

# SAC GFCM

## Sub-Committee on Stock Assessment

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**Date\***    24    October    2011                      **Code\***    ANE0611Gar

**Authors\***    Garcia, E.\*, Bellido, J.M., Torres, P., Quintanilla, L.,  
Giráldez, A., Alemany, F., Iglesias, M., Gonzalez, M.

**Affiliation\***    \* Instituto Español de Oceanografía. Centro Oceanográfico  
de Murcia. C/ Varadero 1. San Pedro del Pinatar. 30740.  
Murcia. Spain.

- Species Scientific name\***
- 1    *Engraulis encrasicolus* - ANE  
Source: GFCM Priority Species
  - 2  
Source: -
  - 3  
Source: -

**Geographical area\***    Western Mediterranean (FAO Subárea 37.1)

**Geographical Sub-Area (GSA)\***    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: ANE0611Gar

Date*	24	Oct	2011	Authors*	Garcia, E.*, Bellido, J.M., Torres, P., Quintanilla, L., Giráldez, A., Alemany, F., Iglesias, M., Gonzalez, M.
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Species Scientific name*	Engraulis encrasicolus - ANE	Species common name*	Anchovy, Anchoa.
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**Data Source**

GSA*	06 - Northern Spain	Period of time*	2002-2010
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**Description of the analysis**

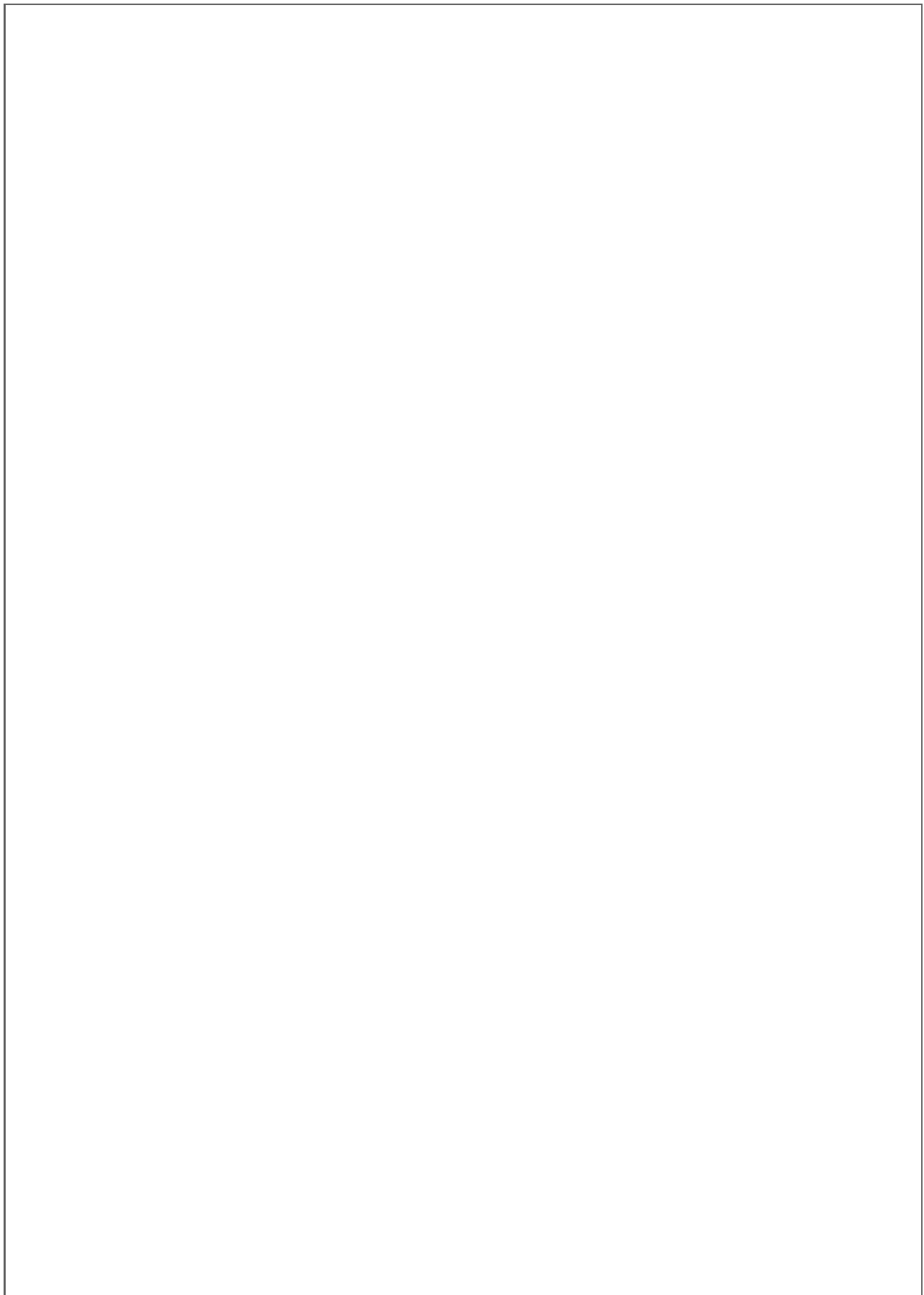
Type of data*	Landings, Length and biological samplings. Tuning from Purse seiners	Data source*	Official statistis IEO sampling network, Acustic survey
Method of assessment*	XSA - Extended Survivor Analysis	Software used*	VPA Suite. Lowestoft. 1995 and FLR Library

**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.**

Fishery assessment by VPA methods of the Spanish Anchovy Stock GSA06 is reported. VPA Lowestoft software suite and FLR library was used adn XSA was the assessment method. A separable VPA was also run as exploratory analysis.



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

Assessment form

Sheet B  
Biology of the species

Code: ANE0611Gar

**Biology**

Somatic magnitude measured (LH, LC, etc)*				Total Length	Units*	1/2 centimeter
Sex	Fem	Mal	Both	Unsexed		
Maximum size observed			6.5		Reproduction season	Spring-Summer
Size at first maturity			14.07		Reproduction areas	Delta Ebro River
Recruitment size			17		Nursery areas	Rosas Bay and Delta

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

		Units	Sex			
			female	male	both	unsexed
Growth model	L <sup>∞</sup>	cm			19	
	K	year-1			0.3419	
	t0	year			-2.321	
	Data source	Otoliths				
Length weight relationship	a				0.0031	
	b				3.2843	

M			M vector (see comments)
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sex ratio (mal/fem)	42.4/57.6
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**Comments**

Combined ALK 2003-2010 were used .  
 Biological sampling 2003-2010 for Maturity at age and Weight-Length relationships.

Natural Mortality value (M) - following the recommendation from the Workshop of the 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	1.17
1	0.43
2	0.32
3	0.27



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

Assessment form

Sheet P1

General information about the fishery

Code: ANE0611Gar

Data source*	Official Statistics, IEO Sampling Network, Acoustic Survey	Year (s)*	2002-2010
Data aggregation (by year, average figures between years, etc.)*	By year 2002-2010		

### 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	ANE
Operational Unit 2	ESP	06	H - Purse Seine (12-24 metres)	02 - Seine Nets	31 - Small gregarious pelagic	ANE
Operational Unit 3	ESP	06	F - Trawl (>24 metres)	02 - Seine Nets	31 - Small gregarious pelagic	ANE
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 - ANE	4	Tons	8399				
ESP 06 H 02 31 - ANE	108	Tons					
ESP 06 F 02 31 - ANE	18	Tons					
Total	130		8399				

Legal minimum size	9 cm TL
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### Comments

The catch (landings) is not split by Fleet segments. It comprises 8399 Tons in 2010 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 2010

The Fleet Segment Purse Seine (12-24 metres) comprises 108 boats in 2010

The Fleet Segment Purse Seine (greater than 24 metres) comprises 18 boats in 2010

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 (2003-2010) and MEDIAS(2010) were used.

**Comments**

A large, empty rectangular box with a thin black border, intended for entering comments.





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

Assessment form

Sheet P2a  
Fishery by Operational Unit

Code: ANE0611Gar

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<b>Data source*</b>	Official Statistics, IEO Sampling Network	<b>OpUnit 1*</b>	ESP 06 G 02 31 - ANE
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### Time series

Year*	2002	2003	2004	2005	2006	2007
Catch	14338	8538	8097	6216	3096	2570
Minimum size	6	6	7.5	7.5	10	7
Average size Lc	13.1	13.4	13.2	14.3	13.4	14.6
Maximum size	17.5	17.5	17	18	18.5	18
Fleet	157	161	155	147	139	132

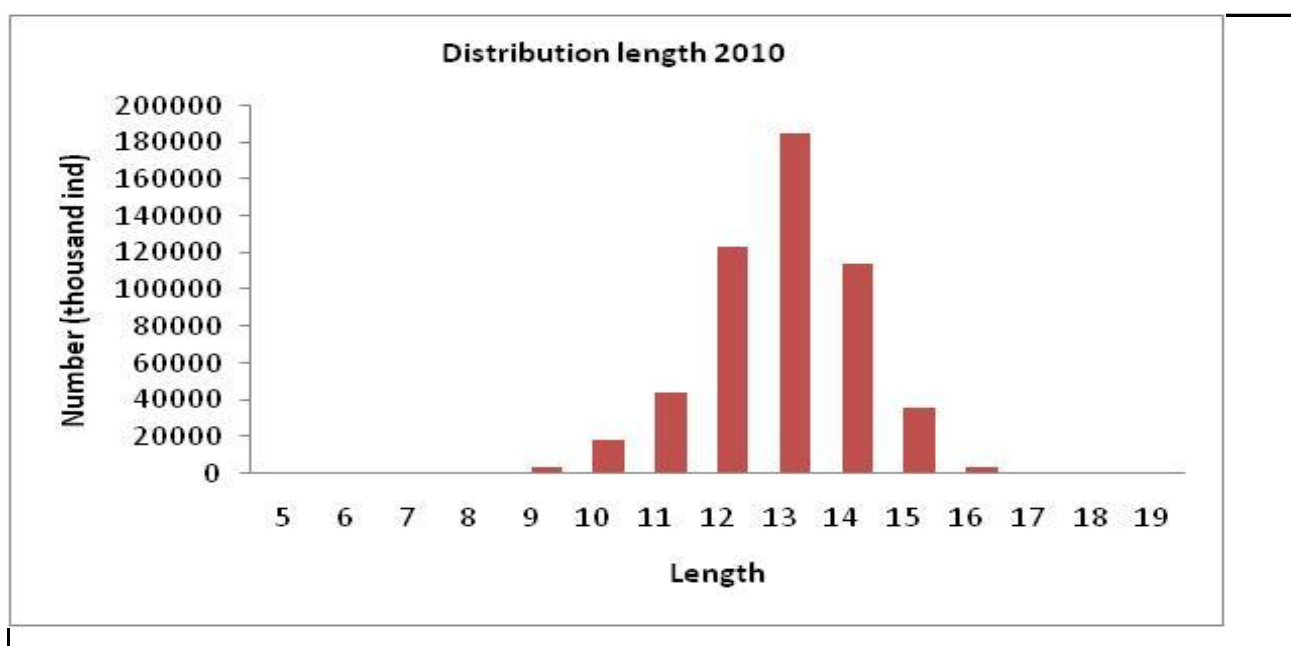
Year	2008	2009	2010			
Catch	2558	9814	8399			
Minimum size	6	8.5	6.5			
Average size Lc	12.8	14.36	14.07			
Maximum size	18.5	17	17			
Fleet	132	132	130			

### Selectivity

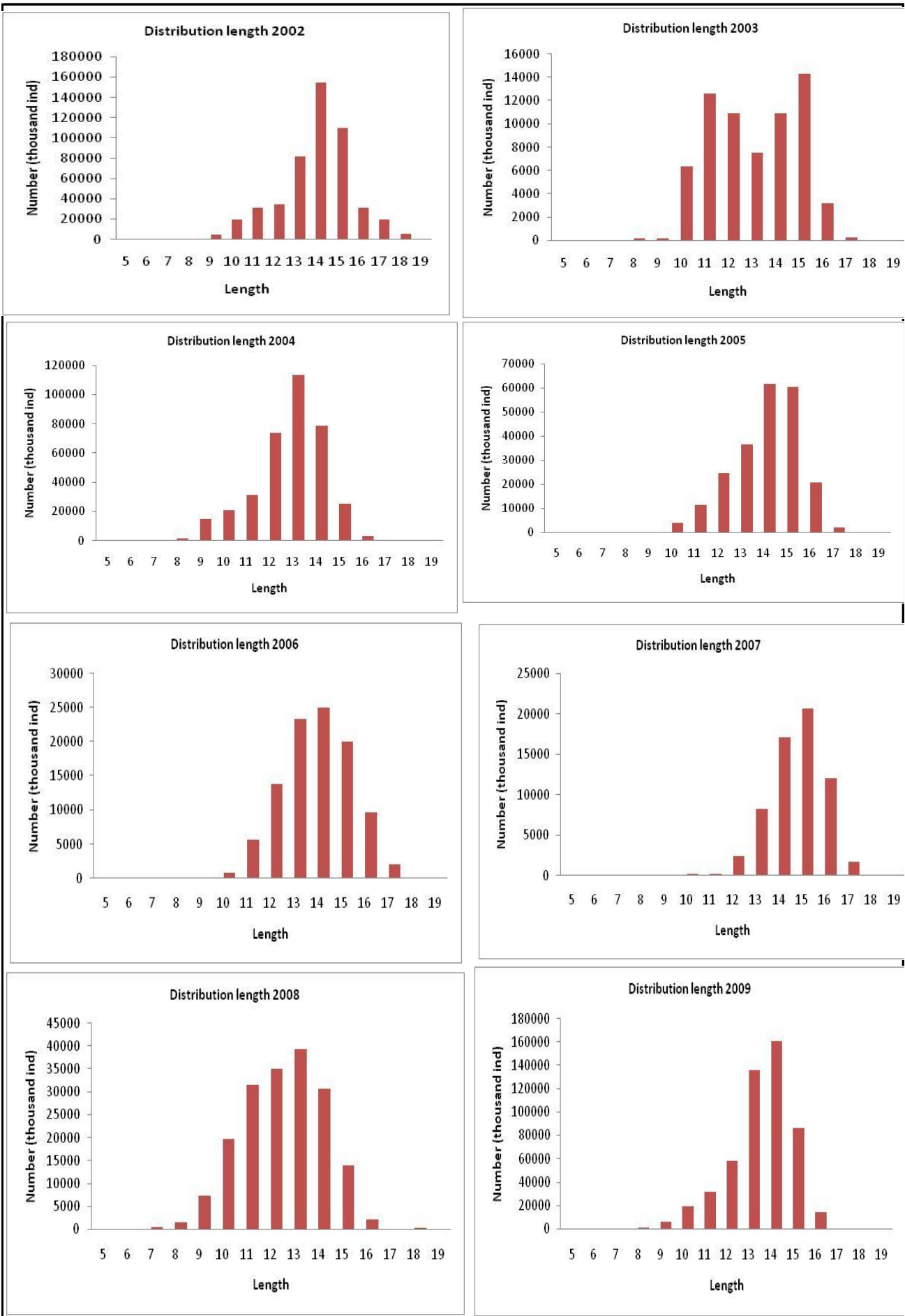
### Remarks

L25		
L50		
L75		
Selection factor		

### Structure by size or age



Structure by size or age



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

Assessment form

Sheet P2a  
Fishery by Operational Unit

Code: ANE0611Gar

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Data source*		OpUnit 2*	ESP 06 H 02 31 - ANE
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**Time series**

Year*						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

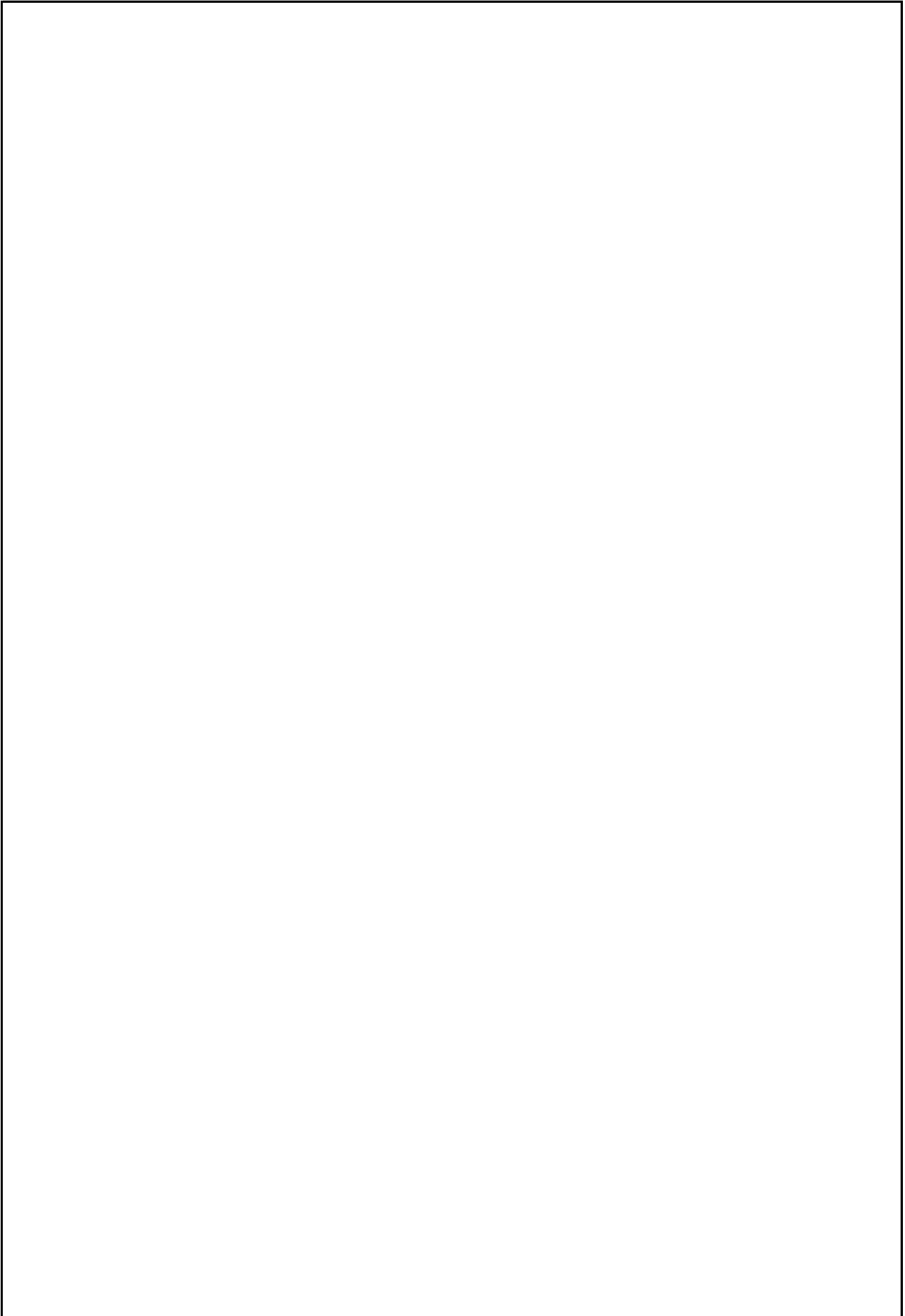
Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

**Selectivity**

**Remarks**

L25		
L50		
L75		
Selection factor		

**Structure by size or age**



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

Assessment form

Sheet P2a  
Fishery by Operational Unit

Code: ANE0611Gar

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Data source*		OpUnit 3*	ESP 06 F 02 31 - ANE
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**Time series**

Year*						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

**Selectivity**

**Remarks**

L25		
L50		
L75		
Selection factor		

**Structure by size or age**



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

Assessment form

Sheet P2b  
Fishery by Operational Unit

Code: ANE0611Gar

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Data source\* Official Statistics, IEO Sampling Network

OpUnit 1\* ESP 06 G 02 31 - ANE

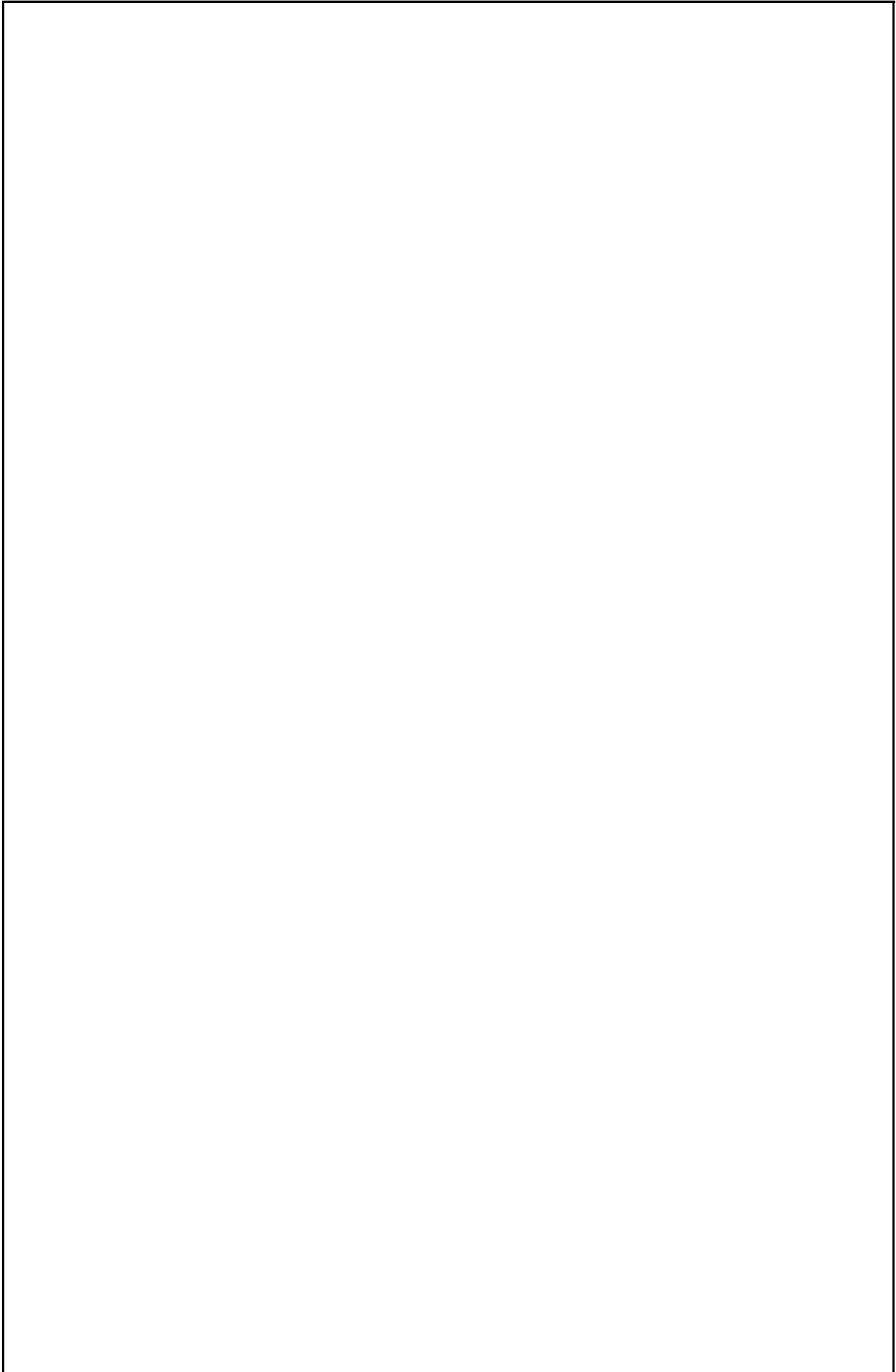
### Regulations in force and degree of observance of regulations

Fishing license: fully observed  
Minimum landing size 9 cm: 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  
Two months temporary fishing closures: fully observed.

### Accompanying species

The most important are:  
Sardine (*Sardina pilchardus*)  
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: ANE0611Gar

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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 and FLR Library
F <sub>terminal</sub>	Not relevant to XSA		

### Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum	6.5	0	Recruitment	2013 millions	
Average	See page 2a		Average population	See coments be	
Maximum	17	3	Virgin population		
Critical			Turnover		

### Average mortality

	Total	Gear				
F <sub>1</sub>	Fbar = 1.034					
F <sub>2</sub>						
Z	See Comments					

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

### Comments

Reference F is Fbar0-2 (average of ages 0 to 2 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). A separable VPA was run as exploratory analysis.

Landings decrease smoothly in 2010 (8399 t), which represents a high value when compared with those obtained during the last five years.

Fbar0-2 in 2010 was 1.034, slightly larger than 2009 (0.89).

F reaches high levels maybe due to high landings with low biomass.

Recruitment in 2010 (2013 millions) is similar to 2009 (2021 millions) and generally seems to follow the trend in SSB.

Both Total Biomass (37039 t) and Spawning Stock Biomass (22980 t) in 2010 decreased compared to 2009 but still remain at high values compared with last eight years.

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

Assessment form

Sheet A2  
Indirect methods: data

Code: ANE0611Gar

Sex*	Both	Gear*	Analysis # *	XSA
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Data source	Input data for XSA
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**Data**



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

Assessment form

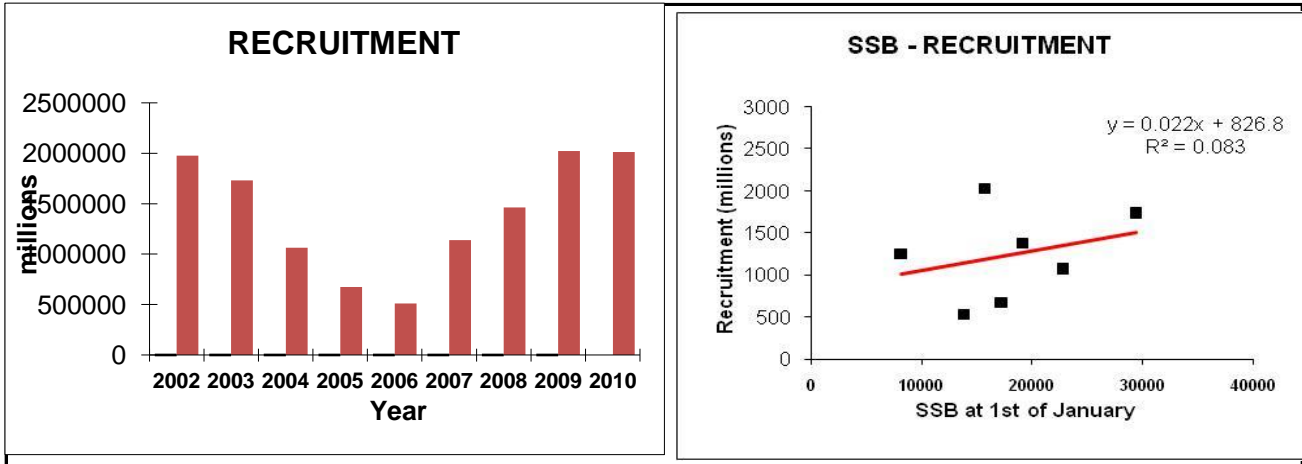
Sheet A3  
Indirect methods: VPA results

Code: ANE0611Gar

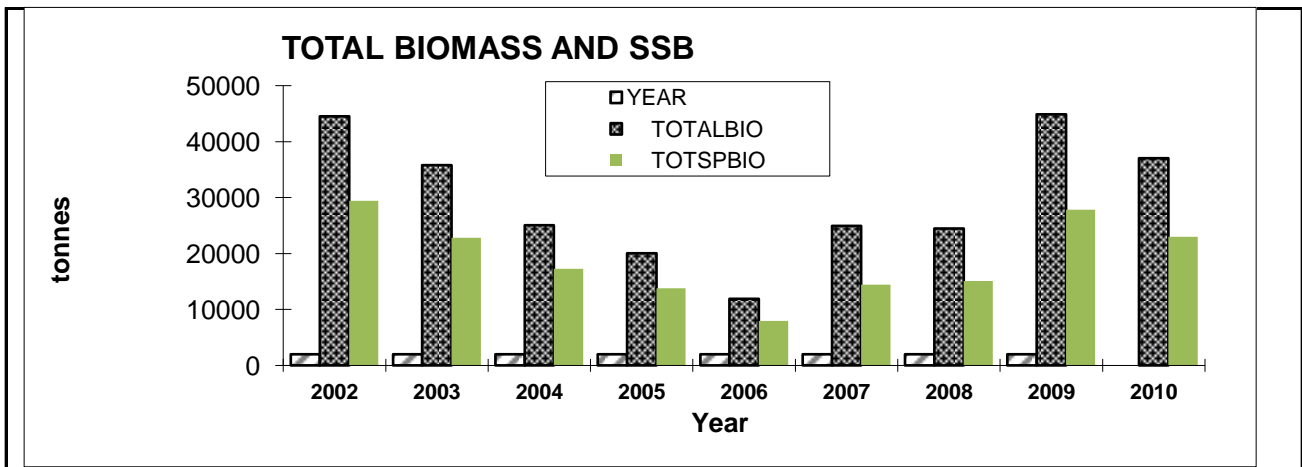
Page 1 / 1

Sex*	Both	Gear*	Purse Seiners	Analysis #*	XSA
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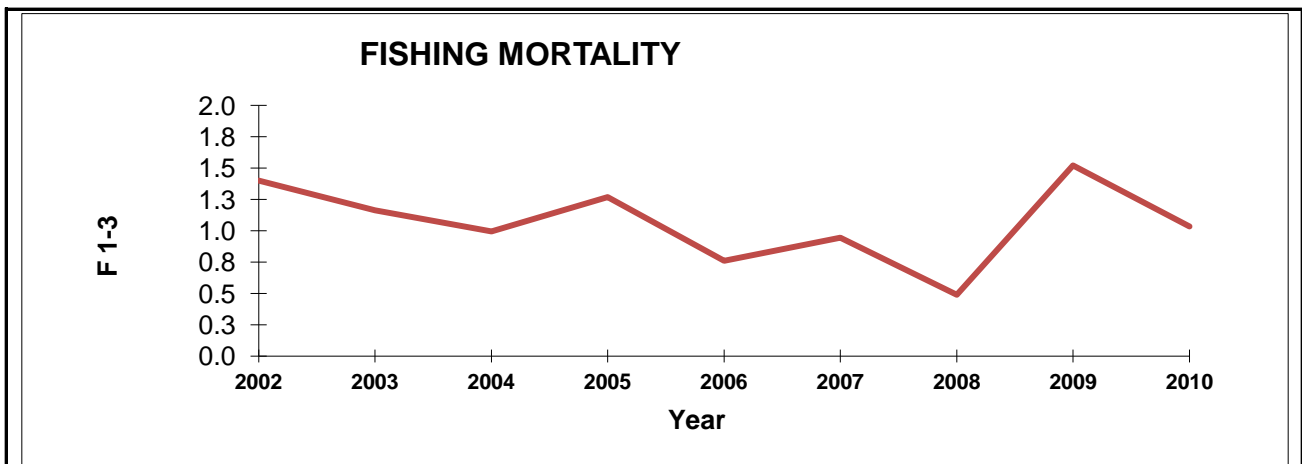
**Population in figures**



**Population in biomass**



**Fishing mortality rates**



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

Assessment form

Sheet other

Code: ANE0611Gar

Page 1 / 1

**Other assessment methods**

Short Terms Deterministic Projections for three years (2011 to 2013).

MFDP software (Multi-Fleet Deterministic Projections).

Landings in 2010 were 8399 t and are predicted to be close 8537 t in 2011 and 8123 t, what account for a stable trend.

Total Biomass and Spawning Stock Biomass will also remain stable during the period 2011-2013.

In this situation it is particularly important to pay special attention to recruitment levels as they could prompt sudden increase or drops in near future.

Table below shows the management options from the short term catch prediction. Assuming F status quo (F11-13 = 1.0043).

2011					
Biomass:SSB	FMult	FBar	Landings		
35329	23041	1	1.0043	8537	
2012				2013	
Biomass:SSB	FMult	FBar	Landing	Biomass:SSB	
34402	22219	0	0	0	41301 28982
.	22219	0.1	0.1004	1244	40123 27818
.	22219	0.2	0.2009	2346	39096 26806
.	22219	0.3	0.3013	3330	38195 25919
.	22219	0.4	0.4017	4214	37398 25136
.	22219	0.5	0.5022	5014	36689 24441
.	22219	0.6	0.6026	5742	36055 23820
.	22219	0.7	0.703	6410	35483 23262
.	22219	0.8	0.8034	7024	34964 22756
.	22219	0.9	0.9039	7593	34492 22297
.	22219	1	1.0043	8123	34058 21876
.	22219	1.1	1.1047	8618	33659 21489
.	22219	1.2	1.2052	9083	33289 21132
.	22219	1.3	1.3056	9520	32946 20801
.	22219	1.4	1.406	9934	32625 20492
.	22219	1.5	1.5065	10326	32325 20204
.	22219	1.6	1.6069	10699	32044 19934
.	22219	1.7	1.7073	11054	31778 19680
.	22219	1.8	1.8077	11394	31527 19440
.	22219	1.9	1.9082	11719	31290 19214
.	22219	2	2.0086	12031	31065 19000

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

Assessment form

Sheet D  
Diagnosis

Code: ANE0611Gar

### Indicators and reference points

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

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

<b>Unidimensional</b>	<input type="radio"/>	? - (or blank) <b>Not known or uncertain.</b> Not much information is available to make a judgment;
	<input type="radio"/>	<b>U - Underexploited, undeveloped or new fishery.</b> Believed to have a significant potential for expansion in total production;
	<input type="radio"/>	<b>M - Moderately exploited,</b> exploited with a low level of fishing effort. Believed to have some limited potential for expansion in total production;
	<input checked="" type="radio"/>	<b>F - Fully exploited.</b> The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;
	<input type="radio"/>	<b>O - Overexploited.</b> 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="radio"/>	<b>D - Depleted.</b> Catches are well below historical levels, irrespective of the amount of fishing effort exerted;
	<input type="radio"/>	<b>R - Recovering.</b> 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="radio"/>	No or low fishing	<input type="radio"/>	Virgin or high abundance
	<input type="radio"/>	Moderate fishing	<input checked="" type="radio"/>	Intermediate abundance
	<input checked="" type="radio"/>	High fishing mortality	<input type="radio"/>	Low abundance
	<input type="radio"/>	Uncertain / Not assessed	<input type="radio"/>	Depleted
			<input type="radio"/>	Uncertain / Not assessed

**Comments**

It is suggested to use less number of age classes.  
Is necessary to have a own ALK for the stock by year; if it is valid to use one from closer areas is better to make it with samples from both areas.  
Also is suggested to use production models with simplified ALKs.

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

Assessment form

Sheet Z

Objectives and recommendations

Code: ANE0611Gar

**Management advice and recommendations\***

Regarding suggestion for management options, this fishery is considered as fully exploited.

As the stock biomass has been fluctuating during the last fourteen years it is suggested not to change the fishing mortality because it seems not have forced this changes.

Although the stock abundance and the recruitment follow the same trend and remains high it is still a low biomass level if it is compared with such a huge area.



**Advice for scientific research\***

**Comments\***

## Conclusions - Assessment:

Landings in 2010 were 8399 t, showing a slight decrease from 2009 (9814 t). The time series shows a soft increasing trend because this is the second high value from 2008 (the lowest one).

There is no very much variability in the fishing mortality in the last few years so it is necessary to have a longer time series to compare.

Recruitment in 2010 (R = 2013 millions) is similar to 2009 (2021 millions). The trend of the recruitments is so important as they can affect seriously to the stock health.

Both Total Biomass (37039 t) and Spawning Stock Biomass (22980 t) in 2010 shows a slight decrease.

## Conclusions - Catch Forecasting:

Assuming statu quo F ( $F_{bar11-13}=1.0043$ ) and conservative recruitment levels (RP02-09 = 1657 millions):

- Landings are predicted to be close to 8537 t in 2011 and 8123 t in 2013.
- Total biomass will be 35329 t in 2011, 34402 t in 2012 and 34058 t in 2013, what account for a stable trend.
- SSB will also remain stable during the period 2011- 2013.

In this situation it is particularly important to pay special attention to recruitment levels as they could prompt sudden increases or drops in a near future.

## Conclusions - Management considerations:

This fishery is considered as fully exploited so it is suggested not to change the fishing mortality because as there is no reference point, the stock biomass remains a low level if it is compared with the whole area.

## Abstract for SCSA reporting

**Authors** Garcia, E.\*, Bellido, J.M., Torres, P., Quintanilla, L.,  
Giráldez, A., Alemany, F., Iglesias, M., Gonzalez, M. **Year** 2011

**Species Scientific name** Engraulis encrasicolus - ANE  
Source: GFCM Priority Species

   
Source: -

   
Source: -

**Geographical Sub-Area** 06 - Northern Spain

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

**Source of management advice\***

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

**Stock Status\***

F - Fully exploited. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;

**Exploitation rate**

High fishing mortality

**Stock abundance**

Intermediate abundance

**Comments**

**Management advice and recommendations\***

Provide a summary of management actions that clearly respond to each finding.

Provide a list of key actions to be taken, including the responsible person, the expected completion date, and the status of the action.

Provide a list of key actions to be taken, including the responsible person, the expected completion date, and the status of the action.

**Advice for scientific research\***

