SAC GFCM
Sub-Committee on Stock Assessment

Date*	27	October	2011	Code*	MUR2511Cha

Authors*

Charis Charilaou

Affiliation*

DFMR- Department of Fisheries and Marine Research, Ministry of Agriculture, Natural Resources and Environment, 1416 Nicosia, Cyprus

Species Scientific name*

1 *Mullus surmuletus* - *MUR*

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: MUR2511Cha

Date*	27	Oct	2011	Authors*	Charis Charilaou

Species Scientific name*	Mullus surmuletus - MUR	Species common name*	Red mullet

Data Source

GSA*	25 - Cyprus Island	Period of time*	2009-2010

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 (Lleonart and Salat, 1997)

Sheets filled out

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

Comments, bibliography, etc.

Reports:

Annual Reports on the Cyprus Fisheries for the years 2005-2010. 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.

2011 Management Plan for the Bottom Trawl Fishery Within the Territorial Waters of Cyprus. July 2011. 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.

Comments, bibliography, etc.

References:

Abella, A., Caddy, J.F., Serena F., (1997). Do natural mortality and availability decline with age? An alternative yield paradigm for juvenile fisheries, illustrated by the hake Merluccius merluccius fishery in the Mediterranean. IFREMER Aquatic Living Resources. 10: 257-269.

Abella, A., Caddy, J. F. and Serena, F. (1998). Estimation of the parameters of the Caddy reciprocal M-at-age model for the construction of natural mortality vectors. DYNPOP. Genova 2-5.10.96 Cahiers Options Medit 35: 191-200.

Caddy, J.F. (1991). Death rates and time intervals: is there an alternative to the constant natural mortality axiom? Rev. Fish. Biol. Fish. 2: 109-138.

Lleonart, J. and Salat. J. (1997). VIT: Software for fisheries analysis. FAO Computerized Information Series (fisheries). pp: 107.

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Assessment form — **Sheet B** — **Biology of the species**

Code: MUR2511Cha

Biology

Somatic magnitude measured (LH, LC, etc)*				Total length	Units*	cm
Sex	Fem	Mal	Both	Unsexed		
Maximum size observed				37	Reproduction season	March - June
Size at first maturity				13.8	Reproduction areas	Shelf
Recruitment size					Nursery areas	Shelf

Parameters used (state units and information sources)

			Sex			
		Units	female	male	both	unsexed
Growth model	L∞	cm				45
	K	years-1				0.1268
	t0	years				-1.08
	Data source	Otolith readings (2)				
Length weight relationship	a					0.01064
	b	cm ang g				3.049

M				vector (3)	

sex ratio (mal/fem)	

Comments

(1) (2) Estimated under the Cyprus National Data Collection Programme.

(3) Vector of M at age was used, calculated from Caddy (1991) equation using the PRODBIOM Excel spreadsheet (Abella et al, 1997):

Age	M
0	0.39
1	0.24
2	0.20
3	0.15
4	0.14
5	0.13
6	0.12

Maturity at age

Age	Prop. matures
0	0.09
1	0.34
2	0.69
3	0.90
4	0.97
5	1.0

Comments

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Assessment form — **Sheet P1** — **General information about the fishery**

Code: MUR2511Cha

Data source*	DFMR official landings data. Discards estimated under the Cyprus National Data Collection Programme.	Year (s)*	2009-2010

Data aggregation (by year, average figures between years, etc.)*	By year

Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	CYP	25	C - Minor gear with engine (6-12 metres)	07 - Gillnets and Entangling Nets	33 - Demersal shelf species	MUR
Operational Unit 2	CYP	25	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	MUR
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 C 07 33 - MUR	500	Tons	34.7	see P2b-1	nsidered negligib		days
CYP 25 E 03 33 - MUR	4	Tons	2.12	see P2b-2	nsidered negligib		days
Total	504		36.82				

Legal minimum size	11 cm TL

Comments

Stripped red mullet in GSA 25 is exploited mainly by the artisanal fleet using set nets (basically trammel nets) and by the bottom otter trawlers in a minor extent. In both fisheries the species is exploited with a number of other demersal species (see P2b).

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 for the years 2009-2010, estimated as sum of products of numbers at age multiplied with weight at age.
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, and are annually estimated from 2008. There are no / neglibible discards of the species in the bottom trawl fishery.
Discards from the artisanal fishery are considered negligible.

Comments

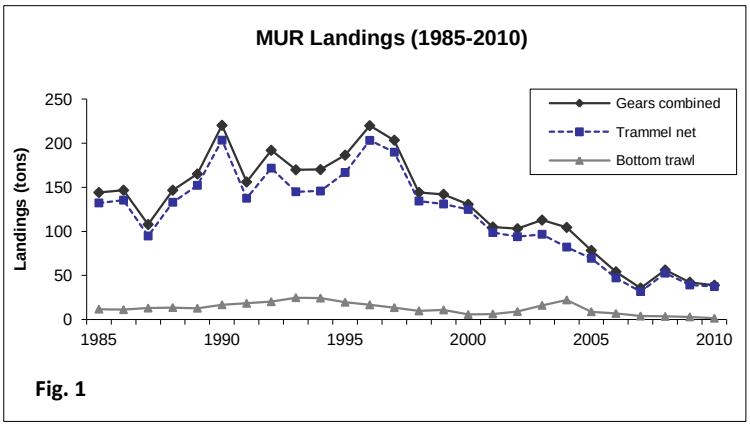


Fig. 1

As shown in the above Figure , for the period 1985-2010 there have been fluctuations in the landings of stripped red mullet during the first half of the period, with a clear decreasing trend from the middle of the '90's. For the last two years (2009-2010) the landings remain at the same levels. It is evident that the species is basically caught by the artisanal fishery (trammel net).

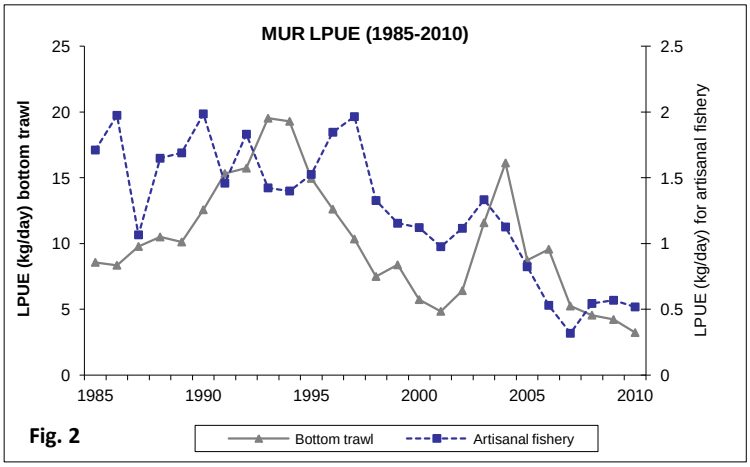


Fig. 2

The figure above shows fluctuations in the landings per unit effort (LPUE - kg/day) of stripped red mullet in both fisheries.

Concerning the artisanal fishery, there was a declining trend in the LPUE from 2003, while from 2008 it seems to remain at the same levels.

Regarding the bottom trawl fishery, the highest values of LPUE were in 1993-1994 and 2004. From 2006 there is a decreasing trend, with the lowest values (of the whole period 1985-2010) recorded in the last two years .

Data source*	DFMR official landings and discards data (sum of products of numbers at age x weight at age)	OpUnit 1*	CYP 25 C 07 33 - MUR

Time series

Year*	2009	2010				
Catch	35.54	33.84				
Minimum size	11	10				
Average size Lc	15	15				
Maximum size	33	30				
Fleet	495	500				

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

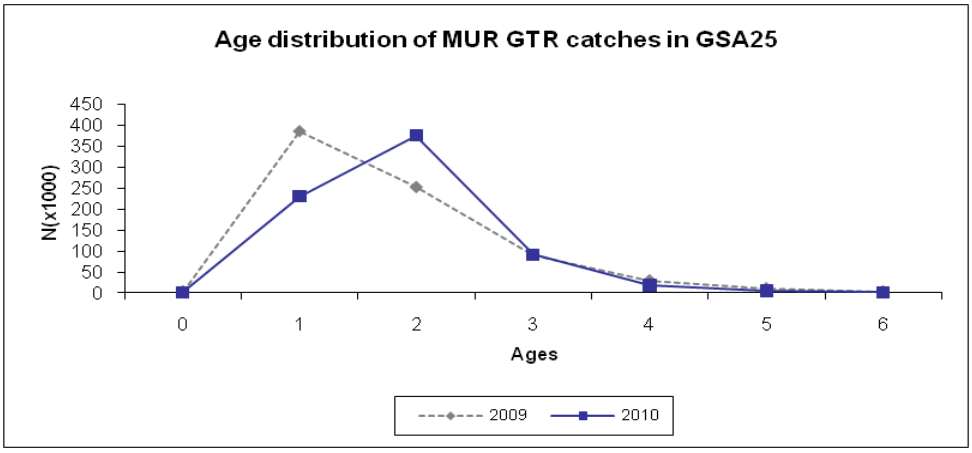
Selectivity

L25	
L50	
L75	
Selection factor	

Remarks

Structure by size or age

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



Structure by size or age

Data source*	DFMR official landings and discards data (sum of products of numbers at age x weight at age)	OpUnit 2*	CYP 25 E 03 33 - MUR

Time series

Year*	2009	2010				
Catch	2.77	1.47				
Minimum size	12	11				
Average size Lc	18	16.5				
Maximum size	22	24				
Fleet	4	4				

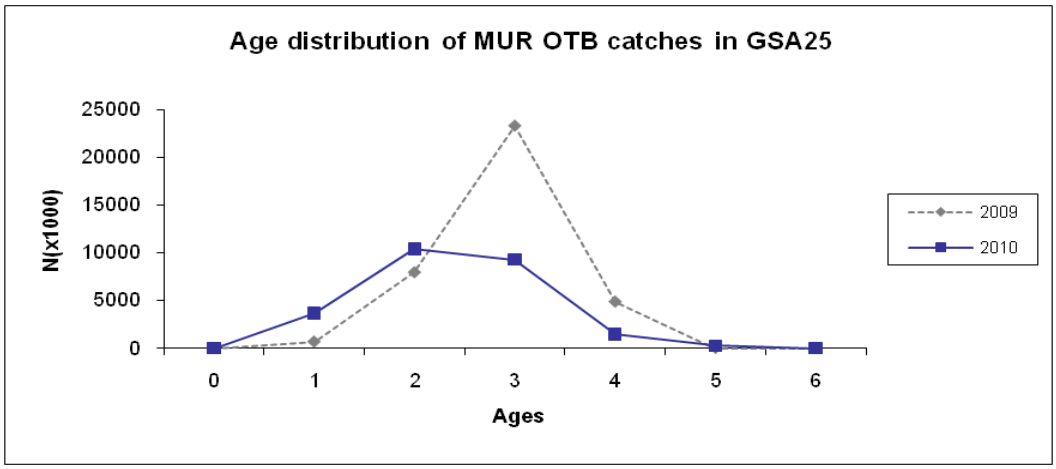
Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

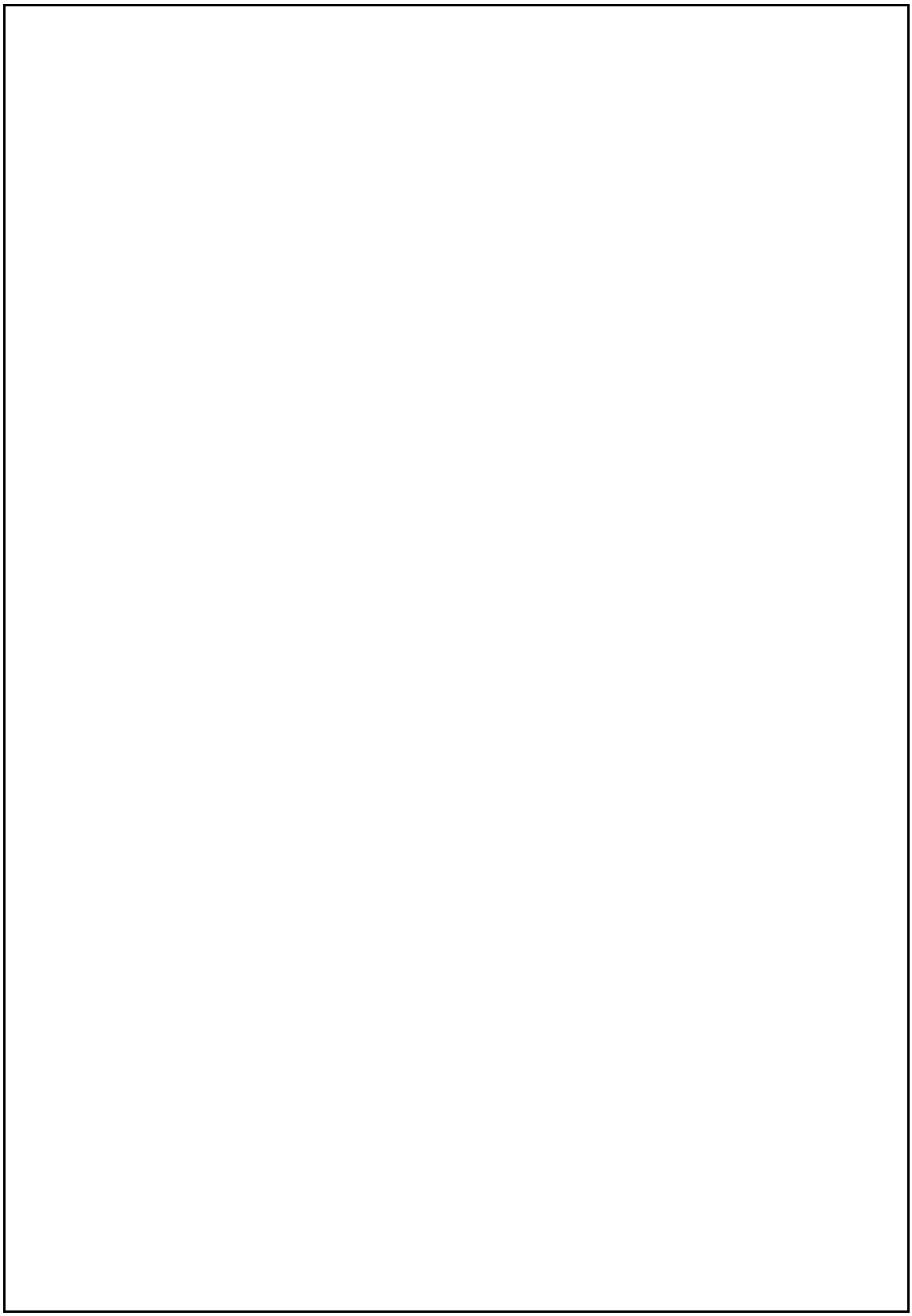
Selectivity **Remarks**

L25		
L50		
L75		
Selection factor		

Structure by size or age

The most exploited age classes by the bottom trawl (OTB) are the age classes 2 and 3.





Data source*	National legislation, DFMR data	OpUnit 1*	CYP 25 C 07 33 - MUR

Regulations in force and degree of observance of regulations

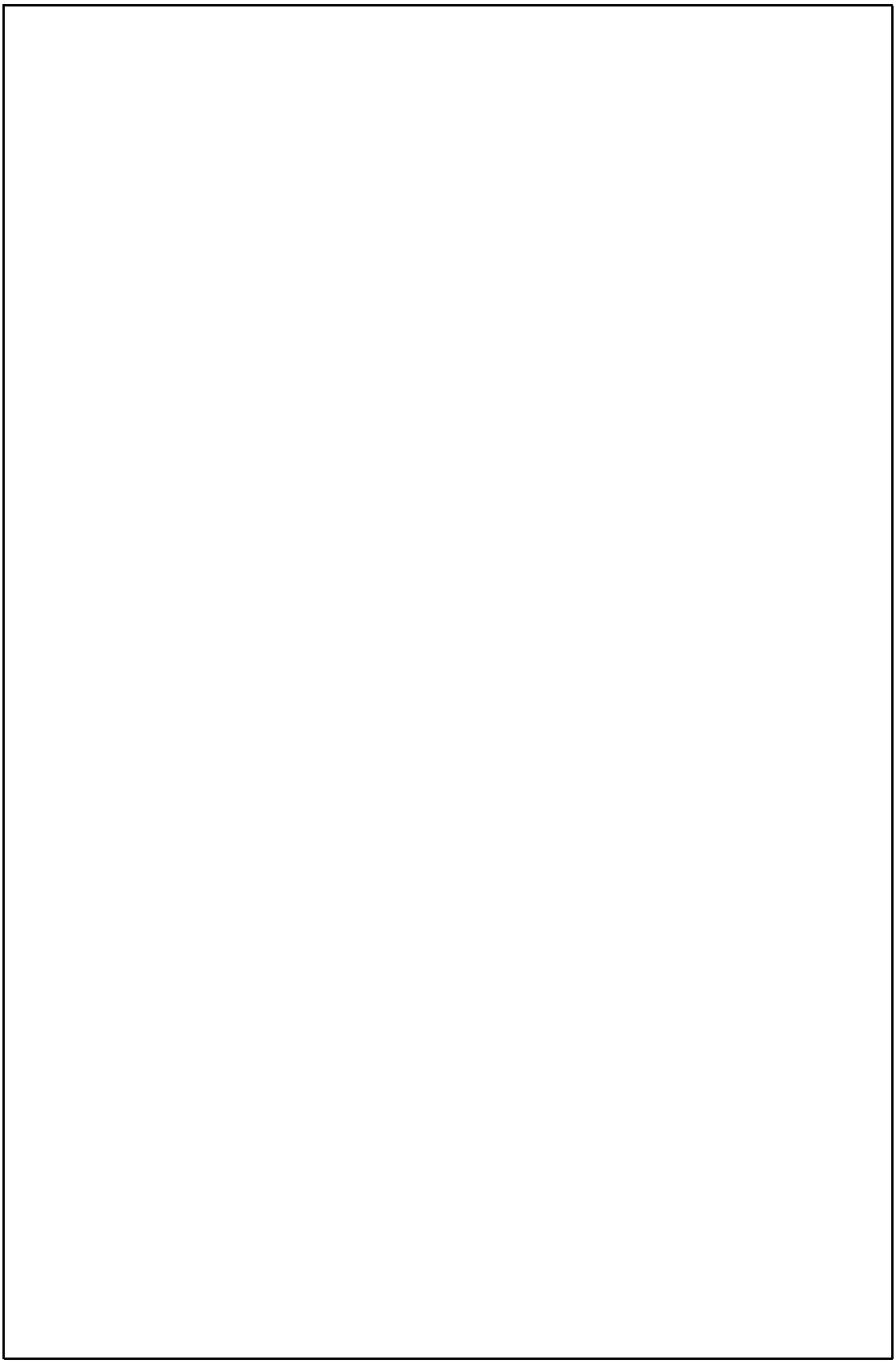
Restriction of the maximum number of licenses. Since 2008 assignment of licensed fishermen in 3 categories (A, B, C), based on their fishing activity and certain criteria. Licenses A&B restricted to 500. The restriction of licenses is fully observed.

Restrictions on the use of fishing gears depending on the fishing license category.
- For licenses A & B:
  Until March 2011 minimum mesh size of nets at 32mm (open mesh size): fully observed. From March 2011 minimum mesh size of nets at 38mm (open mesh size).
  Maximum length of nets: For boats with license A is 5000m, for boats with license B is 3000m. 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.



Data source*	EC and National Legislation, DFMR data	OpUnit 2*	CYP 25 E 03 33 - MUR

Regulations in force and degree of observance of regulations

From 2006 maximum number of licenses restricted to 4: fully observed.

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

From June 2010 the 40mm diamond shape trawl net replaced by a diamond meshed net of 50mm at the cod-end. From November 2011 minimum mesh size of 50mm diamond in any part of the net. Fully observed.

Prohibition of bottom trawling at depths less than 50m and at distances less than 0.7 nautical miles off the coast. Fully observed.
Prohibiton of bottom trawling in the Zygi coastal area, at a distance of 3 nautical miles from the coast. 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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Assessment form

Sheet A1
Indirect methods: VPA, LCA

Code: MUR2511Cha

Sex*	Both

Analysis # *	1-VPA(2010)

Time series

Data	Size	Age
(mark with X)		X

Model	Cohorts	Pseudocohorts
(mark with X)		X

Equation used	Catch equation	Tunig method	
# of gears	2	Software	VIT (Lleonart and Salat, 1997)
$F_{terminal}$	0.12		

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum			Recruitment	1.49	
Average	11.274	1.263	Average population		60
Maximum			Virgin population		
Critical	14.549	2	Turnover		79.62
				SSB	36
				in million	in tons

Average mortality

		Gear					
	Total	Trammel net	Bottom Trawl				
F_1	0.492	0.468	0.024				
F_2	0.291	0.282	0.009				
Z	0.685						

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

Comments

Input data
Fterminal: The value of M in oldest ages (0.12) was used as Fterminal.

Results
The above estimations refer to 2010.

Average mortality:
F1 refers to Mean F
F2 refers to Global F

----------	Total	Trammel net	Bottom trawl
Fbar(1-4)	0.76	0.72	0.04

Sex*	Both

Analysis # *	2-VPA(2009)

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)
$F_{terminal}$	0.12		

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum			Recruitment	1.6	
Average	11.571	1.352	Average population		77
Maximum			Virgin population		
Critical	14.549	2	Turnover		69.17
				SSB	51
				in millions	in tons

Average mortality

		Gear					
	Total	Trammel net	Bottom trawl				
F_1	0.422	0.389	0.033				
F_2	0.29	0.279	0.011				
Z	0.615						

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

Comments

Input data

Fterminal: The value of M in oldest ages (0.12) was used as Fterminal.

Results

The above estimations refer to 2009.

Average mortality:
F1 refers to Mean F
F2 refers to Global F

----------	Total	Trammel net	Bottom trawl
Fbar(1-4)	0.63	0.58	0.06

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Assessment form

Sheet A2
Indirect methods: data

Code: MUR2511Cha

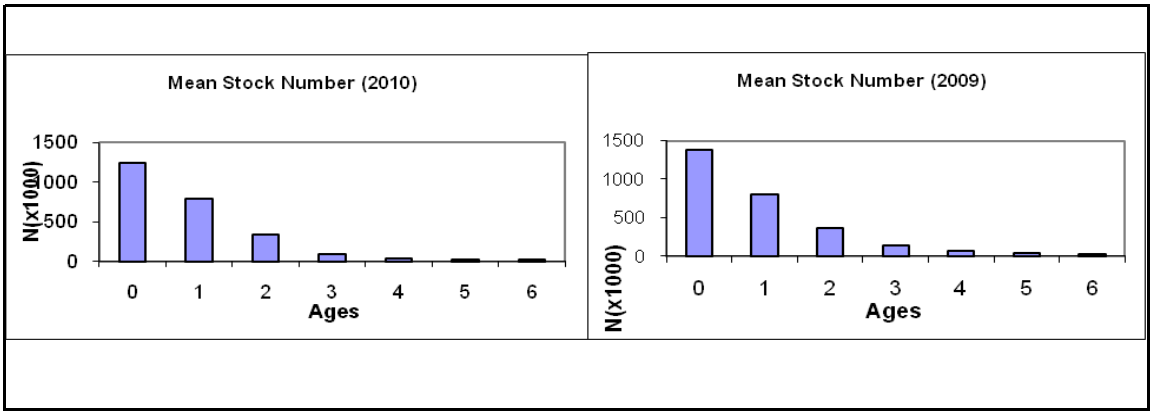
Sex*	Unsexed	Gear*	2	Analysis # *	

Data source	

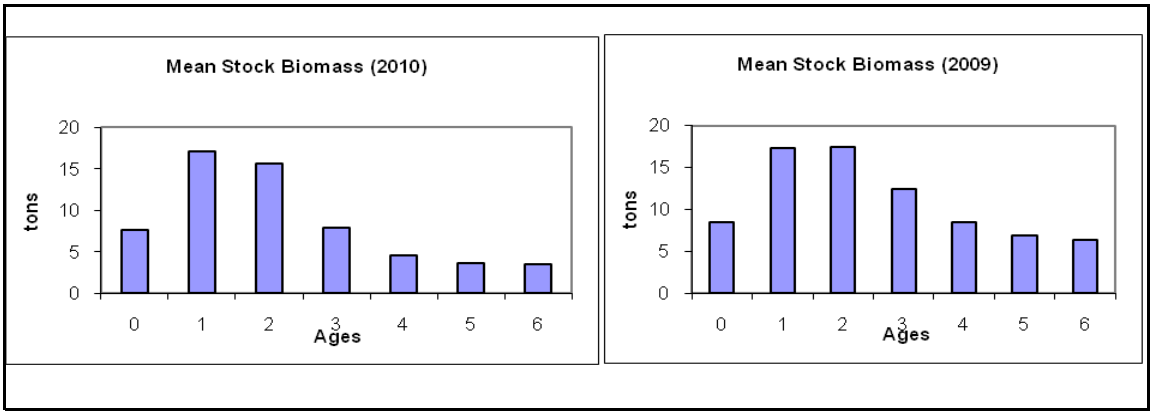
Data

Sex*	Both	Gear*	2	Analysis #*	1,2

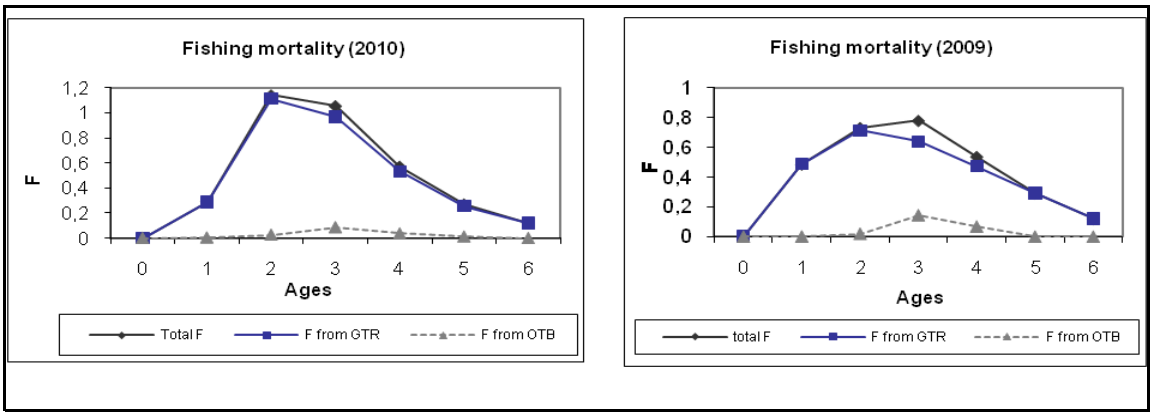
Population in figures



Population in biomass



Fishing mortality rates



Sex*	Both	Gear*	All	Analysis #*	2-VPA(2010),3-VPA(2009)

Population in figures

Population in biomass

Fishing mortality rates

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Assessment form — **Sheet Y** — **Indirect methods: Y/R**

Code: MUR2511Cha

Sex	Both

Analysis #	1,2

# of gears	2	Software	VIT (Lleonart and Salat, 1997)

Parameters used

Vector F	From VPA-pseudocohort analysis
Vector M	See sheet B
Vector N	From VPA-pseudocohort analysis

Model characteristics

Results

	Total	Gear			
		Trammel net	Bottom trawl		
Current YR	23.6 / 22.9	22.7 / 21.3	0.94 / 1.6		
Maximum Y/R	24.7 / 23.7	23.6 / 21.8	1.12 / 1.82		
Y/R 0.1	23.84 / 22.8	22.69 / 20.9	1.15 / 1.9		
F_{max}	0.34 / 0.32				
$F_{0.1}$	0.23 / 0.22				
Current B/R	40.37 / 46.37				
Maximum B/R	62 / 66				
B/R 0.1	82.67 / 95.61				

Comments

In the results, the first values refer to 2010 analysis and the second values to 2009.

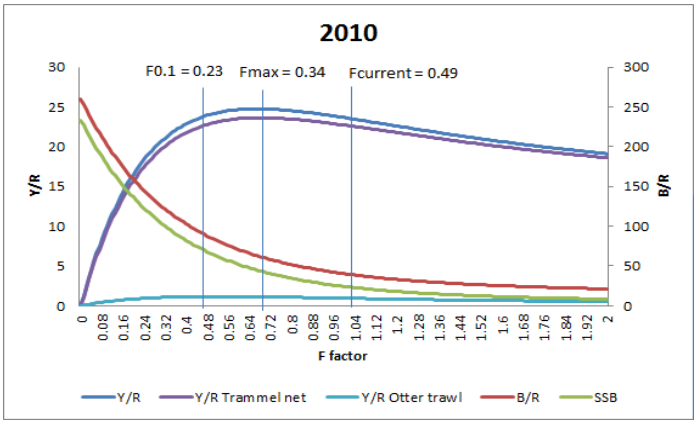
Based on the Y/R analysis of 2010 the current fishing mortality (0.492) is 53% higher than the F0.1 reference point (0.23) and 31% higher than the Fmax (0.34) (see also Figure below).

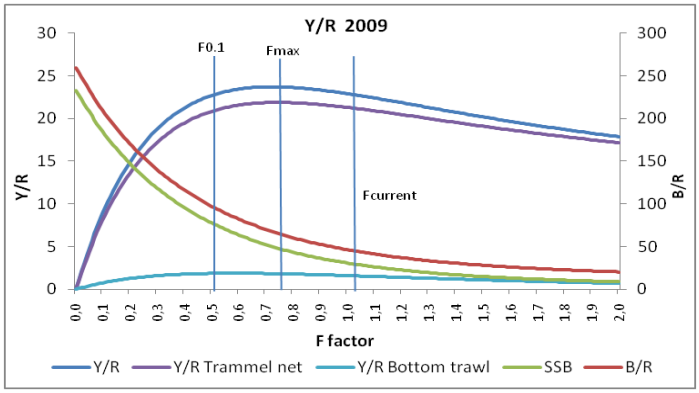
Based on the Y/R analysis of 2009 the current fishing mortality (0.422) is 48% higher than the F0.1 reference point (0.22) and 24% higher than the Fmax (0.32) (see also Figure below).

Comments

Results

	Total	Gear			
Current YR					
Maximum Y/R					
Y/R 0.1					
F_{max}					
$F_{0.1}$					
Current B/R					
Maximum B/R					
B/R 0.1					





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Assessment form	**Sheet D Diagnosis**

Code: MUR2511Cha

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B					
SSB					
F	0.49/0.42		0.23/0.22		First values refer to 2010, second values refer to 2009. Ref. point: F0.1
Y					
CPUE					

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

Unidimensional

○	? - (or blank) **Not known or uncertain**. Not much information is available to make a judgment;
○	U - **Underexploited, undeveloped or new fishery**. Believed to have a significant potential for expansion in total production;
○	M - **Moderately exploited**, exploited with a low level of fishing effort. Believed to have some limited potential for expansion in total production;
○	F - **Fully exploited**. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;
○	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;
○	D - **Depleted**. Catches are well below historical levels, irrespective of the amount of fishing effort exerted;
○	R - **Recovering**. Catches are again increasing after having been depleted or a collapse from a previous;

Bidimensional

Exploitation rate

○	No or low fishing
○	Moderate fishing
◉	High fishing mortality
○	Uncertain / Not assessed

Stock abundance

○	Virgin or high abundance
○	Intermediate abundance
◉	Low abundance

○	Depleted
○	Uncertain / Not assessed

Comments

The stock is in overfishing state, considering that the current F should be reduced by 53% (2010 results) or 48% (2009 results) for reaching the F0.1 reference point.

The stock abundance seems to be in low levels, on the basis of available time series and considering the decrease in official landings and the LPUE of the stock throughout the years.

Code: MUR2511Cha

Management advice and recommendations*

Fishing mortality by the artisanal fleet should be reduced. This could be achieved with the following measures that have been recently implemented/will be implemented in the near future in Cyprus:

Reduction on the number of licensed small scale artisanal boats: DFMR is currently evaluating the possibility of reducing the number of licensed vessels in the artisanal fishery.

Increase of the selectivity of gears targeting the stock: From March 2011 the minimum mesh size of all passive nets was increased from 32 mm to 38 mm.

Advice for scientific research*

A re-evaluation of the growth parameters of the stock is adviced, as well as adoption of acceptable ranges of the species' growth parameters and natural mortality for the Eastern Mediterranean.

Abstract for SCSA reporting

Authors Charis Charilaou

Year 2011

Species Scientific name Mullus surmuletus - MUR

Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area 25 - Cyprus Island

Fisheries (brief description of the fishery)*

Stripped red mullet in GSA 25 is exploited mainly by the artisanal fleet using trammel nets and also by the bottom otter trawlers in a minor extent. The species is exploited with a number of other demersal species for both fisheries.

For the assessment period (2009-2010) the average landings were less than 40 tons, of which the 96% was caught by the artisanal fleet. The most exploited age classes by the artisanal fleet are the ages 1and 2, while the bottom trawl fishery exploits mainly the age classes 2 and 3.

Source of management advice*

(brief description of material -data- and methods used for the assessment)

Data and parameters:

Catch-at age data derived from catches for each fishing gear exploiting the stock (trammel net and bottom trawl), using Age Length Keys. Catches were estimated as sum of products of numbers at age multiplied with weight at age.

M vector for each age class was used, estimated by PRODBIOM (Abella et al., 1997).

The L-W relationship, the maturity at age and the growth parameters used were estimated within the framework of the Cyprus National Fisheries Data Collection Programme.

Assessment method:
VPA-pseudocohort and Y/R analysis for the years 2009 and 2010 separately.

Stock Status*

Exploitation rate	**Stock abundance**
High fishing mortality	Low abundance

Comments

Management advice and recommendations*

Fishing mortality by the artisanal fleet should be reduced. This could be achieved with the following measures that have been recently implemented/will be implemented in the near future in Cyprus:

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A re-evaluation of the growth parameters of the stock is adviced, as well as adoption of acceptable ranges of the species' growth parameters and natural mortality for the Eastern Mediterranean.