SAC GFCM
Sub-Committee on Stock Assessment

Date*	**27**	**October**	**2011**	**Code***	**MUT9911F.F**

Authors*

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Affiliation*

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Species Scientific name*

1 *Mullus barbatus - MUT*
Source: GFCM Priority Species

2
Source: -

3
Source: -

Geographical area*

Strait of Sicily, Central Mediterranean

Geographical Sub-Area (GSA)*

99 - Combination of GSAs

Combination of GSAs

1 15 - Malta Island
2 16 - South of Sicily
3

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Assessment form — **Sheet #0** — **Basic data on the assessment**

Code: MUT9911F.F

Date*	27	Oct	2011	Authors*	F.Fiorentino1, L. Knittweis2, V. Gancitano1, R. Mifsud2, F. Gravino2, G. Garofalo1

Species Scientific name*	Mullus barbatus - MUT	Species common name*	Red mullet

Data Source

GSA*	15 - Malta Island, 16 - South of Sicily	Period of time*	2006-1010

Description of the analysis

Type of data*	LFD from commercial catches, commercial landings data, fisheries independent survey data	Data source*	EU Data Collection Framework data from GSAs 15 & 16
Method of assessment*	LCA, Y/R analysis	Software used*	Vit4Win

Sheets filled out

B	P1	P2a	P2b	G	A1	A2	A3	Y	Other	D	Z	C
1	1	5	5	---	1	1	1	1	3	1	1	---

Comments, bibliography, etc.

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

Abella A., Caddy J., Serena F. (1998) Estimation of the parameters of the Caddy reciprocal M-at-age model for the construction of natural mortality vectors.

Andaloro, F., Prestipino Giarritta, S. (1985) Contribution to the knowledge of the age and growth of the striped mullet, M. barbatus and red mullet, M. surmuletus, in the Sicilian Channel. FAO, Fish. Rep. 336: 89-92.

Caddy J.F. (1991) Death rates and time intervals: is there an alternative to the constant natural mortality axiom? Reviews in Fish Biology and Fisheries, 1 (2): 109-138.

Hoggarth D.D., Abeyasekera S., Arthur R.I., Beddington J.R., Burn R.W., Halls A.S., Kirkwood G.P., McAllister M., Medley P., Mees C.C., Parkes G.B., Pilling G.M., Wakeford R.C., Welcomme R.L. (2006) Stock assessment for fishery management – A framework guide to the stock assessment tools of the Fisheries Management Science Programme (FMSP). FAO Fisheries Technical Paper. No. 487. Rome, FAO. 261 pp.

Comments, bibliography, etc.

Levi D., Andreoli M.G.,. Bonanno A,. Fiorentino F, Garofalo G., Mazzola S., Norrito G., Patti B., Pernice G., Ragonese S., Giusto G.B., Rizzo P., 2003, Embedding sea surface temperature anomalies into the stock recruitment relationship of red mullet (Mullus barbatus L. 1758) in the Strait of Sicily. Sci. Mar. 67, 259–268.

Ragonese S., Andreoli M. G., Bono G., Giusto G. B., Rizzo P., Sinacori G. (2004). Overview of the available biological information on demersal resources of the Strait of Sicily. MedSudMed Technical Documents No.2: 67-74.

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

Code: MUT9911F.F

Biology

Somatic magnitude measured (LH, LC, etc)*			TL		Units*	cm
Sex	Fem	Mal	Both	Unsexed	SAMED, 2002 / Cherif et al. 2007	
Maximum size observed	21	19	21		Reproduction season	peak May/June
Size at first maturity	15.5	13.9			Reproduction areas	near coast
Recruitment size					Nursery areas	

Parameters used (state units and information sources)

			Sex			
		Units	female	male	both	unsexed
Growth model	L∞	cm	23.61	20.16		
	K		0.45	0.57		
	t0		-0.8	-0.8		
	Data source	CNR, IAMC 2010 (otolith readings)				
Length weight relationship	a		0.0134	0.0176		
	b		2.9419	2.8226		

M	vector	see below			

sex ratio (mal/fem)	

Comments

Levi et al., (1992), comparing growth curve of M. barbatus in the Mediterranean, found significant differences between red mullet growth in Sicilian side of Strait of Sicily (GSA 15 and 16) and Gulf of Gabes (GSA 14).

Other evidences supporting the existence of separate stocks of red mullets in Central Mediterranean comes from parasitological observations. A large infestation by a trematode of the genus Stephanostomum seriously affected the red mullet fishery in the Tunisian waters for several months in 1990. No such occurrence was noted in the fish landed at the Sicilian base-ports of the strait of Sicily (Levi et al., 1993).

Other hypothesis on separation of stocks units in the strait of Sicily, was proposed by Levi et al. (1995), on the basis of independence of water masses and circulation system in the Sicilian and African border of the Strait of Sicily.

Since the red mullet is a typical coastal resources, the peculiarity of the Strait of Sicily (two shelfs - the European and the African ones-separated by narrow deep bottoms) supports the hypothesis of the existence of different subpopulations in the area.

Red mullet reproduction in the GSA 13 occurs near the coast, from May to June-July (Gharbi & Ktari, 1981; Cherif et al., 2007). According to Levi (1991) spawning in GSA 15 and 16 takes place in May.

As indicated by Garofalo et al. (2004), two major and clearly separate spawning areas exist in the Northern side of the Strait of Sicily (GSA 15 and 16). They are located over the Adventure Bank, off the South–Western coast of Sicily (GSA 16) and over the Malta Bank, between Sicily and the Maltese Island (GSA 15), respectively, in the outer shelf (100-150m).

Comments

Size	Maturity		Natural mortality	
cm	F	M	F	M
10	0.02	0.51	0.45	0.64
11	0.04	0.68	0.37	0.51
12	0.09	0.81	0.32	0.39
13	0.18	0.90	0.28	0.35
14	0.32	0.95	0.25	0.31
15	0.51	0.97	0.22	0.29
16	0.70	0.99	0.20	0.26
17	0.84	0.99	0.19	0.24
18	0.92	1.00	0.18	0.21
19	0.96	1.00	0.17	0.19
20	0.98	1.00	0.16	0.19
21	0.99	1.00	0.15	0.19
22	1.00	1.00	0.15	0.19
23	1.00	1.00	0.15	0.19
24	1.00	1.00	0.15	0.19
25	1.00	1.00	0.15	0.19

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Assessment form

Sheet P1

General information about the fishery

Code: MUT9911F.F

Data source*	EU Data Collection Framework (DCF) data from GSA 15 & 16	Year (s)*	2006-2010

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*	ITA	99	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	MUT
Operational Unit 2	ITA	99	F - Trawl (>24 metres)	03 - Trawls	33 - Demersal shelf species	MUT
Operational Unit 3	ITA	99	M - Polyvalent (12-24 metres)	07 - Gillnets and Entangling Nets	33 - Demersal shelf species	MUT
Operational Unit 4	MLT	99	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	MUT
Operational Unit 5	MLT	99	M - Polyvalent (12-24 metres)	07 - Gillnets and Entangling Nets	33 - Demersal shelf species	MUT

Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
ITA 99 E 03 33 - MUT	250						
ITA 99 F 03 33 - MUT	140						
ITA 99 M 07 33 - MUT							
MLT 99 E 03 33 - MUT	12						
MLT 99 M 07 33 - MUT	240						
Total	642						

Legal minimum size	11 cm (EC 1967/2006)

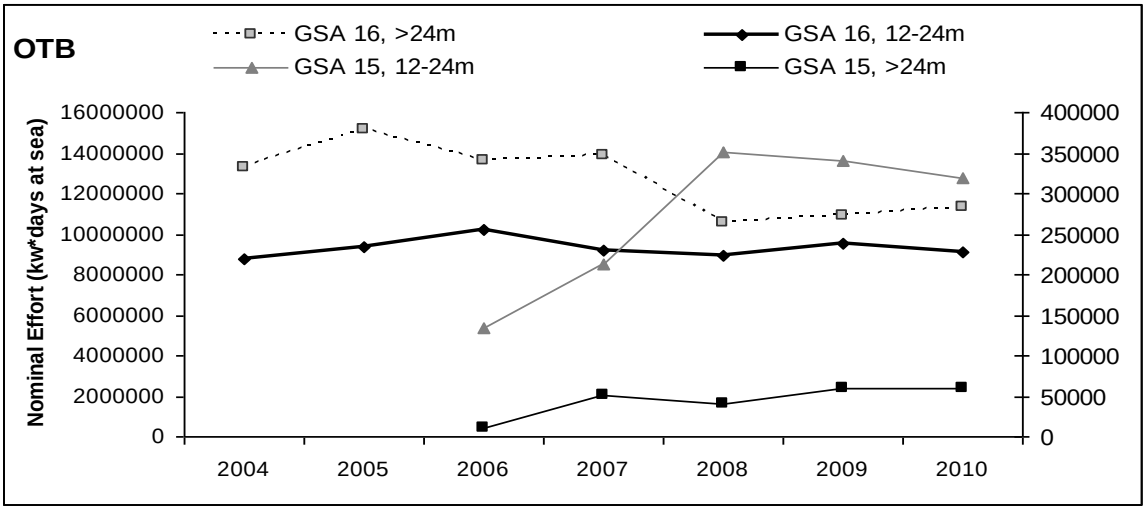
Comments

The effort by main fishing technique and segment deployed in GSA 15 & 16, keeping separate the Italian and Maltese fleet, is shown in the graphs below. The segment of the Italian demersal otter trawl reveals a 20% decrease for vessels larger than 24m in 2008-2010 compared to 2004-2007. A decreasing pattern was also clear for the Italian boats equipped with trammel-nets.

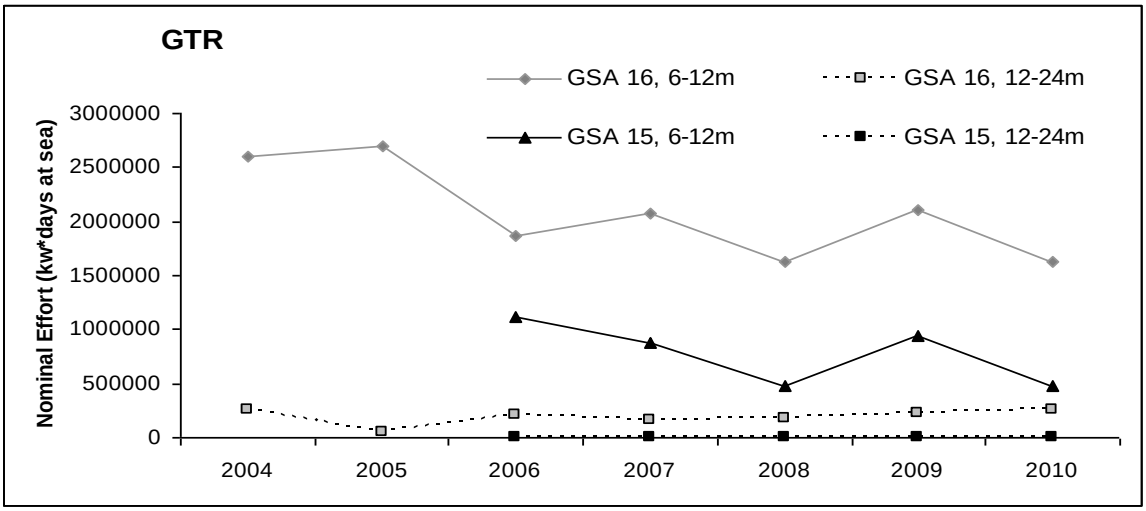
Comparing the contribution of Maltese and Italian vessels showed that Italian vessels were responsible for 98.2% of OTB and 79.6% of GTR fishing effort in the Strait of Sicily.

Annual landings decreased from 1,626 t in 2004 to 770 t in 2010. Demersal otter trawlers dominate the landings by far. In 2005-2010 Maltese landings on average contribued 0.7% to the total landings made by the Maltese and Italian fleets using bottom otter trawls and trammel nets.

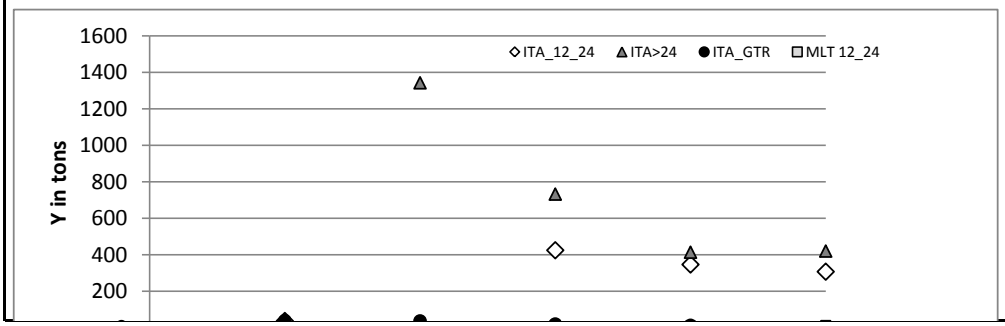
Comments



Nominal effort (kW*days at sea) trends of trawlers (OTB) by segments in GSA 15 (left) & 16 (right), 2004-2010



Nominal effort (kW*days at sea) trends of artisanal fisheries (GRT- trammel nets) segments in GSA 15 & 16, 2004-2010.



Data source*	EU DCF, GSA 16	OpUnit 1*	ITA 99 E 03 33 - MUT

Time series

Year*	2006	2007	2008	2009	2010	
Catch	37		424.8	346.7	307.4	
Minimum size	11	10	10	10	10	
Average size Lc						
Maximum size	22	22	22	22	21	
Fleet	OTB	OTB	OTB	OTB	OTB	

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity

L25	
L50	
L75	
Selection factor	

Remarks

Structure by size or age

FEMALES	Trawlers 12- 24m				
TL (cm)	**2006**	**2007**	**2008**	**2009**	**2010**
10	0	21950	32747	79620	9769
11	73341	89675	136931	143983	39075
12	184470	181043	172645	296180	60929
13	373439	325228	252081	460328	147671
14	622821	550340	329227	755167	314110
15	800097	781254	603387	1030449	573011
16	767174	789684	722298	1196814	1000507
17	713698	754678	672504	1378089	1195672
18	709470	470496	570019	1173900	1092767
19	545685	439610	391815	846310	826503
20	282737	274003	275346	509094	562135
21	206654	141389	125502	259338	270268
22	5279587	4819350	4284502	8129272	0
total	5279587	4819350	4284502	8129272	6092418

Structure by size or age

MALES	Trawlers 12- 24m				
TL (cm)	**2006**	**2007**	**2008**	**2009**	**2010**
10	0	77077	27190	103607	5375
11	246326	317378	185855	338306	24279
12	563238	693704	340439	640562	50115
13	541355	976438	837523	979729	108681
14	470376	827749	990914	1192637	227453
15	492132	660035	746295	1093111	419193
16	480422	567854	699611	1154709	449571
17	220040	235269	368133	800175	266980
18	24759	36936	138709	288982	84681
19	93688	18447	66091	59933	27012
total	3132336	4410888	4400758	6651750	1663340

Data source*	EU DCF GSA 16	OpUnit 2*	ITA 99 F 03 33 - MUT

Time series

Year*	2006	2007	2008	2009	2010	
Catch	1047	1343	732.9	414.1	420.5	
Minimum size	10	10	10	10	13	
Average size Lc						
Maximum size	22	22	22	22	21	
Fleet	OTB	OTB	OTB	OTB	OTB	

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity

L25	
L50	
L75	
Selection factor	

Remarks

Structure by size or age

FEMALES	Trawlers > 24m				
TL (cm)	**2006**	**2007**	**2008**	**2009**	**2010**
10	71962	24445	5966	1281	0
11	241602	376985	152354	10612	0
12	155302	892669	643161	107211	0
13	256052	580200	1034058	139698	3006
14	657378	932302	1542678	160870	7647
15	1179859	1589075	1856986	250943	66292
16	1035983	1583551	1221041	237170	166324
17	866067	1238896	668492	121120	171370
18	837793	560965	351724	30066	138145
19	222484	374064	128776	10877	60697
20	534828	60277	55419	2170	25282
21	71962	24445	5966	1281	11913
22	241602	376985	152354	10612	0
total	6059310	8213428	7660655	1072016	650676

MALES	Trawlers > 24m				
TL (cm)	**2006**	**2007**	**2008**	**2009**	**2010**
10	229939	71051	59764	3290	0
11	206814	831442	949656	32602	0
12	364672	1851494	2483065	133996	0
13	574918	1930867	2248945	353068	22518
14	1490228	2802320	2121474	449364	131132
15	1390963	2753708	1924233	172362	171097
16	582357	929144	766105	31773	129757
17	144404	162348	122590	5056	41438
18	56343	29063	18393	830	15262
19	229939	71051	59764	3290	4249
total	5040636	11361437	10694225	1182341	515454

Data source*	EU DCF GSA 16	OpUnit 3*	ITA 99 M 07 33 - MUT

Time series

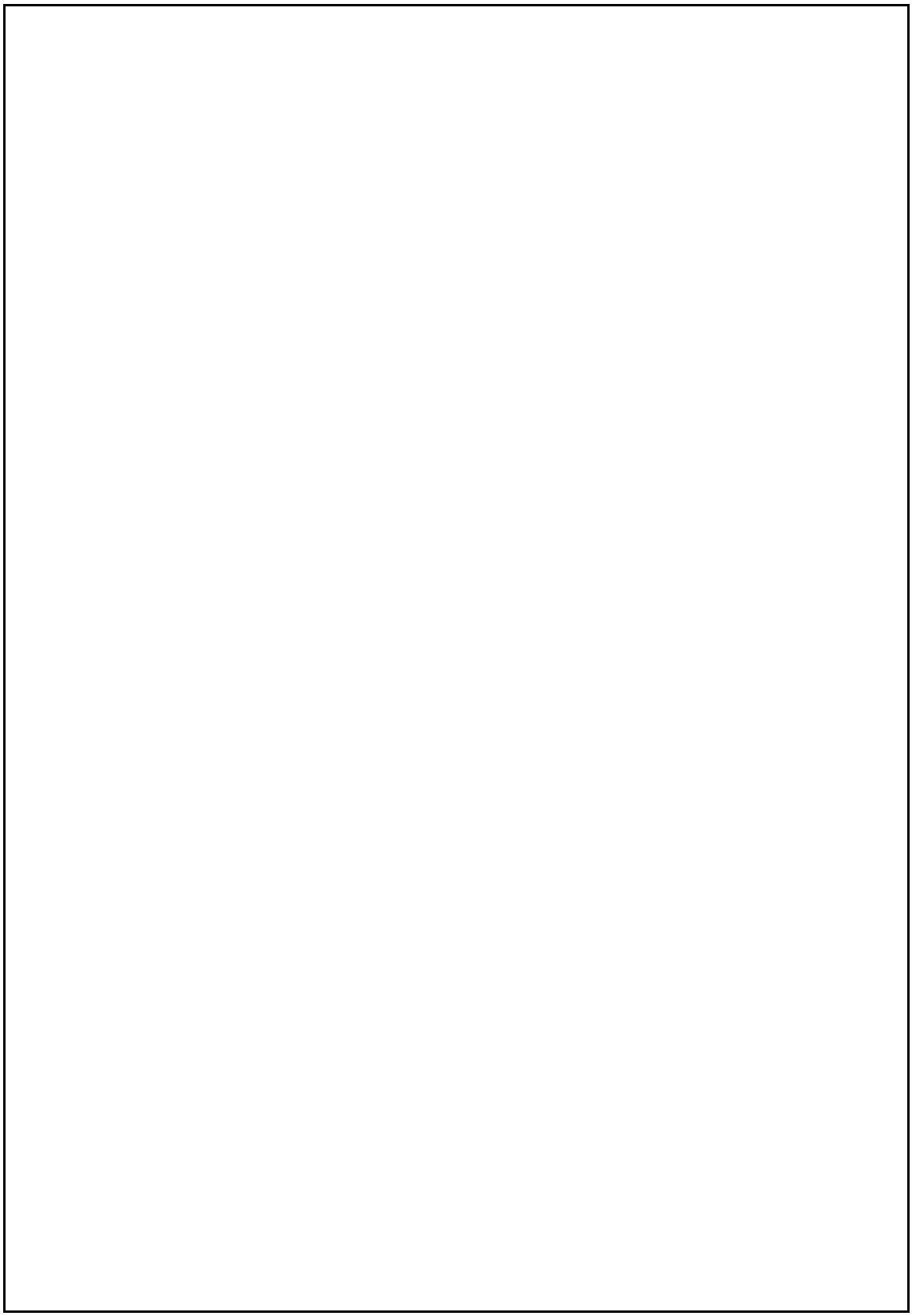
Year*	2006	2007	2008	2009	2010	
Catch	39	37	20	13	0	
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity **Remarks**

L25	
L50	
L75	
Selection factor	

Structure by size or age



Data source*	EU DCF GSA 15	OpUnit 4*	MLT 99 E 03 33 - MUT

Time series

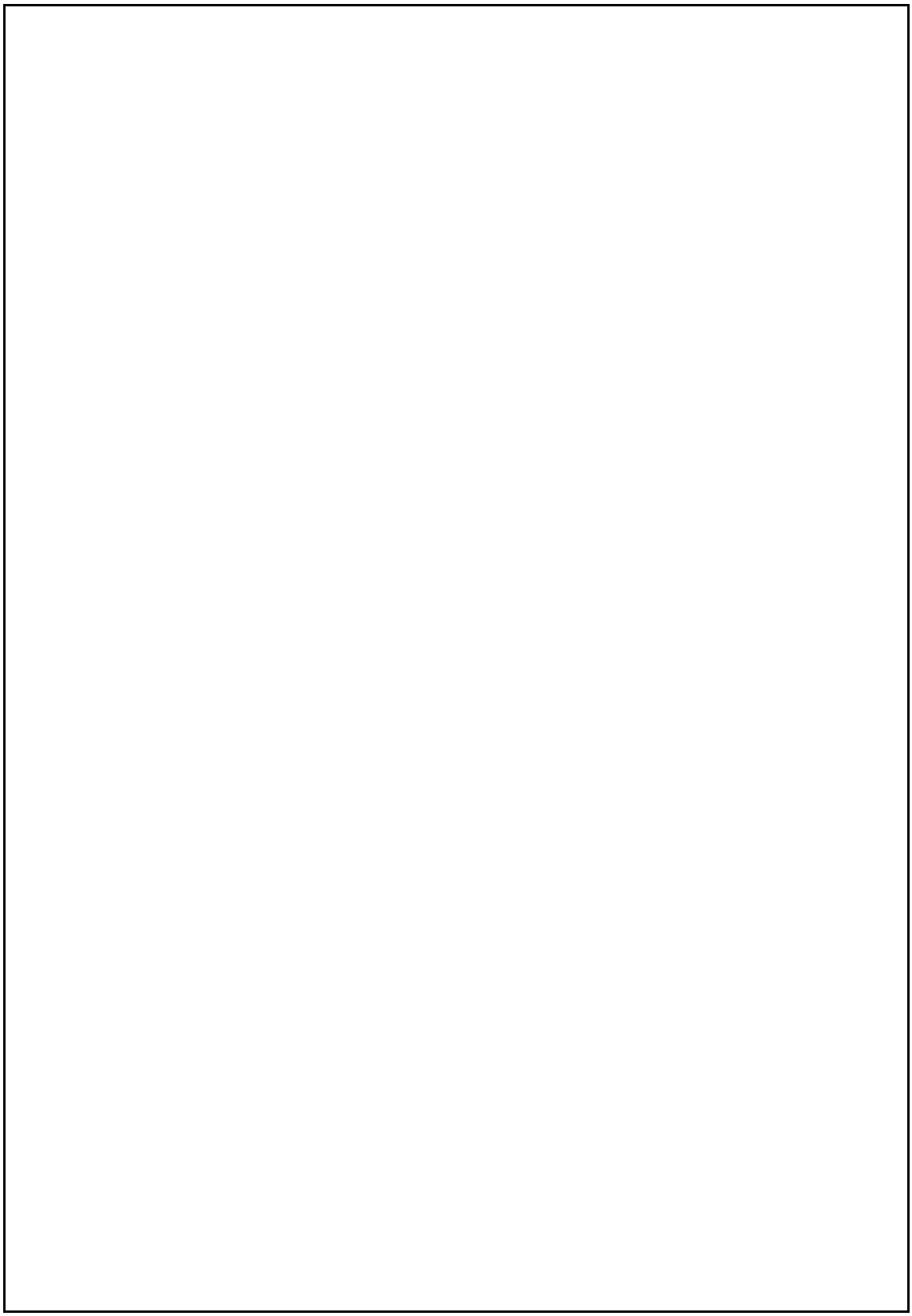
Year*	2006	2007	2008	2009	2010	
Catch	7	0.5	13.8	8.9	12.3	
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity **Remarks**

L25	
L50	
L75	
Selection factor	

Structure by size or age



Data source*	EU DCF GSA 15	OpUnit 5*	MLT 99 M 07 33 - MUT

Time series

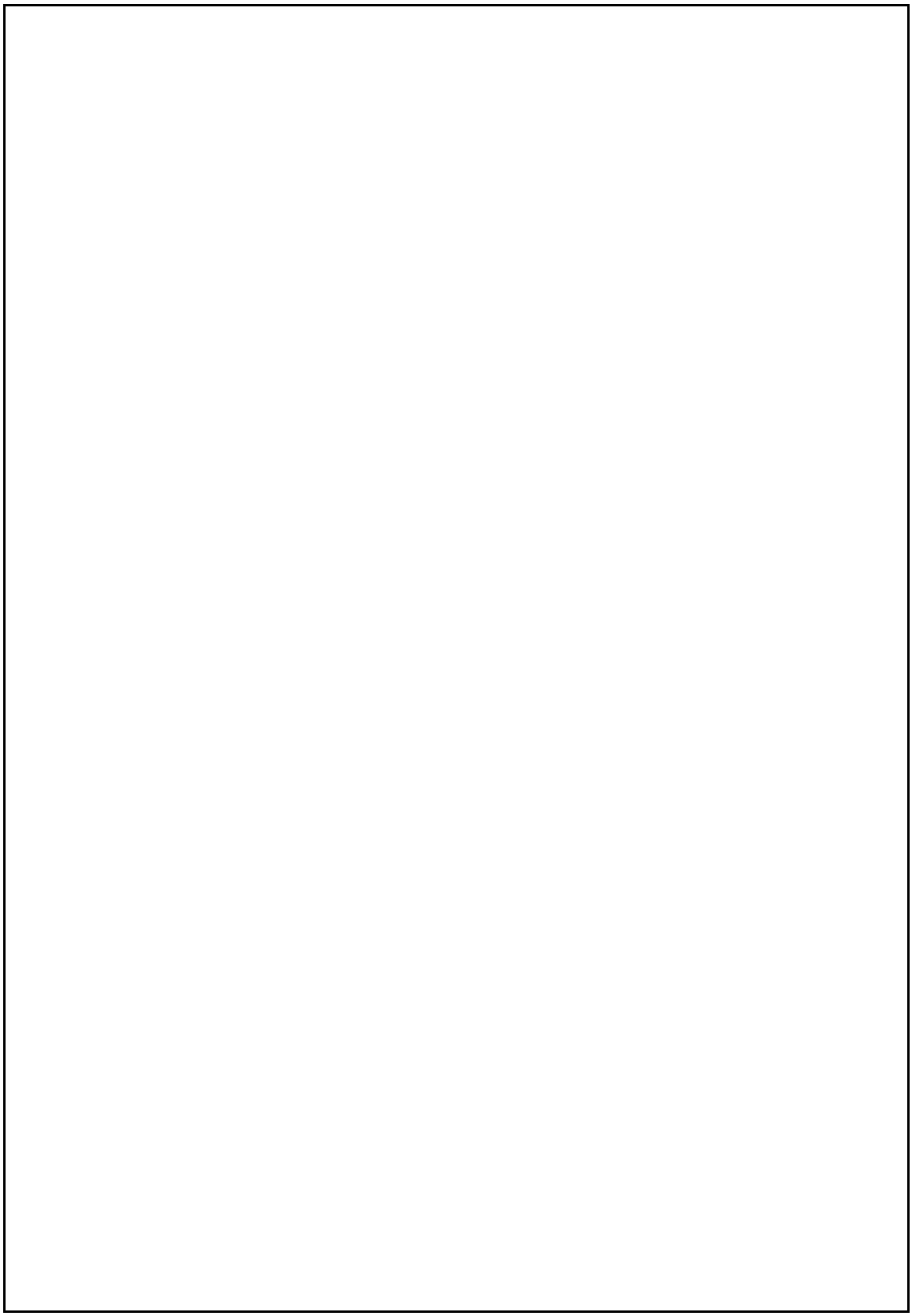
Year*	2006	2007	2008	2009	2010	
Catch	0.75	0.5	0.42	0.35	1.02	
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity **Remarks**

L25	
L50	
L75	
Selection factor	

Structure by size or age



Data source*	EC 1967/2006	OpUnit 1*	ITA 99 E 03 33 - MUT

Regulations in force and degree of observance of regulations

At present there are no formal management objectives for red mullet fisheries in the Strait of Sicily. As in other areas of the Mediterranean, the stock management is based on control of fishing capacity (licenses), fishing effort (fishing activity) , technical measures (mesh size and area closures), and fish size limits.

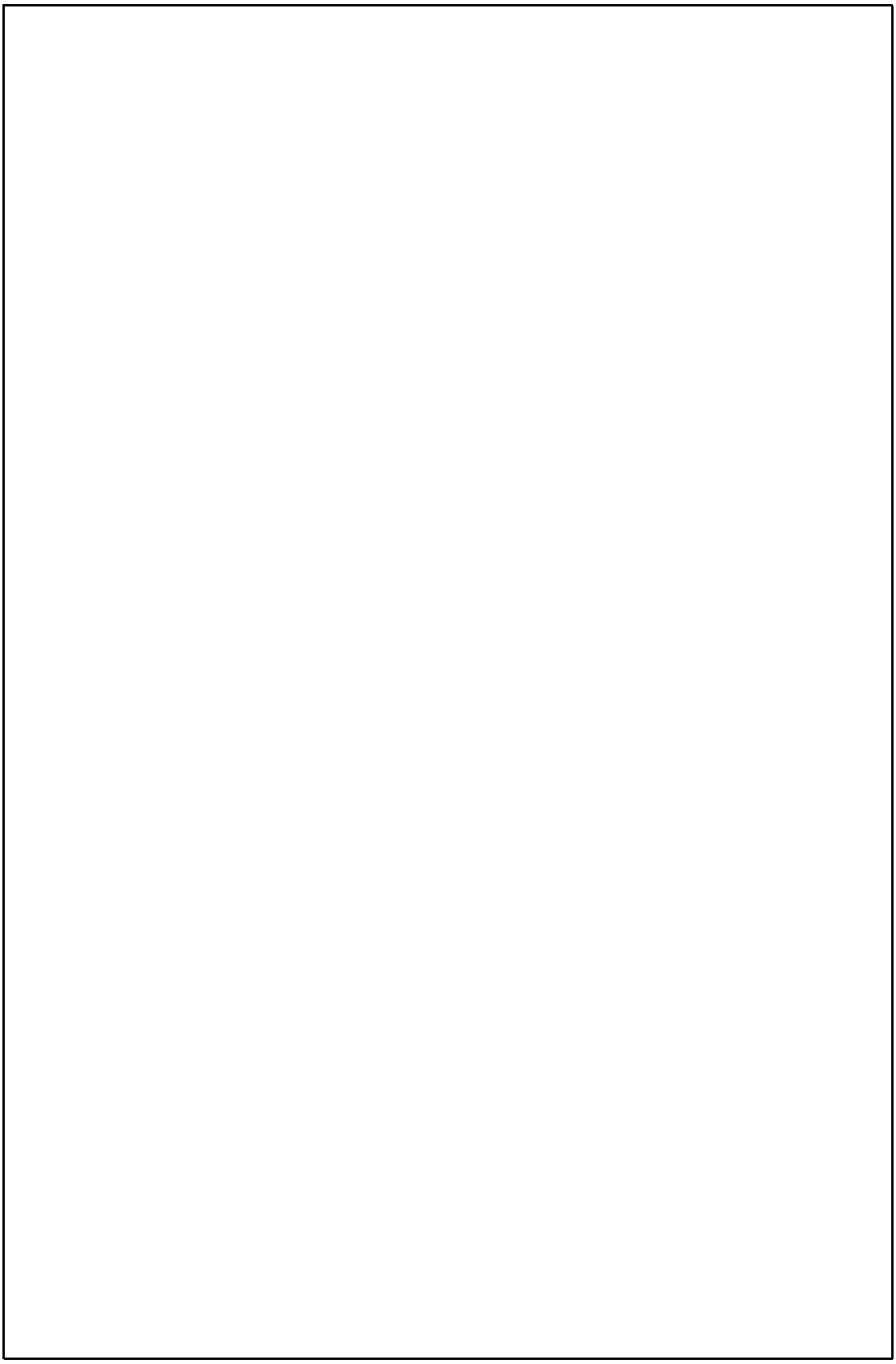
Since 1989 no new fishing licenses were assigned in Italy and a progressive reduction of fleet capacity is occurring.

The adoption of the fishing closure of 30-45 days per year since late eighties have should contributed to reduce the fishing effort on demersal resources off the Sicilian coast. However this measure for many years had low efficacy in Sicily because the period of stopping trawling was not chosen to reduce fishing mortality on juveniles (late summer-early autumn).

Coupling the trawling ban in autumn, when the young red mullets move deeper, with the existing prohibition of trawling within three nautical miles from the coast, where the fish recruit in summer (Voliani, 1999), has proved to produce a remarkable increase of the stock size (Relini et al., 1996; Pipitone et al., 2000). Since 2008 the seasonal trawling ban for Sicilian trawlers was done in September–October contributing to improve the stock status of red mullet.

Accompanying species

Red Mullet is caught together with other important species such as *Mullus surmuletus*, *Merluccius merluccius*, *Pagellus* sp., *Uranoscopus scaber*, *Raja* sp., *Trachinus* sp., *Octopus vulgaris*, *Sepia officinalis*, *Eledone* sp. and *Lophius* sp.



Data source*	EC 1967/2006	OpUnit 2*	ITA 99 F 03 33 - MUT

Regulations in force and degree of observance of regulations

The European Commission regulation 1967/2006 fixed a minimum mesh size of 40 mm square or 50 mm diamond for bottom trawling of EU fishing vessels after July 2008, however derogations were possible until 2010. The regulation CE 27 June 1994 n°1626 of the European Union fixed the minimum marketable size of Mullus sp. at 11 cm total length. This minimum length, confirmed by the new regulation CE 1967 of 21 December 2006, is valid for both Italian and Maltese fishing boats operating in the area.

Accompanying species

Red Mullet is caught together with other important species such as *Mullus surmuletus*, *Merluccius merluccius*, *Pagellus* sp., *Uranoscopus scaber*, *Raja* sp., *Trachinus* sp., *Octopus vulgaris*, *Sepia officinalis*, *Eledone* sp. and *Lophius* sp.

Data source*	EC 1967/2006	OpUnit 3*	ITA 99 M 07 33 - MUT

Regulations in force and degree of observance of regulations

Accompanying species

Red Mullet is caught together with other important species such as *Mullus surmuletus*, *Merluccius merluccius*, *Pagellus* sp., *Uranoscopus scaber*, *Raja* sp., *Trachinus* sp., *Octopus vulgaris*, *Sepia officinalis*, *Eledone* sp. and *Lophius* sp.

Data source*	EC 1967/2006	OpUnit 4*	MLT 99 E 03 33 - MUT

Regulations in force and degree of observance of regulations

At present there are no formal management objectives for red mullet fisheries in the Strait of Sicily. As in other areas of the Mediterranean, the stock management is based on control of fishing capacity (licenses), fishing effort (fishing activity) , technical measures (mesh size and area closures), and fish size limits.

In order to limit the over-capacity of fishing fleet, Maltese fishing licenses have been fixed at a total of 16 trawlers since 2000. Eight new licences were however issued in 2008, a move made possible under EU law by the reduction of the capacities of other Maltese fishing fleets.

In terms of technical measures, the new regulation EC 1967 of 21 December 2006 fixed a minimum mesh size of 40 mm for bottom trawling of EU fishing vessels (Italian and Maltese trawlers). Mesh size had to be modified to square 40 mm or diamond 50 mm in July 2008, and derogations were only possible up to 2010.

Accompanying species

Red Mullet is caught together with other important species such as *Mullus surmuletus*, *Merluccius merluccius*, *Pagellus* sp., *Uranoscopus scaber*, *Raja* sp., *Trachinus* sp., *Octopus vulgaris*, *Sepia officinalis*, *Eledone* sp. and *Lophius* sp.

Data source*	EC 1967/2006	OpUnit 5*	MLT 99 M 07 33 - MUT

Regulations in force and degree of observance of regulations

Accompanying species

Red Mullet is caught together with other important species such as *Mullus surmuletus*, *Merluccius merluccius*, *Pagellus* sp., *Uranoscopus scaber*, *Raja* sp., *Trachinus* sp., *Octopus vulgaris*, *Sepia officinalis*, *Eledone* sp. and *Lophius* sp.

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Assessment form

Sheet A1
Indirect methods: VPA, LCA

Code: MUT9911F.F

Sex*	F & M

Analysis # *	LCA

Time series

Data	Size	Age
(mark with X)	x	

Model	Cohorts	Pseudocohorts
(mark with X)		x

Equation used	VPA	Tunig method	none
# of gears	2	Software	Vit4Win
$F_{terminal}$	0.5 females, 0.6 males		

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum			Recruitment	40.2	
Average			Average population		
Maximum			Virgin population		
Critical			Turnover		
				millions	

Average mortality

		Gear					
	Total						
F_1	0.78						
F_2							
Z							

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

Comments

F1 = Average Fcurrent in 2006-2010, taking into account ages 1-4.

According to VIT analysis, absolute estimations of SSB (combined sex) in the 2006-2010 was 1070 t in 2006, 1307 t in 2007, 1046 t in 2008, 905t in 2009 and 1072 t in 2010.

The estimates of absolute recruitment in millions of individuals (age class 0) from VIT analysis in 2006-2010 were 39.3 in 2006, 57.7 in 2007, 48.0 in 2008, 31.6 in 2009, and 40.2 in 2010.

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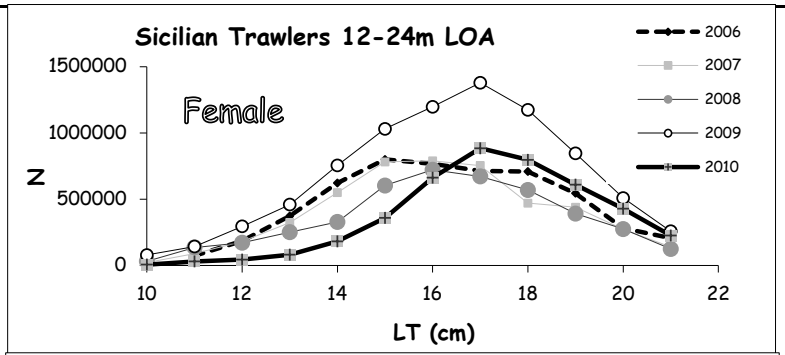
Assessment form	**Sheet A2** **Indirect methods: data**

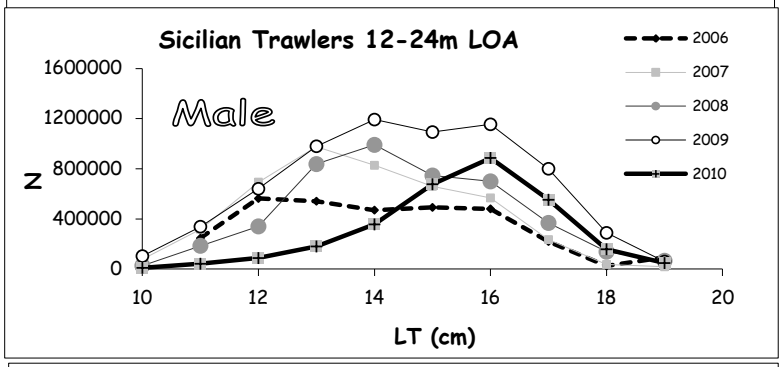
Code: MUT9911F.F

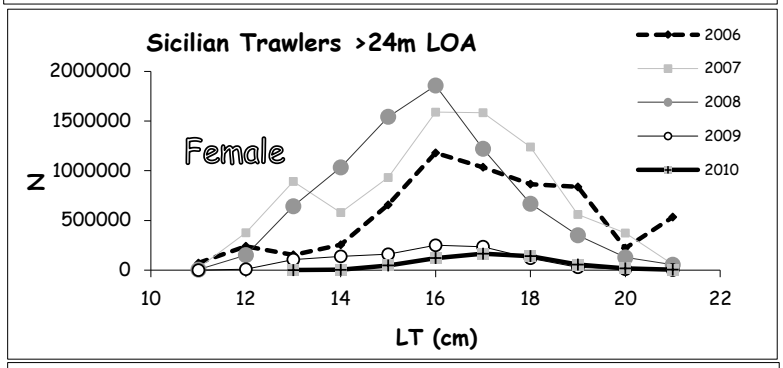
Sex*	M / F	Gear*	OTB	Analysis # *	**LCA**

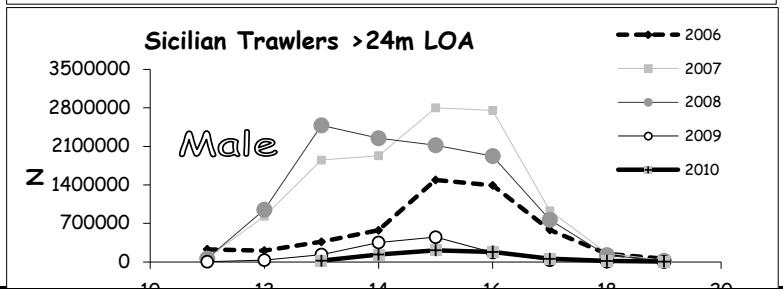
Data source	LFD, Sicilian trawlers

Data



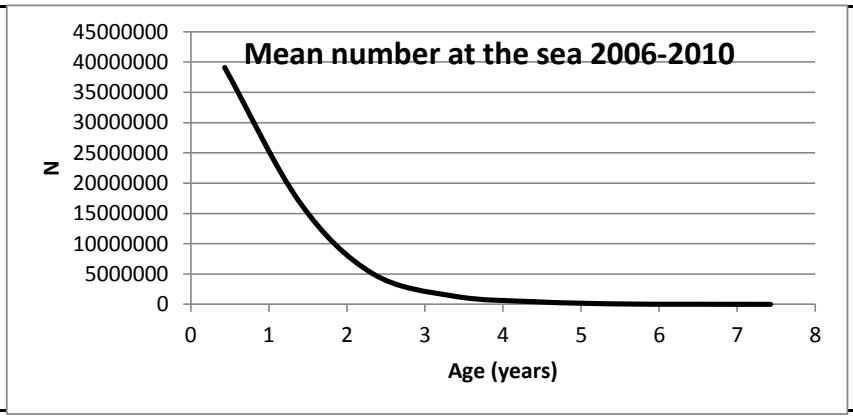




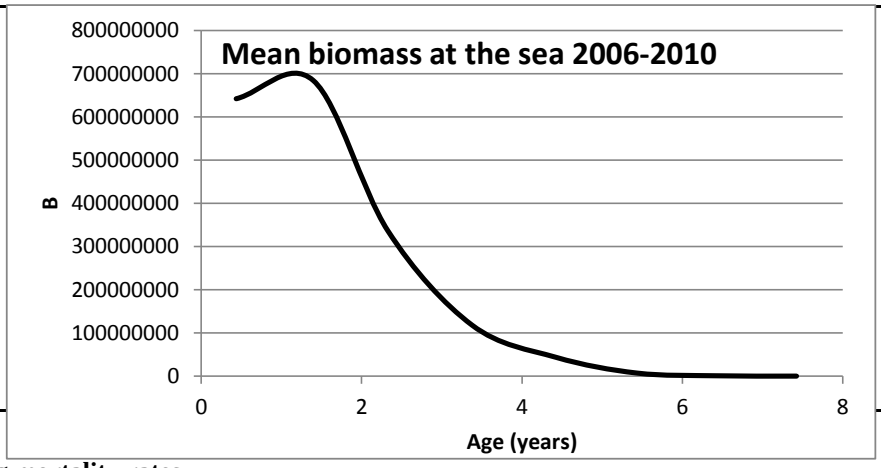


Sex*	F	Gear*	OTB	Analysis #*	LCA

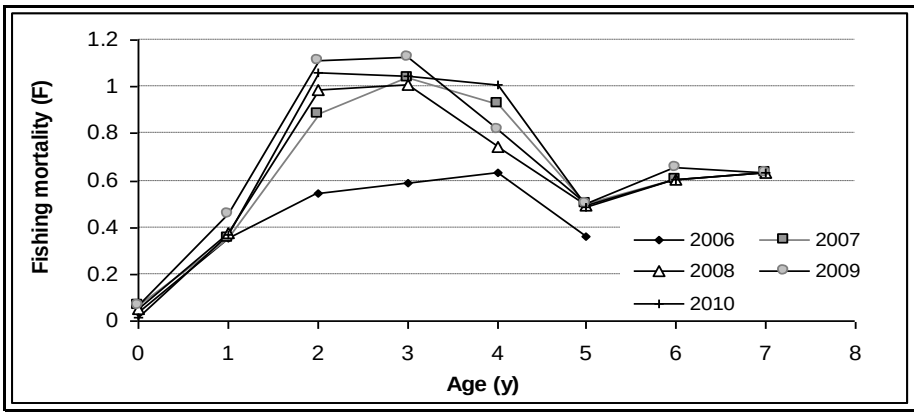
Population in figures



Population in biomass



Fishing mortality rates



Fishing mortalities rates (F) by age for combined sexes of *M. barbatus*

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Assessment form

Sheet Y
Indirect methods: Y/R

Code: MUT9911F.F

Sex	F & M

Analysis #	Y/R

# of gears	n/a	Software	Vit4Win

Parameters used

Vector F	
Vector M	
Vector N	

Model characteristics

Results given below refer to 2010 estimation of yield (g), biomass (g) and SSB (g) per recruit varying fishing mortality by a multiplicative factor as implemented in the Vit4Win package.

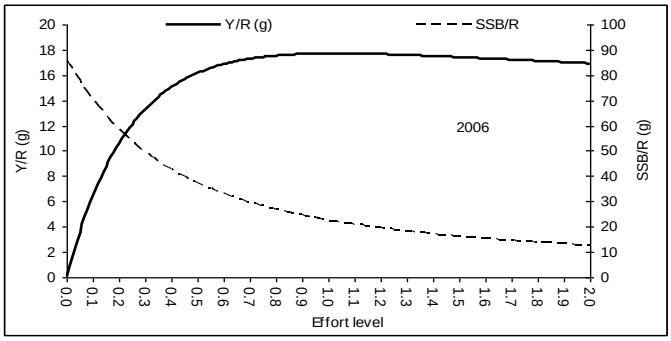
Results

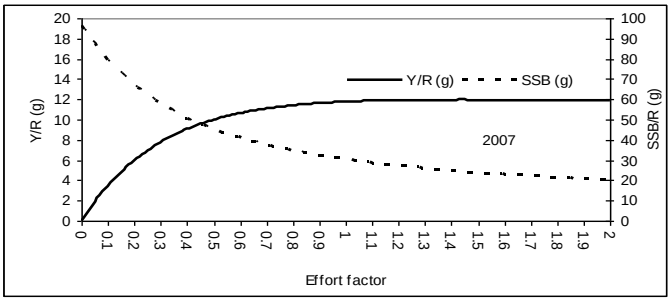
	Total	Gear			
		Vessels 12-24m	Vessels > 24m		
Current YR	17.26	13.7	3.56		
Maximum Y/R	17.4	13.64	3.76		
Y/R 0.1	16.02	12.98	3.03		
F_{max}					
$F_{0.1}$	0.51				
Current B/R	34.39				
Maximum B/R	30.52				
B/R 0.1	45.16				

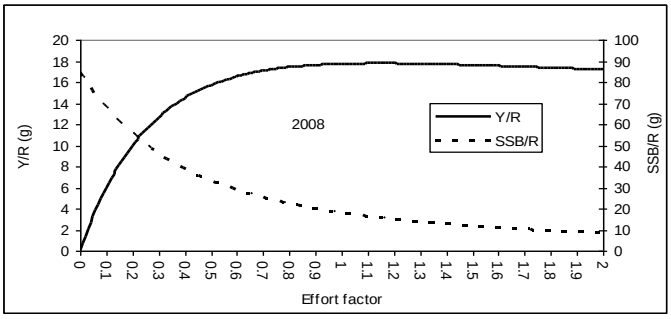
Comments

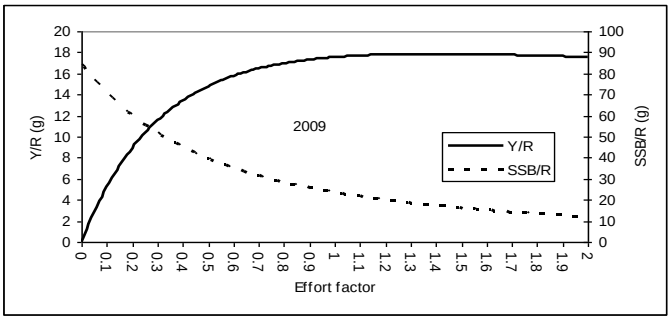
Figures below show the yield and SSB per recruit under varying current fishing mortality (Fc) according to the VIT package (combined sex).

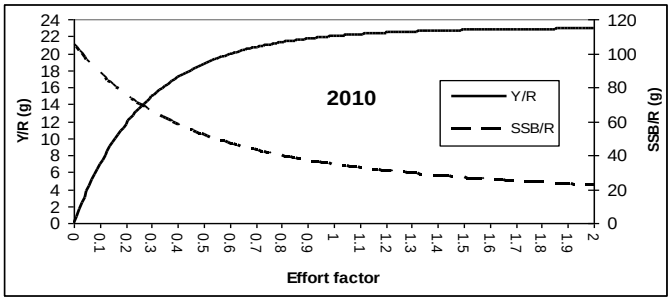
Comments


Y/R (g)
SSB/R
2006
Effort level


Y/R (g)
SSB (g)
2007
Effort factor


Y/R
SSB/R
2008
Effort factor

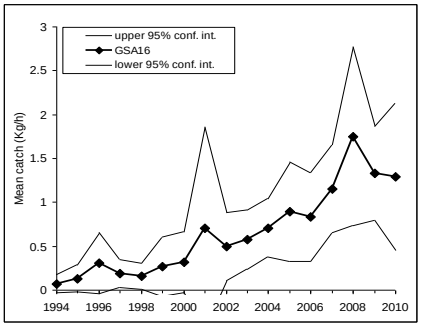

Y/R
SSB/R
2009
Effort factor

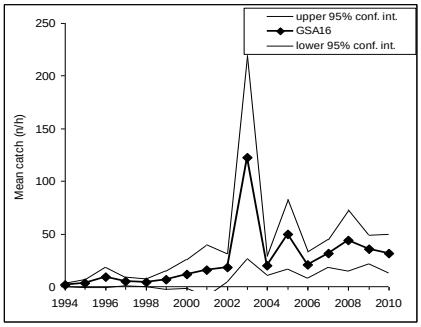

Y/R
SSB/R
2010
Effort factor

Other assessment methods

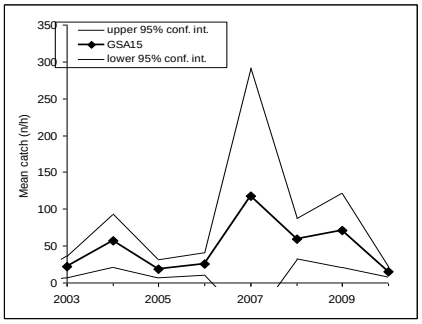
Fishery independent information regarding the state of the red mullet in GSA 16 was derived from the international survey Medits.

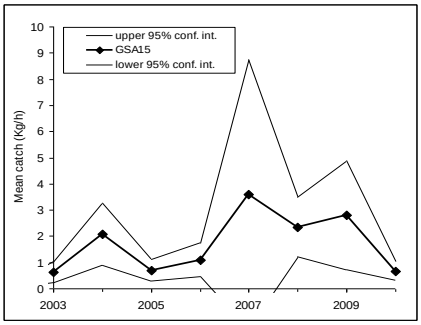
Figures below display the estimated trend in red mullet abundance and biomass in GSA 15 and GSA 16.





Abundance and biomass indices of red mullet in GSA 16.

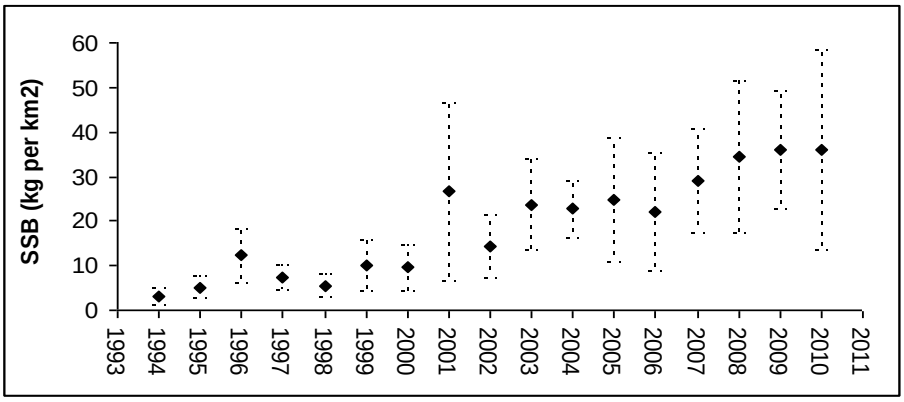




Abundance and biomass indices of red mullet in GSA 15

Other assessment methods

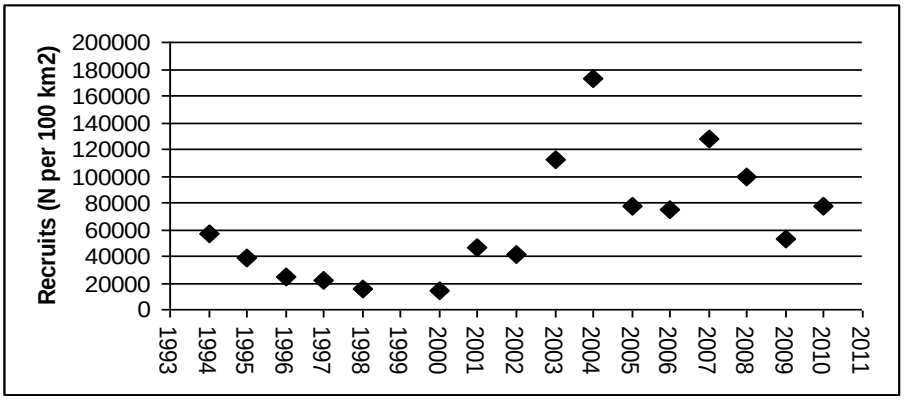
Biomass indices derived from scientific surveys in spring-summer (MEDITS), which is representative of SSB, show a clear increasing trend of spawners'abundance since early 1990s.



Biomass indices derived from scientific surveys in spring-summer (MEDITS). Almost the individuals is mature in this season being representative of SSB at sea.

Other assessment methods

The time series of recruitment indices from trawl surveys in autumn (GRUND surveys) carried out in GSA 16 (individuals smaller than 11 mm CL) showed an increasing trend of recruitment, with high value in 2003-2004 and 2007-2008 that were years affected by strong positive anomalies of the seawater surface temperature (B. Patti personal communication).



Recruit indices derived from scientific surveys in autumn (GRUND). Since the GRUND surveys was not carried out in some years (1999 and 2007) and was suspended since 2009, lacking data was derived from LCA strength of recruitment estimates

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Assessment form	**Sheet D Diagnosis**

Code: MUT9911F.F

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B	34.39		45.16		Biomass and yield values are per recruit
SSB	25		35.75		
F	0.87		0.45		(VIT analysis, F0.1 based on 2006-2010 results, Fc = 2010)
Y	17.26		16.02		
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 of red mullet in the Northern sector of the Strait of Sicily is in overfishing since the current fishing mortality is higher than F0.1 and lower than Fmax. However a decrease of fishing mortality from the 2006-2008 (0.67-0.69) to 2009-2010 (0.58-0.59) was detected suggesting an improvement of the fishery pattern.

Code: MUT9911F.F

Management advice and recommendations*

Considering the Sicilian fleet operating in GSAs 15-16, for which both commercial data were available, a reduction of about 40% of the fishing mortality needs to reach the technical target Reference points F0.1=0.45 (median value of the 2006-2010 assessment). However stock size show an increasing trend of SSB and recruitment indices from trawl surveys. This could be correlated with the reduction of illegal trawling in the coastal areas within the 50 m depth where the recruitment of the species occur in late summer-early autumn, to the reduction of fishing effort since 2008 and to the positive effect of warming of the surface seawater on the recruitment success.

The working group was informed that the Italian government has adopted a management plan in which a reduction of trawler capacity of 25% of that existing in 2008 is planned within 2013. It is recommended to continuously reduce current F through consistent effort reductions, and an improvement in current exploitation patterns.

Advice for scientific research*

Abstract for SCSA reporting

Authors F.Fiorentino1, L. Knittweis2, V. Gancitano1, R. Mifsud2, F. Gravino2, G. Garofalo1

Year 2011

Species Scientific name Mullus barbatus - MUT

Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area 15 - Malta Island, 16 - South of Sicily

Fisheries (brief description of the fishery)*

Red mullet (M. barbatus) is one of the main demersal resources of the coastal areas in the Mediterranean, fished by otter trawl and trammel and gill-net, together with other several species (Voliani, 1999).

Red Mullet is caught together with other important species such as Mullus surmuletus, Merluccius merluccius, Pagellus sp., Uranoscopus scaber, Raja sp., Trachinus sp., Octopus vulgaris, Sepia officinalis, Eledone sp. and Lophius sp. In GSA 15 and 16 red mullet is caught almost exclusively by inshore trawlers operating on shelf fishing-groundsof GSA 16 and 15.

Landings decreased from 1,626 t in 2004 to 770 t in 2010. Demersal otter trawlers dominate the landings by far. In 2005-2010 Maltese landings on average contribued 0.7% to the total landings made by the Maltese and Italian fleets using bottom otter trawls and trammel nets.

Source of management advice*

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

Five complete years (2006-2010) of length frequency distributions from GSA 16 commercial landings data (fished in GSA 15 as well as GSA 16) were available, so an approach under steady state (pseudocohort) assumptions was used. Cohort (VPA equation) and Y/R analysis as implemented in the package VIT4win were thus used. Data were derived from the DCF data call for GSA 15 (total landings data only) 16 (LFDs as well as total landings data). In addition, fishery independent information regarding the state of the red mullet in GSA 16 was derived from the international survey MEDITS and the Italian survey GRUND. Trends in abundance and biomass indices as well as length frequency distributions were plotted.

Stock Status*

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;

Exploitation rate

High fishing mortality

Stock abundance

Intermediate abundance

Comments

Management advice and recommendations*

Considering the Sicilian fleet operating in GSAs 15-16, for which both commercial data were available, a reduction of about 40% of the fishing mortality needs to reach the technical target Reference points $F_{0.1}$= 0.45 (median value of the 2006-2010 assessment). However stock size show an increasing trend of SSB and recruitment indices from trawl surveys. This could be correlated with the reduction of illegal trawling in the coastal areas within the 50 m depth where the recruitment of the species occur in late summer-early autumn, to the reduction of fishing effort since 2008 and to the positive effect of warming of the surface seawater on the recruitment success.

The working group was informed that the Italian government has adopted a management plan in which a reduction of trawler capacity of 25% of that existing in 2008 is planned within 2013. It is recommended to continuously reduce current F through consistent effort reductions, and an improvement in current exploitation patterns.

Advice for scientific research*