

CONSIGLIO NAZIONALE DELLE RICERCHE IRMA

Istituto di ricerche sulle Risorse Marine e l'Ambiente

Via Luigi Vaccara, 61 - 91026 - MAZARA DEL VALLO (TP) Tel. 0923-934116 - 948966 - Fax 906634

e-mail fabiof@irma.pa.cnr.it

ED/TN/FF/4/0600/REL.1

Fabio Fiorentino

A compilation of information on stock assessment in

the GFCM areas presented in standard forms

1. Preface

In the framework of the Scientific Advisory Committee (SAC)-GFCM mandate to develop standard forms and procedures to present data and results on stock assessment in the Mediterranean, it was recognised necessary to submit, at the first Working Group and SCSA meetings, the compilation of the existing information on assessments by the GFCM management units.

With the support of FAO COPEMED project and taking into account the suggestions of the co-ordinator of the Subcommittee for Stock Assessment of the SAC of the GFCM, J. Lleonart, the available data were collected and transfered into appropriate data sheet for consideration and review by the Small Pelagic and Demersal Working Groups. Data concerned the following species:

- Sardina pilchardus
- Engraulis encrasicolus
- Sardinella aurita
- Merluccius merluccius
- Mullus spp.
- Micromesistius poutassou
- Aristeus antennatus

The methodology, the implementation process and the results of this metaanalysis (review of related research studies) were presented at the Working Groups on Small Pelagics and Demersals.

Data and results of available assessments carried out in the last 15 years in Mediterranean were collected, reviewed, stored and presented in a "standard form" as preliminary tool for the work of the first stock assessment Working Groups of Sub-Committee for Stock Assessment (SASC).

These "provisional standard forms" will be used as first basis discussion for defining the scheme of the "new standard form" that will be used for next assessment in the Mediterranean.

The provisional standard forms were presented and reviewed during the two first Working Groups of SASC (Little Pelagic – Fuengirola 1-3 March 2000 and Demersal – Séte 21-23 March 2000).

Taking in mind the aims of the SAC, assessment and parameters for each species were elaborate in order to give the most recent values for each Fishing Management Unit (FMU) and, when possible, keeping separate gear and harbour, on the basis of the last definition of Operative Unit, achieved in the meeting of Barcelona (January 2000, 25-27).

2. Material and method

Meta-data used for the preparation of provisional standard forms were taken mainly on WinPopDyn, an existing data-base implemented by FAO (Coppola et al., 1994), that already contained many information on fisheries and resources of Mediterranean.

Data stored in WinPopDyn derived mainly from published papers, although there are also some information coming from "grey literature".

• Small Pelagic Working Group

Considering the target species of the Small Pelagic Working Group, the user version of WinPopDyn received from FAO, contained the following records:

Sardina pilchardus : 50 Sardinella aurita : 7 Engraulis encrasicolus : 75

New references were added in order to update the version of database and prepare the provisional standard forms as follows:

Sardina pilchardus : 86 (increase of 72%) Sardinella aurita : 9 (increase of 29%) Engraulis encrasicolus : 115 (increase of 53%)

• Demersal Working Group

Regarding the target species of the Demersal Working Groups, the user version of WinPopDyn received from FAO contained the following records:

Merluccius merluccius : 105 Mullus barbatus :79 Mullus surmuletus : 26 Micromesistius poutassou: 15 Aristeus antennatus: 33

New references were introduced in order to bring up to date the version of database and prepare the provisional standard forms as follows:

Merluccius merluccius : 131 (increase of 25%) Mullus barbatus : 105 (increase of 33%) Mullus surmuletus : 39 (increase of 50%) Micromesistius poutassou: 22 (increase of 46%) Aristeus antennatus: 37 (increase of 12%)

3. Some comments about the WinPopDyn

General :

One of the main problems found in working with WinPopDyn consisted in difficulty in inputting time series of Biomass and Recruitment values. This information was requested in the first module, but the program did not allow easily adding more than one value.

Another problem was represented by the impossibility to input data in vectorial form (for example, the F array calculated from Virtual Population Analysis or similar approaches, or the M vector derived from analytical methods).

A further problem was the absence of a field showing the Fishing Management Unit (FMU), in which Mediterranean was divided for management purposes. This field should be obtained transforming fields that are useless for GFCM purpose (for instance the "FAO fishing Area – that will be always "Mediterranean and Black Sea") in a FMU field.

Particular :

<u>WinPopDyn General</u>: it would be useful to insert the field "Management Unit", which is now absent. This field should be added to all the other forms.

<u>WinPopDyn Fishery</u>: to complete the description of fishery status a field concerning a recent measure of fishing effort "Recent f", useful in "surplus production models" should be added. Regarding the yield per recruit analysis a field concerning recent Y/R should be added.

<u>WinPopDyn Assessment</u>: Taking into account the Surplus production models, a field concerning the fishing effort at MSY (f msy) and f $_{0.1}$ should be added.

<u>WinPopDyn Growth</u>: The main modifications for this module might consist in changing the field "Source for K" in "Aging method" and that "Method for t_0 " in "Growth parameters method".

WinPopDyn Mortality and Reproduction: No specific comment - see general comments.

4. Results

The provisional standard forms reporting results of the assessments in the GFCM areas, with the bibliographic references, were presented in tables 1 to 73.

More in detail:

- Engraulis encrasicolus from table 1 to 11;
- Sardina pilchardus from table 12 to 19;
- Sardinella aurita no assessments were available in literature
- Merluccius merluccius from 20 to 40;
- Micromesistius poutassou from 41 to 45;
- Aristeus antennatus from 46 to 52;
- Mullus barbatus from 53 to 69 ;
- Mullus surmuletus from 70 to 73.

It was very difficult to summarise in standard forms the results of assessments available for the Mediterranean given the remarkable differences in the methodology and terminology used in assessment procedures and methods.

Taking in mind the FAO subdivision of Mediterranean into the three main subareas - 37.1 (Western Basin), 37.2 (Central Basin) and 37.3 (Eastern Basin) -, a general lack of information for the Eastern Mediterranean, with the exception of Greece was found. As Cyprus concerns the assessments available were limited to red mullets (table A).

Considering the small pelagics species, only 27 papers dealt with stock assessments (17 on anchovy and 10 on sardine). No assessment was available in literature for *Sardinella aurita*. 12 assessments concerned with the Western basin, 6 assessments with the Central basin and only 4 with the Eastern basin.

Considering demersal species, only 58 of papers contained in the data-base dealt with stock assessments (23 on hake, 17 on red mullet, 5 on striped red mullet, 5 on blue whiting and 8 on blue and red shrimp. 36 assessments regarded the Western Basin, 14 assessments the Central Basin and only 5 the Eastern Basin.

		Engraulis	Sardina	Merluccius	Micromesistiu	Aristeus	Mullus	Mullus	TOTAL
		encrasicolus	pilchardus	merluccius	s poutassou	antennatus	barbatus	surmuletus	
MANA	GEMENT UNIT								
1.1.a	Balearic Islands			1				1	2
1.1.b	Spain	2	2	1	2	2	3		12
	(exc.Alboran)								
1.1.c	Algeria	1	1	1		1			4
1.1.d	Alboran Sea	1	1						2
1.2.e	Gulf of Lion	1	1	1					3
1.3.h	Sardinia			1			1		2
1.3 i	North Sicily			1		1			2
1.3.j	Italy-North	2		5+1	1	3	6		18
	Messina								
1.3.k	North Tunisia			1		1		1	3
2.1.a	North Adriatic	1	1	1			1		4
2.2.b	South Adriatic	2		1	1		1		5
2.2.c	Ionian Sea (Italy)			1	1		1		3
2.2.d	Ionian Sea			3					3
	(Greece)								
2.2.e	South-East Sicily	1	1				1		3
2.2.f	Gulfs of Gabes			1				1	2
	and Hammamed								
3.1.a	Aegean Sea	1		3			2	1	7
3.2.c	Cyprus						1	1	2
TOTAL		12	7	23	5	8	17	5	77

Table A – Assessment of main target species carried out in Mediterranean for Management Units.

Table 1 - Gene	ral Data				
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:
Engraulis encrasicolus	Balearic	1.1.b	Spain	Light Attraction Purse Seine	
Biomass in tons: DEPM: 10000 (1993-94)* ES: 8000(1991-93) (2) LCA : (1992-93) Barcelona port – 2700 Castellon port – 4750 Port selva – 2150	Recruitment in millions: (1992-93) Barcelona port – 900000 at 5.5 cm TL Castellon port – 470000 at 10 cm TL Port selva – 275000 at 6.5 cm TL	 Management options Minimum legal to Areas within 300 and/or shallower prohibited for any Gear cannot be la length and 100 in 	tal length of 9 cm m from the coast than 30 m are purse seiner. arger than 330 m in height.	 Recommendations: With the exception seiners, the increase decrease if Increase minimum decrease Y/R bur spawning biomas Since the recruiter and winter closing period is recommendation 	on of Barcelona ease of F should not in Y/R. m size would t should increase the ss. ment occur in autumn g fishing in this hended.
Note : * DEPM carrie The biomass estimate (1996-3281 tons; 97-	ed out along Catalan ar ed by echo-surveys alo 12243; 98-1569; 99-55	nd Valencian coasts up ong the Catalan coast i18-see annex 5 to the	p to 200 m depth. in the most recent yea Report)	rs is lower than those	found in 1991-93
Fishery and As	ssessment				
Operational unit Fishing along Catalan coast (Barcelona, Port Selva and Castellon)	Stock Status: Risks of Recruitment overfishing	L ₂₅ L ₅₀ =L _c L ₇₅	Age at first capture (t _c):	Mean Length of captu (1992-93) Barcelona port – 8.4 Castellon port – 12.2 Port selva – 10.2	ure in cm TL:
Recent Y:	Recent Y/R in g : (1992-93) Barcelona port – 2.4 Castellon port – 5.5 Port selva – 2.7	%VB - % of current biomass out the expected virgin one (1992-93) Barcelona port – 26 Castellon port – 48 Port selva – 60	Recent F or f: (1992-93) Barcelona port – F=0 Castellon port – F=0. Port selva – F=0.132).533 334	Recent E:

Biology						
L _∞	W _∞	K	to	L max.		
F+M= 20.6 cm TL		F+M= 0.38 y⁻¹	F+M=-0.94 y			
L _r	T _r	A	В	L _m	Tm	
				F+M= 12.6 cm TL		
		F+M= 0.002145 (g	F+M= 3.4121			
		cm⁻³)				
M	T C°	Ageing method	VBGF method	M method		
F+M= 0.81		LFM		Pauly (1980)		
Note:						
References:						
(1) Pertierra J.P., Lleonart J. (1996) – Scientia Marina 60 (Supl.2): 257-267.						
(2) Abad R. et al. (19	996) – FAO Fish. Rep.	537: 191-193.				
(1) Pertierra J.P., Lie (2) Abad R. et al. (19)	996) – FAO Fish. Rep.	537: 191-193.	1:257-267.			

Table 2 - Gene	ral Data						
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:		
		1.1.b	Spain	Light Attraction			
Engraulis	Balearic			Purse Seine			
encrasicolus				Trawling			
Biomass in tons:	Recruitment in millions:	Management options	:	Recommendations:			
DEPM:				 Increase minimul 	m size to 10.5-11 cm		
	(1988-89)			TL, that is close t	o the length at		
ES: 12000 (1991-				maturity.	Ū		
93) (2)	1300			 Close fishing in w 	vinter.		
				 Limit the use of tr 	rawling for anchovy		
LCA : (1988-89)				fishing	v		
9000							
Note : ES carried out	along Valencian coas	ts up to 200 m depth (2	2)				
The biomass estimate	ed by echo-surveys in	the most recent years	is lower than those fou	und in 1991-93 (1996-1	1562 tons; 97-365;		
<u>98-835; 99-199-see a</u>	annex 5 to the Report)						
Fishery and A	ssessment						
Operational unit	Stock Status:	L ₂₅	Y/R _{max.} in g :	Mean Length of captu	ure in cm TL:		
		$L_{50}=L_{c}$					
Fishing along	Fully exploited	L ₇₅	(1988-89)	(1988-89)			
Valencian coast			All gears - 4.1	Purse seine - 12			
Purse seine				Trawler - 10.5			
Trawler							
Recent Y:	Recent Y/R in g :	Virgin Biomass (B ₀) in tons:	Recent F or f:		Recent E:		
All gears	(1988-89)	(1988-89)	(1988-89)				
5300 tons (1988-89)	Purse seine - 3		Purse seine – 0.4*				
	Trawler - 1	26500	Trawler - F=0.22*				
Note: Parameters obt	tained by LCA and Y/R	simulations. *F calcul	ated from a vector as	mean of values corres	ponding to the mean		
length of capture. The Sensitivity analysis shown that variations both in M and K can heavily affect Y/R simulations							

Biology							
L _∞	W _∞	K	to	L max.			
F+M= 19.1 cm TL		F+M= 0.35 y ⁻¹	F+M=-0.95 y				
L _r	Tr	A	В	L _m	Tm		
		F+M= 0.002145 (g cm ⁻³)	F+M= 3.4121				
M	F _{term.} :	Ageing method	VBGF method	M method			
F+M= 0.54	F+M= 1.55	Otolith readings					
Note:							
References:							
 Lleonart J. (1990) conseguimiento: Abad R. et al. (1990) 	 References: (1) Lleonart J. (1990) – La pesqueria de Cataluna y Valencia: description global y planteamiento de las bases para su conseguimiento: Informe Final. Commision de las Comunidades Europeas, DG XIV : 1634 p. (2) Abad R. et al. (1996) – FAO Fish. Rep. 537: 191-193. 						

Table 3 - Gene	Table 3 - General Data						
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:		
Engraulis encrasicolus	Balearic	1.1.d	Spain + Morocco	Purse seiner			
Biomass: Area: DEPM: ES: 1780 (1991-92) VPA:	Spanish Coast (1)	Recruitment:	Management options :	Recommendations:			
Note: Echo surveys o	arried out in October a	and November betwee	n 20 and 200 m depth	(1).			
Fishery and A	ssessment						
Operational unit	Stock Status:		L ₂₅ L ₅₀ =L _c	Mean Length of capture:			
	No assessments for	Spanish coast	L ₇₅				
	Over exploited (Moroccan coast) * (2	2)					
Recent Y: 1992 tons (1998) Moroccan coast (2)	Recent Y/R :	Recent Z:	Recent F or f: f= 5300 trip per year (1997) (2)	Recent E:			
Note: * Although a sli decreasing (2)	ght increase of anchov	y landings was recogi	nised from 1994 onwar	d, the CPUE from 199	92 onward was		
Biology							
L _∞	W _∞	к	to	L max.			
L _r	Tr	A	В	L _m	Tm		
Μ	T C°	Ageing method	VBGF method	M method			
Note:							
References:							
 (1) Abad et al. (1996) – FAO Fish. Rep. 537: 191-193. (2) INRH (2000) – Note succincte sur la pecherie petits pelagiques mediterraneenne du Maroc. Paper presented at WG on small pelagics. Fuengirola (Spain) 1-3 March 2000: 11p. 							

Table 4 - Gene	eral Data				
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:
Engraulis encrasicolus	Balearic	1.1.c	Algeria	Purse seiner	
Area:	Biomass: DEPM: ES:	Recruitment:	Management options :	Recommendations:	
	VPA:				
Note :	·	•	·	·	
Fishery and A	ssessment				
Operational unit	Stock Status:	L ₂₅ L ₅₀ =L _c = 11.2-12.5 cm TL L ₇₅	Age at first capture (t _c):	Mean Length of capture:	
Recent Y:	Recent Y/R :	Recent Z: Z loss =1.39	Recent F or f: F=0.44-0.55	Recent E: E=0.32-0.39	
Note: Assessment ba	ased on Beverton and	Holt Relative Yield per	Recruit Model (Y'/R).	Yield curves does not	show any maximum.
Biology					
L _∞ in cm TL F= 16.1 M= 15	W _∞	K F= 0.46 M= 0.53	t _o	L max.	
L _r	T _r	A	В	L _m	Tm
М	T C°	Ageing method	VBGF method	M method	
F= 0.84 M= 0.94		LFM	Wetherall et al. + ϕ '	Pauly (1980) + correction for small pelagics (0.8)	
Note:					
References: (1) Chavance P. et al	l. (1986) – FAO Fish. F	Rep. 347: 186-204			

Table 5 - Gen	Table 5 - General Data					
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:	
Engraulis encrasicolus	Gulf of Lions	1.2.e	France + Spain	Trawling + Purse seiner		
Area:	Biomass:	Recruitment:	Management	Recommendations:	•	
2940 km ² (ES) (1)	DEPM: 41700 (1993-		options :			
	94) (2)	(1992-93)				
	ES: 50783 (1995-97)	VPA: 880000 millions				
	(1)	at 8.5 cm TL in Séte				
	VPA: 8450 (1992-93;	Port (2)				
	Séte landings) (2)					
Note : Echo survey	s carried out during Jul	y in order to evaluate th	e spawning stock biom	nass. Values obtained	in the last three	
years shown an inc	reasing trend (1)					
Fishery and	Assessment					
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	%VB = % of current	
		$L_{50}=L_{c}$	(t _c):	capture:	biomass out the	
	Moderately	L ₇₅		Trawlers of Séte –	expected virgin one	
	exploited (1)			11.4 cm TL ((2)		
Recent Y:	Recent Y/R :	Recent Z:	Recent F or f:	Recent E:	(1992-93)	
7690 tons (1995-97	')*		F=0.18** (1)		Séte – 56 (2)	
(1)			F=0.2 *** (2)			
Note: * referred onl	y to French catches;**	calculated as ratio betw	een annual catches ar	nd spawning standing	stock (ES);***F	
calculated from a v	ector as mean of value	s corresponding to the I	mean length of capture	e.		
In Sète about 10%	of the catches appears	smaller than the length	at maturity (2)			
Biology						
L _∞	W∞	K	t ₀	L max.		
F+M= 20.6 cm TL (2)	F+M= 0.38 y ⁻⁺ (2)	F+M=-0.94 y (2)			
L _r	Tr		В	L _m	Tm	
		2	F+M= 3.4121 (2)	F+M= 12.6 cm TL		
	F+M= 0.002145 (g	<u>r</u> cm ^{-s}) (2)				
М	T C°	Ageing method	VBGF method	M method		
$F_{\pm}M_{\pm} = 0.81(2)$		L FM (2)		Pauly (1980) (2)		
References:				1 adiy (1500) (2)		
(1) Guennedan V 4	et al. (2000) – Exploitati	on des netits nelacione	s dans le Golf du Lion	et suivi de l'evolution d	les stocks nar echo-	
integration de 1999	a 2000 Paper present	ed at WG on small nels	acics Fuendirola (Snai	n) 1-3 March 2000.27		
(2) Pertierra J.P., L	leonart J. (1996) – Scie	entia Marina 60 (Supl.2)	: 257-267.	,	F.	

Table 6 - General Data						
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:	
Engraulis encrasicolus	Sardinian	1.3.j	Italy	Purse seiner		
Area:	Biomass in tons:	Recruitment:	Management	Recommendations		
	DEPM: 5800 (1993)* ES: 650 (1993)** TS: VPA: 375 (1992-93: Sestri Levante landings)	VPA:48000 in millions at 9 cm TL (1992-93: Sestri Levante landings)		 Considering grobe obtained about 49 caught before t increase minimi increase the sp The recruitmen and winter, fish this period. 	owth, the Ymax should ove the current F. % of anchovy is he length at maturity, um size should awning biomass. t occurring in autumn ing should be close in	
Note: *All Ligurian Sea; ** From coast off Genoa to the Magra River (Liorzou pers.comm.)						
Fishery and A	ssessment					
Operational unit Purse seiners of Sestri Levante	Stock Status:	L_{25} $L_{50}=L_{c}$ L_{75}	Age at first capture (t _c):	Mean Length of capture in cm:	%VB = % of current biomass out the expected virgin one	
Recent Y:	Recent Y/R in g : 4.5	Recent Z:	Recent F or f: F=0.41	Recent E:	(1992-93) Sestri Levante – 42 (2)	
Note: Collapse of cat	ches during the late 80	o's and the early 90's.				
Biology						
L _∞ F+M= 20.6 cm TL	W _∞	K F+M= 0.38 y ⁻¹	t _o F+M=-0.94 y	L max.		
L _r	A	•	В	L _m	Tm	
	F+M= 0.002145 (g cr	n⁻³)	F+M= 3.4121	F+M= 12.6 cm TL		
М	T C°	Ageing method	VBGF method	M method		
F+M= 0.81		LFM		Pauly (1980)		
Note:						
References:	anart (1006) Salar	tio Marina 60 (Surl 0)	. 257 267			
(1) Pertierra J.P., Lieonart J. (1996) – Scientia Marina 60 (Supl.2): 257-267.						

Table 7 - Gene	ral Data				
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:
Engraulis encrasicolus	Sardinian	1.3.j	Italy	Purse seiner	
Area:	Biomass in tons: DEPM: 5800 (1993)* ES: 650 (1993)** TS: VPA: 2100 (1992-	Recruitment: VPA:230000 in millions at 9 cm TL (1992-93: Savona landings)	Management options :	 Recommendations: Considering grow be obtained abov Increase minimul increase the spare 	oth, the Ymax should ve the current F. m size should wning biomass.
	93: Savona landings)			autumn and winte close in this period	er, fishing should be
Note : *All Ligurian Se	ea; ** From coast off G	Senoa to the Magra Riv	ver (Liorzou pers.comr	n.)	
Fishery and A	ssessment				
Operational unit Purse seiners of Savona (Ligurian coast)	Stock Status:	L_{25} $L_{50}=L_{c}$ L_{75}	Age at first capture (t _c):	Mean Length of capture in cm: 11.5	%VB = % of current biomass out the expected virgin one
Recent Y:	Recent Y/R in g :	Recent Z:	Recent F or f:	Recent E:	(1992-93) Savona – 49 (2)
Note: Collapse of cat	ches during the late 19	1 980s and the early 199	0s.		
Biology		, , , , , , , , , , , , , , , , , , ,			
L _∞ F+M= 20.6 cm TL	W_{∞}	K F+M= 0.38 y ⁻¹	t _o F+M=-0.94 y	L max.	
Lr	T _r	A F+M= 0.002145 (g cm ⁻³)	B F+M= 3.4121	L _m F+M= 12.6 cm TL	Tm
М	T C°	Ageing method	VBGF method	M method	
F+M= 0.81		LFM		Pauly (1980)	
Note:					
(1) Pertierra J.P., Lle	onart J. (1996) – Scier	ntia Marina 60 (Supl.2)	: 257-267.		

Table 8 - Gene	ral Data					
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:	
Engraulis encrasicolus	Adriatic	2.1.a	Italy + Croatia	Mid Water Pair Trawlers (Volanti a coppia) Light Attraction Purse Seines (Lampare)		
Biomass in tons:	Recruitment :	Management options	•	Recommendations:	I	
Area: 100000 km2 ES: 180000 Tons (1989-91) (1) VPA+ De Lury: 100000 Tons (1994- 96) (1)	 It was much higher in the late 70s than in the mid to the late 80s. Minimum legal total length of 9 cm Since 1988 trawling is stopped for 40 days in the summer; After the starting of fisheries all trawlers can fish only for 4 days per week. It is forbidden to transform Anchovy into fish-meal. 					
Note : "Volanti" fished r The catches are determ	mostly in the North Adria ined by the recruitment of	tic; "Lampare" operate n of the two immediately p	nainly in the Central Adri receding years.	atic and in the Gulf of Tri	ieste.	
Fishery and As	ssessment					
Operational unit Volanti – Northern ports Lampare – Southern ports	Stock Status: Fully exploited	L ₂₅ L ₅₀ =L _c L ₇₅	Age at first capture (t _c):	Mean Length of captu Volanti – Northern po Lampare – Southern	ure in cm TL: rts = 13 (1992) ports = 15 (1992) (1)	
Recent Y:	Recent Y/R in g:		Recent F or f:		Recent E:	
22700 tons* (1996) (2)			F=0.18 (all gears and	overall area)** (2)		
Note: *Italy is account	table of about 90% of t	he catches. The first y	vear classes (0,1 and 2	e) form about 80% of the	ne captures	
**F values estimated as mean of VPA and Catch and effort assessments over 1988-96.						

Biology						
L _∞	W_{∞}	К	t _o	L max.		
L _r	Tr	A	В	L _m F+M= 9.1 cm TL (3)	Tm	
М	T C°	Ageing method	VBGF method	M method		
F+M=						
Note: Splitting of leng	th structures of catche	es in age structures by	using Length at Age K	eys based on otolith re	eadings.	
References:						
(1) Cingolani N. et al.	(1996) - Scientia Mar	ina 60 (Supl.2): 269-27	77. (2) Cingolani N. et a	al. (1998) – Valutazion	e degli stocks	
pelagici di alici e sard Mediterr. 35:273-282	line in Adriatico con me	etodi di dinamica di po	polazione. Ancona: 13	7 p. (3) Sinovcic G. (19	998) – Cah. Options	
1						

Table 9 - Gene	Table 9 - General Data								
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:				
Engraulis encrasicolus	Ionian	2.2.b	Italy	Purse seiner					
Area: 14790 km2	Biomass in tons: (1994-95) DEPM: 11000	Recruitment:	Management options :	Recommendations:					
Note : Assessments	carried out in the 70s a	and 80s, based on Ann	ual Eggs Production N	Iodel (AEPM) overesti	mated biomass.				
Fisherv and A	ssessment		mes nigher).						
Operational unit	Stock Status:	L ₂₅ L ₅₀ =L _c L ₇₅	Age at first capture (t _c):	Mean Length of capture:					
Recent Y:	Recent Y/R :	Recent Z:	Recent F or f:	Recent E:					
Note:	·	•	•	•	•				
Biology	1	1		1					
L _∞	W _∞	К	t _o	L max.					
L _r	Tr	A	В	L _m	Tm				
М	T C°	Ageing method	VBGF method	M method					
Note:									
References: (1) Casavola N. (199	References: (1) Casavola N. (1999) – Biol. Mar. Medit. 6(1): 553-555.								

Table 10 - General Data								
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:			
Engraulis	Ionian	Unit.	Italy	Purse seiner +				
encrasicolus		2.2.e	,	Pelagic trawl				
Area: 13275 km ² (DEPM)	Biomass in tons:	Recruitment:	Management options :	Recommendations:	·			
Aroo: 10076 km^2	DEPM: 6200 (1998)							
(ES)	ES: 6500 (1998)							
Note : Surveys carrie	ed out in June–July 1998	; Biomass estimatio	ns concerns Spawning	Stock. (1) (2)				
Fishery and A	ssessment							
Operational unit	Stock Status:	L ₂₅ L ₅₀ =L _c L ₇₅	Age at first capture (t _c):	Mean Length of capture:				
Recent Y:	Recent Y/R :	Recent Z:	Recent F or f:	Recent E:				
Note: E values estim	l ated as ratio between ca	Interest in the area ar	F = 0.24 - 0.33	om surveys (1)				
Biology			<u></u>					
L _∞	₩ _∞	К	to	L max.				
L _r	T,	A	В	L _m	Tm			
M	T C°	Ageing method	VBGF method	M method				
Note:								
References:		ataa and diatributia	n of omoll notonion fich	accontrations in the	Strait of Siaily during			
June 1998 Pape	er presented at WG on si	mall pelagics Fuen	n or small pelagics lish pirola (Spain) 1-3 Marc	h 2000: 11p	Strait of Sicily during			
(2) Quintanilla L.F. e	et al. (2000) – Daily Egg I	Production estimate	of the spawning bioma	ass of the Sicilian Char	nnel Anchovy durina			
July 1998. Paper presented at WG on small pelagics. Fuengirola (Spain) 1-3 March 2000: 43 p.								

Table 11 - Gen	Table 11 - General Data					
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:	
		Unit:				
Engraulis	Aegean	0.4	Greece	Purse seiner		
		3.1.a				
Area: 14790 km2	Biomass in tons:	Recruitment:	Management options :	Recommendations:		
(Northern Aegean	DEPM: 40643 (1993)					
Sea)	42708 (1995)					
	ES: 44601 (1995) 39475 (1996)					
Note : Assessments	carried out in the Norther	rn Aegean Sea. Data	a given during the Ses	sion of WG on small p	elagics – Fuengirola	
(Spain) 1-3- march 2	000.	0	0 0		0 0	
Fishery and A	ssessment					
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	Carrying capacity in	
		$L_{50}=L_c$	(t _c):	capture:	terms of biomass	
Purse seiner		L ₇₅				
(Kavala port)				13 cm TL (1997)	42420 tons	
				12.5 cm TL (1998)	(Schaefer Model)	
Recent Y:	Recent Y/R :	Recent Z:	Recent F or f:	Recent E:	MSY	
about 1300 tons					1727 tons	
(1998-99)					(Schaefer Model)	
Note: Assessment ba	ased on Surplus Producti	ion Model (Schaefer	, 1954)by using CEDA	After 19 of intensive f	ishing, the CPUE	
are at same level of	1981. However the mean	length of catches d	ecreased from 14.3 cn	n TL of 1983 (mainly 2	+ age group) to 12.5	
cm TL of 1998(mainl	v 1+ age group), (1)					
Biology	<u> </u>					
L _∞	W _∞	K	t ₀	L max.		
L _r	T _r	A	В	L _m	Tm	
М	T C°	Ageing method	VBGF method	M method		
Note:						
References:						
(1) Vidoris P., Kallian	iotis A. (2000) - Producti	on Model of Engraul	lis encresicolus L., 175	8, in the Thracian Sea	. Paper presented at	
WG on small pelagic	s. Fuengirola (Spain) 1-3	3 March 2000: 4 p.				
	/					

Table 12 - General Data									
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
		Unit:		Light Attraction					
Sardina pilchardus	Balearic		Spain	Purse Seine					
		1.1.b							
Biomass in tons:	Recruitment in	Management op	otions :	Recommendations:					
	millions:								
DEPM:									
	5065 (1988-89) (2)								
ES: 119000 *(1991-93)									
(1)									
(-)									
VPA : 63500**(1988-89)									
(2)									
(-)									
Note : *ES carried out alor	ng Catalan coasts up to	200 m depth, be	etween October and N	ovember.** Biomass e	stimated by VPA is				
referred to Barcelona. Por	t de Selva and Castello	on landings			·····,				
The biomass estimated by	echo-surveys in the m	ost recent vears	is lower than those for	und in 1991-93 (1996-)	86640 tons [.] 97-				
86617 98-64742 99-6514	45-see annex 5 to the F	Report)							
Fishery and Asse	eemont								
Tistiery and Asse					·				
Operational unit	Stock Status:	L ₂₅	Y/R _{max.} in g :	Mean Length of capt	ure in cm TL:				
		$L_{50}=L_{c}$							
Purse seine along	Under-exploited	L ₇₅		(1988-89)					
Catalan coast				13.2 (2)					
(Barcelona, Port de									
Selva and Castellon									
ports) (2)									

Recent Y:	Recent Y/R in g :	Virgin Biomass	Recent F or f:		
19760 tono (1099, 90)	(1000.00)	(B_0) in tons:	(1000 00) (2)		
18760 10115 (1988-89)	(1900-09)	(1000 00)	(1900-09)(2)		
	$2 \in A \in (2)$	(1900-09)			
	3.0-4.3 (2)	116000 (2)	F=0.43		
			As vestor on age ar		
				0 11 10 20 F 10 45	
			$0.009 < F_0 < 0.099$, F_1	=0.11, 0.30 <r<sub>2 < 0.40</r<sub>	$P_3 = 0.40, 0.00 < \Gamma_4$
Noto: Doromotoro obtoino	d by VDA and V/D aim	lations ()/IT poly	$ < 0.74$, $0.09 < F_5 < 0$.90	of voluce
Note: Parameters obtaine	a by VPA and Y/R simil	Liations (VII pake	cage). "F calculated li	om a vector as mean o	
corresponding to the mea	n length of capture. The	e Sensitivity analy	ysis snown that variat	ions doth in ivi and K ca	an neavily affect Y/R
simulations					
Biology		1	1		
L _∞	W∞	K (2)	to	L max.	
F+M= 22 cm TL (2)		F+M= 0.26 y ⁻¹	F+M=-1.1 y (2)		
L _r	T _r	A	В	L _m	Tm
		F+M= 0.0067	F+M= 3.0525 (2)		
		(g cm⁻³) (2)			
Μ	F _{term.} :	Ageing method	VBGF method	M method	
F+M= 0.6 (2)	F+M= 1.87 (2)	Otolith	Tomlinson and	Pauly (1980) (2)	
		readings (2)	Abramson (2)		
Note:			· · · · ·	<u>.</u>	•
References:					
(1) Abad R. et al. (1996) – FAO Fish Rep. 537: 191 – 193.					
(2) Lleonart J. (1990) – La	a pesqueria de Cataluna	a y Valencia: des	cription global y plante	eamiento de las bases	para su
conseguimiento: Informe	Final. Commision de la	s Comunidades I	Europeas, DG XIV : 1	634 p.	

Table 13 - Genera	l Data				
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:
		Unit:		Light Attraction	
Sardina pilchardus	Balearic		Spain	Purse Seine	
		1.1.b			
Biomass in tons:	Recruitment in	Management op	otions :	Recommendations:	
	millions:				
DEPM:				Increasing F mortality	/ due to trawling,
	3756 (1988-89) (2)			should not produce s	ignificant variation in
ES: 200000 *(1991-93)				purse seiner Y/R , wh	nile the increase of
(1)				purse seiner would at	ffect heavily both
				trawling and total Y/R)
VPA : 67350**(1988-89)					
(2)					
				<u> </u>	
Note : ^ES carried out alor	ng Valencian coasts up	to 200 m depth,	between October and	November. The bioma	ass estimated by
ecno-surveys in the most	recent years is lower th	ian those found ii	1 1991-93 (1996-9275	tons; 97-5575; 98-423	33; 99-954-see
annex 5 to the Report).	(DA is not since the Valer	s alla Dant la sallia as			
Biomass estimated by V	PA is referred to valer	icia Port landings	j		
Fishery and Asse	ssment				
Operational unit	Stock Status:	L ₂₅	Y/R _{max.} in g :	Mean Length of captu	ure in cm TL:
		$L_{50}=L_{c}$			
Valencian coast	Under-exploited	L ₇₅	(1988-89)	(1988-89)	
(Valencia port)			Purse seiners =5.2	Purse seiners =14.8-	15.4
			Trawlers = No	Trawlers = 12.9-13.2	2 (2)
Purse seiners			maximum		
Trawlers (2)					

Recent Y:	Recent Y/R in g :	Virgin Biomass	Recent F or f:			
16430tons (1988-89)	(1988-89)	(\mathbf{D}_0) in tons.	(1988-89) (2)			
	(1000 00)	(1988-89)	(1000 00) (2)			
about 15% is catched by	Purse seiners = 4.6-	107000 (2)	Purse seiners =0.30*			
trawling	4.7		Trawlers = 0.045^*			
	Trawlers = $0.81 - 0.83$					
	(2)					
Note: Parameters obtained	d by VPA and Y/R simu	lations (VIT pack	kage). *F calculated fro	om a vector as mean c	of values	
corresponding to the mean	n length of capture. The	e Sensitivity analy	ysis shown that variation	ons both in M and K ca	in heavily affect Y/R	
simulations						
Biology	I		I	Γ	· · · · · · · · · · · · · · · · · · ·	
L _∞	W∞	K (2)	to	L max.		
F+M= 22 cm TL (2)		F+M= 0.26 y	F+M=-1.1 y (2)			
Lr	T _r	A	В	L _m	Tm	
			_			
		F+M= 0.0067	F+M= 3.0525 (2)			
		(g cm °) (2)	1/202			
М	⊢ _{term.} :	Ageing method	VBGF method	M method		
		Otalith	Tamlingan and	$D_{\rm oub}$ (1000) (2)		
F + IM = 0.6 (2)	F + IVI = 1.87 (2)	Otolith	Abromoon (2)	Pauly (1980) (2)		
Noto:		readings (2)	Abramson (2)			
Note.						
Keterences:						
(1) ADAD K. et al. (1996) – FAU FISN Rep. 537: 191 – 193. (2) Lleanart L. (1996) – La pagguaria de Cataluna V. Valancia, description global y plantagmiento, de las bases para su						
(2) Lieurari J. (1990) – La	i pesquena de Calaluna	a y valencia. des			para su	
conseguimento: informe Final. Commision de las Comunidades Europeas, DG XIV : 1634 p.						

Table 14 - Genera	Table 14 - General Data							
Scientific name:	GFCM	Management Unit:	Country:	Fishery:	Stock Name:			
	Subarea:	_	-	-				
Sardina pilchardus		1.1.d	Spain +	Purse seiner				
	Balearic		Morocco					
Biomass:		Recruitment:	Management	Recommendations:				
Area:			options :					
ES: 36900 (1991-93) Spa	nish Coast (1)							
Note: Echo surveys carrie	d out in October a	and November between 20	and 200 m depth (1)					
Fishery and Asse	ssment							
Operational unit	Stock Status:		L ₂₅	Mean Length of	Recent Y/R :			
			L ₅₀ =L _c	capture:				
	 No assessm 	ents for Spanish coast	L ₇₅					
	 Over exploit 	ed (Moroccan coast) * (2)						
Recent Y:			Recent Z:	Recent F or f:	Recent E:			
				f= 5300 trip per year				
10013 tons (1998) All Mor	occan coast.			(1997- Moroccan				
Main landing in Al Hoceim	a (5335 tons) (2)			coast) (2)				
Note: * From 1992 onward	l landings were de	ecreasing. CPUE of AI Ho	ceima Port were dec	reasing from 1982 onw	ard. Catches are			
formed mainly of young of	0 (31%) and 1 (5	2%) age groups (2)						
Biology	-		-	-				
L _∞	W∞	К	to	L max.				
F+M= 21.74 cmTL (2)		F+M= 0.261 (2)	F+M= -4.014 (2)					
Lr	T _r	A	В	L _m	Tm			
		F+M= 0.0000058 (2)	F+M=3.0519 (2)					
Μ	T C°	Ageing method	VBGF method	M method				
		LFM	Gulland and Holt					
	(==		plot					
Note: Nurseries in coastal	areas (<50 m de	pth); Recruitment in spring	-summer (2).					
References:								
(1) Abad et al. (1996) – FA	(1) Abad et al. (1996) – FAO Fish. Rep. 537: 191-193.							
(2) INRH (2000) – Note su	iccincte sur la peo	cherie petits pelagiques me	editerraneenne du Ma	aroc. Paper presented	at WG on small			
pelagics. Fuengirola (Spain) 1-3 March 2000: 11p.								

Table 15 - Gen	eral Data				
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:
Sardina pilchardus	Balearic	1.1.c	Algeria	Purse seiner	
Area:	Biomass: DEPM: ES: VPA:	Recruitment:	Management options :	Recommendations:	
Fishery and A	ssessment				
Operational unit	Stock Status:	L ₂₅ L ₅₀ =L _c =11.7-11.9	Age at first capture (t _c):	Mean Length of capture:	Recent Y/R :
Oran port Alger port	Under-exploited	CM TL			
Recent Y:	Recent Z: Oran Port (1979) Z _{ICCC F} =0.719 Z _{ICCC M} =0.755	Al	ger port (1983-84) Z _{lccc F} =0.622 Z _{lccc M} =0.978	Recent F or f: Oran Port F=0.132-0.199	Recent E: Oran Port E=0.216-0.279
				Alger Port F=0.215-0.453	Alger Port E=0.299-0.463
Note: Assessment ba	ased on Beverton and ng the Y'/R _{max} .	Holt Relative Yield per	Recruit Model (Y'/R).	Current Exploitation ra	tes (E) were always
Biology					
L_{∞} in cm TL	W _∞	К	t _o	L max.	
F= 19.2-19 M= 18.3-18.5		F= 0.345-0.352 M= 0.379-0.371			
L _r	Tr	A	В	L _m	Tm
М	T C°	Ageing method	VBGF method	M method	
F= 0.48-0.504 M= 0.517-0.525	17-18.2	LFM	Wetherall et al. + ϕ'	Pauly (1980) + correct pelagics (0.8)	ction for small
References: (1) Bouchereau J.L.	et al. (1986) – FAO Fis	h. Rep. 347: 163-185.			

Table 16 - Ge	eneral Data							
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:			
Sardina pilchardus	Gulf of Lions	1.2.e	France + Spain	Trawling + Purse seiner				
Area: 2940 km ² (ES) (1)	Biomass: DEPM: ES: 42839 (1995-97) (1)	Recruitment:	Management options :	Recommendations:				
Note : Echo survey years shown an inc	s carried out during Jul reasing trend (1)	y in order to evaluate th	e spawning stock bion	nass. Values obtained	in the last three			
Fishery and	Assessment							
Operational unit French wide vertica opening bottom trawlers	Stock Status: Moderately exploited (1)	L_{25} $L_{50}=L_{c}$ L_{75}	Age at first capture (t _c):	Mean Length of capture:				
Recent Y: 10330 tons (1995- 97)* (1)	Recent Y/R :	Recent Z:	Recent F or f: F=0.24* (1)	Recent E:				
Note: * only referre	d to French catches; **	calculated as ratio betw	veen annual catches a	nd spawning standing	stock (ES).			
Biology		1	Ι.	Ι.	Γ			
L _∞	W _∞	к)	t _o	L max.				
L _r	Tr		В	L _m	Tm			
М	T C°	Ageing method	VBGF method	M method				
References: (1) Geuennegan Y.	References: (1) Geuennegan Y. et al. (2000) – Exploitation des petits pelagiques dans le Golf du Lion et suivi de l'evolution des stocks par							

echo-integration de 1999 à 2000. Paper presented at WG on small pelagics. Fuengirola (Spain) 1-3 March 2000:27 p.

Table 17 - Gen	Table 17 - General Data							
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:			
Sardina pilchardus	Adriatic	2.1.a	Italy + Croatia	Mid Water Pair Trawlers (Volanti a coppia) Light Attraction Purse Seines (Lampare)				
Biomass in tons:	Recruitment in	Management options						
Area: 100000 km ² ES: 350000 Tons (1988-93) VPA+ De Lury: 125000 Tons (1988- 96) (1)	Rmin = 1500 (1995) Rmax= 9500 (1983-84) Rmed= 2900 (1988- 96) (3)	Since 1988 trawling is s the summer; After the starting of fish fish only for 4 days per	stopped for 40 days in eries all trawlers can week.					
Note : "Volanti" fished Sardine is the main targ A decreasing trend in b	mostly in the North Adria get species for Croatian F iomass from the early 80	tic; "Lampare" operate r Purse seiners, which cate is onward was observed	nainly in the Central Adri ch about ½ of total yield (3)	atic and in the Gulf of Tr (2)	ieste.			
Fishery and A	ssessment							
Operational unit Volanti – Northern ports Lampare – Southern ports	Stock Status:	L ₂₅ L ₅₀ =L _c L ₇₅	Age at first capture (t _c):	Mean Length of captu Northern ports = 16.5 Southern ports = 16.5	ure in cm TL: 5 - 17 (1994-96) 5 - 17 (1994-96) (2)			
Recent Y:	Recent Y/R in g :		Recent F or f:		Recent E:			
about 30000 tons* (1996) (2)			F=0.18 (all gears and	l overall area)** (2)				

Note: The first years classes (0,1 and 2) form 55-75% of the captures (2)								
**F values estimated	**F values estimated as mean of VPA, LCA and Catch and effort (Modified De Lury) assessments over 1988-96.							
Biology								
L _∞	W _∞	К	t ₀	L max.				
F+M=21 cm TL		F+M= 0.35 y-1	F+M=-2.42 y					
L _r	Tr	A	В	L _m	Tm			
М	F _{term.}	Ageing method	VBGF method	M method				
F+M= 0.5	F+M= 0.5							
Note: Splitting of leng	th structures of catche	es in age structures by	using Length at Age k	Keys based on otolith r	eadings.			
References:								
(1) Cingolani N. et al. (1998) – Biol. Mar. Medit.5 (3):321-330. (2) Cingolani N. et al. (1998) – Valutazione degli stocks pelagici di								
alici e sardine in Adriatico con metodi di dinamica di popolazione. Ancona: 137 p. (3) Santoianni A. et al. (1999) – Atti A.I.O.L. 13								
(1):11-20.					,			
. ,								

Table 18 - General Data									
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:				
Sardina pilchardus	Ionian	2.2.b	Italy	Purse seiner					
Area: 14790 km2	Biomass in tons:	Recruitment:	Management	Recommendations:					
(South-Western	(1994)		options .						
Adriatic Sea)	DEPM: 14200								
Note : Assessments carried out in the 70s and 80s, based on Annual Eggs Production Model (AEPM) overestimated biomass. Values obtained by AEPM for 1994 was 109000 tons (about 7.5 times higher).									
Fishery and A	ssessment								
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of					
		$L_{50}=L_{c}$	(t _c):	capture:					
		L 75							
Recent Y:	Recent Y/R :	Recent Z:	Recent F or f:	Recent E:					
Note:									
Biology									
L	W _∞	К	t _o	L max.					
L _r	T _r	A	В	L _m	Tm				
М	T C°	Ageing method	VBGF method	M method					
Note:									
References:	(1009) Boon Comm	int Mar Madit 25 (2)	206						
(1) Casavoia IN. et al. (1990) – Rapp.Communit.init.ivier ivieuit., 55 (2). 390									

Table 19 - General Data								
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:			
Sardina pilchardus	Ionian	2.2.e	Italy	Purse seiner + Pelagic trawl				
Area: 10976 km ²	Biomass in tons:	Recruitment:	Management options :	Recommendations:				
(South-western part of Strait of Sicily)	DEPM: no data							
, , , , , , , , , , , , , , , , , , , ,	ES: 21000 (1998)							
Note : Surveys carried out in June 1998; Biomass estimations concerns Recruitment. (1)								
Fishery and A	ssessment							
Operational unit	Stock Status:	L ₂₅ L ₅₀ =L _c L ₇₅	Age at first capture (t _c):	Mean Length of capture:				
Recent Y:	Recent Y/R :	Recent Z:	Recent F or f: F= 0.24-0.33	Recent E:				
Note: F values estimation	ated as ratio between ca	tches in the area and	d biomass resulting fro	m surveys (1).				
Biology				-	-			
L	W_{∞}	К	t _o	L max.				
L _r	T _r	A	В	L _m	Tm			
Μ	T C°	Ageing method	VBGF method	M method				
References: (1) Patti D. et al. (2000) – Echosurveys estimates and distribution of small pelagics fish concentrations in the Strait of Sicily during June 1998. Paper presented at WG on small pelagics. Fuengirola (Spain) 1-3 March 2000: 11p.								

Table 20 - General Data									
Scientific name:	GFCM Subarea:		: GFCM Subarea:		Management Unit:	Country: Spain	Fishery: Trawling Gill pet	Stock Name:	
merluccius	Dalcano		1.1.a		Omnet				
Area:	Biomass:		Recruitment:	Management options	3:	Recommendations:			
	TS: LCA: 97 tons (1980 -9 (1) LCA: 169 tons(1991) (92) (1)	TS: LCA: 1.6 millions (1980-92) (1) LCA: 0.9 millions (1991) (1)			Adopting a 60 mm opening mesh size $(F_0=0; F_1=0.09; F_2=$ 0.68 and $F_4=0.75$) the Y/ R= 66.8 g should be obtained after 3 years (3).			
Note :									
Fishery									
Operational unit Trawling around Baleares	Stock Status: Overexploited (growth overfishing)	L ₂₅ L ₅₀ = L ₇₅	L _c	Age at first capture (t _c):	Mean Length of capture in cm TL : 12.8 (1980-92) (1) 15.9 (1991) (1)	Y/ R _{max} in g 172.8 (1980-91) (3) 106.2 (1991) (1)			
Recent Y:	Recent Y/R in g:	Rece	ent Z:	Recent F or f:	Effort level _{Y/R max.} :	SSB/SSB ₀ :			
99 t (1980-91) (3) 83 t (1991) (1)	56.23 (1980-91) (1) 87.36 (1991) (1)			F = 0.75 (1980-92) (1) F = 0.38 (1991) (1) Main F at age (F ₀ =0.005; F ₁ = 0.46; F ₂ = 0.86 and F ₄ = 0.75) (3)	-86% of the current value (1980-91) (3)	0.5% (1980-91) (3)			
(1) based on LCA or	(1) based on LCA on pseudocohorts								

Biology								
	L _∞	W∞	К	to	L max.			
	M+F=94.2 cm TL (2)		M+F= 0.09 y-1 (2)	M+F=-0.59 y (2)				
L _r	Tr	A	В	L _m in cm TL	Tm			
		M+F=0.0043 (2)	M+F=3.15 (2)	M+F = 32 (3)				
М	T C°	Ageing method	VBGF method	M method				
M+F= 0.15 (2)								
References:								
(1) Oliver P et al. (1995) – Cah. Options Mediterr. 10: 25-26								
(2) Oliver P, Morillas A. (1992) – Rapp. Comm. Int. Mer Medit. 33: 304								

(3) Oliver <u>P.</u> (1993) – Scientia Marina, 57 (2-3): 219 - 227.

Table 21 - General I	Data						
Scientific name:	GFCM Subarea:	Management Unit:	Country: Spain	Fishery:	Stock Name:		
Merluccius	Balearic	1.1.b		Trawling			
merluccius				Long line			
				gill net			
Area:	Biomass:	Recruitment:	Management	Recommendations:			
		TS:	options :				
	TS:			Expected increase Y	/R from 43 to 98 g		
	VPA:	VPA: 40 millions		decreasing current F	of 70%.(1)		
Nota: (1) based on 1	 V/DA and V/D analyzia	(1991) (1)					
Fishery and Asses	sment						
Operational unit	Stock Status:		Age at first capture	Mean Length of	Note:		
	Clock Clauds.	$L_{50} = L_{0}$	(t _c):	capture:	1000.		
Trawling along	Overexploited	L ₇₅			* (2) mean of BH		
Catalan coast;		10		16.8 cm TL (2)	and Jones methods		
Recent Y:	Recent Y/R :	Recent Z:	Recent F or f:	Recent E:			
2390 t (1991) (2)		Z= 0.47 * (1991) (2)	Reported as vector				
Biology	Τ.			Τ.	1		
	L∞	W _∞	ĸ	t _o	L max.		
	M+F=110 cm TL (1)		M+F= 0.11 y-1 (1)	M+F=0.3 y (1)			
L _r	T _r	A	В	L _m			
		M+F=0.000564 (1)	M+F=3.069 (1)	F=39 cm TL (1) M=	32 cm TL (1)		
M		Ageing method	VBGF method	M method			
M+F=0.15 (1) – 0.12	(2)						
References:							
(1) Recasens L. (199	92) – Rapp. Comm. Int.	Mer Medit. 33: 309					
(2) Martin P., Sanche	ez P. (1992) – Rapp. C	omm. Int. Mer Medit. 3	33: 301				

Table 22 - General Data									
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
		Unit:	Algeria	Trawling					
Merluccius	Balearic			Gill net					
merluccius		1.1.c							
Area:	Biomass:	Recruitment:	Management optior	IS :	Recommendations:				
	то.	TO.							
Noto :	VPA	VPA							
Fishery and P	ssessment			T					
Operational unit	Stock Status:	-25	Age at first capture	Mean Length of	Y/ R _{max} in g				
		₋₅₀ =L _c	(t _c):	capture in cm TL :					
Trawling along	Overexploited	-75							
Algerian Coasts		_							
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:					
		Z= 0.66 (3) (LCCC)	F= 0.36 (3)	E= 0.54 (3)					
Note: In the most im	portant fishing port (Bou	haroun) a decreasing	trend was of annual	yield was observed fr	om the mid 80's				
(about 60 tons) to mid	d 90' (about 30 tons) (1)								
Biology									
	L _∞ in cm TL	N_{∞}	K in y-1	t _o in y	L max.				
	F= 80.6 (1)		F= 0.442 (1)	F= -0.139 (1)					
	M= 48.7 (1)		M= 0.075 (1)	M= -0.321 (1)					
	F+M= 51.5 (3)		F+M= 0.22 (3)						
Lr	T _r	Ą	В	L _m in cm TL	Tm				
		= 0.00655	F= 2.99	F= 30.6 (2)					
		M= 0.00443	M= 3.11	M= 21.5 (2)					
Μ	T C°	Ageing method	VBGF method	M method					
M+F= 0.3 (3)		Bhattacharya	Fishparm						
References: (1) Boua	ziz et al. (1998) – Cah.	Options Mediterr. 35:	35-41 (2) Bouaziz et a	al. (1998) – Cah. Optic	ons Mediterr. 35:				
109-117 (3) Djabali et al. (1991) – FAO Fish. Rep. 447: 160-170.									

Table 23 - General Data										
Scientific name:	GF	CM Subarea:	Mana	gement Unit:	Cou	intry:	Fishery:		Stock Na	me:
Merluccius	Gul	f of Lions	12e		Fra	French trav		wlers awlers		
merluccius	Cui		1.2.0		Spa	in	French gill	net		
						-	Spanish lo	ng line		
Area:	Bio	mass:	Recru	uitment:	Mar	nagement	Recomme	ndations:		
	то		то.		opti	ons :	According	to different	biological	scenarios, to
	15:	A: 2150 (2) - 6400	15: \/DA·	20 - 40			from 70 to	max Current	r F would c	e decreased
	(b)	tons (1988) (1) (*)	millio	ns (1988) (1)			The decrea	ase of traw	lina fishina	effort would
	VP/	A: 6100 – 7100 tons	(*)				produce hi	gh increasi	ing of both	gill net and
	(19	88-91) (2) (**)					long line yi	elds (1).	-	-
Nata (*). (**)										
	value		ina An	ACO packages.						
Fishery and P	ASS	essment		T .				T		
Operational unit		Stock Status:		L ₂₅		Age at first capture (t _c):		Mean Ler	ngth of	Virgin Biomass
French trawlers		Overexploited		$L_{50} - L_{c}$				(1) :		Diomass
Spanish trawlers		(growth overfishing)		-13				() !		
French gill net								Fr. trawle	rs – 22.6	
Spanish long line								Sp. trawle	ers – 17.9	
								Fr. gill ne	t – 42.9	
									ne – 49.5 22.2	
Y in 1988 in tons (1)		Recent Y/R (1) (*) :		Y/R _{max} (1) :		Recent F or f	f:	Recent E	:	
French trawlers – 20	13	French trawlers = 67	7 (a)-	TOTAL = 204 ((a) –	Vector of F p	er gear			
Spanish trawlers – 38	81	50 (b)	10 0	78 (b)		according to	different			
French gill net – 384 Spanish long line – 1	62	Spanish trawlers = $\frac{1}{2}$	12 - 9 - 9			piological sce	enarios are			
TOTAL $= 2941$	02	Spanish long line =	- 3 5 - 4			reported (1)				
		TOTAL = 97 - 72								
Note:										

Biology	Biology									
	L _∞ in cm TL	W∞	К	t _o	L max.					
	F= 110 (a) (1) M= 66		F= 0.11 (a) (1) M= 0.195 (1)	F= 0.3 (a) (1) M= 0.3 (b) (1)						
	F= 80.2 (b) (1) M= 55.8		F= 0.113 (b) (1) M= 0.179 (1)	F= -0.524 (1) M=-0.42 (1)						
L _r	T _r	A	В	L _m in cm TL	Tm					
		F+M= 0.00564 (a) (1)	F+M= 3.069 (a) (1)	F= 43 (1)						
		F+M= 0.0069 (b) (1)	F+M= 3.03 (a) (1)	M= 27						
М	T C°	Ageing method	VBGF method	M method						
M+F= 0.15 (a) (1) M+F= 0.2 (b) (1)										
F _{term.} =0.15 (1)										
References:										
(1) Aldebert Y. et al. (1993) – Scientia Marina, 57 (2-3): 207-217.										
(2) Aldebert Y. and F	Recasens L. (1996) – F	AO Fish. Rep., 537: 1	57-164.							
Table 24 - Gen	Table 24 - General Data									
--	------------------------------------	----------------------------------	---	--	--------------------------	--	--	--	--	--
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:					
Merluccius	Sardinian	1.3 h	Italy	Trawling Gill net						
Area:	Biomass: TS:	Recruitment:	Management	Recommendations: Protection of spawni	ng areas mainly					
23700 km ²	VPA:	VPA:		during spring (1)						
Fishery and A	ssessment									
Operational unit Trawling along	Stock Status: L Dverexploited L	-25 -50=L _c -75	Age at first capture (t _c):	Mean Length of capture in cm TL :	Y/ R _{max} in g					
Sardinian Coasts Recent Y:	Recent Y/R in g: F	Recent Z:	Recent F or f:	Recent E:						
	Z	Z= 0.85 (1) (LCCC)	F= 0.54 (1)	E= 0.64 (1)						
Note: Assessment b	ased on trawl surveys da	ata and Exploitation F	Rate as mean over 198	35-97.						
Biology										
	L_{∞} in cm TL V	N	K in y-1	t _o in y	L max.					
	F+M= 63.9 (1)		F+M= 0.15 (1)	F+M= -0.554 (1)						
L _r	T _r A	A	В	L _m in cm TL	Tm					
	F	= 0.00655 ∕I= 0.00443	F= 2.99 M= 3.11	F= 30.6 (2) M= 21.5 (2)						
М	T C° A 14 (1)	Ageing method	VBGF method		M method					
M+F= 0.31 (1)	E	Bhattacharya (1968)	Non Linear regression	n	Pauly (1980)					
References: (1) Addis P. et al. (19	98) – Biol. Mar. Medit. 5	(3): 85-95.								

Table 25 - Gen	Table 25 - General Data								
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
		Unit:							
Merluccius	Balearic	1.3.j +1.3.i	Italy	Trawling					
merluccius		(Tyrrhenian –		Gill nets					
		coast of Calabria		Long lines					
		and Sicily)							
Area:	Biomass:	Recruitment:	Management optior	าร :	Recommendations:				
2	TS:	TS:	Trawling is forbidde	en in the Gulf of S.					
5600 km²	VPA	VPA	Eufemia (Calabria)	Patti and					
			Castellammare (Sic	cily).					
Fishery									
Operational unit	Stock Status:	-25	Age at first capture	Mean Length of	Y/ R _{max} in g				
Trawling along		₋₅₀ =L _c	(t _c):	capture in cm TL :					
Tyrrhenian coast of	Overexploited I	-75							
Calabria and Sicily									
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:					
		2= 1.42 (LCCC)	F= 1.15	E= 0.80					
Note: Assessment ba	ased on trawl surveys d	ata and Exploitation F	ate as mean over 198	35-97.					
Biology									
	L_{∞} in cm TL	V _∞	K in y-1	t _o in y	L max.				
			$E_{1}M_{-} = 0.14(1)$	$E_1M_{-} = 0.62(1)$					
1	F + IVI = 64.5(1)		F + IVI = 0.14(1)	F + ivi = 0.02(1)	T				
L _r	I _r	\	В		Im				
M	T C°	aeina method	VBGE method	M method					
M+F= 0.27 (3)									
References: (1) Grec	o et al. (1998) – Biol. Ma	ar. Medit. 5 (3):74-84.							

Table 26 - Gen	Table 26 - General Data								
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
Marilian	Operation	Unit:	ltah .	Travillar					
Meriuccius	Sardinian	1.3.J	Italy	Irawiing					
Area:	Biomass:		Management	Pecommendations:					
Alea.	Diomass.	iteciulinent.		The simulation	with variable M gives Y/R much				
5800 km ²	TS:	TS:		lower than those	e effected with constant M				
	VPA:	VPA:		 Maintaining the 	current exploitation pattern, the				
				reduction of F n	nortality would not produce				
				relevant increas	se of Y/R (1)				
Fishery and as	ssessment		1						
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	Y/ R _{max} in g				
T		$L_{50} = L_{c} = 13.6 \text{ cm TL}$	(t _c): 1 y	capture in cm TL :					
I rawling along	Overexploited	L ₇₅			20				
Ligurian Coasts	(growth overfishing)	Depent 7	Decent E or fi	Decent Fr					
Recent f.	Recent f/R in g.	Recent Z.	Recent F of I.	Recent E.	E max				
	17	Z= 2.17 (1990-93)	F= 1.6 (1990-93) (1)	E= 0.7 (1990-93)	0.5				
		(LCCC) (1)		(1)					
Note: Thompson Be TL all fish are retaine	II model with vector M-a d by the cod-end; while	at age and nominal re the smallest and larg	cruitment of 1000000 jest ones avoid the ca	of individuals. It is assu atch (double knife-edge	Imed that from Lc to 35 cm selection) (1).				
Biology									
	L_{∞} in cm TL	W _∞	K in y-1	t _o in y	L max.				
	M+F= 49 75		M+F= 0.28	M+F= -0.332					
L _r	T _r	A	В	L _m in cm TL	Tm				
6 in cm TL	0.33 y								
M(1)		Ageing method	VBGF method	M method					
M+F= from 3.15 (age	e 0.33) to 0.29 (age 4)		Non linear	Caddy Vector					
Deferences (1) Eleve	unting at al. (1000) D:	Utolith readings		for Gadus mornua of	North Sea (1991)				
References: (1) Flore	References: (1) Fiorentino et al. (1996) – Biol. Mar. Medit. 3 (1): 548-552.								

Scientific name: GFCM Subarea: Management Country: Fishery: Stock Name: Merluccius Sardinian 1.3,j Italy Trawling Recommendations: Area: Biomass: TS: about 300 tons (mean over 1985-95) Recruitment: Management options : Recommendations: VPA: TS: yPA: VPA: Management options : Recommendations: Trawling along Northern Coasts of Tuscany (Livorno and Viareggio Fleets) Stock Status: L25 L25-L25 LCCC (a) Age at first capture (t_2): Mean Length of capture in cm TL : SSB/SSB_0 1% (a) Recent Y: Recent Y/R in g: Recent Z: Recent F or f: Recent E: F+M= 25 (a) F= 1.9 LCCC (a) M=1.6 (a) M=0.8 (a) M=1.6 (a) M=0.8 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. F= 1.9 LCCC (a) M=1.6 (a) M=2.5 LCCC (a) M=2.5 LCCC (a) M=1.6 (a) M=0.8 (a) M=0.8 (a) M=0.8 (a) M=0.8 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assumin	Table 27 - General Data								
Merluccius merluccius Sardinian Unit: 1.3,j (Northern Tuscany) Italy Trawling Area: Biomass: TS: about 300 tons (mean over 1985-95) Recruitment: TS: bout 300 tons (mean over 1985-95) Recruitment: TS: VPA: Management options : Recommendations: it is raccomended to increase the SSB/SSB0 (1) Note : No evident trends in biomass estimates were detected. TS: VPA: Age at first capture t ₂₀ =L _e =11 cm TL (a) L ₂₅ Age at first capture (t ₂): Mean Length of capture in cm TL : SSB/SSB ₀ 1% (a) Note: No evident trends in biomass estimates were detected. Fully-heavily exploited L ₂₅ Age at first capture (t ₂): Mean Length of capture in cm TL : SSB/SSB ₀ 1% (a) Note: No evident trends in biomass estimates were detected. Fully-heavily exploited L ₂₅ Age at first capture (t ₂): Mean Length of capture in cm TL : SSB/SSB ₀ 1% (a) Note: Assessment overfishing) Fully-heavily exploited F= 1.9 LCCC(a) M=2.5 LCCC (a) F= 2.0 (a) M=1.6 (a) F= 0.8 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. F= 1.9 LCCC(a) M=2.5 LCCC (a) F= 0.2 (b) LCCC(a) M=1.6 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant	Scientific name:	GFCM Subarea:	1	Management	Country:	Fishery:	Stock Name:		
Interfuccius Sardiniziti 1.3.1 (Northern Tuscany) Italy Trawing Area: Biomass: TS: about 300 tons (mean over 1985-95) Recruitment: TS: VPA: Management options : Recommendations: it is raccomended to increase the SSB/SSB0 (1) Note : No evident trends in biomass estimates were detected. TS: VPA: Mean Length of capture in cm TL : SSB/SSB0 (1) Note : No evident trends in biomass estimates were detected. Fishery and assessment Age at first capture (t ₀): Mean Length of capture in cm TL : SSB/SSB0 (1) Nother: Coasts of Tuscany (Livorno and Viareggio Fleets) Fully-heavily exploited Risk of vector Selectivity- vulnerability (b) Age at first capture (t ₀): Mean Length of capture in cm TL : SSB/SSB0 (1) Recent Y: Recent Y/R in g: F+M= 25 (a) F+M= 33 (b) Recent Z: F= 1.9 LCCC(a) M=2.5 LCCC (a) M=2.5 LCCC (a) F= 2.0 (a) M=1.6 (a) F= 0.8 (a) M= 0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	Martuaniun	Cordinion		Unit:	ltoh	Trouding			
Interactions Interactions Interactions Interactions Interactions Area: Biomass: Tuscany) Recruitment: Management options : Recommendations: Area: Biomass: TS: about 300 tons (mean over 1985-95) TS: VPA: Management options : Recommendations: Note : No evident trends in biomass estimates were detected. VPA: Management options : SSB/SSB0 (1) Note : Note status: L25 L25 Image ment options : Mean Length of capture in cm TL : SSB/SSB0 Northern Coasts of Tuscany (Livorno and Viareggio Fleets) Fully-heavily exploited L75 Age at first capture Mean Length of capture in cm TL : 1% (a) Recent Y: Recent Y/R in g: F+M= 25 (a) Recent Z: F= 1.9 LCCC(a) Recent F or f: Recent E: F+M= 33 (b) F= 1.9 LCCC (a) M=1.6 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Seren	meriuccius	Sardinian		1.3.j (Northorn	italy	Trawling			
Area: Biomass: TS: about 300 tons (mean over 1985-95) Recruitment: VPA: Management options : Recommendations: it is raccomended to increase the SSB/SSB0 (1) Note : No evident trends in biomass estimates were detected. TS: VPA: VPA: Mean Length of (t_c): Stock Status: Log=L_c=11 cm TL (a) Operational unit: Trawling along Northern Coasts of Tuscany (Livorno and Viareggio Fleets) Stock Status: Fully-heavily exploited Noter activity- vector Selectivity- vector Selectivity- vector Selectivity- vector Selectivity- vector Selectivity- vector Selectivity- vector Selectivity- vector Selectivity- vector Selectivity- vector Selectivity- recruitment overfishing) Recent Z: Recent F or f: F+M= 25 (a) Recent Z: F= 1.9 LCCC(a) M=2.5 LCCC (a) Recent F or f: M=2.0 (a) M=1.6 (a) Fe 0.8 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	menuccius		-						
TS: about 300 tons (mean over 1985-95) TS: VPA: Interdemention of the second one hake is fully exploited and with minor risk for self-renewal capability (1). Interdemention of the second one hake is fully exploited and with minor risk for self-renewal capability (1). Note: Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. Mean Length of capture in cm TL : If so a content of the second of the second to increase the SSB/SSB0 (1)	Area:	Biomass:		Recruitment:	Management option	<u>ו</u> אר י	Recommendations:		
Image: market set of the system of the sy		TS: about 300 tons			lina agement op io		it is raccomended		
VPA: VPA: SSB/SSB0 (1) Note : No evident trends in biomass estimates were detected. Fishery and assessment SSB/SSB0 Operational unit: Trawling along Northern Coasts of Tuscany (Livorno and Viareggio Fleets) Stock Status: L25 L30=L0=11 cm TL (a) L30=L0=11 cm TL (a) L30=L0=11 cm TL (a) L75 Age at first capture (t_0): Mean Length of capture in cm TL : SSB/SSB0 Note: Assessment Fully-heavily exploited Viareggio Fleets) Fully-heavily Fully-heavily exploited Risk of recruitment overfishing) Vector Selectivity- Vulnerability (b) Age at first capture (t_0): Mean Length of capture in cm TL : SSB/SSB0 Recent Y: Recent Y/R in g: F+M= 25 (a) F+M= 33 (b) Recent Z: M=2.5 LCCC (a) M=2.5 LCCC (a) M=2.5 LCCC (a) Recent F or f: F= 2.0 (a) M=1.6 (a) Recent E: F= 0.8 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.		(mean over 1985-95	5) -	TS:			to increase the		
VPA: Auge and assessment Operational unit: Trawling along Northern Coasts of Tuscany (Livorno and Viareggio Fleets) Stock Status: Fully-heavily exploited L25 L50=Lc=11 cm TL (a) L50=Lc=11 cm TL (a				VPA:			SSB/SSB0 (1)		
Note : No evident trends in biomass estimates were detected. Fishery and assessment Operational unit: Trawling along Northern Coasts of Tuscany (Livorno and Viareggio Fleets) Stock Status: Fully-heavily exploited Risk of vector Selectivity- Vulnerability (b) Age at first capture (t_c): Mean Length of capture in cm TL : SSB/SSB_0 Recent Y: Fully-heavily exploited Risk of vector Selectivity- vulnerability (b) Vector Selectivity- Vulnerability (b) It is is is in the second overfishing) Note: Recent Y/R in g: F+M= 25 (a) F+M= 25 (a) Recent Z: F= 1.9 LCCC(a) M=2.5 LCCC (a) Recent F or f: F= 2.0 (a) M=1.6 (a) F= 0.8 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.		VPA:							
Fishery and assessment Operational unit: Trawling along Northern Coasts of Tuscany (Livorno and Viareggio Fleets) Stock Status: L25 L50=Lc=11 cm TL (a) L75 Age at first capture (tc): Mean Length of capture in cm TL : SSB/SSB0 Pully-heavily viareggio Fleets) Fully-heavily exploited Risk of vector Selectivity- vulnerability (b) Vector Selectivity- Vulnerability (b) 1% (a) 1% (a) Recent Y: Recent Y/R in g: F+M= 25 (a) F+M= 33 (b) Recent Z: M=2.5 LCCC (a) F= 1.9 LCCC(a) M=2.5 LCCC (a) Recent F or f: F= 2.0 (a) M=1.6 (a) Fe 0.8 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Medit. 5 (2): 136-150.	Note : No evident trend	ds in biomass estima	tes we	ere detected.					
Operational unit: Trawling along Northern Coasts of Tuscany (Livorno and Viareggio Fleets)Stock Status:L25 L50=Lc=11 cm TL (a) L75Age at first capture (t_c):Mean Length of capture in cm TL :SSB/SSB_0Northern Coasts of Tuscany (Livorno and Viareggio Fleets)Fully-heavily exploited Risk of overfishing)L75Mean Length of (t_c):SSB/SSB_0Recent Y:Recent Y/R in g: F+M= 25 (a) F+M= 33 (b)Vector Selectivity- Vulnerability (b)Vector Selectivity- Vulnerability (b)Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors.F= 1.9 LCCC (a) M=2.5 LCCC (a)F= 2.0 (a) M=1.6 (a)F= 0.8 (a) M=0.8 (a)Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors.The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1).Medit. 5 (2): 136-150.	Fishery and ass	sessment	-						
Trawling along Northern Coasts of Tuscany (Livorno and Viareggio Fleets)Fully-heavily exploitedL_{50}=L_c=11 cm TL (a) L_{75}(t_c):capture in cm TL :1% (a)Recent Y:Recent Y/R in g: F+M= 25 (a) F+M= 33 (b)Recent Z:Recent F or f:Recent E: F= 2.0 (a) M=1.6 (a)F= 0.8 (a) M=1.6 (a)Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1).Meint So (2): 136-150.	Operational unit:	Stock Status:	L ₂₅		Age at first capture	Mean Length of	SSB/SSB ₀		
Northern Coasts of Tuscany (Livorno and Viareggio Fleets) Fully-heavily exploited L ₇₅ 1% (a) Risk of voerfishing) Risk of voerfishing) Vector Selectivity- Vulnerability (b) 15% (b) Recent Y: Recent Y/R in g: F+M= 25 (a) F+M= 33 (b) Recent Z: F= 1.9 LCCC(a) M=2.5 LCCC (a) Recent F or f: F= 2.0 (a) M=1.6 (a) Recent E: F= 0.8 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	Trawling along		L ₅₀ =L	_{-c} =11 cm TL (a)	(t _c):	capture in cm TL :			
Tuscany (Livorno and Viareggio Fleets) exploited Nettor Selectivity-Vulnerability (b) 15% (b) Recent Y: Recent Y/R in g: Recent Z: Recent F or f: Recent E: F+M= 25 (a) F= 1.9 LCCC(a) M=2.5 LCCC (a) M=1.6 (a) M= 0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M-at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	Northern Coasts of	Fully-heavily	L ₇₅				1% (a)		
Vialeggio Frieets) Kisk of recruitment overfishing) Viector Selectivity-Vulnerability (b) 15% (b) Recent Y: Recent Y/R in g: Recent Z: Recent F or f: Recent E: F+M= 25 (a) F= 1.9 LCCC(a) F= 2.0 (a) F= 0.8 (a) M=2.5 LCCC (a) M=2.5 LCCC (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M-at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	Tuscany (Livorno and	exploited Bick of	Veet	or Solootivity			150((b)		
Recent Y: Recent Y/R in g: Recent Z: Recent F or f: Recent E: F+M= 25 (a) F= 1.9 LCCC(a) F= 2.0 (a) F= 0.8 (a) F+M= 33 (b) M=2.5 LCCC (a) M=1.6 (a) M= 0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M-at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	Viareggio Fieels)	RISK UI	Vulna	or Selectivity-			15% (D)		
Recent Y:Recent Y/R in g: F+M= 25 (a) F+M= 33 (b)Recent Z: F= 1.9 LCCC(a) M=2.5 LCCC (a)Recent F or f: F= 2.0 (a) M=1.6 (a)Recent E: F= 0.8 (a) M=0.8 (a)Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1).Recent F or f: F= 2.0 (a) M=1.6 (a)Recent E: F= 0.8 (a) M= 0.8 (a)Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.Recent E: F= 0.8 (a) M= 0.8 (a)		overfishing)	vullerability (b)						
F+M= 25 (a) $F+M= 33$ (b)F= 1.9 LCCC(a) $M=2.5$ LCCC (a)F= 2.0 (a) $M=1.6$ (a)F= 0.8 (a) $M=0.8$ (a)Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1).F= 0.8 (a) M= 0.8 (a)Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.F= 0.8 (a) M= 0.8 (a)	Recent Y:	Recent Y/R in a:	Recent Z:		Recent F or f:		Recent E:		
F+M= 25 (a) F= 1.9 LCCC(a) F= 2.0 (a) F= 0.8 (a) F+M= 33 (b) M=2.5 LCCC (a) M=1.6 (a) M=0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.									
F+M= 33 (b) M=2.5 LCCC (a) M=1.6 (a) M= 0.8 (a) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.		F+M= 25 (a)	F= 1.	.9 LCCC(a)	F= 2.0 (a)		F= 0.8 (a)		
F+M= 33 (b) Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.			M=2.	5 LCCC (a)	M=1.6 (a)		M= 0.8 (a)		
Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.		F+M= 33 (b)							
Note: Assessment based mainly on trawl surveys data (1985-95) by using both traditional Y/R analysis and a variant assuming M- at age and vulnerability-at age vectors. The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.									
The traditional approach suggests heavy overexploitation and serious danger of recruitment over-fishing; according to the second one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	Note: Assessment bas	sed mainly on trawl su	urveys	s data (1985-95) k	by using both tradition	al Y/R analysis and a	variant assuming M-		
one hake is fully exploited and with minor risk for self-renewal capability (1). Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	The traditional approac	-al age vectors.	orovn	loitation and serie	us danger of recruite	ant over-fishing: acco	rding to the second		
Biology References: (1) Abella A. and Serena F. (1998) – Biol. Mar. Medit. 5 (2): 136-150.	one hake is fully exploit	ted and with minor ris	sk for	self-renewal cana	bility (1)	ient over-nsning, acco	ruing to the second		
	Biology References	: (1) Abella A and	Sere	ena F (1998) – I	Biol Mar Medit 5 (2): 136-150			
Lin cm TI W Kin v-1 to in v L max.			W		K in v-1	t _o in v	L max.		
F = 79.1 (1) $F = 43 (1)$		F = 79.1 (1)	••∞		F =0.185 (1)	F =79.1 (1)	F = 43(1)		
M= 53.4 M= 53.4 M= 27		M= 53.4			M= 0.272	M= 53.4	M= 27		
L _r T _r A B L _m in cm TL Tm	L _r	T _r	А		В	L _m in cm TL	Tm		
F =0.0041 (1) F =3.192 (1)			F =0.	.0041 (1)	F =3.192 (1)				
M= 0.005 M= 3.119			M= 0	.005	M= 3.119				
M T C° Ageing method VBGF method M method	M	T C°	Ageir	ng method	VBGF method	M method			
F = 0.32 (a)	F = 0.32 (a)					a) Constant M			
IVI= 0.47 A) CONSTANT IVI b) Variable M	VI = 0.47					a) Constant M b) Variable M			

Table 28 - Gen	Table 28 - General Data								
Scientific name:	GFCM Subarea:		Management Unit:	Country:	Fishery:	Stock Name:			
Merluccius	Sardinian	Sardinian		Italy	Trawling and				
merluccius			(Northern		gillnet				
			Tyrrhenian Sea)						
Area:	Biomass:		Recruitment:	Management option	S :	Recommendations:			
15300 km ²	TS: VPA:		TS: VPA:			Protection of nursery areas			
Fishery and as	ssessment								
Operational unit	Stock Status:	L ₂₅ L ₅₀ =	=L _c =	Age at first capture (t _c):	Mean Length of capture in cm TL :	Recent E:			
Trawlers of Porto S. Stefano.	Overexploited	L ₇₅			Italian trawlers – 15.1	E= 0.7 (1)			
Italian trawlers –					French trawlers –				
French trawlers -					16.9				
Recent Y: (1991)	Recent Y/R in g: (1991)	Rec	cent Z:	Recent F or f: (1991)	Y/R _{max.} in g	Reduction of current F to obtain Y/R _{max.} .			
10tal - 577 tons	Total – 30	(1)		<u>Italian trawiers</u> –	<u>10tal</u> – 60 Italian trawlers –	- 75%			
417 tons	Italian trawlers – 22			in 12-24 cm TL length	40	1070			
French trawlers -	French trawlers - 8			class. Peak (F=1.9) a	t French trawlers -				
160 tons				about 16-17 cm TL.	20				
				French trawlers -					
				Values higher than 0.	5				
				class Poak (E=0.8) a	•				
				about 17-18 cm Tl					
				(1)					
Note: Assessment ba	ased on LCA and Y/R	analy	/sis by using VIT p	backage (1).	·	·			

Biology								
	L_{∞} in cm TL	W _∞	K in y-1	t _o in y	L max.			
	M+F= 92.98		M+F= 0.119	M+F= -0.371				
L _r	Tr	A	В	L _m in cm TL	Tm			
in cm TL		M+F= 0.00496	M+F= 3.108	F= 40 M= 27				
M(1) M+F= 0.21		Ageing method	VBGF method	M method Pauly (1980)				
LFM								
References: (1)	References: (1) De Ranieri S. et al. (1994) – Biol. Mar. Medit. 1 (2): 27-39.							

Table 29 - Gen	Table 29 - General Data									
Scientific name:	GFCM Subarea:	Management Unit:		Country:	Fishery:	Stock Name:				
Merluccius merluccius	Sardinian		1.3.j (Central Tyrrhenian Sea)	Italy	Trawling and gillnet					
Area:	Biomass:		Recruitment:	Management options :		Recommendations:				
15300 km ²	TS: VPA:		TS: VPA:							
Fishery and as	ssessment									
Operational unit	Stock Status:	L ₂₅ L ₅₀ =	=L _c =	Age at first capture (t _c):	Mean Length of capture in cm TL :	Recent E:				
Trawling along Coast of Latium	Overexploited	L ₇₅				E= 0.7 (1)				
Recent Y:	Recent Y/R in g:	Rec	ent Z:	Recent F or f:	F _{0.1} :	E _{0.1} :				
		1.3	6 (LCCC) (1)	F= 0.96(1)	0.27	0.4				
Note: (1).										
Biology		-			T					
	L_{∞} in cm TL	W∞		K in y-1	t _o in y	L max.				
	M+F= 74.59			M+F= 0.23						
L _r	T _r	A		В	L _m in cm TL	Tm				
in cm TL										
M(1) M+F= 0.4		Age	ing method	VBGF method Non linear	M method Pauly (1980)					
References: (1) Ardiz	zzone et al. (1998) – E	Biol. M	ar. Medit. 5 (3): 5	3-63.						

Table 30 – General Data									
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
Merluccius merluccius	Sardinian	Unit: 1.3.j (Southern	Italy	Trawling					
Area:	Biomass:	Recruitment:	Management option	าร :	Recommendations:				
13000 km ²	TS: VPA:	TS: VPA:			(1)				
Fishery and as	ssessment	·							
Operational unit Trawling along	Stock Status: Overexploited	L ₂₅ L ₅₀ =L _c = 12.4 cm TL L ₇₅ = 13.1 cm TL	Age at first capture (t _c):	Mean Length of capture in cm TL :	Recent E: E= 0.7 (1)				
Coasts of Campania and Calabria									
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	F _{max.} :	E _{0.1} :				
		1.64 (LCCC) (1)	F= 1.28(1)	0.30					
Note: F _{max.} estimate does not agree with t	d with classical Y/R Bey he observed relative sta	verton and Holt mode ability of catch rates fr	 The necessity of red om the trawl surveys in 	ucing F of about 75%, n the last 10 years (1).	suggested by Y/R model,				
Biology			,	, , , , , , , , , , , , , , , , , , ,					
	L_{∞} in cm TL	W_{∞}	K in y-1	t ₀ in y	L max.				
	M+F= 59.16		M+F= 0.165	M+F= -0.554					
L _r	T _r	A	В	L _m in cm TL	Tm				
		M+F= 0.0045	M+F= 3.15						
M(1)Ageing methodVBGF method Non linearM method Pauly (1980)									
Note: The nurserv are	eas was identified by ge	eostatistical tecnhique	s – Gulf of Gaeta and	Gulf of Naples (2)					
References: (1) Spec	licato M.T. et al. (1998)	- Biol. Mar. Medit. 5	(3): 64-73. (2) Spedic	ato M.T. et al. (1995)	– Biol. Mar. Medit. 2(2) :				
239-244. (3) Lembo e	et al. (1998) – Cah. Opt	ions Mediterr., 35: 14	7-154.						

Table 31 - General Data								
Scientific name:	GFCM Subarea:	Management	Country: Italy + Croatia	Fishery: Trawling	Stock Name:			
Merluccius	Adriatic	2.1.a						
merluccius								
Area:	Biomass:	Recruitment:	Recommendations:					
400000 1 2			Increasing the Lc f	from 14 to 16 cm with a	F=0.8, a 25% increase			
100000 km²	IS:	IS:	In Yield should be	achieved (3)	milar increase should			
	VPA	VPA	 Considering to mu be obtained closin 	a to trawling nursery ar	eas (Jabuka pit) (3)			
Note : Y/R simulation	with recruitment of 100	0000 individuals at 8	cm TL (3)	<u> </u>				
Fishery								
Operational unit	Stock Status:	-25	Age at first capture	Mean Length of				
		₋₅₀ =L _c =12.4 cm TL	(t _c):	capture in cm TL :				
Trawling	Overexploited ((1)						
		-75						
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:	F _{0.1} :			
	-	7-1 (1982) (2)	F-075(1982)(2)	F = 0.75(1982)(4)	0 14 (4)			
		_CCC	1 = 0.75(1502)(2)	L = 0.75(1502)(4)	0.14 (4)			
		Z=0.67-0.81 (1983-	F= 0.90(1985-95) (4)					
	8	34) (3) Heincke						
Note: Populations dy	namics on trawl survey	data (1-4).						
Catch rate from trawl	surveys from 1985 to 1	997 shown a slight inc	reasing trend (5).					
Biology								
	L _∞ in cm TL	N_{∞}	K in y-1	t _o in y	L max.			
			$E_1M_{-} \cap 12(1)$					
		٨	F + W = 0.12(1)		Tm			
	'r /		D		1111			
(1)		F+M= 0.00331(2)	F+M= 3.262 (2)					
М	T C°	Ageing method	VBGF method	M method				
M+F= 0.2 (a) (1)								
M+F=0.4 (b)		Otoliths readings	Ford-Walford	Pauly (1980)				
M+F=0.21025(4)) Fish Day, 204, 202 ((0) (0) Eleminus (0)		n 200: 100 115			
KEF: (1) JUKIC S., PI	ccinetti C. (1988) – FAC zoli M. (1986) – EAO Eio	risn Rep. 394: 282-2	(2) Fiamigni C. (1904) – FAU FISN KE	p. ∠90: 109-115			
(5) Piccinetti C. Picci	inetti Manfrin G (1904).	– Riol Mar Medit 1 (2)	+) AIUIZZUIE G.D. (198 1: 77-87 (6) Manfrin G	et al. (1998) – Riol M	lar Medit 5(3):96-			
108.								

Table 32 - Ger	neral Data				
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:
		Unit:	Italy	Trawling	
Merluccius	Ionian	2.2.b		Gill net	
merluccius					
Area:	Biomass:	Recruitment:	Management	Recommendations:	
2(4)			options :	The renewal of stock is	s probably due to areas
14200 km ⁻ (1)	IS:	IS:		are present	g in which spawners
	VPA	VPA			
Fishery					
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	
	Overexploited	$L_{50} = L_{c} =$	(t _c):	capture in cm TL :	
Trawling	(growth overfishing)	L ₇₅			
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:	F _{Ymax.}
		$Z_{LCCC}=1-1.7(1985-97)(1)$		$E_{LCCC} = 0.8 (1985-9)$	1)(2)
		$Z_{\text{LCCC}}=1.31(1991-93)(3)$	F= 0.7-1 (1991-93)	$E_{LCCC}=0.8 (1991-93)$	$\binom{(3)}{(2)}$ 0.2 – 0.3 (3)
		Z LCA=0.96(1991-93) (3)	(3)	$E_{LCA} = 0.7 (1991-93)$	(3)
Note: Assessments	based on population dy	namics on trawl survey	data.		
Biology	-		1	1	I
	L_{∞} in cm TL	W_{∞}	K in y-1	t _o in y	L max.
	F+M= 75.7 (3)		F+M= 0.153(3)	F+M=	
L _r in cm TL	T _r	A	В	L _m in cm TL	Tm
				F = 30	
	— 00	F+M=0.00257(3)	F+M= 3.29 (3)	M = 25	
M	T C°	Ageing method	VBGF method	M method	
F . M 0.00 (0)					
F + IM = 0.29(3)		Otoliths readings	Ford-Walford	Pauly (1980)	
Poforoncoc:					
References.					
(1) Marano et al. (10	188) – Biol Mar Medit 5	(3). 100 -110			
(2) Ungaro et al. (19	92) – Biologia Marina	Suppl Not SIBM: $329-3$	34		
(3) Ungaro N Mara	no G (1996) - FAO Fish	Rep 533 (Suppl) 97 -	- 100		
(2) Ungaro et al. (19(3) Ungaro N., Mara	92) – Biologia Marina, S no G. (1996)- FAO Fish	5иррі. Not. SIBM: 329-3 ı Rep. 533 (Suppl.): 97 –	34 - 100		

Table 33 - General Data								
GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
	Unit:	Italy	Trawling					
Ionian								
	2.2.c							
Biomass:	Recruitment:	Management	Recommendations:					
TS:	TS:	options :						
VPA	VPA							
Stock Status:	L_{25}	Age at first capture	Mean Length of	Y/ R _{max} in g				
Overexploited	$L_{50} = L_c = 11.5 \text{ cm rL}$	(t _c).						
Overexplotted	17	0 78 v		45 (1)				
	-75			10 (1)				
Recent Z:	Recent F or f:	F max. :	Recent E:	B/R / B ₀ /R:				
(1985-1997)			(1985-1997)					
$F Z_{Lccc} = 1.07 (2)$	F= 0.71 (1990-93)	0.2-0.3	F = 0.83(2)	10%				
M Z _{Lccc} = 1.27	(1)		M E = 0.83					
ased on trawl survey da	ata and Beverton and	Holt Y/R and B/R mode	ls (1)					
L _∞ in cm TL	W	K in y-1	t _o in y	L max.				
F+M= 62 (1)		F+M= 0.19 (1)	F+M= -0.39 (1)					
F= 78.22 (2)		F= 0.11 (2)	F= -1.03 (2)					
M= 66.47 (2)		M= 0.13 (2)	M= -0.91 (2)					
T _r	A	В	L _m in cm TL	Tm				
	E . M. 0.0000004 (4)	E M 00(4)						
	F + IVI = 0.0000024(1)	F+IVI= 3.2(1)	M m oth o d					
	Ageing method	VBGF method	ivi metnod					
	Otoliths readings	Non linear regression	Pauly (1980)					
oefficients calculated w	vith TL in mm and TW	in a: reported values a	re mean of spring and	autumn coefficients				
i A et al (1996) – FAC	Fish Rep 533 (Sup	nl)127-141	to mount of opring and					
i A. et al. (1998) Biol. M	lar. Medit. 5(3): 120-1	29.						
	eral DataGFCM Subarea:IonianBiomass:TS:VPAStock Status:OverexploitedRecent Z:(1985-1997)F Z Lccc = 1.07 (2)M Z Lccc = 1.27ased on trawl survey dataL _∞ in cm TLF+M= 62 (1)F= 78.22 (2)M= 66.47 (2)TrDefficients calculated wi A. et al. (1996) – FACA. et al. (1998) Biol. M	eral DataGFCM Subarea:Management Unit:Ionian2.2.cBiomass:Recruitment: TS:TS:VPAVPAVPAStock Status: L_{25} $L_{50}=L_c=11.5 cm TL(1)$ Overexploited(1) L_{75} Recent Z: (1985-1997)Recent F or f: (1985-1997)F Z Lccc = 1.07 (2) M Z Lccc = 1.27F= 0.71 (1990-93) (1)M Z Lccc = 1.27(1)ased on trawl survey data and Beverton andL_{\infty} in cm TLW_{\infty}F+M= 62 (1) F= 78.22 (2) M= 66.47 (2)A F+M=0.0000024 (1) Ageing method Otoliths readingsDefficients calculated with TL in mm and TW i A. et al. (1996) – FAO Fish. Rep. 533 (Supp A. et al. (1998) Biol. Mar. Medit. 5(3): 120-1	eral DataGFCM Subarea:Management Unit:Country: ItalyIonian2.2.cBiomass:Recruitment: TS:Management options :Biomass:TS:VPAVPAVPAVPAVPAAge at first capture (t_c):OverexploitedL25 L50=L_c=11.5 cm TL (1) L75Age at first capture (t_c):Recent Z: (1985-1997)Recent F or f: F Z Lccc = 1.07 (2)F max. :F Z Lccc = 1.07 (2)F= 0.71 (1990-93) (1)0.2-0.3M Z Lccc = 1.27 Lccc = 1.27Management options :VPAVPAVPAK in y-1F+M= 62 (1) F= 78.22 (2) M = 66.47 (2)F+M= 0.19 (1) F= 0.11 (2) M= 0.13 (2)TrABF+M=0.0000024 (1)F+M= 3.2 (1) VBGF method VBGF methodOtoliths readingsNon linear regression Defficients calculated with TL in mm and TW in g; reported values a i A. et al. (1996) – FAO Fish. Rep. 533 (Suppl.) 127-141. A. et al. (1998) Biol. Mar. Medit. 5(3): 120-129.	eral DataGFCM Subarea:Management Unit:Country: ItalyFishery: TrawlingIonian2.2.cManagement options :Fishery: TrawlingBiomass: TS: VPARecruitment: TS: VPAManagement options :Recommendations:Stock Status: Unit: L_{25} Lso=Lc=11.5 cm TL (1) L_{75} Age at first capture (t_c):Mean Length of capture in cm TL :Overexploited L_{25} Lso=Lc=11.5 cm TL (1) L_{75} Age at first capture (t_c):Mean Length of capture in cm TL :Recent Z: (1985-1997) F Z Lccc = 1.07 (2) M Z Lccc = 1.27Recent F or f: (1)F max. : (1980-1993)Recent E: (1985-1997) F E = 0.83 (2) M E = 0.11 (2)L_m in cm TLW_mK in y-1 F+M=0.19 (1) F = 78.22 (2) M = 0.13 (2)F+M=-0.39 (1) F=-1.03 (2) M = -0.91 (2)Tr,AB F+M=0.0000024 (1)L_m in cm TL F+M= 3.2 (1)Ageing methodVBGF methodM method M methodOtliths readingsNon linear regressionPauly (1980)Deficients calculated with TL in mm and TW in g; reported values are mean of spring and i A. et al. (1998) Biol. Mar. Medit. 5(3): 120-129.Heine Counter				

Table 34 - General Data							
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:		
		Unit:		Trawling			
Merluccius	Ionian	2.2.d (Ionian	Greece	Gill net			
merluccius		Sea)					
Area:	Biomass:	Recruitment:	Management	Recommendations:			
	TS:	TS:	options :				
	VPA	VPA		Increase mesh size fro	om 28 to 40 mm		
Fishery							
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of			
		$L_{50} = L_{c} =$	(t _c):	capture in cm TL :			
Trawling	Fully exploited	L ₇₅					
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:	F _{Ymax.}		
		7 0.05(1002.04)(1)					
		$Z_{LCCC}=0.03(1903-04)(1)$ $Z_{LCCC}=0.78(1983-84)(1)$	F=0.67(1983-84)(1)	E=0.79(1983-84)(1)			
Note: Assessment h	ased on trawl survey o	lata and Exploitation Rat	r=0.00(1903-04)(1)	E=0.77(1903-04)(1)			
Biology							
2101099	L in cm Tl	W	K in v-1	t _o in v	l max		
		• • 00		-0 y			
	F+M= 71.7 (1)		F+M= 0.081 (1)				
L _r in cm TL	T _r	A	В	L _m in cm TL	Tm		
				F = 36 (2)			
4-6 (1)		F+M= 0.000019(2)	F+M= 3.234 (2)	M = 31			
M	T C°	Ageing method	VBGF method	M method			
		.					
F+M = 0.18(1)		Otoliths readings	Ford-Walford	Pauly (1980)			
Note: length-weight c	coefficients calculated v	with TL in mm and TW in	n g (2)				
References:	O (0000) The Lists		afliala (Manhara' a	mante and the second			
(1) Papaconstantinou C. (2000) – The biology and the management of Hake (<i>Merluccius merluccius</i> in the Greek Seas) Working							

paper to be presented at WG on Demersals Séte 21-23 March 2000: 17 p. (2) Papaconstantinou C., Stergiou K.I. (1995) – Fish and Fisheries Series 15 - Chapman & Hall – London: 150-180.

Table 35 - Gen	eral Data				
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:
		Unit:		Trawling	
Merluccius	Ionian	2.2.d	Greece	Gill net	
merluccius		(Korinthiakos			
		Gulf)			
Area:	Biomass:	Recruitment:	Management	Recommendations:	•
			options :	Increase mesh size fro	om 28 to 40 mm
	TS:	TS:			
	VPA	VPA			
Fishery		·			
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	
		$L_{50}^{20} = L_{c} =$	(t _c):	capture in cm TL :	
Trawling	Fully exploited	L ₇₅			
(Korinthiakos Gulf)					
````					
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:	F _{Ymax.}
		$Z_{\text{LCCC}}=0.94(1983-84)(1)$	F=0.76(1983-84)(1)	E=0.81(1983-84)(1)	
	<u> </u>	$2_{LCCC} = 1.7(1983-84)(1)$	F=0.89(1983-84) (1)	E=0.83(1983-84) (1)	
Note: Assessment b	ased on trawl survey of	data and Exploitation Ra	te.		
Biology					
	L _∞ in cm TL	W _∞	K in y-1	t _o in y	L max.
	F+M= 65.9 (1)		F+M= 0.068 (1)		
L _r in cm TL	T _r	A	В	L _m in cm TL	Tm
		F+M= 0.000024(2)	F+M= 3.197 (2)	F = 43 (2)	
				M = 36	
M	T C°	Ageing method	VBGF method	M method	
F+M = 0.18 (1)		Otoliths readings	Ford-Walford	Pauly (1980)	
Note: length-weight c	coefficients calculated v	with TL in mm and TW in	n g (2)		

## References:

(1) Papaconstantinou C. (2000) – The biology and the management of Hake (*Merluccius merluccius* in the Greek Seas) Working paper to be presented at WG on Demersals Séte 21-23 March 2000: 17 p.
 (2) Papaconstantinou C., Stergiou K.I. (1995) – Fish and Fisheries Series 15 - Chapman & Hall – London: 150-180.

Table 36 - Ger	neral Data					
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery: Trawling	Stock Name:	
Merluccius	Ionian	2.2.d	Greece	Gill net		
merluccius		(Patraikos Gulf)	)			
Area:	Biomass:	Recruitment:	Management	Recommendations:		
			options :	Increase mesh size	from 28 to 40 mm	
Fishery		VFA				
Operational unit	Stock Status:	1	Ago at first capture	Moon Longth of		
Operational unit			Age at first capture	capture in cm TI		
Trawling (Patraikos Gulf)	Fully exploited	L ₇₅	(tc).			
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:	F _{Ymax.}	
		Z _{LCCC} =1.17(1983-84)( Z _{LCCC} =1.23(1983-84)	(1) $F=0.99(1983-84)(1)$ (1) $F=1.05(1983-84)(1)$	E=0.81(1983-84)(1 E=0.83(1983-84)(1	) 1)	
Note: Assessment b	ased on trawl survey	data and Exploitation	Rate.			
Biology						
	L _∞ in cm TL	₩∞	K in y-1	t _o in y	L max.	
	F+M= 63.8 (1)		F+M= 0.075 (1)			
L _r in cm TL	T _r	A	В	L _m in cm TL	Tm	
		F+M= 0.000020(2)	F+M= 3.23 (2)	F = 36 (2) M = 30		
М	T C°	Ageing method	VBGF method	M method		
F+M = 0.18 (1)		Otoliths readings	Ford-Walford	Pauly (1980)		
Note: length-weight (	coefficients calculated	with IL in mm and IV	v in g (2)			
(1) Papaconstantino	(1000) – The biolo	av and the managem	ont of Hake (Marlucoius	mortuccius in the G	rook Soos) Working	
naper to be presente	a c. (2000) – The blolo	s Séte 21-23 March 2	000.17 n	menuccius in the G	icer Seas working	
(2) Papaconstantino	u C., Stergiou K.I. (199	5) – Fish and Fisherie	es Series 15 - Chapman	& Hall – London: 15	50-180.	

Table 37 - Gen	Table 37 - General Data						
Scientific name:	GFCM Suba	area:	Management Un <u>1.3.k</u> (Strait of Sici Coast)	it: ily – Northern Tunisian	Country:	Fishery:	
		2.2.f (Strait of Sicil Southern Tunisian	y –Eastern and Coast)	i unisia	Gill nets Long lines		
Biomass: TS: LCA: <u>Recruitment</u> : TS: LCA:13 millions of individuals at 10 cm T	Recommend Any deci The bion spece L Any Any deci The bion spece Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter Inter In	mmendations: Any increasing in fishing effort would lead to a long term decreases in Yield and spawnin decreasing of effort would benefit all areas and categories of fleet. The increase of mesh size of trawlers (from 38 to 60 mm) would lead to important long t biomass and yield especially for coastal fleet. The change in exploitation pattern should specially for trawlers in the North and East. Therefore this measure should be gradually The displacement of part of trawlers from South to North should is not sufficient to have landings.(1)				vning biomass; while a g terms gain in spawning uld cause an immediate loss, illy introduced. ve positive effects on hake	
Fishery							
Operational unit <u>North Trawlers</u> <u>Coastal North Eastern</u>	Stock Status:	Y/R max. With few di Y would be	fference among flee obtained reducing	ets, the highest increase effort at 25% of the curre	SSB/SSB ₀ : of nt 1%	MSY in tons Schaefer = 750 tons	
trawlers Southern Trawlers	ploited	value.		Fox = 680 tons			
Recent Y:		Recent F	(1988-91):			Recent f:	
<u>TOTAL</u> =500 tons % for each Operation	al Units	North trawle (F=1.1). Ex Coastal No	orth trawlers= F>0.5 from 13 to 45 cm TL with the maximum at 16 cm1900*FD*HP*10 ⁶ (1991) $=1.1$ ). Exploited range 10-45 cm TL. $= F>0.25$ from 22 to 32 cm TL with the maximum at 28 cm $=-0.65$ $= F$ subjected range 13.42 cm TL				
<u>North Trawlers – 49%</u> <u>Coastal North – 13%</u> <u>Eastern trawlers –309</u> <u>Southern Trawlers</u> -79	(F=0.65). E <u>Eastern tra</u> (F=0.8). Ex <u>Southern tr</u> range 15-4. <u>TOTAL</u> =	$\begin{array}{l} \hline f_{MSY}:\\ \hline astern trawlers = F>0.5 from 15 to 25 cm TL with the maximum at 19 cm\\ \hline southern trawlers = lowest F values with maximum at 22 cm (0.25). Exploitation\\ \hline ange 15-42cm TL.\\ \hline OTAL = F>1 from 15 to 30 cm TL with the maximum at 20\\ \hline \end{array}$			f _{MSY} : Schaefer=1100*FD* HP*10 ⁶ (1985) Fox= 750* FD*HP*10 ⁶ (1983)		
Noto: Assessment or	prried out on me	CIII (F=Z	(2); than decre	ase regularly	on All Evalues are de	rived from graphs	
Biology		an lanuing	<u>s over 1900-91 by</u>			nved nom graphs.	
$L_{\infty}$ in cm TL :		K in y-1:			t ₀ in y	L max.	
F+M= 69.5 (1)		F+M= 0.17	76 (1)				
M:	F _{term} .:	A		В	$L_m$ in cm TL:		
M+F= 0.2 (3)	M+F= 0.6		(1000) = 10 =		F+M= 27 cm TL		
References: (1) Ben Mariem S., Gharbi H. (1996) – FAO Fish Rep.533 (Suppl.): 173-189.							

Table 38 - G	eneral Data						
Scientific name:	GFCM Subarea:	Ν	Management	Country:	Fishery:	Sto	ck Name:
		l	Unit:		Trawling		
Merluccius	Ionian	3	3.1.a (Euboikos	Greece	Gill net		
merluccius		C	Gulf)				
Area:	Biomass:	F	Recruitment:	Management	Recommendations:	Recommendations:	
		FO: 40, 400 tage (4000, 00)		options :	Increase mesh size fro	om 28	3 to 40 mm
	1 S: 48–163 tons (1986-8	1 S: 48–163 tons (1986-88)					
	VPA:	A: VP					
Fishery							
Operational unit	Stock Status:	Stock Status: L ₂₅		Age at first capture	Mean Length of		
		$L_{50}=L_{c}$	=	(t _c ):	capture in cm TL :		
Trawling	Fully exploited	L ₇₅					
(Eubolkos Gulf)							
Booont V:	Percent V/P in a:	Beeer	ot 7:	Booont E or f:	Booont E:		с С
Recent 1.	Recent f/R in g.	Recei	π Ζ.	Recent F OF I.	Recent E.		Г _{Ymax.}
		Z LCCC=	=0.56(1986-88)(1)	F=0.24(1986-88)(1)	E=0.24(1986-88)(1)		
Note: Assessmer	t based on trawl surveys	data ar	nd Exploitation Ra	ite			
Biology							
	L _∞ in cm TL	$W_{\infty}$		K in y-1	t _o in y	Lm	ax.
	F+M− 59.8 (1)			F+M= 0 145 (1)	F+M=-1 59		
	Т.	Δ		B		Tm	
	• r	~					
6-8 (1)		F+M=	0.0000035(2)	F+M= 3.147 (2)	F = 34 (2)		
M	T C°	Ageing	g method	VBGF method	M method		
		-	-				
F+M = 0.32 (1)		Otolith	ns readings	Ford-Walford	Pauly (1980)		
Note: length-weigh	nt coefficients calculated v	vith TL	in mm and TW in	n g (2)			
References:	<b>_</b>	-	_				
(1) Papaconstanti	nou C. (2000) – The biolog	gy and	the management	ot Hake (Merluccius	merluccius in the Gre	ek S	seas). Working
paper to be prese	nted at WG on Demersals	s Séte 2	21-23 March 2000	).			

(2) Papaconstantinou C., Stergiou K.I. (1995) – Fish and Fisheries Series 15 - Chapman & Hall – London: 150-180.

Table 39 - Gen	eral Data					
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:	
		Unit:		Trawling		
Merluccius	Ionian	3.1.a	Greece	Gill net		
merluccius		(Saronikos Gulf)				
Area:	Biomass:	Recruitment:	Management	Recommendations:		
			options :	Increasing mesh size	from 28 to 40 mm,	
	TS:	TS:		short- term decrease	of yield of 2.1% and	
	VPA	VPA		long- term increase of	6% are expected (1).	
Fishery						
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of		
		$L_{50} = L_{c} =$	(t _c ):	capture in cm TL :		
Trawling (Saronikos	Fully exploited	L ₇₅				
Gulf)						
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:	F _{Ymax.}	
		Z _{LCCC} =1.87(1988)(1)	F=1.38(1988)(1)	E=0.74(1988)(1)		
Note: Assessments	based on trawl surveys	data				
Biology						
	L _∞ in cm TL	W∞	K in y-1	t ₀ in y	L max.	
	F+M= 601)		F+M= 0.3 (1)			
L _r in cm TL	T _r	А	В	L _m in cm TL	Tm	
/						
6-8 (1)		F+M= 0.0000025(2)	F+M= 3.203 (2)			
M	T C°	Ageing method	VBGF method	M method		
F+M = 0.49(1)				Pauly (1980)		
Note: length-weight c	coefficients calculated w	with IL in mm and IW	n g (2)			
References:	O(0000) The lit					
(1) Papaconstantinou	10.(2000) - 1 he biolog	gy and the managemer	nt of Hake (Merluccius	meriuccius in the Gre	eek Seas). Working	
paper to be presente	a at wG on Demersals	Sete 21-23 March 200		Q Liall Landar 450	100	
(2) Papaconstantinou C., Stergiou K.I. (1995) – Fish and Fisheries Series 15 - Chapman & Hall – London: 150-180.						

Table 40 - 0	General Data						
Scientific name: Merluccius	GFCM Subarea: Ionian	Management Unit: 3.1.a (North Aegean)	Country: Greece	Fishery Trawlir Gill net	/: ng	Stock Nar	ne:
merluccius	<b>D</b> '	Deres literation	NA				
Area:	Biomass:	Recruitment:	Management	<ul> <li>Management options :</li> <li>Increase mesh size from 28 to</li> <li>Decreasing exploitation of 0+ a groups, an increase of 20% of expected.</li> </ul>		o 40 mm	
	TS:1331-2545 tons (1986- VPA	88) TS: VPA				itation of 0+ se of 20% of	and 1+ f yield is
Fishery		·					
Operational unit	Stock Status:	L ₂₅ L ₅₀ =L _c =	Age at first capture	(t _c ):	Mean Lengt capture in c	th of m TL :	
Trawling (North Aegean)		<b>L</b> /5					
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:			F _{Ymax.}
		Z _{LCCC} =0.72(1990-91)(1) Z _{LCA} =0.87(1990-91) (1)	F _{LCCC} =0.52(1990-91 F _{LCA} =0.70 (1990-91)	LCCC =0.52(1990-91)(1) LCA =0.70 (1990-91) (1) E LC		(1990- 990-91) (1)	
Note: Assessme	ents based on trawl surveys	data					
Biology				1		T	
	$L_{\infty}$ in cm TL	W∞	K in y-1	t _o in y		L max.	
	F+M= 103.7 (1)		F+M= 0.075 (1)	F+M= ·	-1.82 (1)		
L _r in cm TL	T _r	A	В	L _m in c	m TL	Tm	
6-8 (1)		F+M= 0.000003(2)	F+M= 3.179(2)				
М	T C°	Ageing method	VBGF method	M meth	nod		
F+M = 0.18 (1)		Otoliths readings	Ford-Walford	Pauly (	1980)		
Note: length-wei	ght coefficients calculated v	with TL in mm and TW i	n g (2)				
(1) Papaconstan	tinou C. (2000) – The biolog	ov and the managemen	t of Hake (Merluccius	merluco	ius in the Gre	eek Seas) V	Vorkina
paper to be pres	ented at WG on Demersals	Séte 21-23 March 200	0.				
(2) Papaconstan	tinou C., Stergiou K.I. (1998	5) – Fish and Fisheries	Series 15 - Chapman	& Hall -	London: 150	-180.	

Table 41 - Ger	eral Data				
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:
Micromesistius poutassou	Balearic	1.1.b	Spain	Trawling	
Area:	Biomass: VPA: (1988-89) M=0.3 – 5080 (tons) M=0.5 – 7170 (tons)	Recruitment in million VPA: (1988-89) M=0.3 - 83 M=0.5 - 143	s Management options :	Recommendation Further increase of fis produce increasing in should increase after larger than 40 mm.	hs: shing mortality should not yield; while the Y/R adoption of mesh size
Fishery and Asse	ssment				
Operational unit Trawling along Catalan coast;	Stock Status: Slight Overexploited (with M=0.3)	L ₂₅ L ₅₀ =L _c L ₇₅	Mean Length of capture: (1988-89) 18.3 cm TL (1)	Virgin biomass (B ₀ ): (1988-89) M=0.3 - 24500 (tons M=0.5 - 17500 (tons	)
Recent Y: 2461 t (1988-89) (1)	Recent Y/R in g: (1988-89)	Y/R _{max.} : (1988-89)	Recent F or f:		Recent E:
	M=0.5 - 17	obtainable reducing current F by 30-40% (	1)		
Note : Assessment	based on VPA and Y/R	analysis. Fish smaller	than 16 cm TL are ge	enerally discarded (1)	
Biology					1 ·
	L _∞	W∞	К	t _o	L max.
	M+F=48.2 cm TL (1)		M+F= 0.13 y-1 (1)	M+F=-1.69 y (1)	
L _r	Tr	A	В	L _m	
		M+F=0.00816 (1)	M+F=3.00 (1)	M+F= 17-17.5 cm TL	. (1)
M M+F=0.3 and 0.5 (1	F _{term.} = 0.7		Ageing method	VBGF method	M method
References: (1) Lleonart J. (1990 conseguimiento: Inf	)) – La pesqueria de Cat orme Final. Commision d	aluna y Valencia: desc de las Comunidades E	ription global y plante uropeas, DG XIV : 16	eamiento de las bases 534 p.	para su

Table 42 - Ger	neral Data				
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:
Micromesistius poutassou	Balearic	1.1.b	Spain	Trawling	
Area:	Biomass: VPA: (1988-89) M=0.3 – 2731 (tons) M=0.5 – 3723 (tons)	Recruitment in million VPA: (1988-89) M=0.3 – 44 M=0.5 – 75	ns Management options :	Recommendatio	ns:
Fishery and Asse	ssment				
Operational unit Trawling along Valencian coast;	Stock Status: Slight Overexploited (with M=0.3) Underexploitation (with M=0.5)	L ₂₅ L ₅₀ =L _c L ₇₅	Mean Length of capture: (1988-89) 18.3 cm TL (1)	Virgin biomass (B ₀ ): (1988-89) M=0.3 - 8650 (tons) M=0.5 - 8175 (tons)	Note:
Recent Y: 1343 t (1988-89) (1	Recent Y/R in g: (1988-89)	Y/R _{max.} : (1988-89)		1	Recent F or f:
	M=0.3 – 30.8 M=0.5 – 18.0	With M=0.3, Y/R $_{max}$ with M=0.5 Y/R $_{max}$ is	is obtainable reducing obtainable increasing	g current F by 20%; a effort by 80% (1)	
Note : Assessment	t based on VPA and Y/R	analysis. Fish smaller	than 16 cm TL are ge	enerally discarded (1)	
Biology				<u>_</u>	
	$L_{\infty}$	₩∞	K	$t_0$	L max.
L _r	T r	A	B	L _m	
		M+F=0.00816 (1)	M+F=3.00 (1)	M+F= 17-17.5 cm Tl	_ (1)
M M+F=0.3 and 0.5 (1	F _{term.} = 0.7		Ageing method	VBGF method	M method
References: (1) Lleonart J. (1990 conseguimiento: Inf	0) – La pesqueria de Cat forme Final. Commision d	aluna y Valencia: deso de las Comunidades E	cription global y plante Europeas, DG XIV : 16	eamiento de las bases 634 p.	s para su

Table 43 - Ge	neral Data				
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:
Micromesistius poutassou	Sardinian	1.3.j (Ligurian coas	Italy t)	Trawling	
Area:	Biomass:	Recruitment:	Management options :	Recommendations: • Considering E	max as Limit Reference Point, the
5800 km ²	TS: VPA:	TS: VPA:		current fishing r 28% (1)	nortality should be reduced by
Fishery and /	Assessment				
Operational unit Trawling along	Stock Status: Overexploited	$L_{25}$ $L_{50}=L_{c}=$ $L_{75}$	Age at first capture (t _c ): 1 y	Mean Length of capture in cm TL :	
Recent Y:	Recent Y/R in g:	Recent Z:	Recent E:	E ₀₁ :	E max.:
	Ĵ		0.7 (1994-95) (1)	0.4 (1994-95) (1)	0.5 (1994-95) (1)
Note: Assessment	based on trawl survey d	lata and Beverton ar	nd Holt relative Yield pe	er Recruit Model (1).	
Biology					
	$L_{\infty}$ in cm TL	W _∞	K in y-1	t ₀ in y	L max.
	M+F=		M+F=	M+F=	
L _r	T _r	A	В	L _m in cm TL	Tm
M(1)		Ageing method	VBGF method	M method	1
M+F=)		Otolith readings	Non linear regression		
References: (1) Rel	lini G. et al. (1998) – Bio	I. Mar. Medit. 5 (3): 2	20-29.		

Table 44 - G	eneral Data					
Scientific name:	GFCM Subarea:		Management	Country:	Fishery:	Stock Name:
Micromesistius	Ionian		<b>O</b> mu	Italy	Trawling	
poutassou			2.2.b	,	Ŭ	
Area:	Biomass:	Biomass: F		Management options :	Recommendations:	
14200 km ² (1)	TS:		TS: VPA			
Fishery			·		·	
Operational unit	Stock status: L ₂₅ L ₅₀ =L _c =		_c=	Age at first capture (t _c )	: Mean Length of in cm TL :	capture
Trawling	Overexploited (growth overfishing)	L ₇₅				
Recent Y:	Recent Y/R in g:	Rece	ent Z:	Recent F or f:	Recent E:	F _{Ymax.}
		Z _{LCC0} (1)	_C =2.8 (1996-98)	$F= 2.01 (1996-98) (1)$ $E_{LCCC} = 0.7 ($		5-98) (1)
Note: Assessmer	nts based on population	dynam	nics on trawl surv	vey data (1).		
Biology						
	$L_{\infty}$ in cm TL	W∞		K in y-1	t _o in y	L max.
	F+M= 41.4 - 48 (1)			F+M= 0.18 – 0.58 (1)	F+M=	
L _r in cm TL	Tr	А		В	$L_m$ in cm TL	Tm
		F+M		F+M	1 +101 - 20-22	
Μ	T C°	Agei	ng method	VBGF method	M method	
F+M = 0.79 (3)		Otoli	ths readings		Pauly (1980)	
References:						
(1) Marano et al. (	(1998) – Biol. Mar. Medit	:.5 (3):	109 –119			

Table 45 - 0	Table 45 - General Data						
Scientific	GFCM Subarea:	Management Unit:	Country:	Fishery:	Stock Name:		
name:							
	Ionian	2.2.c	Italy	Trawling			
Micromesistius							
poutassou	<u> </u>						
Area:	Biomass:	Recruitment:	Management	Recommendations:			
$11000  \mathrm{km}^2(1)$	TO	те.	options :				
11900 kill (1)		13. \/DA					
Fichary on	d According						
Fishery an	a Assessment				- T		
Operational	Stock status:	5	Age at first capture (t _c )	: Mean Length of	capture		
unit		₀ =L _c =		IN CM IL:			
Trawling	(arowth overfishing)	5					
Recent Y	Recent V/R in a:	ecent 7:	Recent F or f	Recent E [.]	F		
Recent 1.	Recent I/R ing.	500m Z.			Ymax.		
	Z	_ _{CCC} =1.11 (1996-98) (1)	F= 0.66 (1996-98) (1)	E _{LCCC} = 0.59 (199	6-98) (1)		
Note: Assessme	ents based on population	dynamics on trawl surve	y data (1).		·		
Biology					-		
	$L_{\infty}$ in cm TL W	∞	K in y-1	t _o in y	L max.		
	F = 1/1/3		F= 0.22	F = -1 32			
	M = 42.5 (1)		M= 0.24 (1)	M = -1.20			
L _r in cm TL	T _r A		B	L _m in cm TL	Tm		
8-9	F	ŀМ	F+M	F +M = 20-22			
Μ	T C°	geing method	VBGF method	M method			
E = 0.43		tolithe readings		Pauly (1980)			
M = 0.46(1)		tonthis readings		1 aury (1900)			
References:	1 1			1	1		
(1) Tursi A. et al.	. (1998) – Biol. Mar. Medit	.5 (3): 120 –129; (2) Te	ursi A. et al. (1992) – E	Biologia Marina, Supp	I. Not. SIBM 1:377-		
378.			. ,				

Table 46 - Gen	eral Data				
Scientific name:	GFCM Subarea:	Management Un	it: Country:	Fishery:	Stock Name:
		1.1.b	Spain	Trawling on slope	
Aristeus antennatus	Balearic	(Catalonia)		fishing grounds	
Area:	Biomass:	Recruitment in	Management	Recommendations:	
	VPA:	millions:	options :	The age composition	sition of the stock
	F M	VPA:		and its dynamics	s is highly dependent
	1984 – 394 88	F M		on recruitment.	
	1985 – 556 50	1984 – 28 10		<ul> <li>Considering Y/R</li> </ul>	max as target
	1986 – 421 37	1985 – 31 11		reference point,	only in females a
	1987 - 346 42	1986 – 24 8		variation of +200	% in K and +20% in
	1988 – 370 71	1987 - 20 12		M would compa	tible with
	1989 – 374 134	1988 – 35 18		overexploitation	
		1989 – 27 30			
Note : From 1983 to	1993 the annual landing	s in Catalonia resulte	ed stable (250-350 tons	5)	
Fishery and as	ssessment				
Operational unit	Stock Status: L	-25	Mean Length of	B ₀ :	SSB:
		₋₅₀ =L _c	capture in mm CL :		
Trawlers of Blanes,	Fully or under	-75		F M	
Arenys and	exploited		F = 34.2 – 39.5	1984 – 1098 81	
Barcelona ports				1985 – 1342 98	
			M = 24.8 – 27.3	1986 – 964 73	
				1987 - 677 69	
				1988 – 1268 142	
				1989 – 1168 251	
Recent Y in tons:	Recent Y/R in g: F	Recent F or f:	Y/R _{max.} in g:	Effort level _{Y/R max} .	(%):
1984 – 30	E- in the different	F M		F- 1984 1985 198	6 1987 1988 1989
1985 – 35	pseudo-cohorts 1	1984 – 1.07 1.5			
1986 – 24	ranges between 9	1985 – 1.31 1.7		0 +10 +3	0 +30 -40 -20
1987 – 35	and 10 7	1986 - 0.8 + 1.2			
1988 – 51	1	1987 - 1.13 1.4			
1989 – 88	M – 0.9 <y r<1.7<="" td=""><td>1988 – 1.74 0.9</td><td></td><td>M - Y/R is a monot</td><td>onically increasing</td></y>	1988 – 1.74 0.9		M - Y/R is a monot	onically increasing
	1	1989 – 1.44 1.6		curve.	· · · · · · · · · · · · · · · · · · ·
Note: Assessment ba	ased on VPA and LCA	and Y/R analysis by u	using VIT packages. Bo	oth males and female	s were considered.
Sensitivity analysis or	n K and M were performe	ed.			

Biology							
	L _∞ mm CL (1)	W _∞	K y-1 (1)	t ₀ y (1)	L max.		
			<b>F</b> 0.0	F 0.07			
	F=/6		F=0.3	F = -0.07			
	M=54		M=0.25	M=-0.5			
L _r	T _r	A	В	L _m in cm TL	Tm		
		F=0.00264	F=2.47				
		M=0.00402	M=2.32				
М	F _{term} =	Ageing method	VBGF method	M method			
F= 0.5		LFM	Non linear				
M=0.8			regression				
References:							
(1) Demestre M., Lleo	onart J. (1993) – Sci. N	Aar. 57(2-3): 183-189.					
( ) = = = = = = = = = = = = = = = = = =							

Table 47 - Gen	eral Data						
Scientific name:	GFCM Subarea:	Management Un	it: Country:	Fishery:	Stock Name:		
		1.1.b	Spain	Trawling on slope			
Aristeus antennatus	Balearic	(Valencian Coas	t)	fishing grounds			
Area:	Biomass:	Recruitment in	Management	Recommendations:			
	VPA:	millions:	options :	The age composition	sition of the stock		
	F M	VPA:		and its dynamics	s is highly dependent		
		F M		on recruitment.			
	1988 – 451 34	1988 – 24 6		Considering Y/R	max as target		
	1989 – 391 64	1989 – 33 11		reference point,	only in females a		
				variation of +20%	% in K and +20% in		
				M would compat	ible with		
				overexploitation.			
Note :							
Fishery and as	ssessment						
Operational unit	Stock Status:	L ₂₅	Mean Length of	B ₀ :	SSB:		
		$L_{50}=L_c$	capture in mm CL :				
Trawlers of Gandia	Fully or under	L ₇₅		F M			
and Calp of	exploited		F = 33.8 – 41				
Valencian coast				1988 – 1268 142			
			M = 26.1 – 26.3	1989 – 1168 251			
Decent V in tono	Depent V/D in g	Decent E er fi	V/D in au	Effort lovel (			
Recent Y In tons.	Recent f/R in g.	Recent F of I.	r/R _{max.} In g.	EIIOIT IEVEI Y/R max. (	<i>7</i> 0).		
1988 - 51	F-87-Y/R-108	F M		F- 1988 1989			
1989 - 88	1 0.7 \$171\$10.0	1 101		+50 -30			
	M – 4 3 <y 7<="" r<4="" td=""><td>1988 – 0 79 1 39</td><td></td><td></td><td></td></y>	1988 – 0 79 1 39					
		1989 – 1.3 0.9		M - 1988 1989			
				+20 +40			
Note: Assessment b	ased on LCA and Y/R	analysis by using VIT	packages. Both males	and females were cor	nsidered. Sensitivitv		
analysis on K and M	analysis on K and M were performed.						

	Biology							
) W _~	K y-1 (1)	t ₀ y (1)	L max.					
	F=0.3	F=-0.07						
	M=0.25	M=-0.5						
A	В	L _m in cm TL	Tm					
F=0.00354	F=2.39							
M=0.00532	M=2.25							
Ageing method	VBGF method	M method						
LFM	Non linear							
	regression							
•		•	•					
– Sci Mar 57(2-3): 183-18	RQ							
	) W _∞ A F=0.00354 M=0.00532 Ageing method LFM	)       W∞       K y-1 (1)         F=0.3       M=0.25         A       B         F=0.00354       F=2.39         M=0.00532       M=2.25         Ageing method       VBGF method         LFM       Non linear regression	) $W_{\infty}$ K y-1 (1) t ₀ y (1) F=0.3 F=-0.07 M=-0.5 A B L _m in cm TL F=0.00354 F=2.39 M=2.25 Ageing method VBGF method M method LFM Non linear regression					

Table 48 - Genera	I Data				
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:
		Unit:			
Aristeus	Balearic	1.1.c	Algeria	Trawling on slope	
antennatus	D:			fishing-grounds	
Area:	Biomass:	Recruitment:	Management opti	ons :	Recommendations:
km ²	TS	TQ			
NIII	13. \/ΡΔ·	13. \/ΡΔ·			
Note:	V1 / (.	VT 7 (.			
Fishery and asses	ssment				
Operational unit	Stock Status:	L ₂₅	Age at first capture	Optimal Length	Recent E:
		$L_{50} = L_c = 22 \text{ mm CL}$	(t _c ):	of capture in mm	
Trawling off	Fully exploitation	L ₇₅		CL :	0.58
Algerian coast			1 y		
-					_
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	E _{max.} :	E _{0.1} :
		(1980)	0.64	0.62	
Noto: Assassment	based on trawl surv	I.IID ov data and Polativ	U.04	Holt model Z obtair	and as mean of LCCC and
Wetherall et al. me	thods	ey uata anu Treiativ			led as mean of LCCC and
Biology					
	L _∞ in mm CL	W _∞	K in y-1	t₀ in y	L max.
	F= 65.1		F= 0.365	F= 0	
L _r	Tr	A	В	L _m in mm CL	Tm
in mm CL		A 1 (1 1		F= 27	
M (1)		Ageing method	VBGF method	M	
F 0.47			Non linear	actimated on virgin	ataal
$\Gamma = 0.47$	hippui Matel (109	LTIVI		esumated on virgin	SLUCK
		0 – FAU FISH. Rep	J. 341. ZZ I-Z3 I.		

Table 49 - Genera	I Data					
Scientific name:	GFCM Subarea:		Management	Country:	Fishery:	Stock Name:
			Unit:		<b>-</b>	
Aristeus	Sardinian		1.3.I + 1.3.K	Italy	I rawling on slope	
antennatus	Diamagai				Tisning-grounds	Decomposed at is not
Area:	Biomass:		Recruitment:	Management opti	ions :	Recommendations:
km ²	TQ		Te			mm oponing mosh size is
	13. \/ΡΔ·	,	13. \/ΡΔ·			recommended
Note:	V1 / (.		vi /(.			
Fishery and asses	ssment					
Operational unit	Stock Status:	L ₂₅		Age at first capture	Optimal Length	Recent E:
		L ₅₀ =	L _c = CL	(t _c ):	of capture in mm	
Trawling N-W	Under exploitation	L ₇₅			CL :	
Strait of Sicily	(a) or fully			1 y		
	exploitation (b)					
Recent Y:	Recent Y/R in g:	Rece	ent Z:	Recent F or f:	F _{max} .:	E _{0.1} :
				F = 0.3 (a)	F = 1.1 (a)	
			· · · · · · · · · · · · · · · · · · ·	F = 0.6 (D)	F = 0.6 (D)	
Note: (1). Assessn	nent based on trawls	surve	ey data and ivio	dified Y/R Beverton	and Holt model (Pa	ulik and Gales, 1964).
ыоюду		147		Kiny 1	tiny	
	L∞ IN MM CL	<b>VV</b> ∞		rx III y-1	ι ₀ π γ	
	F= 69.1			F= 0.53	F= 0	
L _r	Tr	А		В	L _m in mm CL	Tm
in mm CL						
M (1)		Agei	ing method	VBGF method	M method	
				Non linear		
F = 0.5 (a)		LFM		regression		
$F = U.\delta (D)$	annon C. Dionahin	; NA /				
References: (1) Ra	igonese 5., Bianchin	i ivi. (	1990) – FISN. I	TES. 20. 120-137.		
1						

Table 50 - Gen	eral Data							
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:		Stock I	Name:	
				Trawling o	n slope			
Aristeus antennatus	Sardinian	1.3.j	Italy	fishing-gro	unds			
Area:	Biomass:	Recruitment:	Management	Recomme	ndations:			
Note : In the early 80	TS: VPA: 's the resource collapsed	TS: VPA: d (2) After the recovery (	options : (1987) CPUE (kg	Gi     ag     rea     rea	ven the dire gregations a commended on is sugges int for fisher cording to the cording to the cording to the cording to the crease Y/R. cruitment ar er day) of S	ect harv a prude d st as tar ry. he asse reduct Howev <u>e expe</u> 5.Margh	est of spawning ential approach is rget reference essments using ion of F might not rer highest level of cted (1). erita Ligure	
trawlers decreased fr	trawlers decreased from 35 to 18 between 1987 and 1995 (1).							
Fishery and A	ssessment							
Operational unit	Stock Status:	Recent F or f:	F _{max.} (1) :		F _{0.1} (1) :		Current	
Trawling along the Central Eastern Ligur coast.	Overexploited (risk of recruitment overfishing)	M=0.3+a: 0.4 M=0.5+a: 0.29 M=0.3+b: 0.28 M=0.5+b: 0.19	M=0.3+a: 0.3 M=0.5+a: no M=0.3+b: 0.2 M=0.5+b: no	33 maximum 28 maximum	M=0.3+a: ( M=0.5+a: ( M=0.3+b: ( M=0.5+b: (	0.18 0.5 0.13 0.19	Spawning Potential Ratio (%): M=0.3+a: 18.5 M=0.5+a: 37 M=0.3+b: 23.5 M=0.5+b: 46.8	
Y in in tons (1) 1991 – 58 1992 – 62 1993 – 47	Recent Y/R (1) (*) : M=0.3+a: 13.8 M=0.5+a: 8.9 M=0.3+b: 11.7 M=0.5+b: 6.6	Y/R _{max.} (1) : M=0.3+a: 13.8 M=0.5+a: no maximu M=0.3+b: 11.7 M=0.5+b: no maximu	Y/R _{0.1} (1) : M=0.3+a: 12 M=0.5+a: 8.9 M=0.3+b: 10 M=0.5+b: 6.6	.9 5 .7 5	Mean Leng capture in TL (1) :	gth of cm	F _{0.1} Spawning Potential Ratio (%): M=0.3+a: 35.8 M=0.5+a: 41.6 M=0.3+b: 39.2 M=0.5+b: 47	
Note: Females forms 1991 and 1995. Asse	s more than 90% of the c essment based on landin	atches. The fraction of y gs and trawl survey data	/oung temales (LC a. LCA by using V	<38mm) de IT package (	creased from	m 60 to	35% between	

Biology									
	L _∞ in mm CL	W∞	К	t _o	L max.				
	F= 71.21 (a) (1)		F= 0.317 (a) (1)	F= -0.047 (a) (1)					
	F= 76.9 (b) (1)		F= 0.213 (b) (1)	F= -0.019 (1)					
L _r	Tr	A	В	L _m in cm TL	Tm				
		F = 0.00354) (1)	F+M= 2.386 (1)	F= 43 (1)					
М	F term.	Ageing method	VBGF method	M method					
F= 0.3-0.5 (1)	F =0.15 (1)	FLM	Non linear regression						
References:									
(1) Fiorentino	et al. (1998) - Cah. Op	otions Méditerr., 35: 32	23-333.						
(2) Orsi Relin	i L.,, Relini G. (1998) -	Cah. Options Méditerr	[.] ., 35: 311-322.						

Table 51 - Gen	eral Data						
Scientific name:	GFCM Subarea:		Management	Country:	F	-ishery:	Stock Name:
Aristeus antennatus	Sardinian		1.3.j (Central Tyrrhenian Sea)	Italy	f	Frawling on slope ishing-grounds	
Area:	Biomass:		Recruitment:	Management opti	ons	:	Recommendations:
15300 km²	TS: VPA:		TS: VPA:				The adoption of the legal mesh size (40 mm of opening) would better the status of stock exploitation.
Note: A slight decrea	sing trend of mean len	gth c	f females and cat	ch rate in trawl surve	eys	from 1991 to 1995 is	s shown.
Fishery and as	ssessment						
Operational unit Trawling along Coast of Latium	Stock Status: Overexploited	L ₂₅ L ₅₀ = L ₇₅ (199	EL _c =34.8 mm CL 91-95)	Age at first capture (t _c ):		Optimal Length of capture in mm CL : 39.6	Recent E: (1991-95) E= 0.74 (1)
Recent Y:	Recent Y/R in g:	Rec (199 1.7	ent Z: 91-95) 7 (LCCC) (1)	Recent F or f: (1991-95) F= 1.32 (1)		F _{0.1} : (1991-95) 0.53	E _{0.1} : (1991-95)
Note: (1). Assessme only females (more th	nt based on trawl surv nan 85% of catches) a	ey da re co	ata and classical nsidered.	Y/R Beverton and Ho	olt n	nodel. Since males a	re negligible in the catch,
Biology		1					•
	L _∞ in mm CL	W∞		K in y-1	t	_o in y	L max.
	F= 67.65			F= 0.49	F	= 0	
L _r	Tr	A		В	L	_{-m} in mm CL	Tm
in mm CL					F	= 27	
M(1) F= 0.45		Age	ing method	VBGF method Non linear regression	۲ ۲	M method Djabali et al. (1994)	
References: (1) Collc	oca F. et al.(1998) – Bi	ol. M	ar. Medit. 5 (2): 2	18-231.			

Table 52 - Gen	eral Data				
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:
Aristeus antennatus	Sardinian	Unit: 1.3.j (Southern Tyrrhenian Sea)	Italy	Trawling on slope fishing-grounds	
Area:	Biomass:	Recruitment:	Management optio	ns :	Recommendations:
13000 km ²	TS: VPA:	TS: VPA:			
Fishery and as	ssessment				
Operational unit	Stock Status:	-25	Age at first capture	Mean Length of	Recent E:
Trawling along Coasts of Campania and Calabria	Light I Overexploitation	₋₅₀ =L _c = 32.8 mm CL ₋₇₅ =	(t _c ): 1 y	capture:	(1)
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	F _{max.} :	F _{0.1} :
	9	1.96 (LCCC) (1)	F= 1.31 (1)	1.31	0.57
Note: Assessment ba females are consider	ased on trawl survey da ed.	ta and classical Y/R	Beverton and Holt mo	del. Since males are n	negligible in the catch, only
Biology					
	L _∞ in mm CL	$N_{\infty}$	K in y-1	t _o in y	L max.
	F= 66.8	== 82	F= 0.558	F= -0.234	
L _r	T _r	٩	В	L _m in cm TL	Tm
		M+F= 0.00241	M+F= 2.484		
M(1)		Ageing method	VBGF method Non linear	M method Pauly (1980)	
F= 0.65		_FM	regression		
References: (1) Spec	licato et al. (1998) – Bio	I. Mar. Medit. 2 (2): 2	39-244.		

Table 53 - Gen	eral Data				
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:
		Unit:	Spain	Trawling	
Mullus barbatus	Balearic	1.1.b		Trammel nets	
		(Catalonia)			
Area:	Biomass:	Recruitment:	Management	Recommendations:	
			options :	Modifying trawling (lo	ong term) :
				<ul> <li>A decrease of 10</li> </ul>	0% of effort, increase
	VPA: 31.3 tons (1993	3- VPA: 6400000		trawler Y of 7% a	and trammel of 37%.
	94) (1)			An increase of m	hesh size from 40 to
		(1993-94) (1)		50, increase trav	vler Y of 67% and
				trammel of 245%	o. 
				Applying both me	easures should
				produce an incre	ease of trawler y of
Nata - After sheep size	. fielding lawel and some	aitation nottone of these	line at the second second life since	73% and tramme	el of 317%.
Note : After changing	g fishing level and expl	loitation pattern of traw	ling the new equilibriur	n should be reached a	itter about 4 years.
Fishery and a	ssessment				
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	B ₀ :
		$L_{50}=L_{c}$	(t _c ):	capture in cm TL :	
Fishing off Vilanova	Overexploited	L ₇₅			558 tons
i la Gelrtu	(growth overfishing)		0.73 y	8.5 (1)	
(Catalonia)					
Recent Y:	Recent Y/R in g:	Recent F or f:	Y/R _{max.} in g:	Effort level _{Y/R max.} :	SSB:
(Sep.1993- Oct.94)					4- 0.4
total - 72 tons (1)	<u>Irawl</u> – 10.97	I rawl -values	<u>I rawl</u> – 15.93	-64% of the current	17.2 tons
	<u>I rammel net – 0.22</u>	higher than 2 in 8-	Trammel net	- value	
% of different gears	(1)	12 and in 17-20	0.62		
$\frac{1 \text{ rawl}}{7} = 98\%$		length classes.			
<u>I rammel net</u> – 2%		<u>I rammel net</u> –			
		Values lower than			
Noto: Accomment h	and on VDA by using	Ulasses (1)			
INDIG. ASSESSIIIEIII D	ased on VEA by Using	VIT ANU WOFLA PACK	ayes.		

Biology								
	L∞	W∞	К	t _o	L max.			
	M+F=33 cm TL (1)		M+F= 0.38 y-1 (1)	M+F=-0.07 y (1)				
L _r	Tr	A	В	L _m in cm TL	Tm			
		M+F=0.008 (1)	M+F=3.145 (1)					
М	F _{term.} =0.2	Ageing method	VBGF method	M method				
M+F=0.432 (1)		Bhattacharya (1967)	Non linear regression	Djabali et al. (1994)				
References:								
(1) Demestre M. et al. (1997) – J. Appl. Ichthyol. 13: 49-56.								

Table 54 - Gen	eral Data								
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
		Unit:	Spain	Trawling					
Mullus barbatus	Balearic	1.1.b		Trammel nets					
		(Castellon)		_					
Area:	Biomass:	Recruitment:	Management	Recommendations:					
			options :	Modifying trawling (Ic	ong term) :				
	TS:	TS:		<ul> <li>A decrease of 10</li> </ul>	0% of effort, increase				
	VPA: 77 tons (1993-9	94) VPA: 5800000		trawler Y of 2% a	and trammel one of				
	(1)			28%.					
		(1993-94) (1)		An increase of m	tesh size from 40 to				
				50, increase trav					
				<ul> <li>Appliying both me produce an increase</li> </ul>	easures should				
				1/% and tramme	ase of liawier 1 of				
Note: After changing fishing level and exploitation pattern of trawling the new equilibrium should be reached after about 4 years									
Fishery and as	seesement				nor about 1 youro.				
Fishery and as		[ ]	A man at first santume	Manu Laueth of					
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	B ₀ :				
Fishing off Castellon	Overexplaited	$L_{50}=L_{c}$	(l _c ).	capture in cm TL.	610 tons				
(Valencian	(arowth overfishing)	<b>└</b> 75	0.85 v	135(1)	01010115				
Community)	(growin overnaning)		0.00 y	10.0 (1)					
Recent Y:	Recent Y/R in a:	Recent F or f:	Y/R may in a:	Effort level V/R max :	SSB:				
(Sep.1993- Oct.94)									
total $-123$ tons (1)	Trawl – 21.64	Trawl –values	Trawl – 22.76	-52% of the current	29.9 tons				
	Trammel net – 2.59	higher than 1.5 from	Trammel net	- value					
% of different gears	(1)	11 to 20 cm TL with	5 15						
<u>Trawl</u> – 93%		a peak (F=2.5) at 12	2						
<u>Trammel net</u> – 7%		and at 19 cm TL.							
		<u>Trammel net</u> –							
		values higher than							
		0.5 from 15 to 22							
		cm TL. With a peak							
		at 19 (F=1)(1)							
Note: Assessment ba	ased on VPA by using	VII and MSFLA pac	kages.						
Biology									
----------------------	---------------------------	---------------------	--------------------------	-------------------------	--------	--	--	--	--
	L∞	W∞	К	t ₀	L max.				
	M+F=32 cm TL (1)		M+F= 0.385 y-1 (1)	M+F=-0.593 y (1)					
L _r	T _r	A	В	L _m in cm TL	Tm				
		M+F=0.008 (1)	M+F=3.145 (1)						
М	F _{term.} =0.2	Ageing method	VBGF method	M method					
M+F=0.432 (1)		Bhattacharya (1967)	Non linear regression	Djabali et al. (1994)					
References:									
(1) Demestre M. et a	I. (1997) – J. Appl. Icht	hyol. 13: 49-56.							

Table 55 - Gen	eral Data						
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:		
		Unit:	Spain	Trawling			
Mullus barbatus	Balearic	1.1.b		Trammel nets			
		(Santa Pola)					
Area:	Biomass: TS: VPA: 127.5 tons (199 94) (1)	Recruitment: TS: VPA: 7300000 individuals (1993-94) (1)	Management options :	<ul> <li>Recommendations: Modifying trawling (long term) :</li> <li>A decrease of 10% of effort, increative trawler Y of 5% and trammel one 24%.</li> <li>An increase of mesh size from 40 50, increase trawler Y of 48% and trammel one of 161%.</li> <li>Appliyng both measures should produce an increase of trawler Y of 2000</li> </ul>			
51% and trammel one of 193%.							
Note. After changing	Inshing level and explo	bilation pattern of trawi	ing the new equilibrium	n should be reached al	ter about 4 years.		
Fishery and as	ssessment	Γ.	Г. <u>.</u>		Γ-		
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	B ₀ :		
Fishing off Santa pola (Valencian Community)	Overexploited (growth overfishing)	L ₅₀ =L _c L ₇₅	(t _c ): 0.87 y	10.05 (1)	871 tons		
Recent Y:	Recent Y/R in g:	Recent F or f:	Y/R _{max.} in g:	Effort level _{Y/R max} . :	SSB:		
(Sep.1993- Oct.94) <u>total</u> – 114 tons (1) % of different gears Trawl – 97%	<u>Trawl</u> – 14.02 <u>Trammel net</u> – 1.61 (1)	<u>Trawl</u> –values higher than 1 from 10 to 17 cm TL with main peak (E=1.5)	<u>Trawl</u> – 14.77 <u>Trammel net</u> – 2.2	-36% of the current value	97.4		
Trammel net – 3%	ased on VPA by using	at 12 cm TL. <u>Trammel net</u> - values lower than 0.5.(1) VIT and MSFLA packs	ages.				

Biology									
	L∞	W∞	К	t ₀	L max.				
	M+F=33 cm TL (1)		M+F= 0.280 y-1 (1)	M+F=-0.493 y (1)					
L _r	T _r	A	В	L _m in cm TL	Tm				
		M+F=0.008 (1)	M+F=3.145 (1)						
М	F _{term.} =0.2	Ageing method	VBGF method	M method					
M+F=0.37 (1)		Bhattacharya (1967)	Non linear regression	Djabali et al. (1994)					
References:									
(1) Demestre M. et a	I. (1997) – J. Appl. Icht	hyol. 13: 49-56.							

Table 56 - Genera	l Data					
Scientific name:	GFCM Subarea:		Management	Country:	Fishery:	Stock Name:
			Unit:			
Mullus barbatus	Sardinian		1.3.h	Italy	Trawling	
			(Sardinian Sea	)		
Area:	Biomass:		Recruitment:	Management opti	ons :	Recommendations:
$22700 \mathrm{km}^2$	TO.		TC.			
23700 KIII	13. \/DΔ·		13. \/DΔ·			
Fishery and asses	sment					
Operational unit	Stock Status	1 25		Age at first capture	Mean Length of	Recent E
		L ₅₀	=L_=	(t _c ):	capture in cm TL	
Trawling along	Fully/Heavy-	$L_{75}$	c	(-0)-	:	E= 0.58 (1)
Coast of Sardinian	exploitation					
Recent Y/R in g:	Recent Z:	Re	cent F or f:	F _{0.1} :	E _{0.1} :	
		_				
	2.86 (LCCC) (1)	F=	1.65(1)	0.53	0.38	
Noto: Assassment	based on trawl surv		data and Exploit	ation Pate (1)		
Pielogy		<u>cys</u> "- D				
ыоюду	References: (1) Add	IIS P	. et al. (1998) –	BIOI. Mar. Medit. 5	(3): 85-95.	
	L in om Tl	147		K in v-1	t- in v	L may
		۷۷∞		IX III y-1	<b>1</b> 0 III <b>y</b>	
	M+F= 24 55			M+F= 0.79	M+F= 0.479	
.  .	T.	А		B		Tm
	• •				F= 14	
in cm TL					M=11	
M(1)	1	Age	eing method	VBGF method	M method	L
M+F= 1.21 with 15	5 °C	Ŭ	-	Non linear	Pauly (1980)	
		LFN	N	regression		

Table 57 - Gen	eral Data							
Scientific name:	GFCM Subarea:		Management Unit:	Country:	Fishery:	Stoc	k Name:	
Mullus barbatus	Sardinian		1.3.j (Southern Tyrrhenian Sea)	Italy Trawling				
Area:	Biomass:		Recruitment:	Management optior	ns :	Reco	ommendations:	
5800 km ²	TS: VPA:		TS: VPA:	Trawling ban in: • Gulf of S. E (Calabria) • Gulf of Patt • Gulf of Cas (Sicily)	tufemia ii (Sicily) tellammare	After of Ca M.ba befor	After the trawling ban in the Gulf of Castellammare catch rate of M.barbatus are much higher than before (up to 20-30 time).	
Fishery and assessment								
Operational unit Trawling along Coasts of Calabria and Sicily (1) Recent Y:	Stock Status: Over-exploited (1) Recent Y/R in g:	$ \begin{array}{c} L_{25} \\ L_{50}=L_{c}= \\ L_{75}= \\ \\ \end{array} $ Recent Z: F $Z= 1.42 (LCCC) (1) \\ \\ \end{array} $		Age at first capture (t _c ): Recent F or f: F= 1.07 (1)	Mean Length capture in cm	of TL :	Recent E: E= 0.75 (1)	
Note: Assessment b	ased on trawl surve	eys data	and exploitation ra	ate.(1).				
Biology		•	·					
	L _∞ in cm TL	W∞		K in y-1	$t_0$ in y	L ma	x.	
	M=21.9			M=0.212	M=-2.1			
L _r	T _r	А		В	L _m in cm TL	Tm		
M(1) M+F= 0.35		method	VBGF method Non linear regression	method M method near Pauly (1980) sion				
References: Greco	S. et al. (1998) -	- Biol. N	/ar. Medit. 5 (3):	74-84.				

Table 58 - Ger	neral Data						
Scientific name:	GFCM Subarea:		Management	Country:	F	ishery:	Stock Name:
			Unit:			•	
Mullus barbatus	Sardinian		1.3.j	Italy	Italy T		
			(Ligurian Sea)				
Area:	Biomass:		Recruitment:	Management optic	ons		Recommendations:
	TS:		TS:				(1)
5800 km ²	VPA:		VPA:				
Fishery and a	ssessment						
Operational unit		Stock S	Status:	L ₂₅		Age at first capture	Mean Length of capture in
Trawling along Ligur	ian Coasts (1)			$L_{50} = L_c =$		(t _c ):	cm TL :
		Fully-e	xploited (1)	L ₇₅		0.4	
From French border	to Leghorn (2)	Over-e	xploitation (2)				
Recent Y:	Recent Y/R in g:	Recent Z:		Recent F or f:		Recent E:	Z _{MBP} : (2)
		Z= 0.97	7 (1985-87)				
	13		) (1)	F= 0.46 (1985-87) (	1)	E= 0.47(1985-87)	Schaefer = 3
		$Z_{(0-1)} =$	5.2 (1994-95)				
		Surviva	al rates (2)	Tates (2)			Fox = 1.8
Note: Assessment b Models.	ased on trawl surv	eys data	by using: (1) Clas	ssical Beverton and F	loit	Model; (2) Composit	e Surplus-Production
Biology							
	$L_{\infty}$ in cm TL	W∞		K in y-1	to	n y	L max.
	M+F- 23.2			M+F= 0 336	N	1+F0 904	
1	T	Δ		B		in cm Tl	Tm
<b>∟</b> r	'r			D		m III CIII I L -14 (3)	
6 in cm TL	0.25 y				Ň	1=11	
M(1)	· · · ·	Ageing	method	VBGF method	N	1 method	
				Non linear	N	lean of different met	hods
M+F= 0.51 Otolith			readings	regression			
References:							
(1) Relini et al. (1994	l) – Biol. Mar. Medi	t. 1 (2): 1	1-21. (2) Ab	ella et al. (1999) – Ac	quat	. Living Resour. 12(3	3): 155-166.
(3) Orsi Relini L., Arr	naldi D. (1986) – Bo	oll. Mus.	Ist. Biol. Univ. Ger	nova, 52: 237 – 250.			

Table 59 - Gene	Table 59 - General Data								
Scientific name:	GFCM Subarea:	Manageme	ent Unit:	Country:	Fishery:		Stock Name:		
		1.3.j							
Mullus barbatus	Sardinian	(Ligurian S	ea -	Italy	Irawling				
Aree:	Piomooo:	Rooruitmo	uscany)	Managamant					
Area.	DIOMASS.	Recruitmen	π.		Recommen	<ul> <li>Increase of the SSB/SSB0 is</li> </ul>			
	TS	TS		options .	<ul> <li>Increase of the SSD/SSBUTS</li> <li>recommended</li> </ul>				
	10.	10.			Decreasing F only a slight increase				
	VPA:	VPA:			of Y/R (about 10 %) should be				
					exp	ected (b).	,		
					<ul> <li>Incr</li> </ul>	easing Lc to	o 11-12 cm TI an		
					incr	ease of abo	out 15-20% of Y/R		
					sho	uld be likely	/. This may be		
					obta Sor	ained with a	trawling ban during		
Note · September-Octobel. (b) (1)									
Fishery and assessment									
Operational unit:	Stock Status:			L ₂₅	Age at fir	st capture	SSB/SSB ₀		
Trawling along	(1)			L ₅₀ =L _c =9.3 cm T	L (t _c ):		0		
Northern Coasts of	Fully-exploited			(a)			4%		
Tuscany (1)	Risk of recruitment over	-fishing		L ₇₅					
From Leghorn to Elba	(2)			Vector					
Island (2)	Fully-exploited			Selectivity-					
	Decent 7:		Desert	Vulnerability (b)		7 . (0)			
Recent Y/R in g:	Recent Z:		Recent I	- or i:		Z _{MBP} : (2)			
(a)	(a) F= 3.81		(a) F= 2.0			Schaefer -	- 3		
F = 10.5	M= 3.65		M = 1.6			Conderer -	- 0		
M=	(b)		(b)			Fox = 1.8			
(b)	Vector derived from sur	vival rates	F= High	er than 2 from 9.5	to 15.5 cm				
F=12.5	obtained from trawl surv	/eys	TL class	es. Peak at 13.5 o	cm (F=5).				
M= 12Y:			M= High	M= Higher than 2 from 9.5 to 13.5 cm					
	Z ₍₀₋₁₎ = 3.38 (1994-95) S   rates (2)	Survival	TL classes. Peak at 10.5 cm (F=5).						

Note: Assessment based on trawl surveys data (1985-95) by using both traditional Thompson and Bell analysis and a variant assuming M- at age and F-at age vectors. The traditional approach (a) suggests heavy overexploitation. A 65% reduction of F would produce 35% improvement of Y/R, and increase Lc to 16 cm TL would produce 50% augment in Y/R.; according to the second one (b) red mullet is fully exploited (1).

Assessment based on trawl surveys data and Composite Surplus Production Models (2).

Biology									
	L _∞ in cm TL F =29.2 (1) M= 22	W	K in y-1 F =0.68(1) M= 0.74	t _o in y	L max. F = 43 (1) M= 27				
L _r	T,	A F	B F =3.149 (1)	$L_m$ in cm TL F =16 (1)	Tm				
6 cm		=0.007 67 (1) M= 0.0078 8	M= 3.132	M= 3.132					
M F= 1.01 (a) M= 1.13	T C°	Ageing method LFM	VBGF method	M method c) Constant M – Pauly (1980) d) Variable M – (Abella et al.1997)					
References: (1) Voliani A. et a	al. (1998) – Biol. Mar. Medit. 5	(2): 169-183. (2) Abe	lla et al. (1999) – .	Aquat. Living Resour.	12(3): 155-166.				

Table 60 - General Data									
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
Mullus barbatus	Sardinia	1.3.j (Northern Tyrrhenian Sea)	Italy	Trawling Trammel nets					
Area:	Biomass: TS: VPA: 62.7 tons (1993- 94) (1)	Recruitment: TS: VPA: 5200000 individuals (1993-94) (1)	Management options :	<ul> <li>Recommendations:</li> <li>Modifying trawling (long term) :</li> <li>A decrease of 10% of effort, increat trawler Y of 7% and trammel of 379</li> <li>An increase of mesh size from 40 t 50, increase trawler Y of 67% and trammel of 245%.</li> <li>Applying both measures should produce an increase of trawler Y of 73% and trammel of 317%.</li> </ul>					
Note : After changing fishing level and exploitation pattern of trawling the new equilibrium should be reached after about 4 years.									
Operational unit Trawlers of Porto S. Stefano (Tuscany) (1) From Argentario to Giannutri Island (2)	Stock Status: Over-exploited (1) (growth overfishing) Over-exploited (2)	L ₂₅ L ₅₀ =L _c L ₇₅	Age at first capture (t _c ):	Mean Length of capture in cm TL : 9.3 (0.83 y) (1)	B ₀ : 558 tons				
Recent Y: (Sep.1993- Oct.94) total – 95 tons (1) % of different gears <u>Italian type trawl</u> – 18% <u>French type trawl</u> – 82%	Recent Y/R in g: <u>Italian type trawl</u> – 3.3 <u>French type trawl</u> – 15.17 (1)	Recent F or f: (1) <u>Italian type trawl</u> – values higher than <b>0.5</b> from 20 to 28 cm TL. <u>French type trawl</u> – values higher than <b>1</b> from 11 to 24 cm TL and higher than <b>2</b> from 18 to 23 cm TL. (1)	Y/R _{max} in g: (1) <u>Italian type trawl</u> – 7.45 <b>French type</b> trawl – 20.36	Effort level _{Y/R max.} : -72% of the current value (1) SSB: 43.2 tons (1)	Recent Z: $Z_{(0-1)} = 5.0 (1994-95)$ Survival rates (2) $Z_{MBP}$ : (2) Schaefer = 3 Fox = 1.8				

Note: Assessment based on: VPA and Y/R analysis by using VIT and MSFLA packages (1); trawl surveys data (MEDITS) and Composite Surplus Production Models (2).

Biology									
	L _∞	W∞	К	t _o	L max.				
	M+F=34.5 cm TL (1)		M+F= 0.336 y-1 (1)	M+F=-0.143 y (1)					
L _r	T _r	А	В	L _m in cm TL	Tm				
		M+F=0.008 (1)	M+F=3.125 (1)						
М	F _{term.} =0.2	Ageing method	VBGF method	M method					
M+F=0.404(1)		Bhattacharya (1967)	Non linear regression	Djabali et al. (1994)					
References: (1) Demestre M. e	et al. (1997) – J. Appl. Ichth	nyol. 13: 49-56. (2) A	bella et al. (1999) – Aq	uat. Living Resour. 12	(3): 155-166.				

Table 61 - Ger	neral Data					
Scientific name:	GFCM Subarea:	Manag	jement	Country:	Fishery:	Stock Name:
Mullue barbatue	Sardinian	Unit:		Itoly	Trawling and	
Wullus barbatus	Saruman	(Centra	al	Italy	aillnet	
		Tyrrhe	nian Sea)		gimier	
Area:	Biomass:	Recrui	tment:	Management optic	ons :	Recommendations:
$15300 \text{ km}^2$	Te	TQ				
10000 KIII	VPA:	VPA:				
Fishery and a	ssessment	1				
Operational unit	unit Stock Status: L ₂₅			Age at first capture	Mean Length of	Recent E:
	Fully exploited	red $L_{50} = L_c =$		(t _c ):	capture in cm TL :	F 0.27 (1)
Coast of Latium	Fully-exploited					E = 0.37(1)
				_		
Recent Y/R in g:	Recent Z:	Recent F o	or f:	F _{0.1} :	E _{0.1} :	
	1.35 (LCCC) (1)	F= 0.49(1)		0.53	0.38	
		( )				
		- (   D -				
Note: Assessment b	based on trawl surveys d	ata and Bev	verton and	Holt Y/R analysis (1)	).	
ыоюду	1			Kin v A	4 10 11	L mov
	L _∞ IN CM IL	VV∞		K III y-1	ι ₀ π y	L max.
	M+F= 25.33			M+F= 0.44		
L _r	T _r	A		В	L _m in cm TL	Tm
in cm Tl						
M(1)		Ageing met	hod	VBGF method	M method	
M+F= 0.86		0 0		Non linear	Pauly (1980)	
	LFM	regression				
References: (1) Ardiz	zzone et al. (1998) – Bic	I. Mar. Med	lit. 5 (3): 53	3-63.		
References: (1) Ardia	zzone et al. (1998) – Bic	LFM I. Mar. Med	lit. 5 (3): 53	regression 3-63.		

Table 62 - Gen	eral Data							
Scientific name:	GFCM Subarea:		Management	Country:		Fishery:		Stock Name:
Mullus barbatus	Sardinian		Unit: 1.3.j (Southern Tyrrhenian Sea)	Italy	Italy			
Area:	Biomass:		Recruitment:	Management options	6 :	L		Recommendations:
13000 km ²	TS: VPA:		TS: VPA:					
Fishery and assessment								
Operational unit		Stock S	Status:		L ₂₅	10.1	Rece	ent E:
Trawling along Coasts of Campania and Calabria (1)		Fully-he	Fully-heavily exploited (1) Over-exploited (2)		$\begin{bmatrix} L_{50} = L_c = 12.4 \text{ cm} \\ TL \\ L_{75} = 13.1 \text{ cm TL} \end{bmatrix} = $		E= 0	9.6 (1)
Gulf of Gaeta and Na	ples (2)							
Recent Y:	Recent Y/R in g:	Recent	Z:	Recent F or f:	F _{max.} :	F _{max.} :		.: (2)
		Z= 2.49 (LCCC) (1) $Z_{(0-1)} = 6.6 (1994-95)$ Survival rates (2)		F= 1.58 (1)	F= 1.49 (1)		Scha Fox	aefer = 3 = 1.8
Note: F max. estimate	d with classical Y/F	R Beverte	on and Holt model	. The Y _{max.} would be of	otained re	educing 5-6%	curre	ent F (1). Trawl
Biology	S) and Composite	Surplus	Production Wodel	s (Z).				
Бююду	$L_{\infty}$ in cm TL	$W_{\infty}$		K in y-1		t _o in y		L max.
	F= 27.28 M=20.96			F= 0.467 M=0 594		F= -0.414 M=-0 249		
L _r	T _r	A		В		$L_{\rm m}$ in cm TL		Tm
		M+F=	0.00776	M+F= 3.18		M=11.5		
M(1)	•	Ageing	method	VBGF method		M method		
M+F= 0.36		LFM		Non linear regression	Non linear regression		Pauly (1980)	
References: (1) Spec	licato et al. (1998)	– Biol. N	lar. Medit. 5 (3): 64	4-73. (2) Abella et al. (1	999) – A	quat. Living R	lesou	r. 12(3): 155-166

Table 63 - Gen	eral Data								
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:				
		Unit:	Italy + Croatia	Trawling					
Mullus barbatus	Adriatic	2.1.a							
Area:	Biomass:		Management	Recommendations:					
0	TS		options :						
100000 km ²	Italy + International wa	aters		Seasonal fishing ban for 30-45 days in					
	1983 – 554 tons			summer (Italian Flee	et) affects positively				
	1984 - 504			fishery, allowing rec	cruitment at a larger				
	1985 - 444			size.					
	Ex Yugoslavia								
	1983 - 2297								
1984 - 2680									
Note: *Recruitment o	Note: *Recruitment occurs mainly along Italian coast, while spawning stock is present mainly along Croatian Coasts (1)								
Fishery and assessment									
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of					
		$L_{50}=L_{c}=(1)$	(t _c ):	capture in cm TL :					
Trawling		L ₇₅							
Recent Y*:	Recent Y/R in g:	Recent Z:	Recent F or f:	F _{0.1} :					
		$Z_{(0-1)} = 1.64 (1983-$	F= 2.6 (1985-95) (3)	1.00 (3)					
Note: Deputations du		(2) Survivariate	Estimated from LCCC						
Catch rate from trawl	surveys from 1985 to	1997 shown a slight in	creasing trend (1).						
Biology	, , , , , , , , , , , , , , , , , , ,	Ŭ	<u> </u>						
	L _∞ in cm TL	W _∞	K in y-1	t ₀ in y	L max.				
	F+M = 27.5		F+M = 0.5	-					
L _r in cm TL	T _r	A	В	L _m in cm TL	Tm				
M	T C°	Ageing method	VBGE method	M method					
F+M = 0.91-0.51 (3)		, igoing motiou		Pauly (1980); Diaba	li et al. (1993)				
References: (1) Picci	netti C. (1998) – Biol. N	/ar Medit.1 (2): 77-87.	(2) Arneri E., Jukic S.	(1986) - FAO Fish R	ep. 345: 79 – 85.				
(3) Ardizzone G.D. (1	998) - Biol. Mar. Medit	. 5 (2): 151-168.		•					

Table 64 - Gen	eral Data						
Scientific name:	GFCM Subarea:		Management	Country:		Fishery:	Stock Name:
			Unit:			Trawling	
Mullus barbatus	Ionian 2		2.2.b	Italy		U U	
Area:	Biomass: R		Recruitment:	Management options :		Recommendations:	
$14200 \text{ km}^2(1)$	TS:		TS:				
	VPA		VPA				
Fishery and A	ssessment						
Operational unit	Stock Status:	L ₂₅		Age at first capture	Me	an Length of	F _{0.1} :
		L ₅₀ =	=L _c = 8 cm TL	(t _c ):	ca	oture in cm TL :	
Trawling	Overexploited	$L_{75}$					0.33 (1)
	(growth over-						
	fishing)						
Recent Y/R in g:	Y/R _{max.} in g:	Rec	cent Z:	Recent F or f:	Re	cent E:	F _{Ymax.:}
					E =	:0.61 (1991) (1)	
8		ZLC	cc=1.13(1991) (1)	F=0.7 (1991) (1)	F=(	0.66 (1992)	0.64 (1)
		ZLC	_{CC} =1.28(1992)	F=0.85 (1992)			
Note: Assessment c	arried out form trawl su	irvey	s data and Beverto	n and Holt Y/R model.			
Biology						-	
	$L_{\infty}$ in cm TL	$W_{\infty}$		K in y-1		t _o in y	L max.
	F+M= 19.7 (1)			F+M= 0.360 (1)		F+M= -1.18 (1)	
L _r in cm TL	T _r	А		В		L _m in cm TL	Tm
						F = 14 (1)	
5		F+N	<i>I</i> = 0.08 (1)	F+M= 3.09 (1)		M = 11	
Μ	T C°	Age	eing method	VBGF method		M method	
F+M = 0.43 (1)		Oto	liths readings	Non Linear regressio	n	Chen and Watanab	e (1989)
References:							
(1) Marano et al. (198	88) – Biol. Mar. Medit.5	5 (3):	109 -119				
(2) Ungaro et al. (199	94) – Biol. Mar. Medit.1	(1):	317-318.				
(3) Ungaro N., Marar	no G. (1996)- FAO Fish	Rep	o. 533 (Suppl.): 97 -	99			

Table 65 – Genera	Table 65 – General Data							
Scientific name:	GFCM Subarea	:	Management Unit:	Country:	Fishery:	St	ock Name:	
Mullus barbatus	Ionian		2.2.c	Italy	Trawling			
			(Ionian Sea –					
			Italian versant)					
Area:	Biomass:		Recruitment:	Management	Recommendations			
$11000 \text{ km}^2$			15: \/DA·	options :				
Fishery and asses	sment		VFA.					
Operational unit	Stock Status	05		Age at first capture	Mean Length	of	Recent E	
operational and		$L_{50} = L_{c}$	= 8.5 *(1)	$(t_c)$ :	capture in cm	n TL		
Trawling in Italian	Over-exploited	L ₇₅ =			1:		E= 0.74 (1)	
side of Ionian	(1-2)							
Sea(1)							_	
Recent Y/R in g:	Recent Z:	Recen	t F or f:	B /B ₀ by B/R	Recent Y/R max.		F _{max.} :	
9.5	71 50	<b>F</b> _ 1 1	8 (1)	analysis:	in g:		E- 0.4	
9.0	(1990-93)(1)	1 - 1.1	10 (1)	14%	10.5		1 = 0.4	
	(1000 00) (1)				1010			
Note: Assessment	based on trawl s	urveys	data by using Be	everton and Holt Y/F	R and B/R Mode	el. Lc	corresponding to 30 mm	
opening mesh size	*. (1)							
Biology		1			I	<b>.</b>		
	L _∞ in cm TL	$W_{\infty}$		K in y-1	t _o in y	Lr	max.	
	F+M= 25.2 (1)			F+M= 0.26 (1)	F+M= -1.71 (1)			
L _r	Tr	А		В	L _m in cm TL	Tn	n	
					F= 13.5 (1)			
		F+M=C	).0000057 (2)	F+M=3.22 (2)	M=12.5			
V (1) M ₁ E _{-0.44}		Ageing	, method	VBGF method	Diabali at al. (1	0021		
$101+1^2 = 0.41$		Otolith	readings	regression		ອອວ)		
References: (1) Tu	rsi A. et al. (1994	$\rightarrow$ ) – Mar	. Life 4 (2) : 33-4	3. (2)Tursi A. et al	. (1996) – FAO	Fish.	Rep. 533 (Suppl.): 127-141.	

Table 66 - General	l Data							
Scientific name:	GFCM Subarea		Management	Country:	Fishery:	Stock Name:		
Mullus barbatus	Ionian	onian		Italy	Trawling			
Area:	Biomass:		Management	Recommendations	Recommendations:			
5800 km²	TS: VPA:		options	Keeping c from 0.5 to long term in terms o of the cato	from 0.5 to 2 times the current value of current F, the long term yield does not change significantly. Howeve in terms of economic value, to double the potential val of the catches fishing mortality should be reduced to 2			
	Recruitment: TS: VPA:			<ul> <li>% of current value.</li> <li>Increasing mesh size from 32 to 40 mm opening, no only a 3% rise of yield and 14% of value, but also his benefits would be expected from a 50% effort increas (→ a 5% weight increase) (1)</li> </ul>				
Fishery and asses	sment							
Operational unit	Stock Status:	$L_{25}$ $L_{50}=L_{25}$	=	Age at first capture (t _c ):	Mean Length o	of Recent E:		
Trawling in Sicilian side of Strait of Sicily (1)	Over-exploited (1)	$L_{75} =$			:	E= 0.7 (4)		
Recent Y:	Recent Y/R in a:	Recen	t Z:	Recent F or f:	E _{max.} : 0.59 (1)			
865 tons	5							
(1985-87) (3)					E _{0.1} : 0.56 (1)			
Note: Assessment Model (1).	based on trawl s	urveys	data by using Be	everton and Holt Re	lative Y/R Model a	and Thompson and Bell		

Biology								
	L _∞ in cm TL	W∞	K in y-1	t₀ in y	L max.			
	F+M= 27.6		F+M= 0.154	F+M= -2.637				
L _r	T _r	A	В	L _m in cm TL	Tm			
5-6 cm		F+M=0.0103	F+M=3.0183					
M(1)		Ageing method	VBGF method	M method				
M+F= 0.25			Non linear	Chen and Wata	nabe (1989)			
		Otolith readings	regression					
References:								
(1) Levi D. et al. (1	1993) – Fish. Res	., 17: 333-341.						
(2) Cannizzaro L.	et al. (1991) – N.	T.R. – I.T.P.P. 39: 1-33						
(3) Andreoli M.G.	et al. (1995) – N.	T.R. – I.T.P.P. ( Special	publication), 4 (2): 2	223 p.				
(4) Levi D. et al. (1	1998) – Biol. Mar.	Medit. 5 (3): 130-139.						

Scientific name:       GFCM Subarea:       Management Unit:       Country:       Fishery:       Stock Name:         Mullus barbatus       Aegean Sea       3.1.a (Saronikos Gulf)       Greece       Trawling       Trawling         Area:       Biomass:       Recruitment:       Management options :       Recommendations:       •         km²       TS:       TS:       TS:       TS:       Tawling –         VPA:       VPA:       VPA:       Beach seiner-       •       It is, however, recommended prevent any increase of current levels.									
Mullus barbatus       Aegean Sea       3.1.a (Saronikos Gulf)       Greece       Trawling         Area:       Biomass:       Recruitment:       Management options :       Recommendations:         km²       TS:       TS:       TS:       Trawling –         VPA:       VPA:       VPA:       Beach seiner-       Beach seiner-         Fishery and assessment       Eishery and assessment       Second       It is, however, recommended prevent any increase of current									
Area:       Biomass:       Recruitment:       Management options :       Recommendations:         km²       TS:       TS:       Trawling –       Before accepting conclusions assessment, it is necessary to estimation of M.         VPA:       VPA:       VPA:       Beach seiner-       It is, however, recommended prevent any increase of curren levels.         Fishery and assessment       Time       Time       Time       Time									
km²     TS:     TS:     Trawling –       VPA:     VPA:     VPA:     Beach seiner-       Fishery and assessment     Fishery and assessment	Recommendations:								
Fishery and assessment	<ul> <li>Before accepting conclusions of assessment, it is necessary to validate estimation of M.</li> <li>It is, however, recommended to prevent any increase of current fishing levels.</li> </ul>								
	Fishery and assessment								
Operational unitStock Status: $L_{25}$ Age at first captureMean Length of capture in cm TL $E_{max.}$ :Trawling inFully exploitation $L_{75} =$ <									
$\begin{bmatrix} L = 0.75 \\ 0 \\ 0 \\ \hline \\ Under exploitation \\ with 0.75 < M < 0.95 \end{bmatrix}$									
Recent Y/R in g:Recent Z:Recent F or f:Recent Y/R max. in g:Recent E:E $_{0.1}$ :(1)(1)									
$F = 0.93 (a)(1) \qquad F = 0.50 (a) \qquad F = 0.75 (a)$									
$\begin{bmatrix} Z_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.88 (1989 -   F = 1.13 (D) \\ F_{LCCC} = 1.13 (D$									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$									
Note: Assessment based on trawl surveys data by using Beverton and Holt Relative Y/R Model. Lc, corresponding to 28 mm opening mesh siz, was estimated by LCCC (1). According to a Fox Surplus Production Model, based on catches and effort of all Mullidae in all Greek Seas from 1964 to 1986 and using f									

Biology								
	L _∞ in cm TL	W _∞	K in y-1	t _o in y L max.				
	F+M= 23.5 (1)		F+M= 0.51 (1)	F+M= -0.86 (1)				
L _r	Tr	A	В	L _m in cm TL	Tm			
		F+M=0.0000057	F+M=3.22 (2)	F= 13.5 (1)				
		(2)		M=12.5				
M(1)	4.00.0	Ageing method	VBGF method	M method				
M+F=0.94 (a)with	16°C							
M+F=0.75 (b)		Otolith readings	Non linear	Pauly (1980) and	d other guessed values			
M+F=0.6 (b)			regression					
M+F=0.5 (b)								
Note: length-weight	coefficients calculated wi	th TL in mm and TV	V in g.					
References:								
(5) Karlou C., Vran	tzas N. (1989) – FAO	Fish. Rep. 412: 28	3-43.					
(6) Vrantzas N. et a	al. (1992) - FAO Fish.	Rep. 477: 51-67.						
(7) Stergiou K.I. et	al. (1992) - FAO Fish.	Rep. 477: 97- 113	3.					

Table 68 - Genera	I Data					
Scientific name:	GFCM Subarea:	Management Unit:	Country:	Fishery:		Stock Name:
Mullus barbatus	Aegean Sea	3.1.a	Greece	All Greece (2)	eece (2)	
		(Central		<b>T</b> II <b>TO OO</b> ( ()		
		Aegean Sea)		Trawling -/2.6% of the	otal	
				Greek catches	/	
				Coastal fishery – 23	o 6	
Area [.]	Biomass [.]	Recruitment:	Management optic	obastar hishery 20.	Recomme	endations:
	(1990-91)					
km ²	TS : 94 tons (0-200m)	TS:				
	– Western Aegean)	VPA:				
	TS : 2048 tons (0-					
	200m) – Northern					
	Aegean)					
Fishery and asses	ssment	-			_	
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	E _{max.} :	
Trouding in	Over fieled	L ₅₀ =L _c =	(t _c ):	capture in cm IL	(1)	
Control Accorn	Over-fished	L ₇₅ =				
Sea (1)						
Recent Y/R in a	Recent 7 [.]	Recent F or f	Recent Y/R may in a	· Recent E·	F o 1 ·	
Aegean Sea			Hobolit Init max. In g	(1)	(1)	
(1986)	Z = 1.28 (1990-91)	F= 0.80 (1)		E= 0.62	( )	
1848 tons of M.	(1)	. ,				
barbatus over						
3841 tons of						
Mullidae (2).						
Note: Assessment	based on trawl surveys	s data and Exploit	ation Rate analysis (	1). According to a Fo	x Surplus	Production
Model, based on ca	atches and effort of all N	Mullidae in all Gre	ek Seas from 1964 t	o 1986 and using f $_{0.1}$	as referer	nce, resulted
that fully exploitatio	on was achieved in 1986	δ (2).				

Biology		Biology								
	L _∞ in cm TL	W _∞	K in y-1	t _o in y	L max.					
	F= 25.5(1)		F= 0.21(1)	F= -2.13 (1)						
	M= 22.7		M= 0.25	M= -1.85						
L _r	T _r	A	В	L _m in cm TL	Tm					
6-8 cm FL		F+M=0.0000064	F+M=3.179 (1)	F= 10.4 (1)						
		(1)		M= 9.4						
M(1)		Ageing method	VBGF method	M method						
M+F= 0.48		Otolith readings	Ford-Walford plot	Pauly (1980)						
Note: length-weight	coefficients calculated wi	th FL in mm and TV	/ in g.							
References:										
(1) Vassiloupou	u V., Papaconstantinou	u C. (1992) – FAO	Fish. Rep. 477: 115	5-126.						
(2) Stergiou K.I.	et al. (1992) - FAO Fish	n. Rep. 477: 97- 11	3.							

Table 69 - Genera	I Data				
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:
		Unit:			
Mullus barbatus	Eastern	3.2.c	Ciprus	Trawling	
		(Ciprus)			
Area:	Biomass:	Recruitment:	Management	Recommendations:	
0			options :	<ul> <li>Displace t</li> </ul>	rawlers from inshore to offshore
km ²	TS:	TS:	Trawling and	fishing-gro	unds or forbid inshore trawling
	ACA: 229 tons (1989)	ACA: 7.3	Coastal fishery		nder to February for 2 years.
		millions (1989)			Tor closed areas for 2 years.
Note: Biomass at S 1989 (1)	Sea, estimated at beginr	ning of fishing sea	ason (31 October of e	each year),remai	ned quite stable from 1986 to
Fishery and asses	ssment				
Operational unit	Stock Status:	-25	Age at first capture	Mean Length of	of Y/R _{max.} :
		$L_{50} = L_{c} =$	(t _c ):	capture in cm	TL   (1)
Trawling and	Over exploited	_ ₇₅ =		:	
Coastal fishery (1)			0.5 y (1)		All gears
					18.7
Recent Y:	Recent Y/R in g:	Recent Z:	Recent F or f:	Recent E:	F _{max} :
				(1)	
	All gears	All gears	All gears		All gears
All gears	15.3 (1989)	Z = 1.28 (1989)	$F_{mean} = 1.01 (1)$	All gears	$F_{mean} = 0.4$ (1)
440 (200)		(1)		E = 0.79	
118 tons (1989)		Based on ACA	F at age result lowe	r	
			than mean one on C	)	
			and 1 age groups		
			(F=0.1) and higher		
			on 4 age group		
			<u>(</u> +=2.8).		
Note: Assessment	based on Age Cohort A	Analysis (ACA) ar	nd Beverton and Hol	t Y/R Model(1).	

Biology									
	L _∞ in cm TL	W _∞	K in y-1	t _o in y	L max.				
	F+M= 25 (1)	F+M= 166 (1)	F+M= 0.27 (1)	F+M= -1.2 (1)					
Lr	Tr	A	В	L _m in cm TL	Tm				
	0.33 y								
Μ		Ageing method	VBGF method	M method					
M+F= 0.27 (1)									
References:									
(8) Hadjistephanou	I N.A. (1992) - FAO Fis	sh. Rep. 477: 23-3	34						

Table 70 - Gen	eral Data					
Scientific name:	GFCM Subarea:		Management	Country:	Fishery:	Stock Name:
			Unit:	Spain	Trawling	
Mullus surmuletus	Balearic				Gill net	
			1.1.a			
Area:	Biomass:		Recruitment:	Management		
				options :		
	TS:		TS:		Adopting a 60 mm op	pening mesh size
	LCA: tons (1980 -91)	(1)	LCA: 3.9 millions		$(F_0=0; F_1=0.2; F_2=1)$	.4 and F ₄ = 1.7) the
			(1980-91) (1)		Y/R = 62.1g should b	e obtained after 3
					years (1).	
Note : Current openi	ng mesh size 40 mm (*	1)				
Fishery						
Operational unit	Stock Status:	L ₂₅		Age at first capture	Mean Length of	Y/ R _{max} in g
		$L_{50} =$	L _c	(t _c ):	capture in cm TL :	(1980-91)
Trawling around	Overexploited	$L_{75}$				58.05 with current
Baleares	(growth overfishing)				15.8 ( 1.31 y)	exploitation
					(1980-91) (1)	pattern;
						67. 3 with 60
		_				opening m.s. (1)
Recent Y:	Recent Y/R in g:	Rec	ent F or f:		Effort level _{Y/R max.} :	SSB/SSB ₀ :
		(198	30-91) (1)		740/ 6/1	
	36.61 (1980-91)(1)			4 10	-74% of the current	2% (1980-91) (1)
		High	nest values of F or	h age 1 and 2 groups	value	
		(F=1	1.9). 			
			estones on age C	and 5 groups		
		(0.14	4 <f<u.17). rmodioto voluco o</f<u.17). 	$p_{0} = 2 (E_{-} 0.72)$ and		
	Recent B/R in g:	age	4 (F=0.24) groups	S.		
	20.6 (1080-01) (1)					
	29.0 (1900-91) (1)					
(1) based on LCA ca	arried out on pseudocol	horts				

Biology									
	L _∞ M+F=29.75 cm TL (1)	₩ _∞	K M+F= 0.49 y-1 (1)	t ₀ M+F=-0.31 y (1)	L max.				
L _r	T _r	A M+F=0.0093 (1)	B M+F=3.07 (1)	L _m in cm TL M+F = 15 (1)	Tm				
М	F _{term.} :	Ageing method	VBGF method	M method					
M+F= 0.20 (1)	0.35	Otolith readings							
References:									
(1) Oliver P et al. (1995) – Cah. Options Mediterr. 10: 25-26									
(2) Oliver P	(2) Oliver P, Morillas A. (1992) – Rapp. Comm. Int. Mer Medit. 33: 304								
(3) Oliver <u>P</u>	(3) Oliver <u>P.</u> (1993) – Scientia Marina, 57 (2-3): 219 - 227.								

Table 71 - General D	Data						
Scientific name: GFCM	l Subarea:	Management Unit:	Country: Tunisia	Fishery: • Trawling	Stock Name:		
Mullus surmuletus Sardini	ian + Ionian	1.3.k and 2.2.f		<ul> <li>Coastal fishery</li> </ul>			
Area: Recruit	itment	<ul> <li>Recommendations:</li> <li>50 % increasing trawling effort would produce an 12 % and 18% improvof trawler Y/R in North and East coast respectively, while a 25% decrease in both coastal fisheries.</li> <li>40 % decreasing trawling effort would produce an 21 % and 25% decrease of trawler Y/R in North and East coast respectively, while a 12% increase in both coastal fisheries.</li> </ul>					
Biomass: Manag TS: LCA:	gement options	<ul> <li>The adoption of a 60 mm opening mesh size would produce a 30 and 51 % decrease of trawler Y/R in North and East coast, respectively, while a 89% increase of coastal fisheries</li> <li>Maintaining the current M.S., a 40% increase of effort only in North coast would produce a an 36 % and 27% increase of trawlers and coastal in North and East coast respectively (1).</li> </ul>					
Note : Current opening mesh	h size 38 mm (1)						

Fishery and assessment							
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	Y/ R _{max} in g		
		L ₅₀ =L _c	(t _c ):	capture in cm TL :	_		
Northern coast	Northern	L ₇₅					
(1.3.k)	coast						
Eastern coast	Under exploited						
(2.2.f)							
	Eastern						
Southern coast	coast						
(2.2.1)	Fully Exploited						
	Southern						
	coast						
	Overexploited						
Surplus Production N	lodel	Recent f:	Recent F				
(1980-91)			(1988-91) (1)	have as at the			
Northern –Eastern co	past	Northern -Eastern	NOTITIETTI COASI - ITAWIET				
MSY = 550 t (Schaef	er) – 580 (Fox).	coast	0.25 from 11 to 18 cm TL Exploited range 9-21 cm TL				
4		4	Northern coast - coastal fishery				
$f_{MSY} = 1115^{*}10^{4} \text{ day}^{*}$	HP (Schaefer) -	f ₁₉₉₁ = 600*10 ⁴	Values between 0.25 and 0.4 for TL $>$ 18 cm. Exploited range				
1576"10 day"HP (FC	DX).	day"HP	16-21cm TL.				
Southern coast			All gears North – Mean F=0.75 from 12 to 21 cm TL; Mean				
MSY = 1035 t (Schaefer) - 930 (Fox).			F=0.25 from 9 to 12 cm TL.				
		Southern coast	Eastern coast - trawler				
$f_{MSY} = 1539*10^6 \text{ day*HP}$ (Schaefer) -		( 0400*40 ^f	Values lower than 0.1 a	II over length classes	. Exploited range 9-		
13/3*10° day*HP (Fox)		1 ₁₉₉₁ = 2100°10° dov*HP	21 cm TL.				
		uay nr	Eastern coast – coastal fishery				
			Values close 0.2 for TL	>18 cm. Exploited rai	nge 16-21cm TL.		
Note: Assessment based on Surplus Production Model and LCA carried out on pseudocohorts (ANALEN) (1)							

Biology								
	L _∞	W _∞	К	to	L max.			
	M+F=27.06 cm TL (1)		M+F= 0.5 y-1 (1)					
L _r	Tr	A	В	L _m in cm TL	Tm			
		M+F=0.0093 (1)	M+F=3.07 (1)	M+F = 15.5 (1)				
М	F _{term.} :	Ageing method	VBGF method	M method				
M+F= 0.57 0.54 (1) 0.57								
Note:								
References:								
(1) Ben Mariem et al. (1996) – FAO Fish. Rep. 533 (Suppl.): 269-284.								

Table 72 - General Data								
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:		Stock Name:		
		Unit:						
Mullus surmuletus	Aegean Sea	3.1.a	Greece	All Greece (2)				
		(Central			_			
		Aegean Sea)		Trawling –72.6% of to	otal			
				Greek catches				
				Beach seiner – 3.8 %				
•				<u>Coastal fishery</u> – 23.6	5			
Area:	Biomass:	Recruitment:	Management option	ons :	Recomme	endations:		
1	(1990-91)	TO						
Km-	те.							
<b>Fickers</b> and access	15:	VPA:						
Fishery and asses		1.			-			
Operational unit	Stock Status:	L ₂₅	Age at first capture	Mean Length of	= max. :			
	Over ficked	$L_{50} = L_{c} =$	(t _c ):	capture in cm IL (	1)			
	Over-fished	$L_{75} =$		÷				
Central Aegean								
Depont V:	Booont 7:	Booont E or f:	Booont V/D in a:	Booont E:	<u> </u>			
Recent f.	Recent Z.	Recent F OF I.	Recent f/R ing.		- 0.1 -			
Aegeen See	7 = 1.31(1000-01)	$F_{-} \cap Q_{1}(1)$						
(1986)	(1)	1 = 0.34 (1)		F = 0.72(1)				
1993 tons of M	(')							
barbatus over								
3841 tons of								
Mullidae (2).								
Note: Assessment based on trawl surveys data and Exploitation Rate analysis (1). According to a Fox Surplus Production								
Model, based on catches and effort of all Mullidae in all Greek Seas from 1964 to 1986 and using f at as reference, resulted								
that fully exploitation was achieved in 1986 (2).								

Biology								
	L _∞ in cm FL	W∞	K in y-1	t _o in y	L max.			
	F= 41.3(1)		F= 0. 0996 (1)	F= -2.77 (1)				
	M= 38		M= 0.1043	M= -2.76				
L _r	T _r	A	В	L _m in cm TL	Tm			
6-8 cm FL		F=0.0000056 M=0.0000051 (1)	F= 3.23 M=3.25 (1)	F= 13.8 (1) M= 11.5				
M(1)		Ageing method	VBGF method	M method				
M+F= 0.37	M+F= 0.37 Otolith readings Ford-Walford plot Pauly (1980)							
Note: length-weight coefficients calculated with FL in mm and TW in g.								
References:								
(3) Vassiloupou V., Papaconstantinou C. (1992) – FAO Fish, Rep. 477; 115-126.								
(4) Stergiou K.I. et al. (1992) - FAO Fish. Rep. 477: 97- 113.								

Table 73 - General Data							
			Courset mar	<b>F</b> iele e m u	Cta als Namas		
Scientific name:	GFCM Subarea:	Management	Country:	Fishery:	Stock Name:		
		Unit:					
Mullus surmuletus	Eastern	3.2.c	Ciprus	Trawling and			
		(Ciprus)		Coastal fishery			
Area:	Biomass:	Recruitment:	Management	Recommendations:			
			options :	<ul> <li>Displace t</li> </ul>	rawlers from inshore to offshore		
km ²	TS:	TS:		fishing-grounds or forbid inshore			
	CA: 307 tons (1989)	CA: 11.2		from Nove	mber to February for 2 years.		
		millions (1989)		<ul> <li>Introductio</li> </ul>	n of closed areas for 2 years.		
Note: Biomass at S	ea. estimated at begin	ning of fishing sea	ason (31 October of	each vear), remai	ned quite stable from 1986 to		
1989 (1)				ouorryour,, roma			
Fishery and asses	ssment						
Operational unit	Stock Status:	Age at first	Mean Length of	Y/R max	Recent Y/R in a		
oporational ante		capture (t.)	capture in cm TL	(1)	i tooont i jit ii gi		
Trawling and	Fully exploited			(')	All gears		
Coactal fishory (1)	I dily exploited	0.5 v (1)	Trowlorg 11.2		19 7 (1090)		
		0.5 y (1)	Indwiers= 11.2	All gears	18.7 (1969)		
	Decest 7		Inshore inshery= To				
Recent Y:	Recent Z:	Recent F or T:		Recent E:	F _{max} :		
		All gears $= 0.74(1)$		(1)			
	All gears	$\Gamma_{\text{mean}} = 0.74(1)$			All gears		
All gears	Z = 1.09 (1989) (1)	F at age result lower	than mean one on 0	All gears	$F_{mean} = 0.6$ (1)		
	Based on CA	(F=0.03), 1 (F=0.33)	and 5plus (F=0.35) age	E= 0.68			
155 tons (1989)		groups.					
		From 2 to 4 age grou	ps F ranges between 0.9	97			
		and 1.31.					
Note: Assessment	based on Age Cohort	Analysis (CA) and	Beverton and Holt	Y/R Model (1).			
Biology	Γ			Г			
	L _∞ in cm TL	W _∞	K in y-1	t _o in y	L max.		
	F+M= 33.2 (1)	F+M= 506 (1)	F+M= 0.103 (1)	F+M=3.24 (1)			
Μ	T _r	A	В	L _m in cm TL	Tm		
M+F= 0.35 (1)	0.33 y						
References: (1)	Hadjistephanou N.A. (1	992) - FAO Fish.	Rep. 477: 23-34		•		

## 5. Bibliografia

**Abad R., Miquel J., Iglesias M. (1996)** – Campanas de evaluacion por metodos acusticos de sardina, boqueron y ochavo en el Mediterraneo Occidental. *FAO Fish. Rep.* 537: 191-193.

Abella A., Serena F. (1998) – Stato di sfruttamento del nasello nei compartimenti di pesca di Livorno e Viareggio. *Biol. Mar. Medit.* 5 (2): 136-150.

Abella A., Belluscio A., Bertrand J., Carbonara P.L., Giordano D., Sbrana M., Zamboni A. (1999) – Use of MEDITS trawl survey data and commercial fleet information for the assessment of some Mediterranean demersal resources. *Aquat. Living Resour.* 12 (3): 155-166.

Addis P. Campisi S., Cuccu D., Follesa M.C., Murenu M., Sabatini A., Secci E., Cau A. (1998) – Mari di Sardegna: Sintesi delle ricerche sulla pesca a strascico negli anni 1985-97. *Biol. Mar. Medit.* 5(3): 85-95.

Aldebert Y., Recasens L., Lleonart J. (1993) – Analysis of gear interactions in a hake fishery: the case of the Gulf of Lions (NW Mediterranean). *Scientia Marina*, 57 (2-3): 207-217.

Aldebert Y., Recasens L. (1996) – Méthodes d'evaluation du stock de merlu du golfe du Lion. *FAO Fish. Rep.*, 537: 157-164.

Andreoli M.G., Campanella N., Cannizzaro L., Garofano G., Giusto G.B., Jereb P., Levi D., Norrito G., Ragonese S., Rizzo P., Sinacori G. (1995) – Rilevazione campionaria delle statistiche della pesca nelle Marinerie della Sicilia meridionale (Minipestat): data report. *N.T.R. – I.T.P.P.* (Special publication), 4 (2): 223 p.

Ardizzone G.D. (1998) – Un tentativo di valutazione delle condizioni di *Merluccius merluccius* e *Mullus barbatus* nei mari italiani. *Biol. Mar. Medit.* 5 (2): 151-168.

Ardizzone G.D., Belluscio A., Gentiloni P., Colloca GF., Cardinale M., Crespi V., Carpentieri P., Schintu P. (1998) – Valutazione delle risorse demersali Unità Operativa T 4: Foce del Garigliano - Isola di Giannutri Periodo 1985-98. *Biol. Mar. Medit.* 5 (3): 53-63.

**Arneri E., Jukic S. (1986)** – Some preliminary observations on the biology and dynamics of *Mullus barbatus* in the Adriatic Sea. *FAO Fish Rep.* 345: 79 – 85.

**Ben Mariem S., Garbi H. (1996)** – Interactions dans les peches tunisiennes du merlu (*Merluccius merluccius mediterraneus* (L., 1758) . *FAO Fish. Rep.* 533 (Suppl.): 173-189.

**Ben Mariem S., Gharbi H., Ezzeddine-Najai S. (1996)** – Le rouget de roche (*Mullus surmuletus*) en Tunisie : Evaluation des stocks et aménagement des pecheries. *FAO Fish. Rep.* 533 (Suppl.): 269-284.

**Bouaziz A., Bennoui A., Djabali F., Maurin C. (1998)** – Reproduction du merlu *Merluccius merluccius* (Linnaeus, 1758) dans la région de Bou-Ismail. *Cah. Options Méditerr.*, 35: 109-117.

**Bouaziz A., Semroud R., Djabali F., Maurin C. (1998)** – Estimation de la croissance du merlu *Merluccius merluccius* (Linnaeus, 1758) de la region centre de la cote algérienne par analyse des fréquences de tailles. *Cah. Options Méditerr.*, 35: 35-41.

**Bouchereau J.L., Djabali F., Do Chi T. (1986)** – Essais d'evaluation de l'etat d'exploitation des stocks de sardines dans les divisions statistiques Baléares et golfe du lion, par quelques méthodes analytiques simples. *FAO Fish. Rep.* 347: 163-185.

**Cannizzaro L., Alagna A., Andreoli M.G., Gianformaggio N. (1991)** – Relazione taglia– peso per alcuni pesci del Canale di Sicilia. *N.T.R. – I.T.P.P.* 39: 1-33.

**Casavola N., De Ruggieri P., Rizzi E., Lo Caputo S. (1998)** – Daily egg production method for spawning biomass estimates of Sardine in the South-Western Adriatic Sea. *Rapp. Comm. int. Mer Médit.*, 35 (2): 396.

**Casavola N. (1999)** – Valutazione della biomassa di alici mediante la stima della produzione giornaliera di uova lungo le coste adriatiche pugliesi nel 1995. *Biol. Mar. Medit.*, 6 (1): 553-555.

Chavance P., Chabane F., Hemida F., Korichi H., Sanchez M.P., Bouchereau J.L., Tomasini J.A., Djabali F. (1986) – Evaluation du rendement par recrue relatif à partir de frequences de taille: application à quelques stocks d'anchois, de sardinelles et de chinchards de la Méditerranée occidentale. *FAO Fish. Rep.* 347 : 186-204.

**Cingolani N., Giannetti G., Arneri E. (1996)** – Anchovy fisheries in the Adriatic Sea. *Scientia Marina*, 60 (Supl.2): 269-277.

**Cingolani N., Arneri E., Giannetti G., Santojanni A., Belardinelli A. (1998)** – Valutazione degli stocks pelagici di alici e sardine in Adriatico con metodi di dinamica di popolazione. *Relazione finale*. CNR – IRPEM Ancona: 137 p.

**Cingolani N., Arneri E., Giannetti G., Santojanni A., Belardinelli A. (1998)** – Valutazione degli stock di alici e sardine in Adriatico con metodi di dinamica di popolazione. *Biol. Mar. Medit.*, 5 (3): 321-330.

**Colloca F., Gentiloni P., Agnesi S., Schintu P., Cardinale M., Belluscio A., Ardizzone G.D. (1998)** – Biologia e dinamica di popolazione di *Aristeus antennatus* (Decapoda: Aristeidae) nel Mar Tirreno Centrale. *Biol. Mar. Medit.* 5 (2): 218-231.

**Coppola S.R., Garibaldi L., Die D. (1994)** – POPDYN: Population dynamic database. *FAO Computerized Information Series* – *Fisheries* 7: 30 p.

**Demestre M., Lleonart J. (1993)** – Population dynamics of *Aristeus antennatus* (Decapoda : Dendrobranchiata) in the northwestern Mediterranean. *Sci. Mar.* 57 (2-3): 183-189.

**Demestre M., Sbrana M., Alvarez F., Sanchez P. (1997)** – Analysis of the interaction of fishing gear in *Mullus barbatus* fisheries of the Western Mediterranean. *J. Appl. Ichthyol.* 13: 49-56.

De Ranieri S., Belcari P., Bertolini D., Biagi F., Mori M., Reale B., Sartor P., Sbrana M., Viva C. (1994) – Considerazioni sullo stato di sfruttamento delle risorse demersali (Isola d'Elba – Isola di Giannutri). *Biol. Mar. Medit.* 1 (2): 27-39.

Djabali F., Boudraa S., Bouhdid A., Bousbia H., Bouchelaghem E.H., Brahmi B., Dob M., Derdiche O., Djekrir F., Kadri L., Mammasse M., Stamboull A., Tehami B. (1990) – Travaux réalisés sur les stocks pélagiques et démersaux de la région de Béni-saf. *FAO Fish. Rep.* 447: 160-170.

**Fiorentino F., Zamboni A., Orsi Relini L. (1996)** – La valutazione dello sfruttamento di *Merluccius merluccius (L.)* nel Mar Ligure mediante il modello strutturale di Thompson e Bell. *Biol. Mar. Medit.* 3 (1): 548-552.

**Fiorentino F., Orsi Relini L., Zamboni A., Relini G. (1998)** - Remarks about the optimal harvest strategy for red shrimps (*Aristeus antennatus*, Risso 1816) on the basis of the Ligurian experience. *Cah. Options Méditerr*. 35: 323-333.

**Flamigni C. (1984)** – Preliminary utilization of trawl survey data for hake (*Merluccius merluccius* L.) population dynamics in the Adriatic Sea. *FAO Fish Rep.* 290: 109-115.

**Giovanardi O., Rizzoli M., Jukic S. (1986)** – Preliminary considerations on the fishery management of the hake (*Merluccius merluccius* L.) stock in the Adriatic Sea. *FAO Fish Rep.* 345: 71-78.

**Greco S., Rinelli P., Giordano D., Perdichizzi F. (1998)** – Valutazione delle risorse demersali da Capo Suvero a San Vito Lo Capo (Tirreno Meridionale). *Biol. Mar. Medit.* 5 (3):74-84.

**Guennegan Y., Liorzou B., Bigot J.L. (2000)** – Exploitation des petits pelagiques dans le Golf du Lion et suivi de l'evolution des stocks par echo-integration de 1999 a 2000. Paper presented at WG on small Pelagics. Fuengirola (Spain) 1-3 March 2000: 27 p.

Hadjistephanou N.A. (1992) – Assessment of five demersal marine fish stocks of Cyprus for the year 1989. *FAO Fish. Rep.* 477: 23-34.

**INRH (2000)** – Note succincte sur la pecherie petits pelagiques mediterraneenne du Maroc. Paper presented at WG on small Pelagics. Fuengirola (Spain) 1-3 March 2000: 11 p.

**Jukic S., Piccinetti C. (1988)** – Contribution to the knowledge on the short and long-term effects of application of 40 mm codend mesh size in Adriatic trawl fishery - eastern Adriatic coast. *FAO Fish Rep.* 394: 282-290.

**Karlou C., Vrantzas N. (1989)** – Evaluation of the relative yield per recruit approach in the case of the stockof Red Mullet (*Mullus barbatus* L. 1758) in the Saronikos Gulf. *FAO Fish. Rep.* 412: 28-43.

Lembo G., Spedicato M.T., Silecchia T., D'Agostino V. (1998) – Distribution of nursery areas of *Merluccius merluccius* obtained by geostatistical techniques. *Cah. Options Méditerr.*, 35: 147-154.

Levi D., Andreoli M.G., Giusto G.B. (1993) – An analysis based on trawl-survey data of the state of the "Italian" stock of *Mullus barbatus* in the Sicilian Channel, including management advice. *Fish. Res.*, 17: 333-341.

Levi D., Ragonese S., Andreoli M.G., Norrito G., Rizzo P., Giusto G.B., Gancitano S., Sinacori G., Bono G., Garofalo G., Cannizzaro L. (1998) – Sintesi delle ricerche sulle risorse demersali dello stretto di Sicilia (Mediterraneo Centrale) negli anni 1985-97 svolte nell'ambito della legge 41/82. *Biol. Mar. Medit.* 5 (3)130-139.

**Lleonart J. (1990)** – La pesqueria de Cataluna y Valencia: description global y planteamiento de las bases para su conseguimiento: Informe Final. Commision de las Comunidades Europeas, DG XIV : 1634 p.

Manfrin G., Paolini M., Piccinetti C. (1998) – Le risorse demersali dell'Alto e Medio Adriatico. *Biol. Mar. Medit.* 5(3): 96-108.

Marano G., Ungano N., Marano C.A., Marsan R. (1988) – La ricerca sulle risorse demersali del bacino adriatico sud-occidentale (anni 1985-97): sintesi dei risultati. *Biol. Mar. Medit.*5 (3): 109–119.

Martin P., Sanchez P. (1992) – Length distribution and total mortality rate Z of *Merluccius merluccius*, *Mullus barbatus* and *Eledone cirrhosa* exploited by the trawling fleet in 1982 and 1991 off the Catalan Coast (NW Mediterranean). *Rapp. Comm. int. Mer Médit.*, 33: 301.

**Oliver P., Morillas A. (1992)** – Etat d'exploration du Merlu (*Merluccius merluccius* L.) et de Rouget (*Mullus surmuletus* L.) des lles Baléares. *Rapp. Comm. int. Mer Médit.*, 33: 304.

**Oliver P. (1993)** – Analysis of fluctuations observed in the trawl fleet landings of the Balearic Islands. *Scientia Marina*, 57 (2-3): 219 - 227.

**Oliver P., Massuti E., Renones O. (1995)** – Methods of approach on the population dynamics of hake (*Merluccius merluccius*) in Majorca (NW Mediterranean). *Cah. Options Méditerr.*, 10: 25-26.

**Orsi Relini L., Arnaldi D. (1986)** – Note di biologia della triglia di fango, *Mullus barbatus* L. 1758, del Mar Ligure; riproduzione e reclutamento. *Boll. Mus. Ist. Biol. Univ. Genova*, 52 suppl.: 237 – 250.

**Orsi Relini L., Relini G. (1998)** - Long term observations of *Aristeus antennatus*: Sizestructures of the fished stock and growth parameters, with some remarks about the "recruitment". *Cah. Options Méditerr.* 35: 311-322.

**Papaconstantinou C., Stergiou K.I. (1995)** – Biology and fisheries of eastern Mediterranean hake (*M. merluccius*). Fish and Fisheries Series 15, Chapman & Hall, London: 150-180.

**Papaconstantinou C. (2000)** – The biology and the management of Hake (*Merluccius merluccius*) in the Greek Seas. Working paper presented at WG on Demersals. Séte (France) 21-23 March 2000: 17p.

Patti B., Mazzola S., Calise L., Bonanno A., Buscaino G., Cosimi G. (2000) – Echosurveys estimates and distribution of small pelagics Fish concentrations in the Strait of Sicily during June 1998. Paper presented at WG on small Pelagics. Fuengirola (Spain) 1-3 March 2000: 11 p.

Pertierra J. P., Lleonart J. (1996) – NW Mediterranean anchovy fisheries. *Scientia Marina*, 60 (Supl.2): 257-267.

**Piccinetti C., Piccinetti Manfrin G. (1994)** – Considerazioni sullo stato di sfruttamento delle risorse demersali (Alto e Medio Adriatico). *Biol. Mar Medit*.1 (2): 77-87.

**Quintanilla L.F., Garcia A., Giraldez A., Cuttitta A. (2000)** – Daily Egg Production estimate of the spawning biomass of the Sicilian Channel Anchovy during July 1998. Paper presented at WG on small Pelagics. Fuengirola (Spain) 1-3 March 2000: 43 p.

**Ragonese S., Bianchini M.L. (1996)** – Growth, mortality and yield-per-recruit of the deep-water shrimp *Aristeus antennatus* (Crustacea – Aristeidae) of the strait of Sicily (Mediterranean Sea). *Fish. Res.* 26: 125-137.

**Recasens L. (1992)** – L'Etat d'exploitation du Merlu (*Merluccius merluccius*) de la Mer Catalane (Nord Ouest Méditerranée). *Rapp. Comm. int. Mer Médit.*, 33: 309.

Relini G., Orsi Relini L., Fiorentino F., Massi D., Zamboni A. (1994) – Considerazioni sullo stato di sfruttamento delle risorse demersali (Ventimiglia – Foce del Magra). *Biol. Mar. Medit.* 1 (2): 11-21.

Relini G., Fiorentino F., Zamboni A., Massi D., Orsi Relini L. (1998) – Sintesi delle ricerche sulla pesca a strascico negli anni 1985-97 – Unità Operativa 1. *Biol. Mar. Medit.* 5 (3): 20-29.

Santojanni A., Arneri E., Belardinelli A., Cingolani N., Giannetti G. (1999) – Fluctuations of biomass of Sardines (*Sardina pilchardus*, Walb.) in the Adriatic Sea. *Atti A.I.O.L.*, 13 (1): 11-20.

**Sinovcic G. (1998)** – The population dynamics of the juvenile anchovy, *Engraulis encrasicolus* (L.), under the Estuarine conditions (Novigrad Sea – Central Eastern Adriatic). *Cah. Options Méditerr.*, 35: 273-282.

Spedicato M.T., Greco S., Lembo G., Perdichizzi F., Carbonara P. (1995) – Prime valutazioni sulla struttura dello stock di *Aristeus antennatus* (Risso, 1816) nel Tirreno Centro-Meridionale. *Biol. Mar. Medit.* 2 (2): 239-244.

**Spedicato M.T., Lembo G., Carbonara P., Silecchia T. (1998)** – Valutazione delle risorse demersali dal Fiume Garigliano a capo Suvero. *Biol. Mar. Medit.* 5 (3): 64-73.

Stergiou K.I., Petrakis G., Papaconstantinou C. (1992) – The Mullidae (*Mullus barbatus, M. surmuletus*) fishery in Greek waters, 1964-1986. FAO Fish. Rep. 477: 97-113.
Tursi A., Sion L., Maiorano L., Panza M. (1992) – Le nurseries di *Micromesistius poutassou* (Risso, 1826) nel Mar Jonio. *Biologia Marina*, suppl. al Notiziario SIBM, 1: 377-378.

**Tursi A., Matarrese A., D'Onghia G., Sion L. (1994)** – Population biology of red mullet (*Mullus barbatus* L.) from the Ionian Sea. *Mar. Life* 4 (2) : 33-43.

**Tursi A., Matarrese A., D'Onghia G., Sion L., Maiorano P. (1996)** – The yield per recruit assessment of hake (*Merluccius merluccius* L. 1758) and red mullet (*Mullus barbatus* L. 1758) in the Ionian Sea. *FAO Fish. Rep.* 533 (Suppl.): 127-141.

Tursi A., Matarrese A., D'Onghia G., Maiorano P., Panza M. (1998) - Sintesi delle ricerche sulle risorse demersali del Mar Jonio (da Capo d'Otranto a Capo Passero) realizzate nel periodo 1985-97. *Biol. Mar. Medit.* 5(3): 120-129.

**Ungaro N., Rizzi E., Marano G. (1992)** – Note sulla biologia e pesca di *Merluccius merluccius* (L.) nell'Adriatico pugliese. *Biologia Marina*, suppl. al Notiziario SIBM, 1: 329-334.

**Ungaro N., Rizzi E., Marzano M.C. (1994)** – Utilizzo del modello di Beverton e Holt, "rendimento per recluta (Y/R)", per la risorsa *Mullus barbatus L*. nell'Adriatico pugliese. *Biol. Mar. Medit.*1 (1): 317-318.

**Ungaro N., Marano G. (1996)** – Considerations on the hake stock of the South-Western Adriatic Sea. *FAO Fish Rep.* 533 (Suppl.): 97-100.

**Vassilopoulou V., Papaconstantinou C. (1992)** – Aspects of the biology and dynamics of Red Mullet (*Mullus barbatus*) in the Aegean Sea. *FAO Fish. Rep.* 477: 115-126.

**Vidoris P., Kallianiotis A. (2000)** - Production Model of *Engraulis encrasicolus L.*, 1758, in the Thracian Sea. Paper presented at WG on small Pelagics. Fuengirola (Spain) 1-3 March 2000: 4 p.

Voliani A., Abella A., Serena F. (1998) – Problematiche inerenti la valutazione dello stato di sfruttamento di *Mullus barbatus. Biol. Mar. Medit.* 5 (2): 169-183.

Vrantzas N., Kalagia M., Karlou C. (1992) – Age, growth and state of stock of Red Mullet (*Mullus barbatus* L., 1758) in the Saronikos Gulf of Greece. FAO Fish. Rep. 477: 51-67.

Yahiaoui M., Nouar A., Messili A. (1986) – Evaluation des stocks de deux especes de crevettes profondes de la famille des pénéidés : *Aristeus antennatus* et *Parapenaeus longirostris. FAO Fish. Rep.* 347: 221-231.