

## SAC GFCM Sub-Committee on Stock Assessment

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<b>Date*</b>	5	October	2009	<b>Code*</b>	PIL0609Bel
<b>Authors*</b>	Bellido, J.M.1*, Garcia, E.1, Quintanilla, L.2, Torres, P2., Giráldez, A.2, Ceruso, C.1, Alemany, F.3, Iglesias, M.3				
<b>Affiliation*</b>	1 Instituto Español de Oceanografía. Centro Oceanográfico de Murcia. C/ Varadero 1. San Pedro del Pinatar. 30740. Murcia. Spain.				
<b>Species Scientific name*</b>	<p><b>1</b> Source: GFCM Priority Species</p> <p><b>2</b> Source: -</p> <p><b>3</b> Source: -</p>				
<b>Geographical area*</b>	Western Mediterranean (FAO Subarea 37.1.)				
<b>Geographical Sub-Area (GSA)*</b>	06 - Northern Spain				
Combination of GSAs	1				
	2				
	3				

## SAC GFCM - Sub-Committee on Stock Assessment (SCSA)

Assessment form

Sheet #0

Basic data on the assessment

Code: PIL0609Bel

Date*	5	Oct	2009	Authors*	Bellido, J.M.1*, Garcia, E.1, Quintanilla, L.2, Torres, P2., Giráldez, A.2, Ceruso, C.1, Alemany, F.3, Iglesias, M.3
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Species Scientific name*	Sardina pilchardus - PIL	Species common name*	Sardine, Sardina
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### Data Source

GSA*	06 - Northern Spain	Period of time*	1994-2009
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### Description of the analysis

Type of data*	Landings, Length and biological samplings. Tuning from Purse seiners	Data source*	Official Statistics, IEO Sampling Network, Acoustic Survey
Method of assessment*	Provisional XSA analysis - Extended Survivor Analysis	Software used*	VPA Suite. Lowestoft. 1995 & FLR library

### Sheets filled out

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

### Comments, bibliography, etc.

The provisional XSA analysis was not accepted as a basis for advice. The main reasons were the use of a common ALK for some years, and doubts about the natural mortality. The XSA analysis may be indicative of trends in recruitment and biomass, but the fishing mortality estimates are highly uncertain. Therefore the advise is based on direct evidences.

**Comments, bibliography, etc.****Bibliography (Published papers and books):**

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

Caddy, J.F. (1991). Death rates and time intervals: Is there an alternative to the constant natural mortality axiom? *Rev. Fish Bio./ Fisheries*, 1: 109-13 8.

De Oliveira, J.A.A., Uriante, A., and Roel, B., 2005. Potential improvements in the management of Bay of Biscay anchovy by incorporating environmental indices as recruitment predictors. *Fisheries Research*, 75: 2-14.

Freon, P. and Misund, O.A., 1999. Dynamics of Pelagic Fish Distribution and Behaviour: Effects on Fisheries and Stock Assessment. Fishing News Books, UK, 348 pp.

Hilborn, R. and Walters C.J., 1992. quantitative Fisheries Stock Assessment; Choice, Dynamics and Uncertainty. New York: Chapman and Hall, 570 pp.

Leonard, J. and Maynou, F., 2003. Fish Stock Assessment in the Mediterranean: state of the art. *Scientia Marina*, 67: 37-49.

Patterson, K., 1992. Fisheries for small pelagic species: an empirical approach to management targets. *Review in Fish Biology and Fisheries*, 2: 321-338.

Ramon M.M and Castro, J.A., 1997. Genetic variation in natural stocks of *Sardina pilchardus* (Sardines) from the western Mediterranean Sea. *Heredity*, 78: 520-528.

Sheperd, J.G., 1999. Extended Survivors Analysis: An improved method for the analysis of catch-at-age data and abundance indices. *Journal of Marine Science*, 56: 584-591.

**Bibliography (Technical Reports and grey literature):**

Darby, C.D. and Flatman, S., 1994. Virtual Population Analysis, version 3.1 (Windows/DOS) user guide. Information Technology Series 1. CEFAS, Lowestoft, UK.

Reports from the SCSA and SAC of the General Fisheries Commission for the Mediterranean (GFCM), available at [http://www.fao.org/fi/body/rfb/GFCM/gfcm\\_home.htm](http://www.fao.org/fi/body/rfb/GFCM/gfcm_home.htm) and/or <ftp://cucafera.icm.csic.es/pub/scsa/>

Reports from the Assessment Working Groups of the International Council for the Exploration of the Seas (ICES), particularly the small pelagics assessment working group WGMHSA. Available at [www.ices.dk](http://www.ices.dk)

Reports from the SGMED Working Groups on the Mediterranean of the Scientific, Technical and Economic Committee for Fisheries (STECF). Available at <http://fishnet.jrc.it/web/stecf>.

**SAC GFCM - Sub-Committee on Stock Assessment (SCSA)**

Assessment form

Sheet B  
Biology of the species

Code: PIL0609Bel

**Biology**

Somatic magnitude measured (LH, LC, etc)*				Total Length	Units*	1/2 centimeter
Sex	Fem	Mal	Both	Unsexed		
Maximum size observed			22		Reproduction season	Oct-Mar
Size at first maturity			13.3		Reproduction areas	All the coast
Recruitment size			8.5		Nursery areas	Bays

**Parameters used (state units and information sources)**

		Units	Sex			
			female	male	both	unsexed
Growth model	L $\infty$	cm			22	
	K	year-1			0.4586	
	t0	year			-1.4157	
	Data source	Otoliths				
Length weight relationship	a				0.0059	
	b				3.1406	
M				M vector (see comments)		
sex ratio (mal/fem)		44/56				

**Comments**

ALK 2003-2007, combined ALK for 1994-2002, 2008 and 2009. Length Distributions 1994-2009.

Biological sampling 2004-2009 for Maturity at age and Weight-Length relationships.

Natural Mortality value (M) - Following the recommendation from the Workshop on Mediterranean Stock Assessment Standardization (SG-ECA/RST/MED 09-01), a vector (declining value of M with age) instead of a constant value was used. The vector was estimated using the ProdBiom method (Abella et al., 1997) based on Caddy (1991).

Age	M
0	1.20
1	0.46
2	0.34
3	0.29
4	0.26
5+	0.25



## SAC GFCM - Sub-Committee on Stock Assessment (SCSA)

Assessment form

Sheet P1

General information about the fishery

Code: PIL0609Bel

Data source*	Official Statistics, IEO Sampling Network, Acoustic	Year (s)*	1994-2009
Data aggregation (by year, average figures between years, etc.)*	By year 1994-2008		

### Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	ESP	06	G - Purse Seine (6-12 metres)	02 - Seine Nets	31 - Small gregarious pelagic	PIL
Operational Unit 2	ESP	06	H - Purse Seine (12-24 metres)	02 - Seine Nets	31 - Small gregarious pelagic	PIL
Operational Unit 3	ESP	06	F - Trawl (>24 metres)	02 - Seine Nets	31 - Small gregarious pelagic	PIL
Operational Unit 4						
Operational Unit 5						

Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
ESP 06 G 02 31 - PIL	4	Tons	7896				
ESP 06 H 02 31 - PIL	111	Tons					
ESP 06 F 02 31 - PIL	17	Tons					
Total	132		7896				

Legal minimum size	11 cm TL
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### Comments

The catch (landings) is not split by Fleet segments. It comprises 7896 Tons in 2009 for the three Operational Units. Although landings are not still separated by Fleet segments we can provide a segmentation of the pelagic fleet in GSA06, with number of boats for every fleet segment:

The Fleet Segment Purse Seine (6-12 metres) comprises 4 boats in 2009

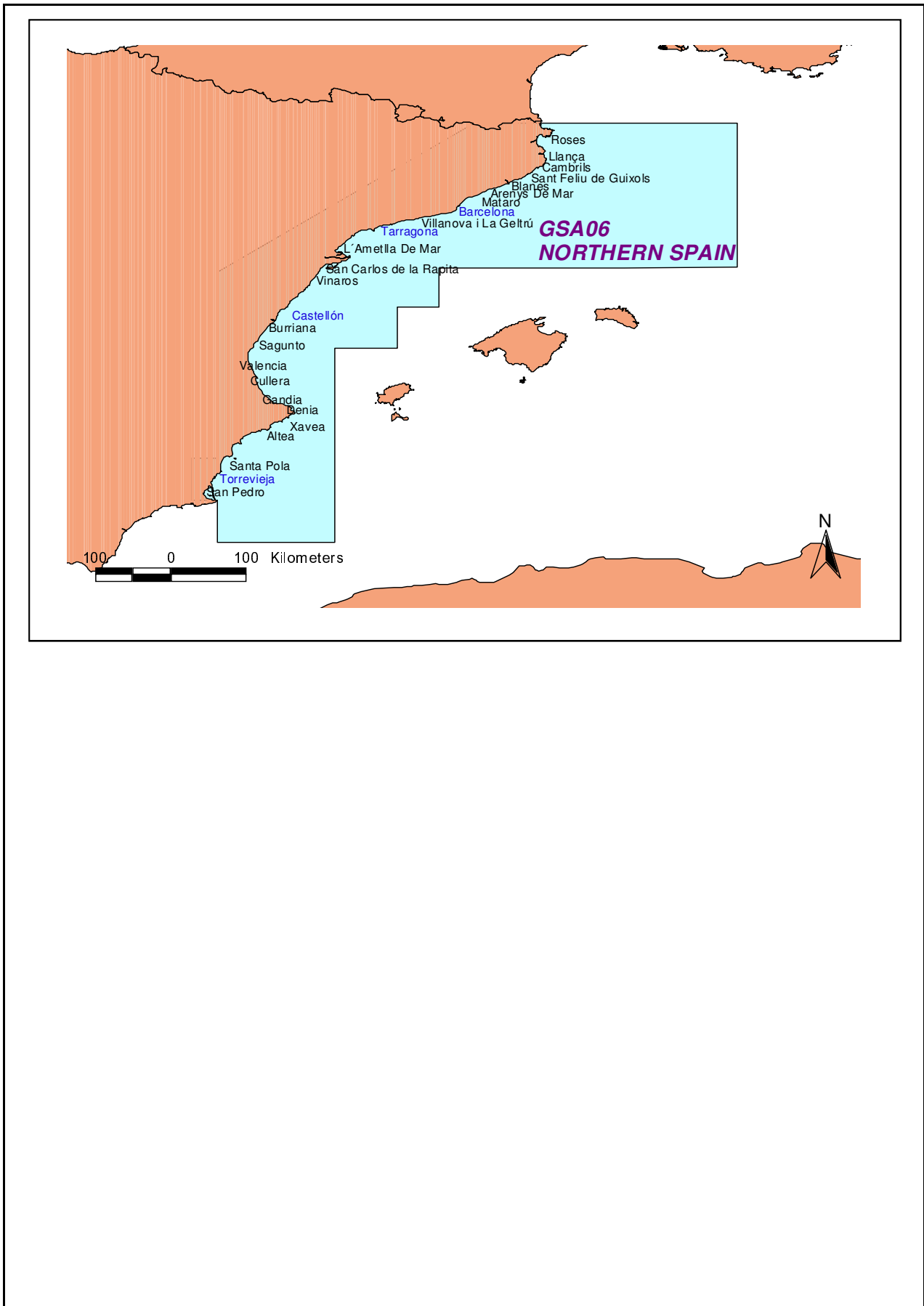
The Fleet Segment Purse Seine (12-24 metres) comprises 111 boats in 2009

The Fleet Segment Purse Seine (greater than 24 metres) comprises 17 boats in 2009

Then, and because that landing aggregation, we prefer to fill pages P2a and P2b considering the three fleet segments as an unique pelagic fleet.

Landing Ports are shown in the attached Figure. Sampling ports are highlighted in blue. Tuning data from acoustic survey ECOMED (2003-2009) and MEDIAS (2009) were used.

Comments



**SAC GFCM - Sub-Committee on Stock Assessment (SCSA)**

Assessment form

Sheet P2a  
Fishery by Operational Unit

Code: PIL0609Bel

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Data source*	Official Statistics, IEO Sampling Network	OpUnit 1*	ESP 06 G 02 31 - PIL
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**Time series**

Year*	1998	1999	2000	2001	2002	2003
Catch	32274 t	36142 t	36972 t	30275 t	18762 t	20817 t
Minimum size	9.5 cm	6 cm	9 cm	9 cm	8 cm	6.5 cm
Average size Lc	16.66 cm	16.78 cm	16.72 cm	16.9 cm	16.56 cm	16.84 cm
Maximum size	19.5 cm	20 cm	20 cm	20.5 cm	20.5 cm	22 cm
Fleet	223		207	179	157	161

Year	2004	2005	2006	2007	2008	2009
Catch	24874 t	22081 t	29381 t	23984 t	14123 t	7896 t
Minimum size	6.5 cm	9 cm	9 cm	9.5 cm	9.0 cm	8.5 cm
Average size Lc	17.02 cm	16.87 cm	16.08 cm	17.81 cm	16.9 cm	17.82 cm
Maximum size	23.5 cm	22.5 cm	22.5 cm	22.5 cm	22.0 cm	22.00 cm
Fleet	155	147	139	132	132	132

**Selectivity**

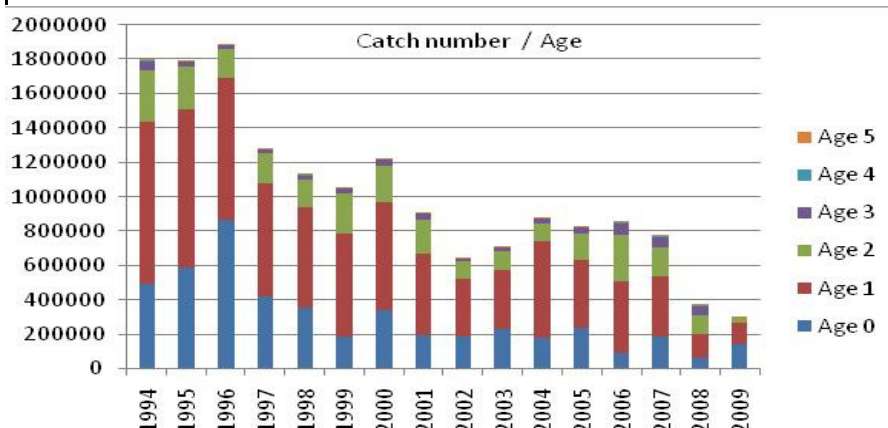
**Remarks**

L25		
L50		
L75		
Selection factor		

Unit: Catch in Numbers (thousands)

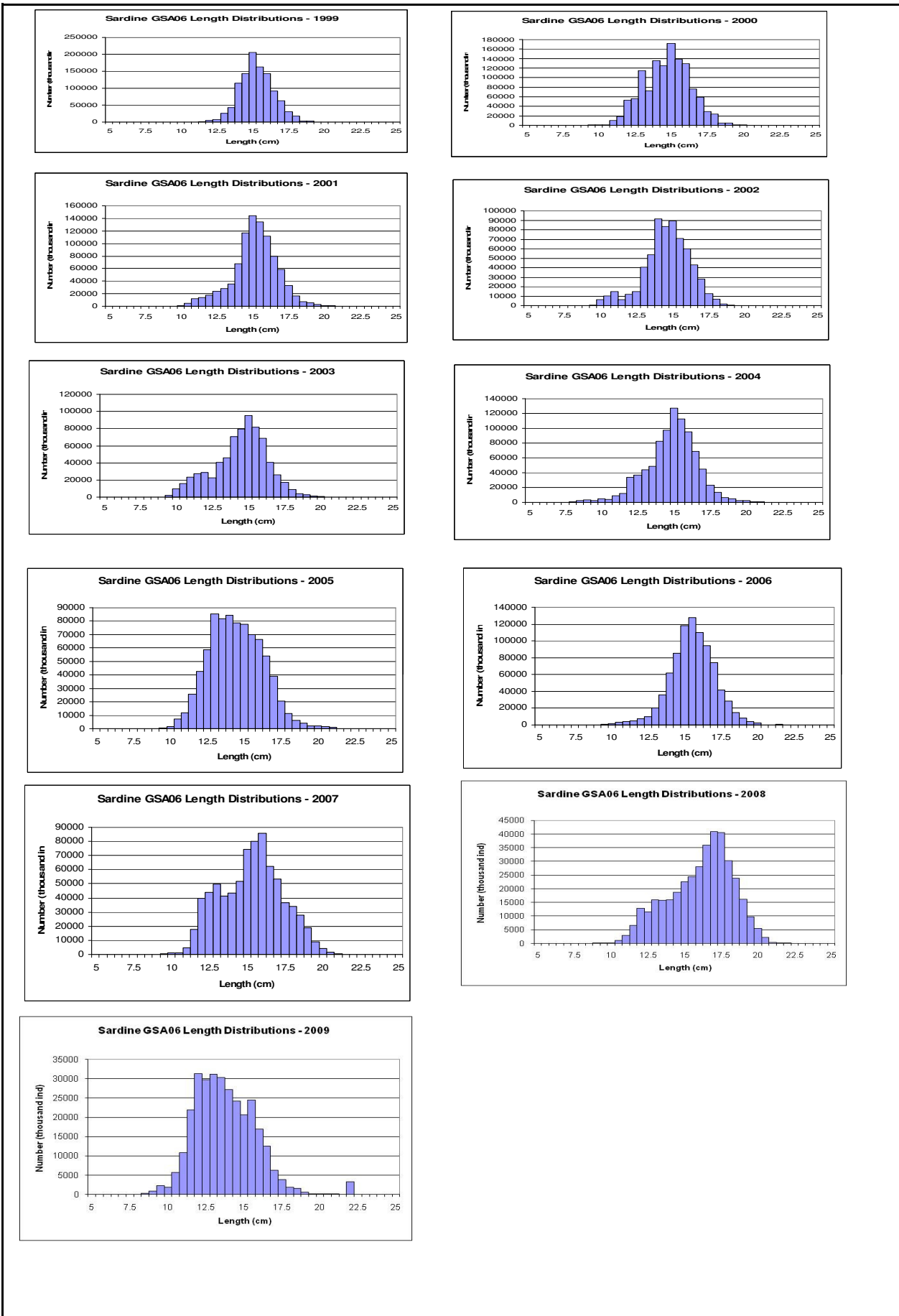
**Structure by size or age**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Age 0	494569	594098	866001	425922	355520	193194	341089	197682	187372	232292	179311	240491	95769	189211	64546	148125
Age 1	941781	919897	831054	653478	585036	598499	633136	477321	340132	345204	565322	394545	418667	347590	142840	123068
Age 2	300744	245670	160898	178067	154908	226686	207861	193795	103026	111670	105701	156411	263762	171745	107209	30975
Age 3	54740	32726	29361	27301	26023	36172	38368	38383	15893	19612	24194	36016	68543	54387	49323	3721
Age 4	6867	2983	3459	2623	3219	3433	5734	6247	1408	3263	8596	6123	11390	16573	15991	719
Age 5	1375	450	516	275	387	319	672	946	123	515	3198	1444	1000	2450	2490	3365





Structure by size or age



## SAC GFCM - Sub-Committee on Stock Assessment (SCSA)

Assessment form

Sheet P2b

Fishery by Operational Unit

Code: PIL0609Bel

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Data source*	Official Statistics, IEO Sampling Network	OpUnit 1*	ESP 06 G 02 31 - PIL
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### Regulations in force and degree of observance of regulations

Fishing license: fully observed  
Minimum landing size 11cm: not fully observed (Some landings under minimum size in some specific ports).  
No fishing allowed on weekend. Time at sea 12 hours per day and 5 days a week: fully observed  
Several technical measures regulations (gear and mesh size, engine, GRT, etc...): not fully observed  
Temporary fishing closure (two months, variable along the time series): fully observed.

### Accompanying species

The most important are:  
Anchovy (*Engraulis encrasicolus*)  
Mediterranean Horse Mackerel (*Trachurus mediterraneus*)  
Other Horse Mackerels (*Trachurus trachurus* and *Tachurus picturatus*)  
Mackerel (*Scomber scombrus*)  
Chub Mackerel (*Scomber japonicus*)  
Round sardinella (*Sardinella aurita*)  
Bogue (*Boops boops*)



**SAC GFCM - Sub-Committee on Stock Assessment (SCSA)**

Assessment form

Sheet A1  
Indirect methods: VPA, LCA

Code: PIL0609Bel

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Sex\* Both

Analysis # \* XSA

**Time series**

Data	Size	Age
(mark with X)	X	X

Model	Cohorts	Pseudocohorts
(mark with X)	X	

Equation used	VPA	Tuning method	XSA
# of gears	Purse seiners	Software	VPA95. Lowestoft suite
F <sub>terminal</sub>	Not relevant to XSA		

**Population results (please state units)**

	Sizes	Ages		Amount	Biomass
Minimum	8.5	0	Recruitment	2300 millions	
Average	See page 2a		Average population	See coments below	
Maximum	22	5+	Virgin population		
Critical			Turnover		

**Average mortality**

	Total	Gear				
F <sub>1</sub>	Fbar=1.20					
F <sub>2</sub>						
Z	See Comments					

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

**Comments**

Reference F is Fbar1-3 (average of ages 1 to 3 are considered the reference ages of this fishery). Following the recommendation from the Workshop on Mediterranean Stock Assessment Standardization (SG-ECA/RST/MED 09-01), a vector instead of a constant value was used. The vector was estimated using the ProdBiom method (Abella et al., 1997) based on Caddy (1991).

An exploratory analysis was conducted estimating a Log Catch Curves analysis. Log Catch Curves show no conflicts between ages and cohorts follow the standard pattern level of an exploited cohort when entering and passing through the fishery. Log Catch Curves can be seen in the figure below.

Landings decrease in 2009, reaching up 7896 t, which represents the lowest landings of the assessed time series. Fishing mortality is at a moderate-high level (F09=0.1.20), lower to that of 2008 (2.52). Recruitment in 2009 (2300 millions) is higher to 2008 (R08=1155 millions) following a decreasing trend from 2003 onwards. The trend of the recruitments is so important as they can affect seriously to the stock health. Both Total Biomass(TB=52960 t) and Spawning Stock Biomass (SSB=25970 t) in 2009 are also the between the lowest of the time series.

**SAC GFCM - Sub-Committee on Stock Assessment (SCSA)**

Assessment form

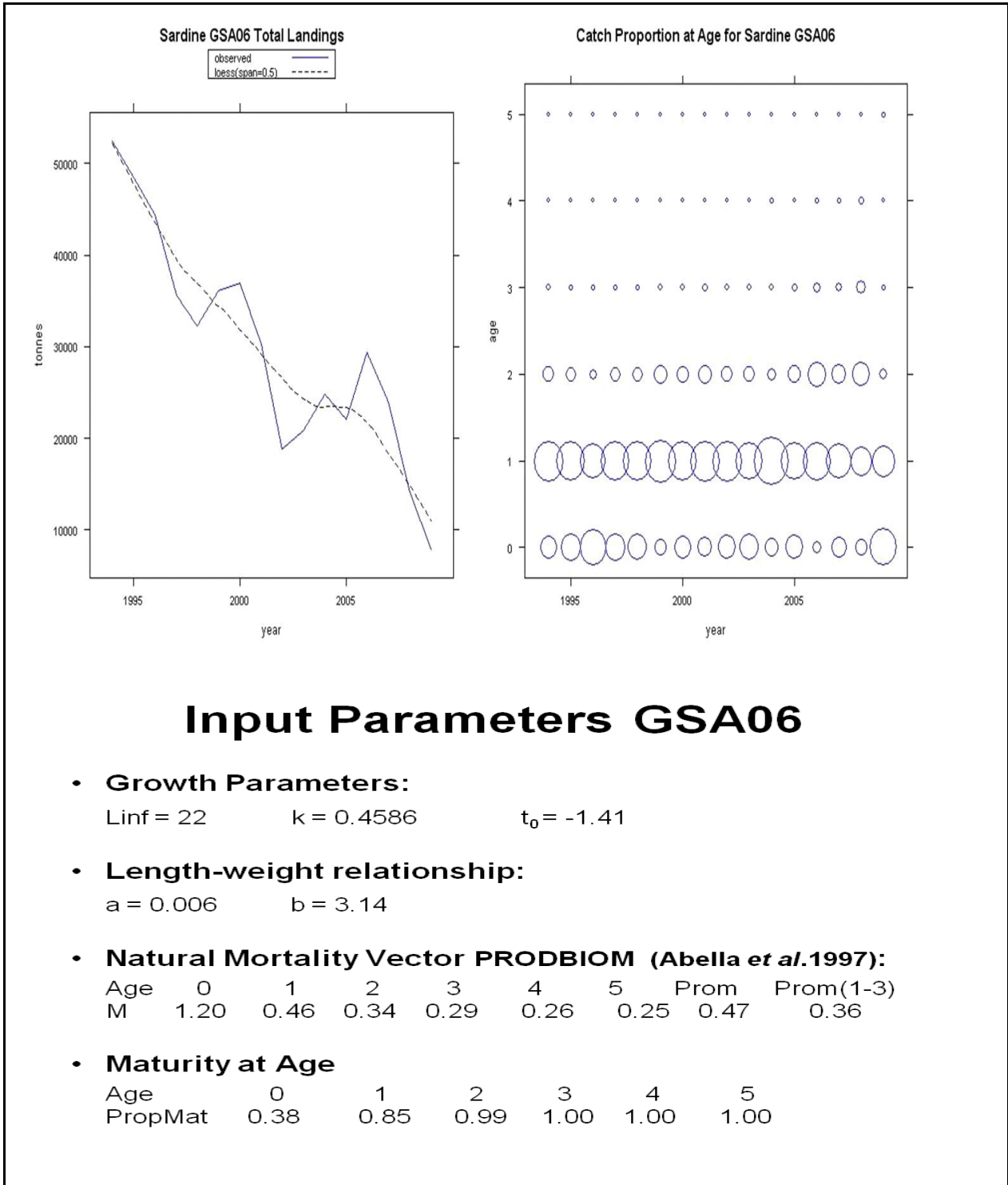
Sheet A2  
Indirect methods: data

Code: PIL0609Bel

Sex*	Both	Gear*	Purse seiners	Analysis # *	XSA
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Data	Input data for XSA
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**Data**



## Input Parameters GSA06

- Growth Parameters:**

Linf = 22      k = 0.4586      t<sub>0</sub> = -1.41

- Length-weight relationship:**

a = 0.006      b = 3.14

- Natural Mortality Vector PRODBIOM (Abella et al.1997):**

Age	0	1	2	3	4	5	Prom	Prom(1-3)
M	1.20	0.46	0.34	0.29	0.26	0.25	0.47	0.36

- Maturity at Age**

Age	0	1	2	3	4	5
PropMat	0.38	0.85	0.99	1.00	1.00	1.00

**SAC GFCM - Sub-Committee on Stock Assessment (SCSA)**

Assessment form

Sheet A3

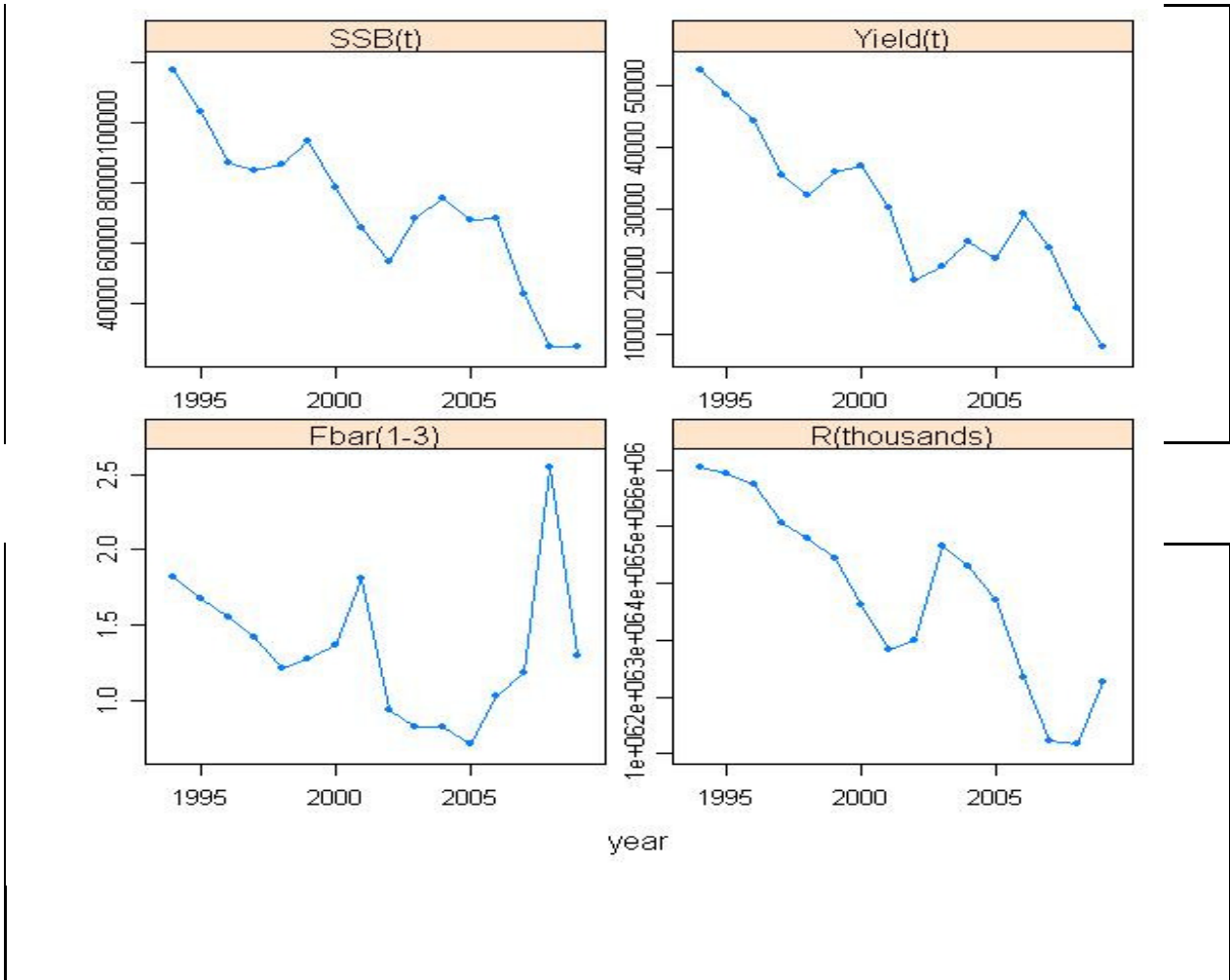
Indirect methods: VPA results

Code: PIL0609Bel

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Sex*	Both	Gear*	Purse Seiners	Analysis #*	XSA
------	------	-------	---------------	-------------	-----

**Population in figures**



**Fishing mortality rates**



**SAC GFCM - Sub-Committee on Stock Assessment (SCSA)**

Assessment form

Sheet other

Code: PIL0609Bel

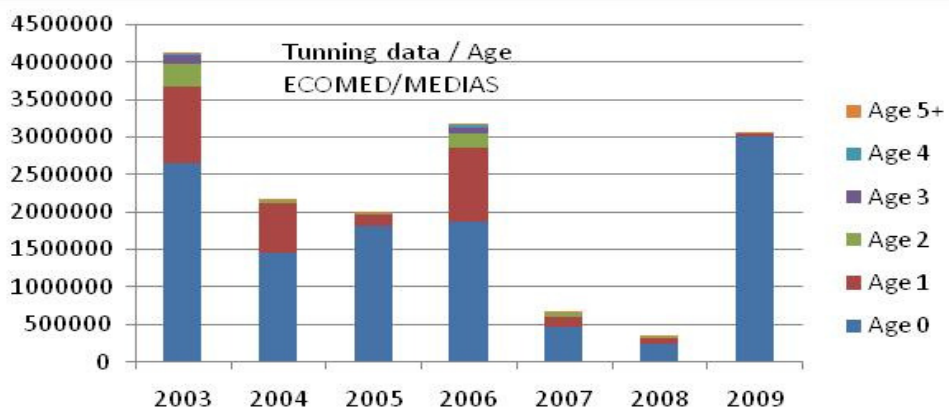
Page 1 /

**Other assessment methods**

Empty box for other assessment methods.

**Sardine GSA06 - survey (thousands)**

	2003	2004	2005	2006	2007	2008	2009
Age 0	2644895	1452813	1822703	1875572	464073	243165	2990000
Age 1	1023948	863482	138817	974858	142152	80839	50000
Age 2	296513	43619	33541	200506	56599	27476	0
Age 3	110993	7767	2261	71175	13104	6329	0
Age 4	38387	6443	2198	29054	6209	1790	0
Age 5+	8566	3046	2063	23748	1600	654	0



## SAC GFCM - Sub-Committee on Stock Assessment (SCSA)

Assessment form

Sheet D  
Diagnosis

Code: PIL0609Bel

### Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B					Not Reference Point defined yet
SSB					Not Reference Point defined yet
F					Not Reference Point defined yet
Y					Not Reference Point defined yet
CPUE					Not Reference Point defined yet

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

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

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



**Comments**

Lacking a reliable analytic assessment, the advice is based on evidence in the fishery and survey data. The catches have had a strong downwards trend throughout the time series (which goes back to 1994.) The 2009 catch is the lowest on record. In the length composition in the catches, the balance between small and large fish has been relatively stable, except in 2009, it is strongly skewed towards small fish.

According to the survey, the recruitment has declined gradually since 2003, but with a stronger year class in 2009. Fish from age 1 and upwards has been almost absent in the survey since 2007, and has virtually disappeared in 2009..

This evidence points in the direction of the recruitment as a main driving force in the population dynamics, where the stock and catches have declined as a result of a declining recruitment. In addition, the length distributions and age distributions indicate that older fish is depleted more rapidly in recent years, in particular after 2007. The reason for that is not clear, but the fishery must be at least partly responsible. Migration to other areas is not likely as the the same trends are seen in GSA07. The stock biomass in itself is not known, but it seems likely that it has declined in line with the decline in the catches and survey index.

Although the recruitment in 2009 is encouraging, the incoming year class now dominates the stock almost completely. The exploitation rate is not known, but it is likely that it is high, as the year classes are depleted rapidly. To improve the situation and restore a normal age composition in the stock and thereby facilitate further good recruitments, a reduction in the exploitation rate seems necessary.

**SAC GFCM - Sub-Committee on Stock Assessment (SCSA)**

Assessment form

Sheet Z

Objectives and recommendations

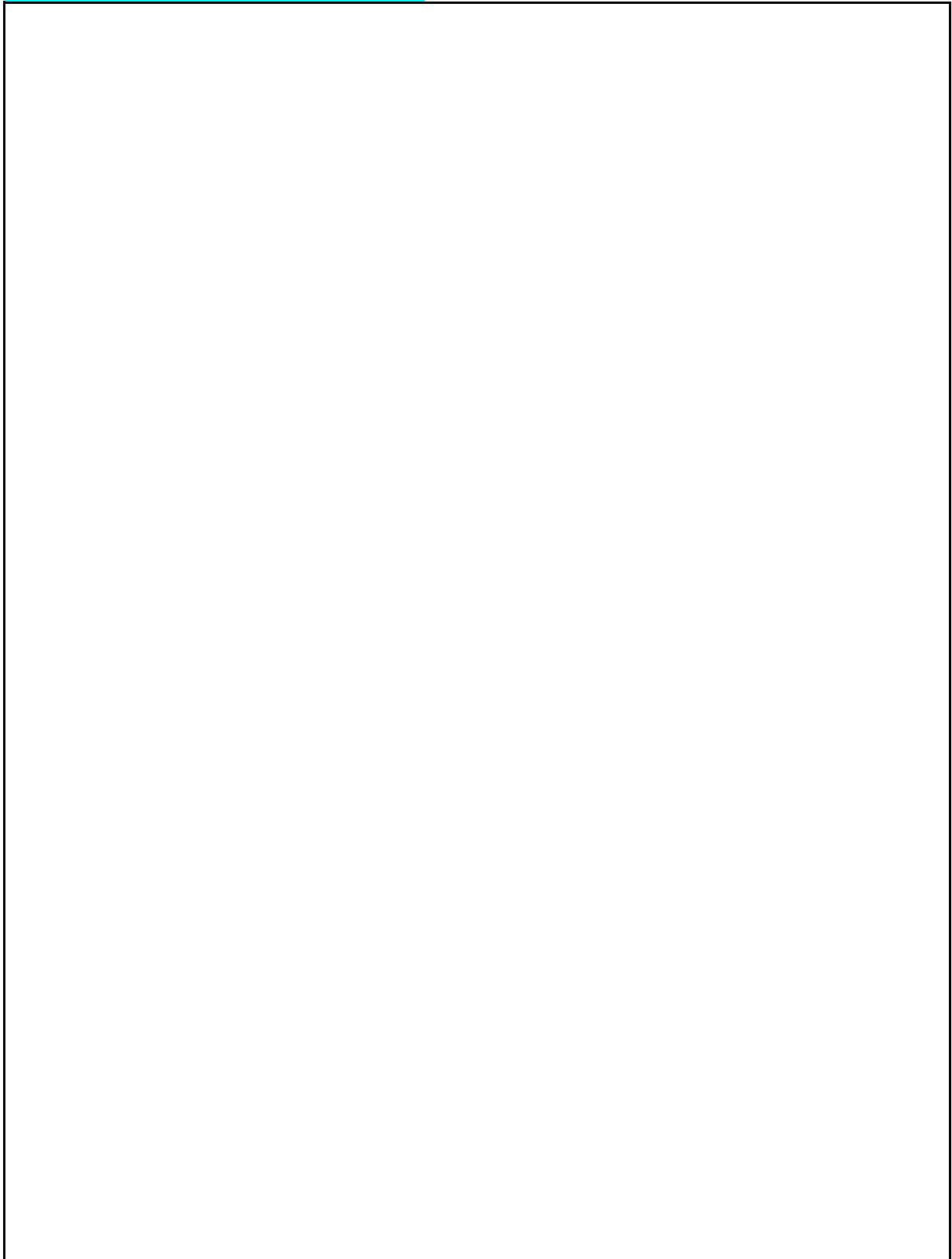
Code: PIL0609Bel

**Management advice and recommendations\***

The stock has declined over many years, partly due to reduced recruitment and partly to poor survival of the recruits. Most likely, the stock has been increasingly overexploited in recent years. The 2009 year class looks promising, but it is necessary to preserve that year class to restore a normal stock structure and facilitate better future recruitments. Unless the recruitment levels increase in the near future, this fishery will be being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse. Therefore, a substantial reduction in exploitation is advised.

Taking into account the possible link between GSA06 and GSA07, which includes parallel changes in the ecosystem in the most recent years, it is also advised to harmonize management measures in the two areas, to ensure that they are restrictive in both areas.

**Advice for scientific research\***



**SAC GFCM - Sub-Committee on Stock Assessment (SCSA)**

Assessment form

Sheet C  
Comments

Code: PIL0609Bel

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**Comments\***

Landings have decreased gradually since 1998, from over 32000 tons to less than 8000 tons. There are indications both in the surveys and the catch data that the recruitment has declined over the last ten years. The XSA assessment is not acceptable as a basis for the advise but may give indications of the trend in biomass and the recruitment which are both strongly declining.

Conclusions - Management considerations:

This stock is at a low level. Unless the recruitment levels increase in the near future, this fishery will be being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse.

## Abstract for SCSA reporting

**Authors**

Bellido, J.M.1\*, Garcia, E.1, Quintanilla, L.2, Torres, P2., Giráldez, A.2, Ceruso, C.1, Alemany, F.3, Iglesias, M.3

**Year**

2009

**Species Scientific name**

Sardina pilchardus - PIL

Source: GFCM Priority Species

Source: -

Source: -

**Geographical Sub-Area**

06 - Northern Spain

### Fisheries (brief description of the fishery)\*

Sardine (*Sardina pilchardus*) and anchovy (*Engraulis encrasicolus*) are the main target species of the purse seine fleet in Northern Spain GSA06, but other species with lower economical importance are also captured, sometimes representing a high percentage of the capture: horse mackerel (*Trachurus* spp.), mackerel (*Scomber* spp.), frigate mackerel (*Auxis rochei*), Atlantic saury (*Scomberesox saurus*) and gilt sardine (*Sardinella aurita*).

This report is exclusively focused on fishery of sardine.

**Source of management advice\***

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

Fishery assessment by VPA methods of the Spanish sardine stock GSA06 is shown. VPA Lowestoft software suite was used and XSA was the assessment method. A separable VPA was also run as exploratory analysis for both stocks. Stochastic short term projections were also produced.

Data used:  
Landings from 1994-2009 from all Fishery ports from GSA06.  
ALK 2004-2009, combined ALK for 1994-2003. Length Distributions 1994-2009.  
Biological sampling 2004-2009 for Maturity at age and Weight-Length relationships.  
Tuning data from acoustic survey ECOMED (2003-2008) and Medias (2009).

**Stock Status\***

O - Overexploited. The fishery is being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse;

**Exploitation rate**

Uncertain / Not assessed

**Stock abundance**

Low abundance

**Comments**

Lacking a reliable analytic assessment, the advice is based on evidence in the fishery and survey data. The catches have had a strong downwards trend throughout the time series (which goes back to 1994.) The 2009 catch is the lowest on record. In the length composition in the catches, the balance between small and large fish has been relatively stable, except in 2009, it is strongly skewed towards small fish.

According to the survey, the recruitment has declined gradually since 2003, but with a stronger year class in 2009. Fish from age 1 and upwards has been almost absent in the survey since 2007, and has virtually disappeared in 2009..

This evidence points in the direction of the recruitment as a main driving force in the population dynamics, where the stock and catches have declined as a result of a declining recruitment. In addition, the length distributions and age distributions indicate that older fish is depleted more rapidly in recent years, in particular after 2007. The reason for that is not clear, but the fishery must be at least partly responsible. Migration to other areas is not likely as the the same trends are seen in GSA07. The stock biomass in itself is not known, but it seems likely that it has declined in line with the decline in the catches and survey index.

Although the recruitment in 2009 is encouraging, the incoming year class now dominates the stock almost completely. The exploitation rate is not known, but it is likely that it is high, as the year classes are depelted rapidly. To improve the situation and restore a normal age composition in the stock and thereby facilitate further good recruitments, a reduction in the exploitation rate seems necessary.

### Management advice and recommendations\*

The stock has declined over many years, partly due to reduced recruitment and partly to poor survival of the recruits. Most likely, the stock has been increasingly overexploited in recent years. The 2009 year class looks promising, but it is necessary to preserve that year class to restore a normal stock structure and facilitate better future recruitments. Unless the recruitment levels increase in the near future, this fishery will be being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse. Therefore, a substantial reduction in exploitation is advised.

Taking into account the possible link between GSA06 and GSA07, which includes parallel changes in the ecosystem in the most recent years, it is also advised to harmonize management measures in the two areas, to ensure that they are restrictive in both areas.

**Advice for scientific research\***

