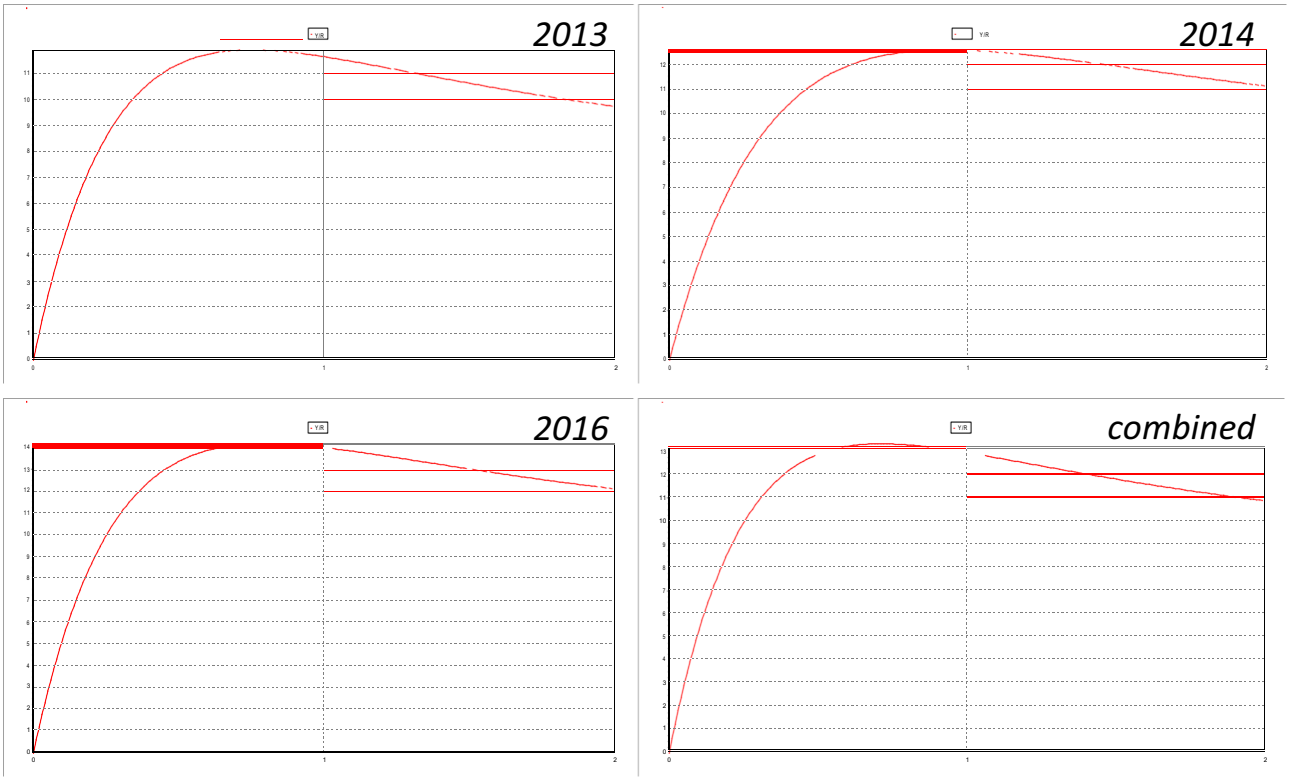

Figure 6.1.4-1. Yield per recruit in the year 2013, 2014, 2016 and combined datasets, based on natural mortalit evaluated on ProdBiom

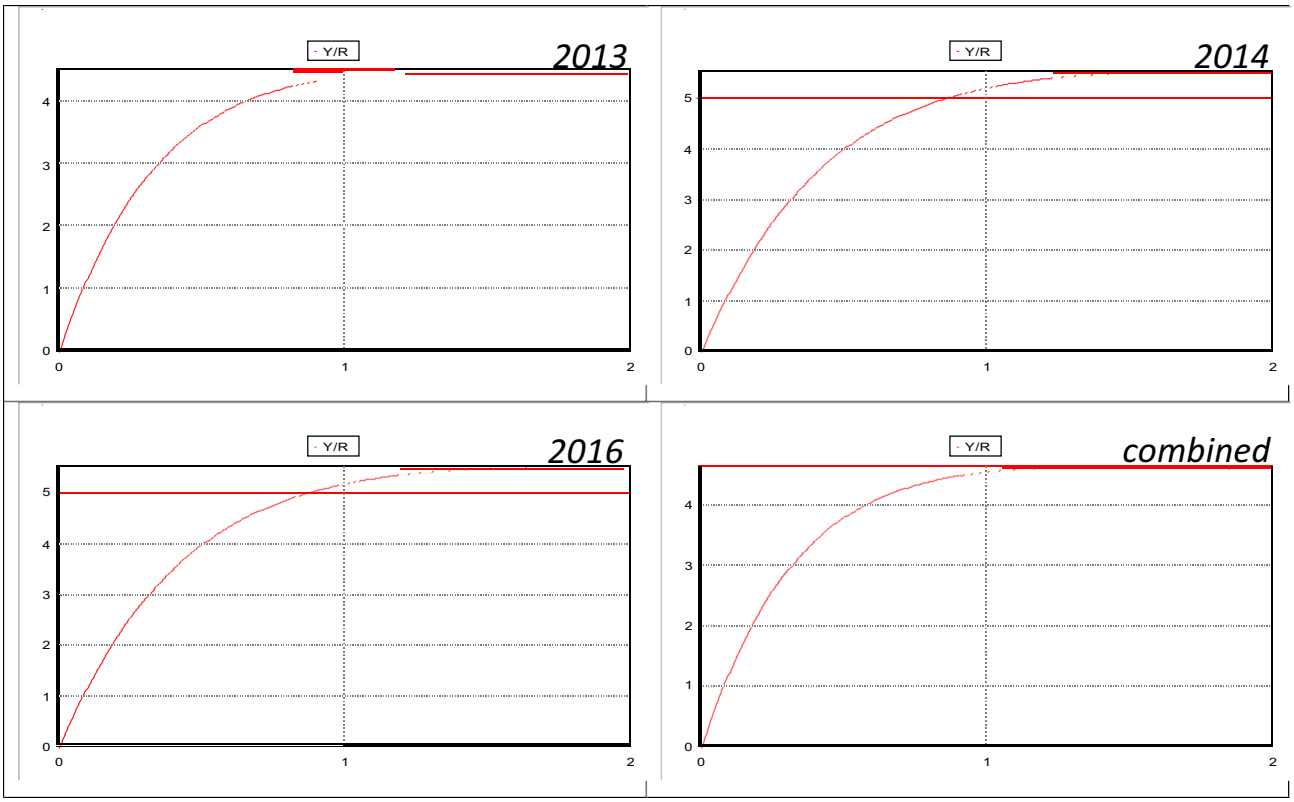

Figure 6.1.4-2. Yield per recruit in the year 2013, 2014, 2016 and combined datasets, based on natural mortalit evaluated on Gislason et al. (2010).

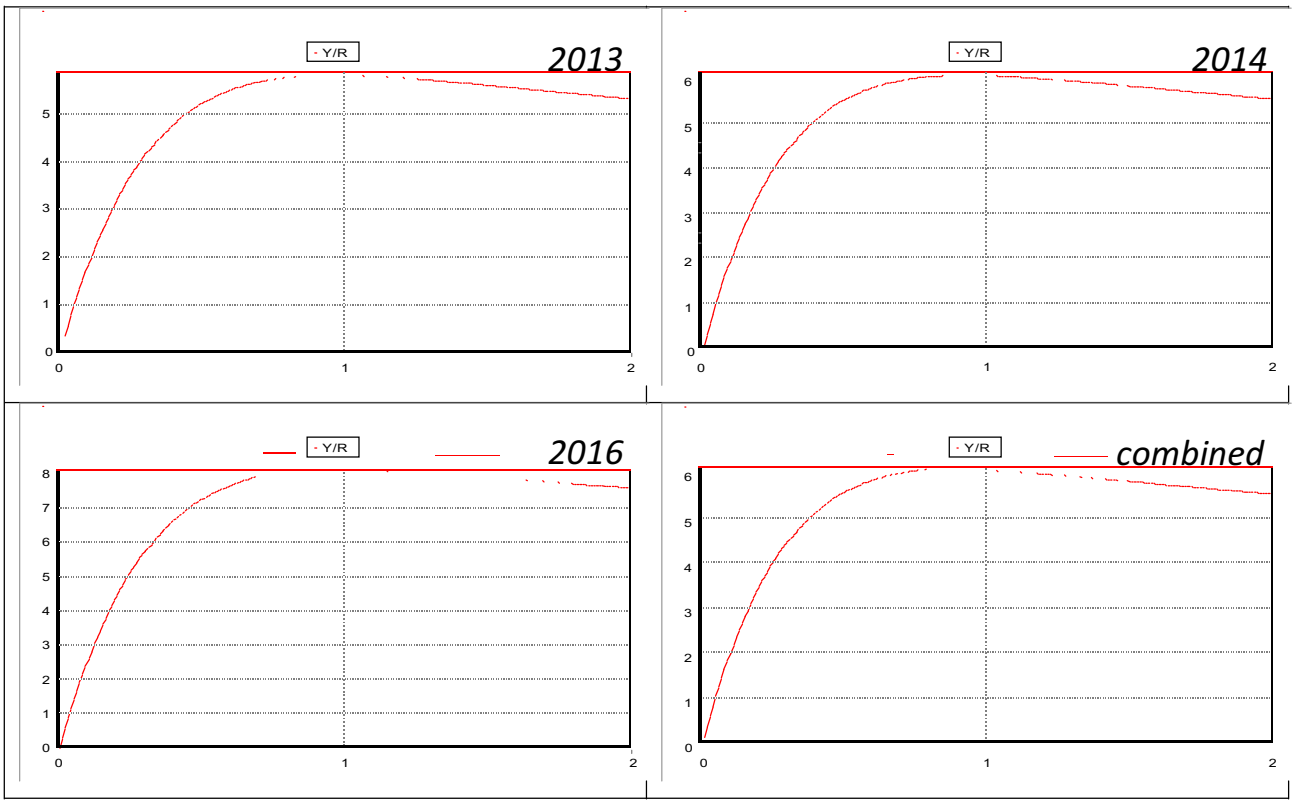

Figure 6.1.4-3. Yield per recruit in the year 2013, 2014, 2016 and combined datasets, based on natural mortalit evaluated on Chen & Watanabe (1989).

Table 6.1.4-1. Fishing mortality per year and different evaluation of the natural mortality

2013	ProdBiom	Gislson et al. (2010)	Chen & Watanabe (1989)
Fcurr	0.723	0.600	0.667
F0.1	0.354	0.450	0.394
Fcurr/f0.1	2.041	1.333	1.695

2014	ProdBiom	Gislson et al. (2010)	Chen & Watanabe (1989)
Fcurr	0.536	0.426	0.487
F0.1	0.316	0.400	0.351
Fcurr/f0.1	1.695	1.064	1.389

2016	ProdBiom	Gislson et al. (2010)	Chen & Watanabe (1989)
Fcurr	0.638	0.537	0.593
F0.1	0.325	0.413	0.356
Fcurr/f0.1	1.961	1.299	1.667

2013-14-16	ProdBiom	Gislson et al. (2010)	Chen & Watanabe (1989)
Fcurr	0.693	0.555	0.616
F0.1	0.319	0.400	0.345
Fcurr/f0.1	2.174	1.389	1.786

According to the last section of table 6.1.4-1, regardless the system we use to evaluate the natural mortality, in the last years the ratio Fcurr / F0.1 is above the threshold of 1.33.

6.1.5 Robustness analysis

6.1.6 Retrospective analysis, comparison between model runs, sensitivity analysis, etc.

6.1.7 Assessment quality

Stability of the assessment, evaluation of quality of the data and reliability of model assumptions.

7 Stock predictions

When an analytical assessment exists, predictions should be attempted. All scenarios tested (recruitment and/or fishing mortality) should be reported. The source of information/model used to predict recruitment should be documented.

7.1 Short term predictions

7.2 Medium term predictions

7.3 Long term predictions

8 Draft scientific advice

We report in the following table the result obtained by using the Chen & Watanabe (1989) evaluation of the natural mortality.

Based on	Indicator	Analytic al reference point (name and value)	Current value from the analysis (name and value)	Empirical reference value (name and value)	Trend (time period)	Stock Status
Fishing mortality	Fishing mortality	($F_{0.1}$, = 0.345)	Fcurrent/F0.1 = 1.786		N	O_H
	Fishing effort					
	Catch					
Stock abundance	Biomass					
	SSB					
Recruitment						
Final Diagnosis		High level of overfishing				

State the rationale behind that diagnoses, explaining if it is based on analytical or on empirical references

8.1 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 biomassindex

- **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)*