

SAC GFCM Sub-Committee on Stock Assessment

Date*

26	November	2009
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 Code*

MUT2509Cha

Authors*

Charis Charilaou

Affiliation*

DFMR - Department of Fisheries and Marine Research, Ministry of Agriculture, Natural Resources and Environment. 1416 Nicosia, Cyprus
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- Species Scientific name*
- 1 *Mullus barbatus* - *MUT*
Source: GFCM Priority Species
 - 2
Source: -
 - 3
Source: -

Geographical area*

Cyprus Island

Geographical Sub-Area (GSA)*

25 - Cyprus Island

Combination of GSAs

1	
2	
3	

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Assessment form

Sheet #0

Basic data on the assessment

Code: MUT2509Cha

Date*	26	Nov	2009	Authors*	Charis Charilaou
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Species Scientific name*	Mullus barbatus - MUT	Species common name*	Red mullet
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Data Source

GSA*	25 - Cyprus Island	Period of time*	2005-2008
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Description of the analysis

Type of data*	Age composition of landings per gear, official landings data, biological parameters	Data source*	DFMR
Method of assessment*	VPA-pseudocohort and Y/R analysis	Software used*	VIT (Leonart and Salat, 1997)

Sheets filled out

B	P1	P2a	P2b	G	A1	A2	A3	Y	Other	D	Z	C
1	1	2	2	---	1	---	1	1	---	1	1	---

Comments, bibliography, etc.

Comments:

The biological data used were collected within the framework of the Cyprus National Data Collection Programme, according to the EC Data Collection Regulation.

The stock assesment was performed during the STECF-SGMED 09-02 Working Group for the Mediterranean meeting (June 2009).

Comments, bibliography, etc.**Reports:**

Annual Reports on the Cyprus Fisheries for the years 1985-2008. Departmental Reports. Department of Fisheries and Marine Research, Ministry of Agriculture, Natural Resources and Environment.

Pilot Study Report on the Evaluation of Discards of the Cyprus Fishery, as part of Cyprus's National Fisheries Data Collection Programme 2006. November 2007. Department of Fisheries and Marine Research, Ministry of Agriculture, Natural Resources and Environment.

Management Plan for the Bottom Trawl Fishery within the Territorial Waters of Cyprus. December 2007. Department of Fisheries and Marine Research, Ministry of Agriculture, Natural Resources and Environment.

Reports from the SGMED Working Groups on the Mediterranean of the Scientific, Technical and Economic Committee for Fisheries (STECF). Available at <https://stecf.jrc.ec.europa.eu/events>

References of softwares/methods used:

Leonart J. and J. Salat (1997). VIT: software for fishery analysis. FAO Computerised Information Series (Fisheries). No. 11. Rome, FAO.

Abella A., Caddy J.F., Serena F. (1997) Declining natural mortality with age and fisheries on juveniles: a Mediterranean demersal fishery yield paradigm illustrated for *Merluccius merluccius*. Aquatic Living Resources 10: 257–269.

Kirkwook, G.P., Aukland, R. and Zara, S.J. (2001) Length Frequency Distribution Analysis (LFDA), Version 5.0. MRAG Ltd, London, UK.

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Sheet B
Biology of the species

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Biology

Somatic magnitude measured (LH, LC, etc)*				Total length	Units*	cm
Sex	Fem	Mal	Both	Unsexed		
Maximum size observed			25		Reproduction season	April - July
Size at first maturity			9		Reproduction areas	Shelf
Recruitment size					Nursery areas	Shelf

Parameters used (state units and information sources)

		Units	Sex			
			female	male	both	unsexed
Growth model	L [∞]	cm			26.61	
	K	years-1			0.183	
	t0	years			-2.488	
	Data source	Otolith readings				
Length weight relationship	a				0.00797	
	b	cm and g			3.12	

M			vector (see comments)
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sex ratio (mal/fem)	
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Comments

An M vector was used, as estimated by PRODBIOM spreadsheet (Abella et al., 1997):

Age	M
0	0.26
1	0.12
2	0.10
3	0.09
4+	0.08

Maturity at age:

Age	Prop. Matures
0	0.465
1	0.9
2	0.94
3	1
4+	1

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Sheet P1

General information about the fishery

Code: MUT2509Cha

Data source*	DFMR official landings data. Discards have been estimated under the Cyprus National Data Collection Programme	Year (s)*	1985-2008
Data aggregation (by year, average figures between years, etc.)*	Annual landings of red mullet by operational unit		

Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	CYP	25	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	MUT
Operational Unit 2	CYP	25	C - Minor gear with engine (6-12 metres)	07 - Gillnets and Entangling Nets	33 - Demersal shelf species	MUT
Operational Unit 3						
Operational Unit 4						
Operational Unit 5						

Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
CYP 25 E 03 33 - MUT	4	Tons	19.41	<i>Spicara smaris</i> , <i>A...</i>	included	<i>S.smaris</i> , <i>B. boo</i>	days
CYP 25 C 07 33 - MUT	500	Tons	20.21	<i>M. surmuletus</i> , <i>B...</i>	considered negli		days
Total	504		39.62				

Legal minimum size	11 cm TL
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Comments

Red mullet in GSA 25 is exploited by the bottom otter trawlers and the artisanal fleet using set nets (basically trammel nets), with other demersal species. The average percentage of *M. barbatus* in the overall landings of the bottom trawl and artisanal fishery, for the period 2005-2008, was 7% and 2% respectively.

Fleet: Since 2006 the number of licensed bottom trawlers operating in GSA25 has been reduced by 50% (from 8 to 4).

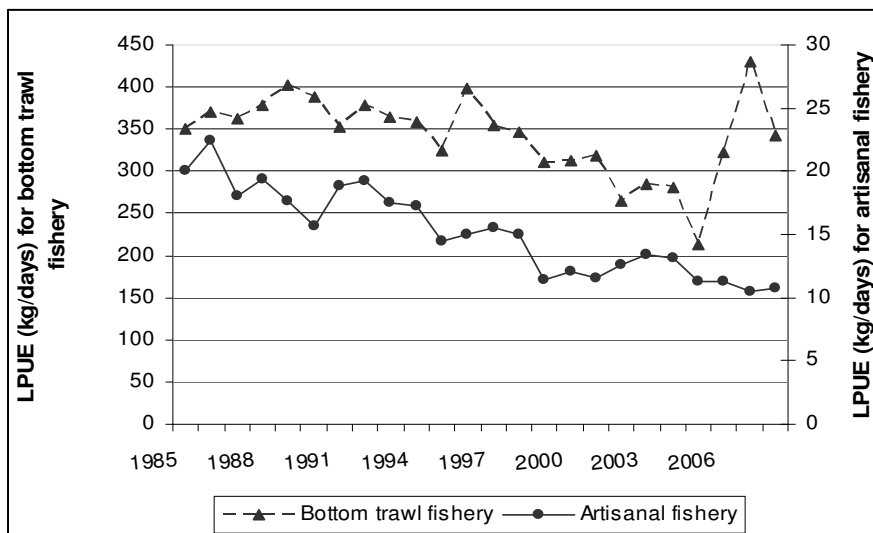
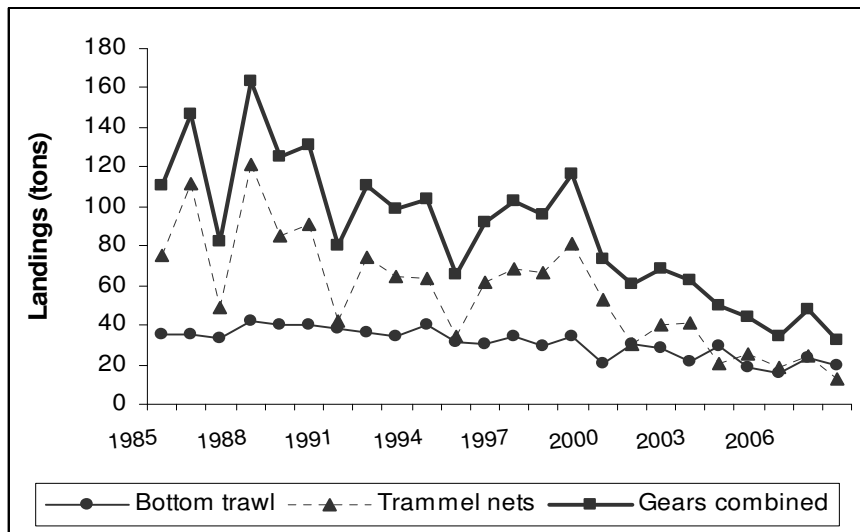
Catch: For both operational units, catch refers to the average values of the years 2005-2008.

Discards from the bottom trawl were evaluated for the first time in 2006, through a pilot study under the 2006 Cyprus National Fisheries Data Collection Programme. The discard estimates of *M. barbatus* for 2006 and 2008 were less than 200kg, accounting for about 1% of the total catch of the species. Since the discard values for these two years were similar, their average value was used for the years 2005 and 2007.

Discards from the artisanal fishery are considered negligible.

Comments

The following figures provide the official landings of *M. barbatus* in GSA 25 by fishing gear and the overall LPUE by fishing fleet, for the years 1985-2008. The Landings figure presents a declining trend in the landings from both gears, mostly from the trammel nets. The LPUE figure shoes a declining trend until 2006 (the year that the licensed bottom trawlers were reduced at 50%); since then, LPUE for the artisanal fleet seems to be stable, while for the bottom trawl fishery LPUE in 2007 reached the highest value of the time period. During the period of the assement, 2005-2008, the two gears contribute almost equally to the landings.



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Sheet P2a
Fishery by Operational Unit

Code: MUT2509Cha

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Data source*	DFMR official data	OpUnit 1*	CYP 25 E 03 33 - MUT
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Time series

Year*	1997	1998	1999	2000	2001	2002
Catch	33.8	29.33	34.52	20.89	30.68	28.46
Minimum size						
Average size Lc						
Maximum size						
Fleet	8	8	8	8	8	8

Year	2003	2004	2005	2006	2007	2008
Catch	21.16	29.7	18.67	15.82	23.25	19.97
Minimum size			7	7	7	7
Average size Lc			13	13	13	13
Maximum size			24	22	23	22
Fleet	8	8	8	4	4	4

Selectivity

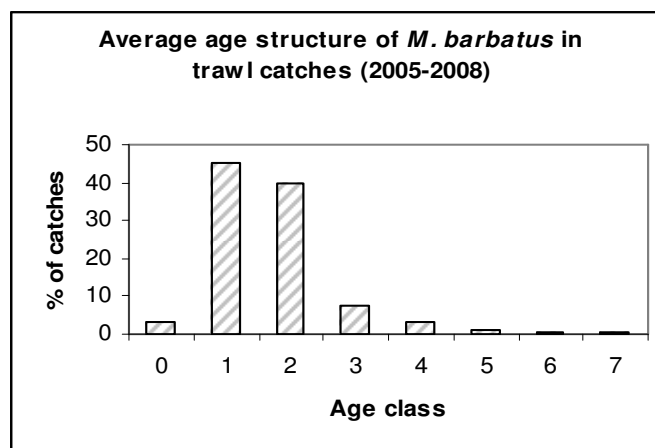
Remarks

L25		
L50		
L75		
Selection factor		

Structure by size or age

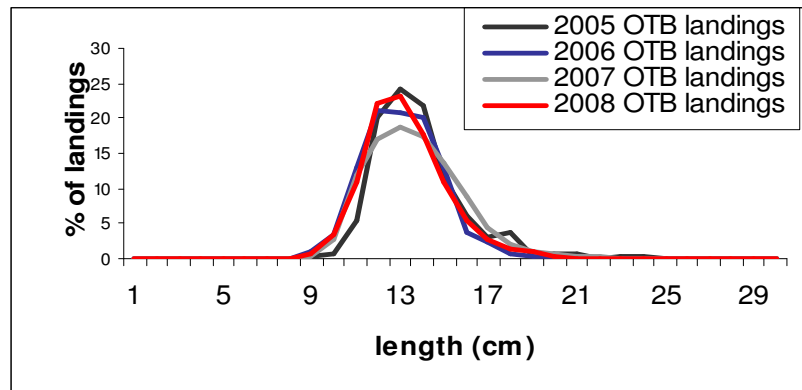
Comments: Discard estimates have been included in the catches only for the period 2005-2008. For the period 1985-2004 catches refer to landings.

The most exploited age classes by the bottom trawl, in the period 2005-2008, are the age classes 1 and 2.



Structure by size or age

The size structure of the bottom trawl landings for the years 2005 - 2008 is provided in the following figure.



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Sheet P2a
Fishery by Operational Unit

Code: MUT2509Cha

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Data source*	DFMR official data	OpUnit 2*	CYP 25 C 07 33 - MUT
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Time series

Year*	1997	1998	1999	2000	2001	2002
Catch	68.96	66.92	81.53	52.45	30.05	39.71
Minimum size						
Average size Lc						
Maximum size						
Fleet	466	490	498	500	500	500

Year	2003	2004	2005	2006	2007	2008
Catch	41.16	24.52	25.21	18.39	24.63	12.6
Minimum size			11	10	10	11
Average size Lc			13	14	14	14
Maximum size			17	22	25	25
Fleet	500	500	500	457	490	498

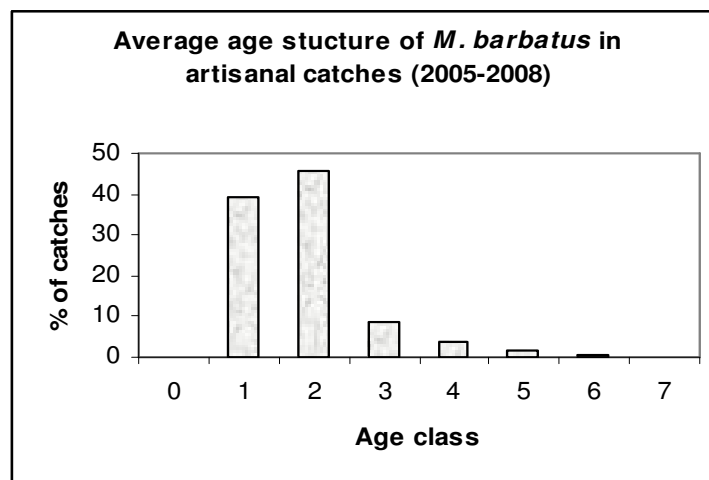
Selectivity

Remarks

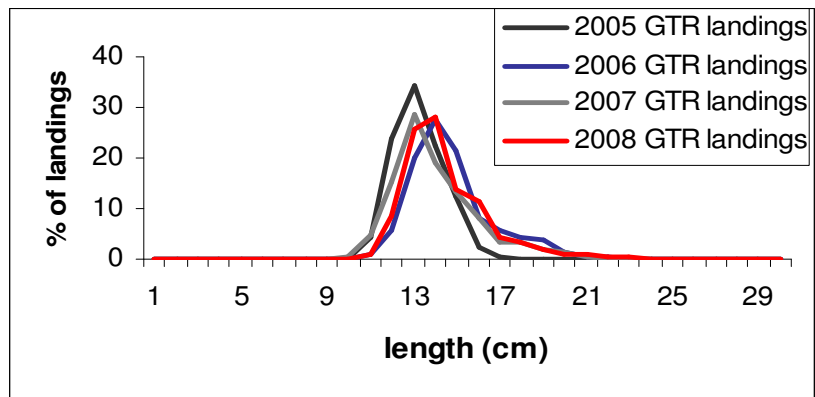
L25		
L50		
L75		
Selection factor		

Structure by size or age

The most exploited age classes by the artisanal fleet (trammel net) are the age classes 1 and 2.



The size structure of the landings from the artisanal fleet (trammel net) for the years 2005 - 2008 is provided in the following figure.



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Sheet P2b
Fishery by Operational Unit

Code: MUT2509Cha

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Data source*	EC and National Legislation, DFMR data	OpUnit 1*	CYP 25 E 03 33 - MUT
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Regulations in force and degree of observance of regulations

Maximum number of licenses restricted to 4 (since 2006): fully observed.

Closed trawling period from 1st of June until the 7th of November (in force since the mid '80s) : fully observed.

Minimum mesh size of trawl net at 40mm (diamond shape) : fully observed. From 1st of June 2010 the 40mm diamond shape trawl net will be replaced by a square meshed net of 40mm or by a diamond meshed net of 50mm at the cod-end.

Prohibition of bottom trawling at depths less than 50m and at distances less than 0.7 nautical miles off the coast. From November 2008 there is a prohibition of bottom trawling at distances between 0.7 and 1.5 nautical miles in certain areas within the territorial waters. Fully observed.

Accompanying species

Spicara smaris
Boops boops
Mullus surmuletus
Pagellus erythrinus
Octopus vulgaris
Loligo vulgaris
Sepia officinalis
Eledone moschata
Octopus macropus
Pagellus acarne
Serranus cabrilla
Synodus saurus
Scorpaena spp.
Trigloporus lastovisa
Uranoscopus scaber
Pagrus pagrus
Merluccius merluccius

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Sheet P2b
Fishery by Operational Unit

Code: MUT2509Cha

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Data source*	National Legislation, DFMR data	OpUnit 2*	CYP 25 C 07 33 - MUT
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Regulations in force and degree of observance of regulations

Restriction of the maximum number of licenses. Since 2008 assignment of licensed fishermen in 3 categories (A, B, C), based on their fishing activity and certain criteria. Licenses A&B restricted to 500. The restriction of licenses is fully observed.

Restrictions on the use of fishing gears depending on the fishing license category.

- For licenses A & B:

Minimum mesh size of nets at 32mm (open mesh size): fully observed. In the near future the minimum mesh size will be set at 36mm.

Maximum length of nets: For boats with license A is 5000m, for boats with license B is 3000m. Fully observed.

Restriction on the use of monofilament nets: Maximum length at 2400 m, allowable range of mesh size (open mesh size) 34 - 50 mm. Fully observed.

Maximum height of nets: 4m. Fully observed.

Restrictions on the time and duration of fishing, depending on mesh sizes. Fully observed.

- For licenses C (not fully observed):

Minimum mesh size of nets at 36mm (open mesh size).

Prohibition of the use of monofilament nets.

Maximum length of nets: 600 m.

Restriction of number of fishing days at 70 days annually, during weekends of certain months.

Accompanying species

Sparisoma cretense

Mullus surmuletus

Octopus vulgaris

Sepia officinalis

Serranus cabrilla

Scorpaena spp.

Labridae

Diplodus spp.

Boops boops

Pagellus erythrinus

Siganus spp.

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Sheet G
Indirect methods. Global model

Code: MUT2509Cha

Analysis #*

Page 1 /

Data source*	<input type="text"/>	Gear*	<input type="text"/>
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Model characteristic

Type of model*	<input type="text"/>	Fitting criterion	<input type="text"/>
Software	<input type="text"/>	Bibliographical source	<input type="text"/>

Data

Year	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Catch	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Effort	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
CPUE	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Year	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Catch	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Effort	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
CPUE	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Adjustment

RMS	<input type="text"/>
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Results

Carryng capacity	<input type="text"/>	a	<input type="text"/>
Growth rate	<input type="text"/>	b	<input type="text"/>
Catchability	<input type="text"/>	<input type="text"/>	<input type="text"/>
MSY	<input type="text"/>	<input type="text"/>	<input type="text"/>
EMSY	<input type="text"/>	TACMSY	<input type="text"/>
E0.1	<input type="text"/>	TAC0.1	<input type="text"/>
Ecurrent	<input type="text"/>	<input type="text"/>	<input type="text"/>

Comments

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Assessment form

Sheet A1
Indirect methods: VPA, LCA

Code: MUT2509Cha

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Sex* Both

Analysis # * 1 - VPA

Time series

Data	Size	Age
(mark with X)		X

Model	Cohorts	Pseudocohorts
(mark with X)		X

Equation used	Standard catch equation	Tunig method	
# of gears	2	Software	VIT (Lleonart and Salat, 1997)
F _{terminal}	0.3		

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum			Recruitment	1.48 millions	14.3 (tons)
Average	13.037	1.295	Average population	2.67 millions	71.72 (tons)
Maximum			Virgin population		445.2 (tons)
Critical	12.555	1	Turnover		69.92
				SSB	58.16 (tons)

Average mortality

	Gear					
	Total	Bottom trawl	Trammel net			
F ₁	0.566	0.268	0.297			
F ₂	0.37	0.187	0.183			
Z	0.677					

(F1 and F2 represent different possible calculations. Please state them)

Comments

For the estimation of the F terminal the length frequency data from the Cyprus Medits survey (2005-2008) were used, for plotting length-converted catch curves of the oldest ages, using the LFDA software (Kirkwook et al., 2001).

F1 refers to Mean F
F2 refers to Global F

----	Total	Bottom Trawl	Trammel net
Fbar (1-3)	0.84	0.41	0.43

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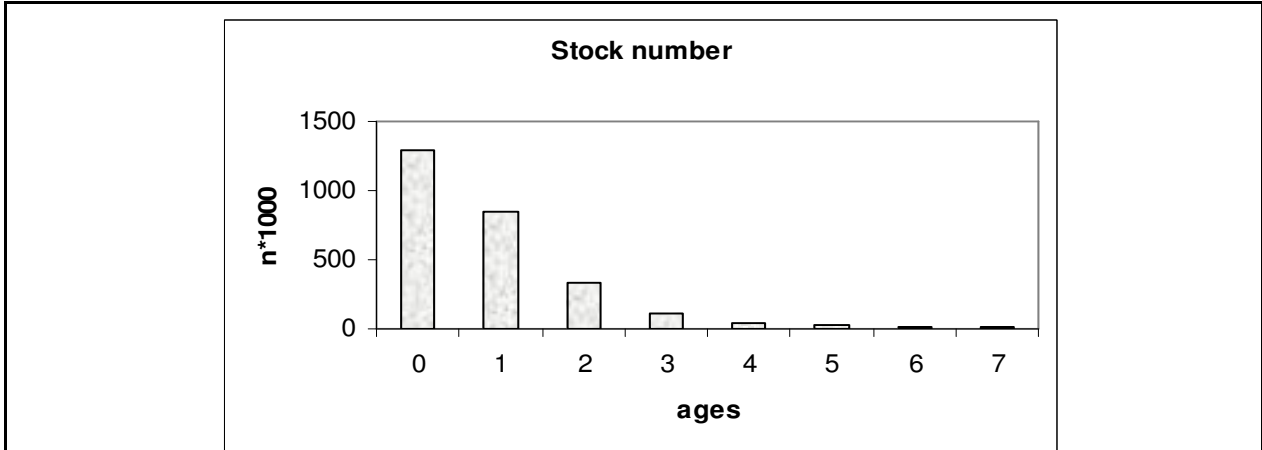
Sheet A3
Indirect methods: VPA results

Code: MUT2509Cha

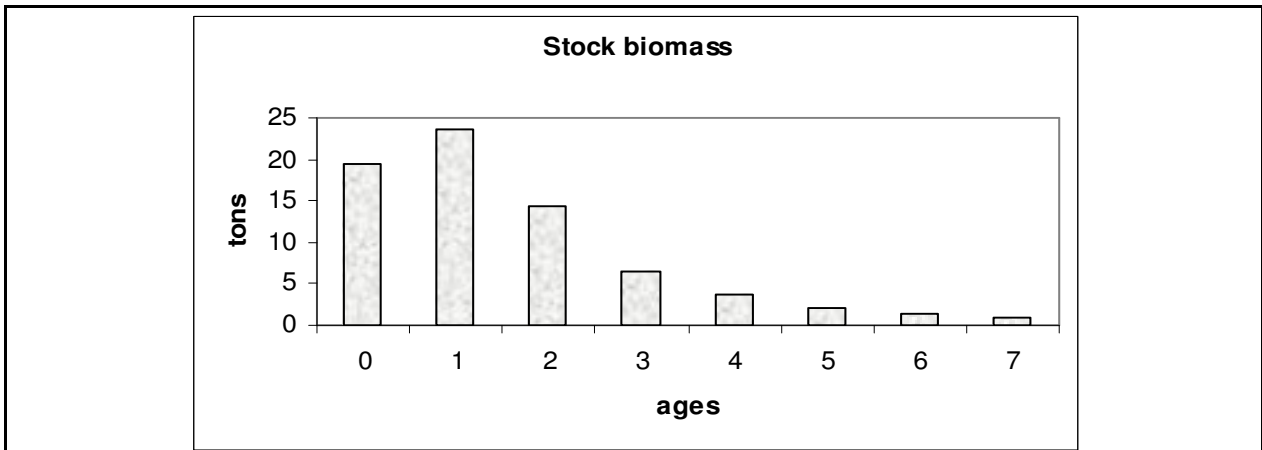
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Sex*	Both	Gear*	All	Analysis #*	1
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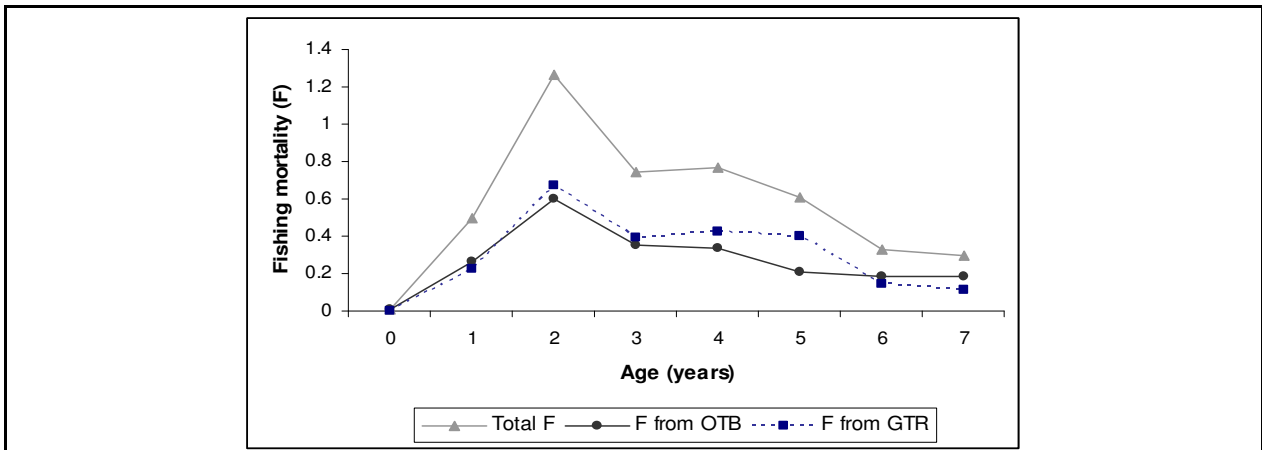
Population in figures



Population in biomass



Fishing mortality rates



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Assessment form	Sheet Y Indirect methods: Y/R

	Sex	Both			Code: MUT2509Cha
			Analysis #	1	

# of gears	2	Software	VIT (Leonart and Salat, 1997)
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Parameters used

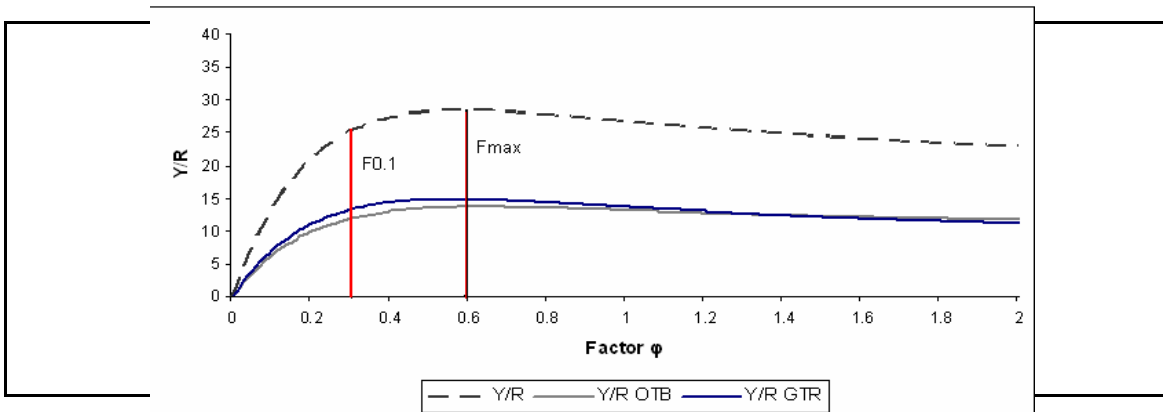
Vector F	
Vector M	
Vector N	
	The data from VPA-pseudocohort were used as inputs

Model characteristics

Results

	Total	Gear		
		Bottom trawl	Trammel net	
Current YR	26.74	13.10	13.64	
Maximum Y/R	28.40	13.60	14.80	
Y/R 0.1	27.02	12.81	14.21	
F _{max}	0.34	0.36	0.32	
F _{0.1}	0.22			
Current B/R	48.39			
Maximum B/R	78.92			
B/R 0.1	115.70			

Comments



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Sheet D
Diagnosis

Code: MUT2509Cha

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B					
SSB					
F					
Y					
CPUE					

Stock Status* Use one (or both) of the following two systems for the stock assessment status description

Unidimensional	<input type="checkbox"/>	? - (or blank) Not known or uncertain . Not much information is available to make a judgment;
	<input type="checkbox"/>	U - Underexploited, undeveloped or new fishery . Believed to have a significant potential for expansion in total production;
	<input type="checkbox"/>	M - Moderately exploited , exploited with a low level of fishing effort. Believed to have some limited potential for expansion in total production;
	<input type="checkbox"/>	F - Fully exploited . The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;
	<input checked="" type="checkbox"/>	O - Overexploited . The fishery is being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse;
	<input type="checkbox"/>	D - Depleted . Catches are well below historical levels, irrespective of the amount of fishing effort exerted;
	<input type="checkbox"/>	R - Recovering . Catches are again increasing after having been depleted or a collapse from a previous;

Bidimensional	Exploitation rate		Stock abundance			
	<input type="checkbox"/>	No or low fishing	<input type="checkbox"/>	Virgin or high abundance	<input type="checkbox"/>	Depleted
	<input type="checkbox"/>	Moderate fishing	<input type="checkbox"/>	Intermediate abundance	<input type="checkbox"/>	Uncertain / Not assessed
	<input checked="" type="checkbox"/>	High fishing mortality	<input checked="" type="checkbox"/>	Low abundance		
	<input type="checkbox"/>	Uncertain / Not assessed				

Comments

The estimated reference points F_{max} (0.34) and $F_{0.1}$ (0.22), in relation with the estimated value of F_{bar} (1-3) (=0.84) suggest an overexploitation state of the stock. The estimated current biomass (71.72 tons) in relation to the virgin biomass (445.2 tons) suggest a low abundance of the stock.

The two gears (trawl and trammel net) show a similar exploitation pattern, exploiting age classes 1 and 2, and contribute almost equally to the landings (for the period 2005-2008).

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Sheet Z

Objectives and recommendations

Code: MUT2509Cha

Management advice and recommendations*

Fishing pressure exercised from both gears should be reduced. This could be achieved with the following measures that will be implemented in the near future:

- Increase of the minimum mesh size of nets from 32 to 36mm (open mesh size)
- Replacement of the 40mm diamond shape trawl net by a square meshed net of 40mm or by a diamond meshed net of 50mm at the cod-end (from 1st of June 2010).

It is noted that the licensed bottom trawlers have been recently reduced at 50% (from 8 to 4, in 2006), and that a further reduction of the number of bottom trawlers operating in territorial waters remains a priority for the Government within the Operational Program for Fisheries 2007 – 2013.

Advice for scientific research*

Re-evaluation of the biological parameters (growth parameters, maturity) of the species.
Adoption of acceptable ranges of the species' growth and natural mortality parameters for the Eastern Mediterranean.