

## SAC GFCM Sub-Committee on Stock Assessment

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Date\* 

27	October	2011
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Code\* 

HKE0111Pér
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Authors\* 

Pérez-Gil José Luis, González María, Torres Pedro, García Teresa, García Cristina, Baro Jorge and Melendez María José.
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Affiliation\* 

IEO-Centro Oceanográfico de Málaga, P. O. Box 285, 29640 Fuengirola (Spain)
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Species Scientific name\* 

<b>1</b>	Source: GFCM Priority Species
<b>2</b>	Source: -
<b>3</b>	Source: -

Geographical area\* 

Mediterranean 37.1.1 FAO
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Geographical Sub-Area (GSA)\* 

01 - Northern Alboran Sea
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Combination of GSAs 

1	
2	
3	

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

Assessment form

Sheet #0

Basic data on the assessment

Code: HKE0111Pér

Date*	27	Oct	2011	Authors*	Pérez-Gil José Luis, González María, Torres Pedro, García Teresa, García Cristina, Baro Jorge and Melendez María José.
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Species Scientific name*	Merluccius merluccius - HKE	Species common name*	European Hake
			Merluza

### Data Source

GSA*	01 - Northern Alboran Sea	Period of time*	2002-2010
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### Description of the analysis

Type of data*	Size composition of commercial landings	Data source*	I.E.O. DCF. Official landings data from regional government
Method of assessment*	VPA-Extended Survivor Analysis. Y/R, Yield per Recruit Analysis	Software used*	Lowestoft program; Darby and Flatman, 1994 - EXCEL

### Sheets filled out

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

### Comments, bibliography, etc.

Baro J., Meléndez M.J, and del Árbol M. J. Informe técnico sobre una acción piloto de selectividad de artes de arrastre en el mar de Alborán. (RAI-AP-25/2003)-IEO. 2004

García-Rodríguez M. And Esteban A. Algunos aspectos sobre la biología y pesca de la merluza mediterránea *Merluccius merluccius* (Linnaeus, 1758) en la Bahía de Santa Pola (sureste de la península ibérica). (1995). Bol.Inst,Esp.Oceanogr; 11(1).3-25.

García-Rodríguez M. And Esteban A. (2002). How fast does hake grow?. A study on the Mediterranean hake (*Merluccius merluccius* L.) comparing whole otoliths readings and length frequency distributions data. SCI .MAR.,66(2):145-156.

Leonart J. and J. Salat (1992) VIT. Programa de Análisis de Pesquerías. Inf. Téc. Sci. Mar., 168-169.

Maynou F., J. Leonart and J.E. Cartes (2003) Seasonal and spatial variability of hake (*Merluccius merluccius* L.) recruitment in the NW Mediterranean. Fisheries Research, 60: 65-78.

Mendoza M., García T and Baro J. Using classification trees to study the effects of fisheries management plans on the yield of *Merluccius merluccius* (Linnaeus, 1758) in the Alboran Sea (Western Mediterranean). Fisheries Research 102 (2010) 191–198

**Comments, bibliography, etc.**

Orsi Relini L., C. Papaconstantinou, S. Jukic-Peladic, A. Souplet, L. Gil de Sola, C. Piccinetti, S. Kavadas and M. Rossi (2002) Distribution of the Mediterranean hake populations (*Merluccius merluccius smiridus* Rafinesque, 1810) (Osteichthyes: Gadiformes) based on six years monitoring by trawl-surveys: some implications for management. *Scientia Marina*, 66(Suppl. 2): 21-38.

Sartor P., L. Recasens, C. Viva and J. Leonart (2001) Analysis of the impact of the fishery on the adult population of European hake in the northwestern Mediterranean. *Rapp. Comm. Int. Mer Médit.*, 36: 321-322.

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

Assessment form

Sheet B  
Biology of the species

Code: HKE0111Pér

**Biology**

Somatic magnitude measured (LH, LC, etc)*				TL	Units*	cm
Sex	Fem	Mal	Both	Unsexed		
Maximum size observed			75		Reproduction season	All year: Feb and
Size at first maturity					Reproduction areas	Upper Slope
Recruitment size					Nursery areas	Continental Shelf

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

		Units	Sex			
			female	male	both	unsexed
Growth model	$L_{\infty}$				110	
	K				0.178	
	t0				0.001	
	Data source	Mellon et al, 2009 - (Tagging Data)				
Length weight relationship	a	0.0048				
	b	3.12	IEO-DCF			

M	0.31				
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sex ratio (mal/fem)	0.36
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**Comments**

M is mean of a Natural mortality vector, PROBIOM Caddy and Abella, 1999.

0	1	2	3	4	5+
1.24	0.73	0.47	0.38	0.34	0.31

[Empty rectangular box for comments]

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

Assessment form

Sheet P1

General information about the fishery

Code: HKE0111Pér

Data source*	I.E.O. DCF	Year (s)*	2003-2010
Data aggregation (by year, average figures between years, etc.)*	By year		

### Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	ESP	01	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	HKE
Operational Unit 2						
Operational Unit 3						
Operational Unit 4						
Operational Unit 5						

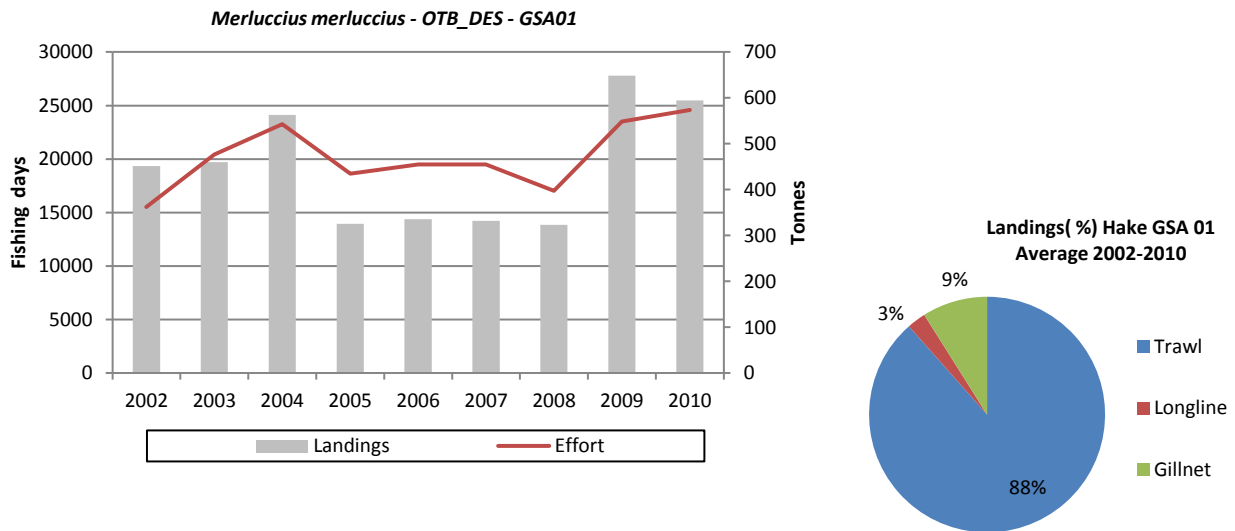
Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
ESP 01 E 03 33 - HKE	230	Tons	448				ishing/day
Total	230		448				

Legal minimum size	20 cm total length
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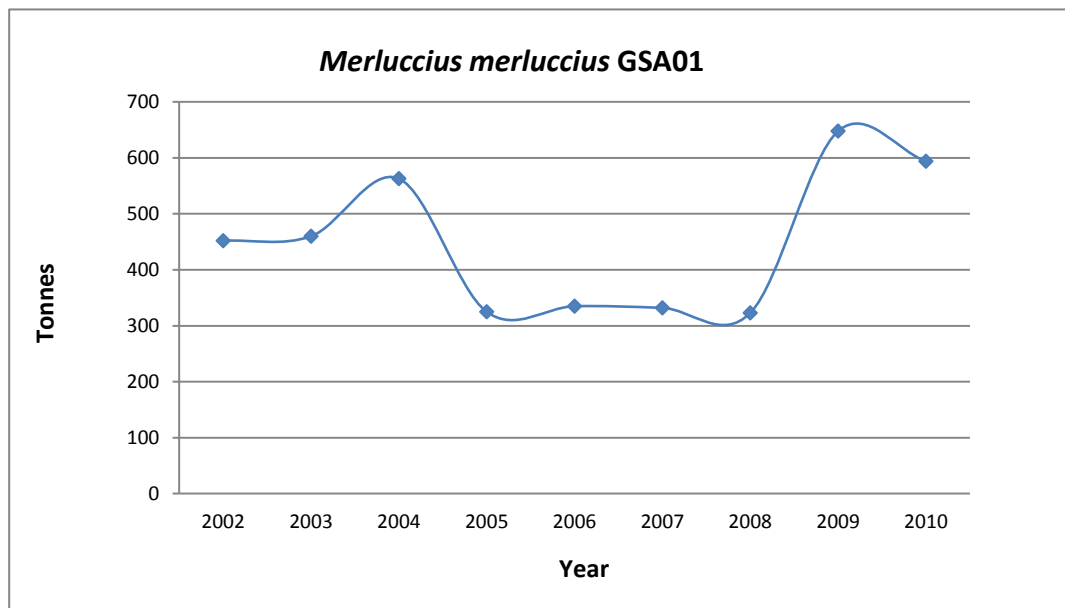
### Comments

From official data, in 2010 the total trawl fleet of the whole geographical sub-area 01 (Northern Alboran Sea) comprise an average of 230 boats), averaging 34.9 GRT and 175.8 HP. The port of Almeria had the largest number of boats with an average of 40 units. The fleet with the largest GRT corresponded to the port of Garrucha (55.3 t), followed by the port of Motril (44.7 t) by that of Almeria (43.1 t). Engine power was correlated to the size of the fishing vessel. Highest engine power was associated with those vessels based in the port of Garrucha (289.8 HP), Almeria port (205.7 HP) and Motril port (190.7 HP). The HP of fishing vessels is directly related to the distance to the fishing grounds where they normally operate (Mendoza et al, 2010)

Comments



During the last years, an increase in landings was observed, starting in 2002 and reaching the maximum value in 2004, followed by a stabilization in catches (around 300 tons) during the period 2005-2008. Catches increase in 2009 reaching 648 tons (the highest in the series) and decreasing to 594 tons in 2010.



Evolution of Merluccius merluccius landings in the GSA 1 (Nother Spain) for the period 2002-2010.

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

Assessment form

Sheet P2a  
Fishery by Operational Unit

Code: HKE0111Pér

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Data source*	IEO: size composition of trawl catches. Official la	OpUnit 1*	ESP 01 E 03 33 - HKE
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### Time series

Year*	2002	2003	2004	2005	2006	2007
Catch	452	460	563	326	335	332
Minimum size		9	9	10	8	12
Average size Lc		22.4	20.5	25.2	17.3	20.4
Maximum size		67	63	75	71	66
Fleet	258	220	243	250	252	236

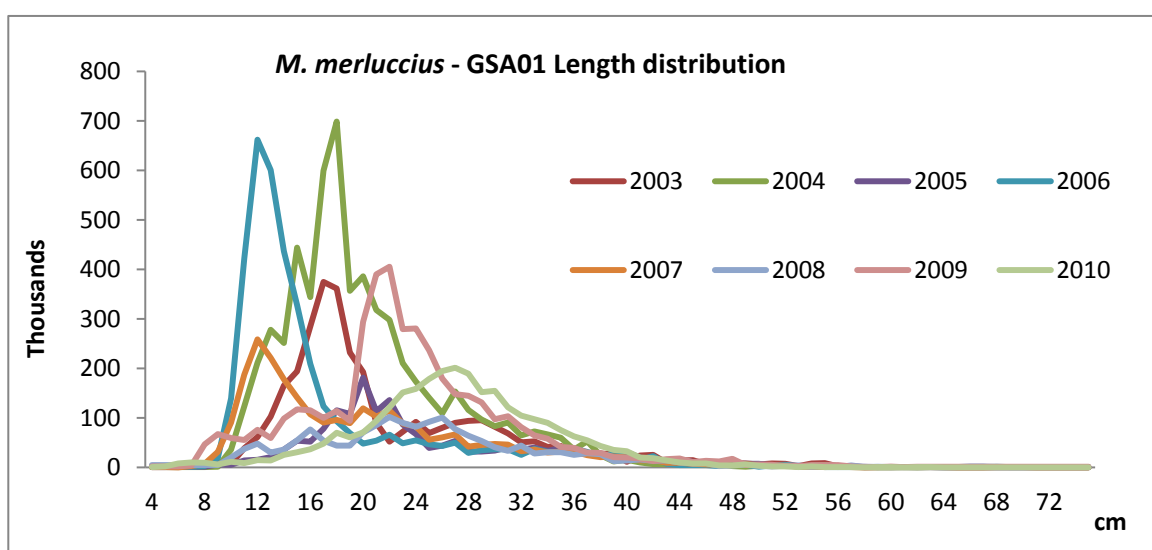
Year	2008	2009	2010			
Catch	323	648	594			
Minimum size	10	10	11			
Average size Lc	25	23.7	27.3			
Maximum size	70	68	74			
Fleet	227	212	205			

### Selectivity

### Remarks

L25	12.19 cm	Baro J, Meléndez M.J. y del Árbol J. Informe del seguimiento científico sobre una acción piloto de selectividad con artes de arrastre en aguas del litoral de Málaga. (RAI-AP-25/2003).IEO. 2004
L50	13.55 cm	
L75	14.99 cm	
Selection factor	2.8	

### Structure by size or age

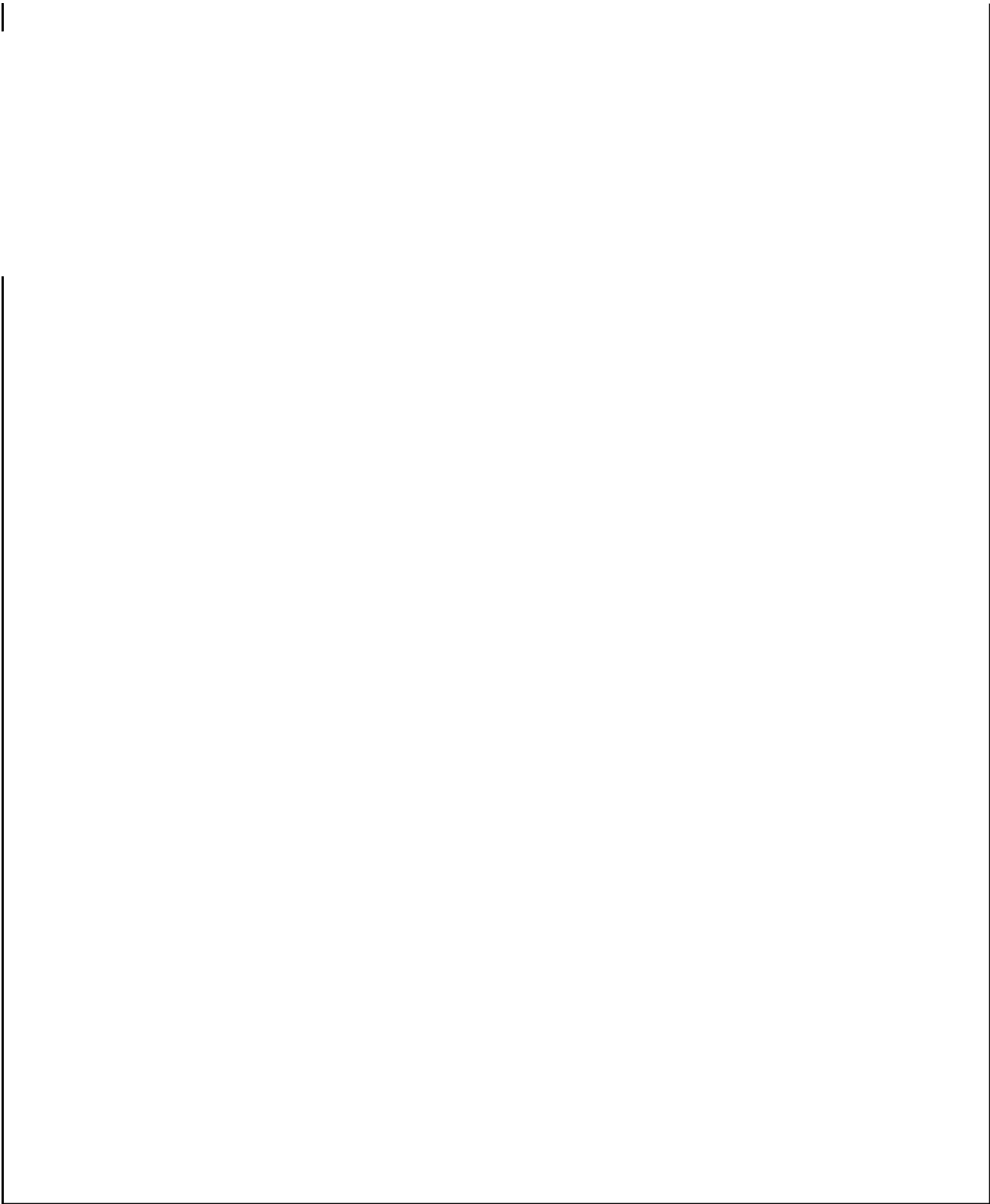


The plot emphasizes the decrease of the catch proportion at age 0 after 2007, indicates ages 1 as fully recruited to the fishery and suggests a change in the exploitation.



Structure by size or age

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

Assessment form

Sheet P2b  
Fishery by Operational Unit

Code: HKE0111Pér

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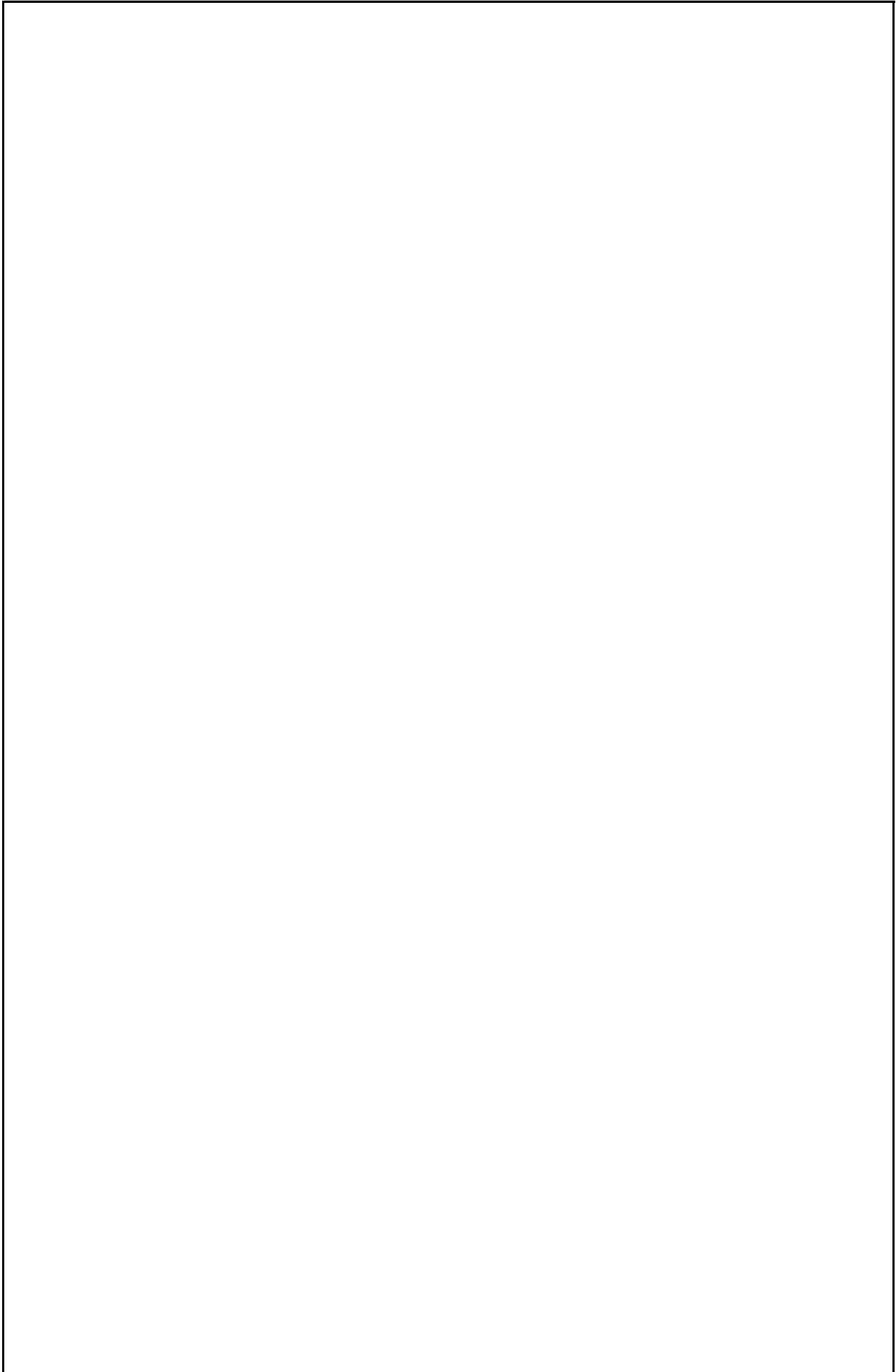
Data source\* IEO: size composition of trawl catches. Official landin OpUnit 1\* ESP 01 E 03 33 - HKE

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

- Fishing license : fully observed
- Engine power limited to 316 KW or 500 HP: not fully observed
- Mesh size in the codend (40 mm square or 50 mm rhomboidal): fully observed
- Fishing forbidden within upper 50 m depth: not fully observed
- Time at sea (12 hours per day and 5 days per week): fully observed
- Minimum legal size (20 mm CL): observed

### Accompanying species

- Conger conger
- Galeus melastomus
- Helicolenus dactylopterus
- Lepidopus caudatus
- Lepidorhombus spp.
- Lophius spp.
- Micromesistius poutassou
- Mullus barbatus
- Mullus surmuletus
- Nephrops norvegicus
- Octopus vulgaris
- Pagellus bogaraveo
- Phycis blennoides
- Parapenaeus longirostris
- Scylliorhinus canicula
- Scorpaena spp.



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

Assessment form

Sheet A1  
Indirect methods: VPA, LCA

Code: HKE0111Pér

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Sex*	B
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Analysis # *	XSA
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### Time series

Data	Size	Age
(mark with X)		X

Model	Cohorts	Pseudocohorts
(mark with X)	X	

Equation used	Catch equation	Tuning method	Extended Survivor Analysis (XSA)
# of gears	1	Software	Lowestoft VPA V3.2 (Darby and Flatman, 1994)
F <sub>terminal</sub>	1.17		

### Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum	8	0	Recruitment	6939	1238
Average	25.27	3	Average population	16483	1124
Maximum	75	5+	Virgin population		
Critical			Turnover		SSB
					321
				Thousands	Tons

### Average mortality

	Total	Trawl	Gear			
F <sub>1</sub>	1.083	Fbar 0-4				
F <sub>2</sub>	1.3357	F bar 1-4				
Z	1.67					

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

### Comments

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

Assessment form

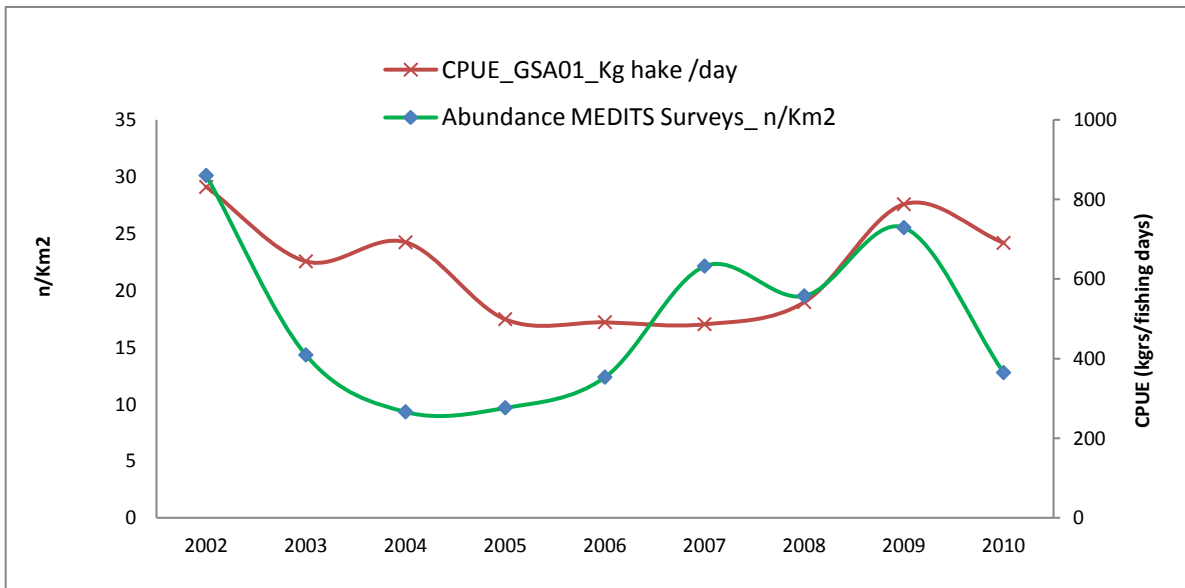
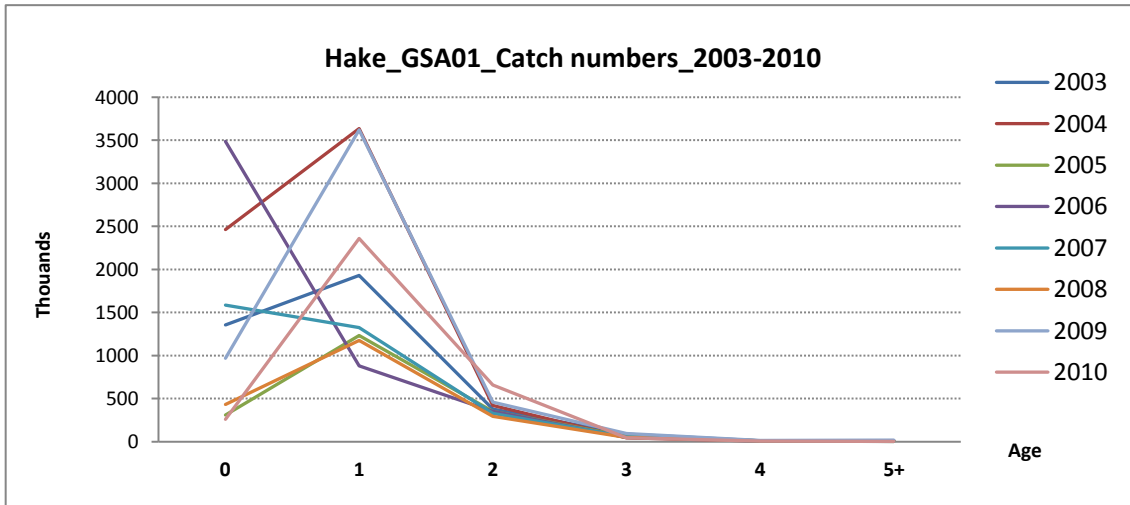
Sheet A2  
Indirect methods: data

Code: HKE0111Pér

Sex*	B	Gear*	Trawl	Analysis # *	VPA
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Data	Catch number by age and CPUE from surveys and commercial fleet
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**Data**



VPA-XSA was performed using data from MEDTIS\_ES surveys indices (n per Km<sup>2</sup>) and CPUE (Kgrs/fishing days) from GSA01 ports..

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Assessment form

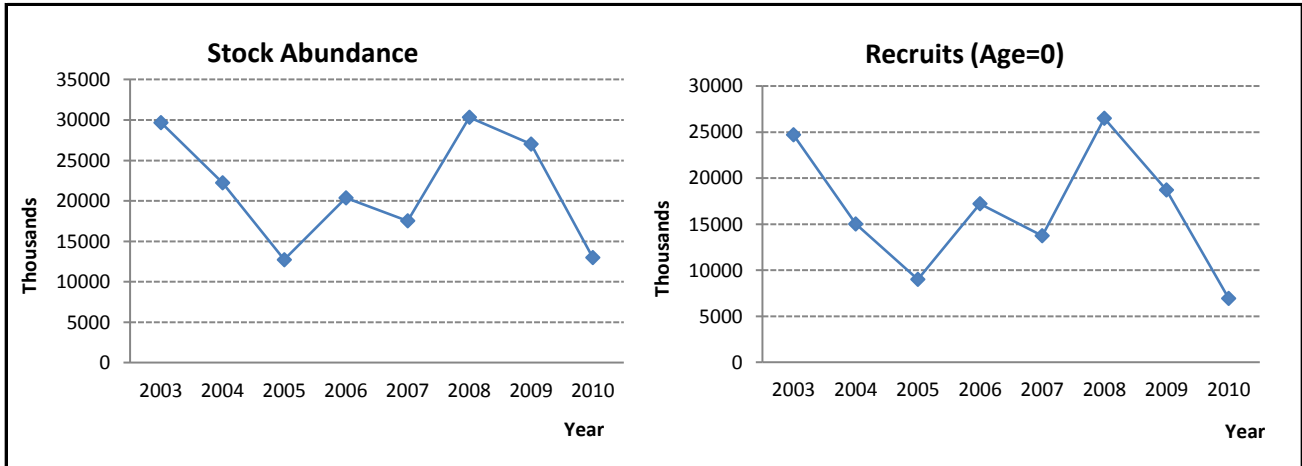
Sheet A3  
Indirect methods: VPA results

Code: HKE0111Pér

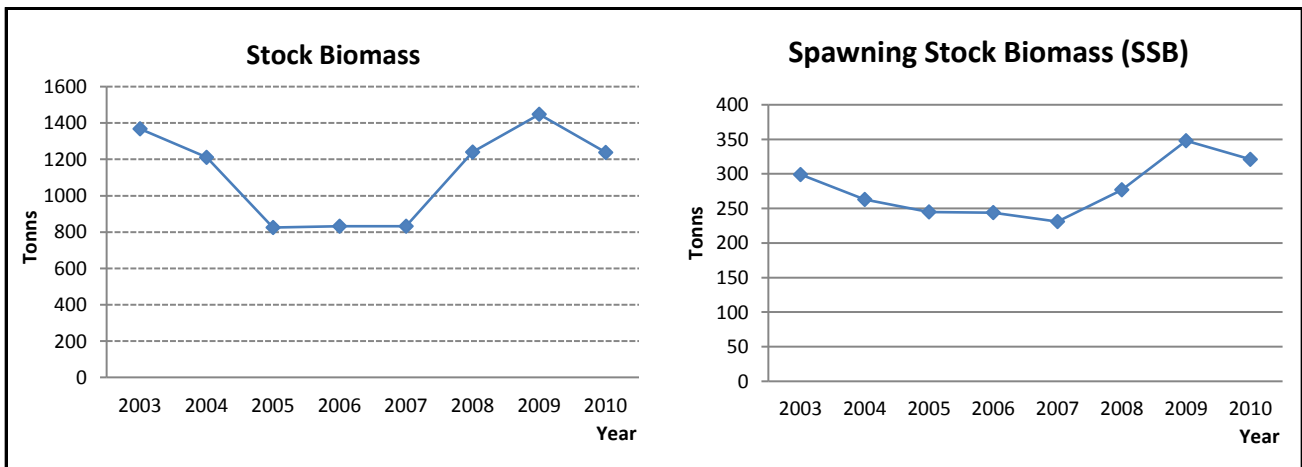
Page 1 / 3

Sex*	B	Gear*	Trawl (OTB_DES)	Analysis #*	VIT
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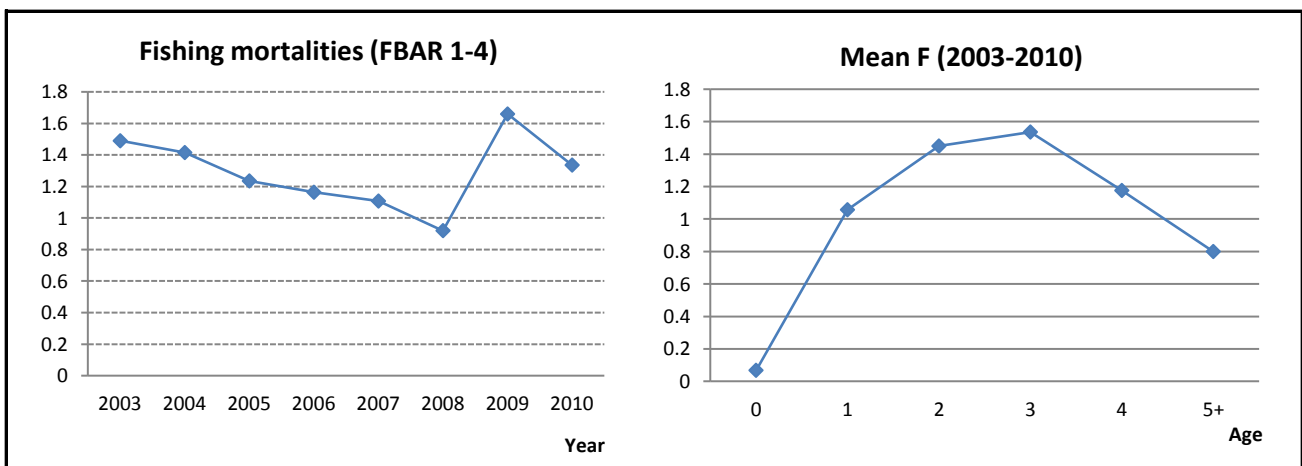
**Population in figures**



**Population in biomass**



**Fishing mortality rates**



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

Assessment form

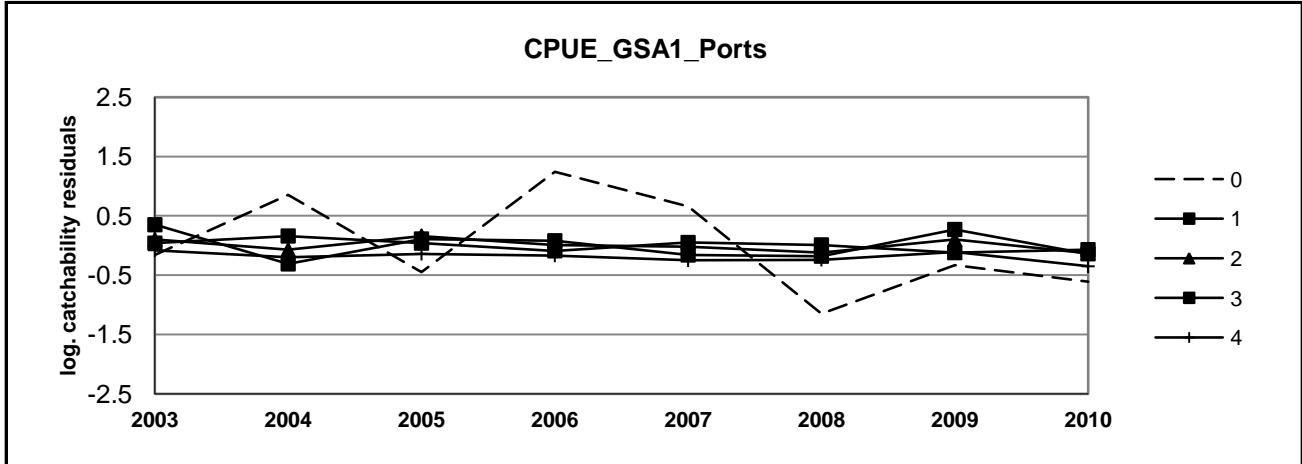
Sheet A3  
Indirect methods: VPA results

Code: HKE0111Pér

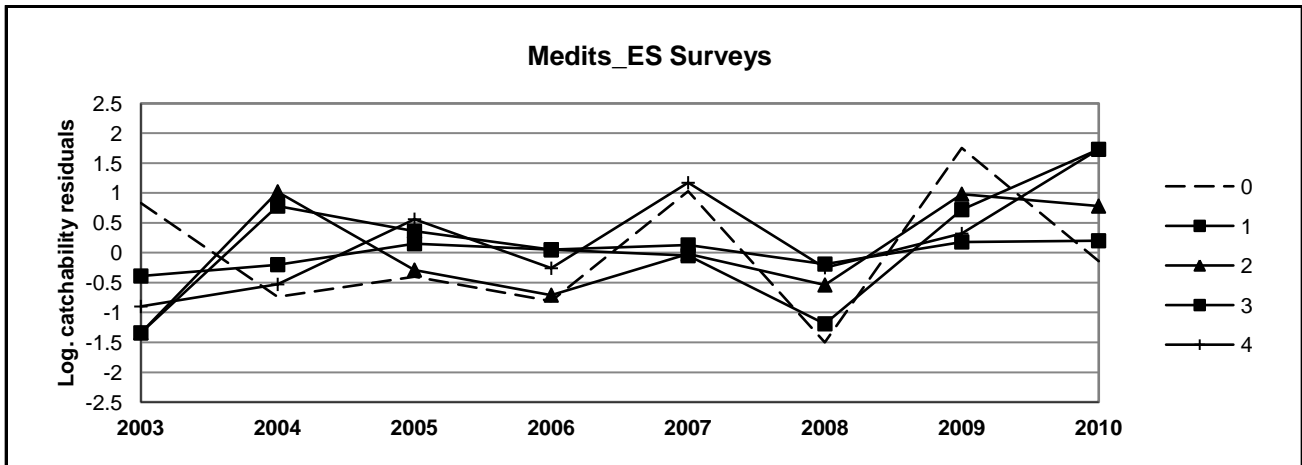
Page 2 / 3

Sex*	B	Gear*	Trawl	Analysis #*	XSA Tunning Residuals
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**Population in figures**



**Population in biomass**



**Fishing mortality rates**

Log catchability residual plots.  
No unusual pattern of residuals and conflicts between ages is observed.

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

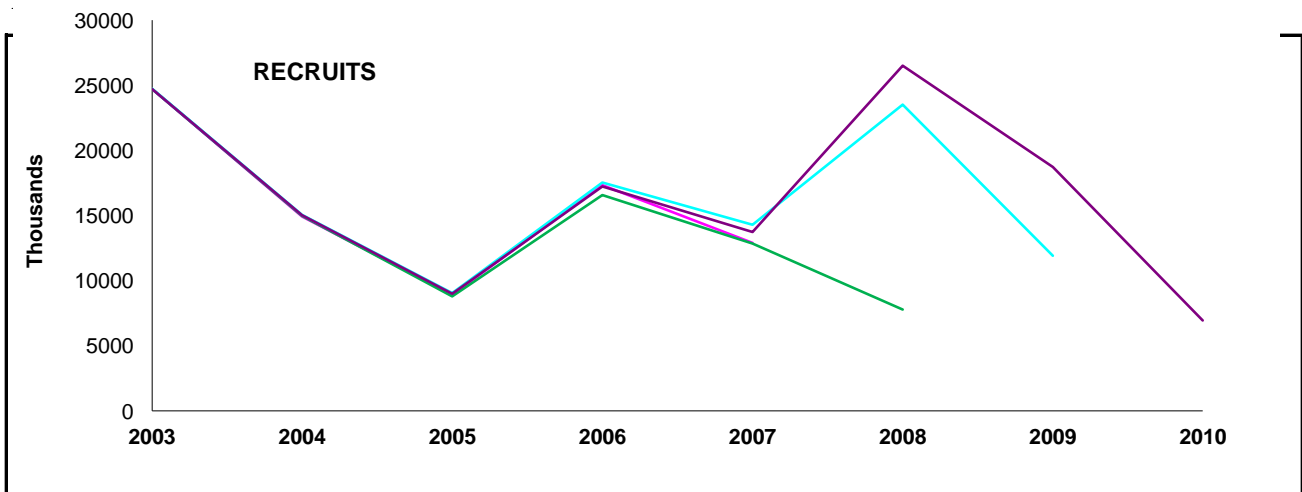
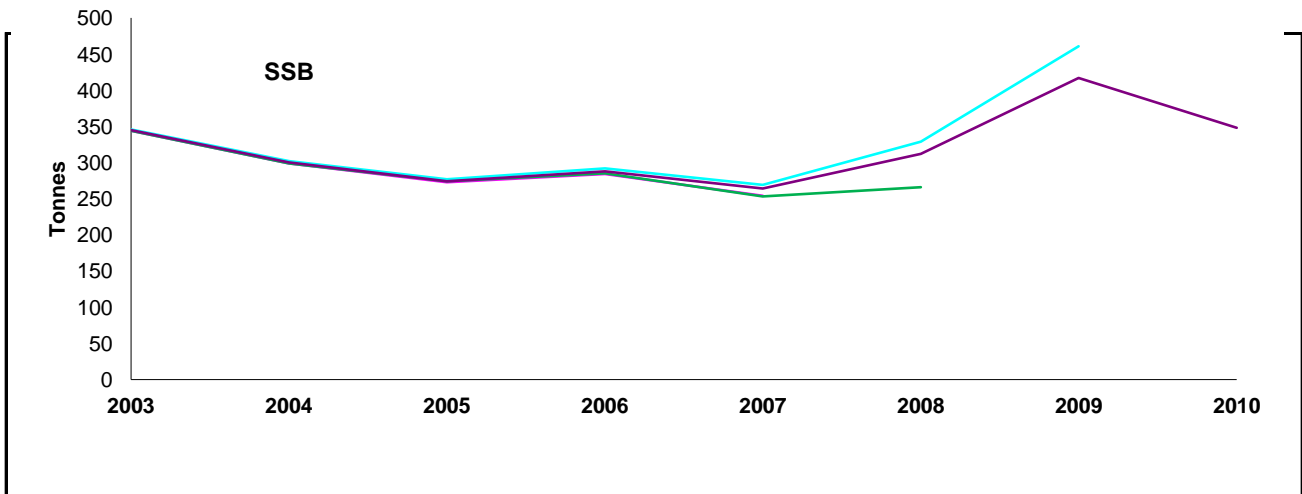
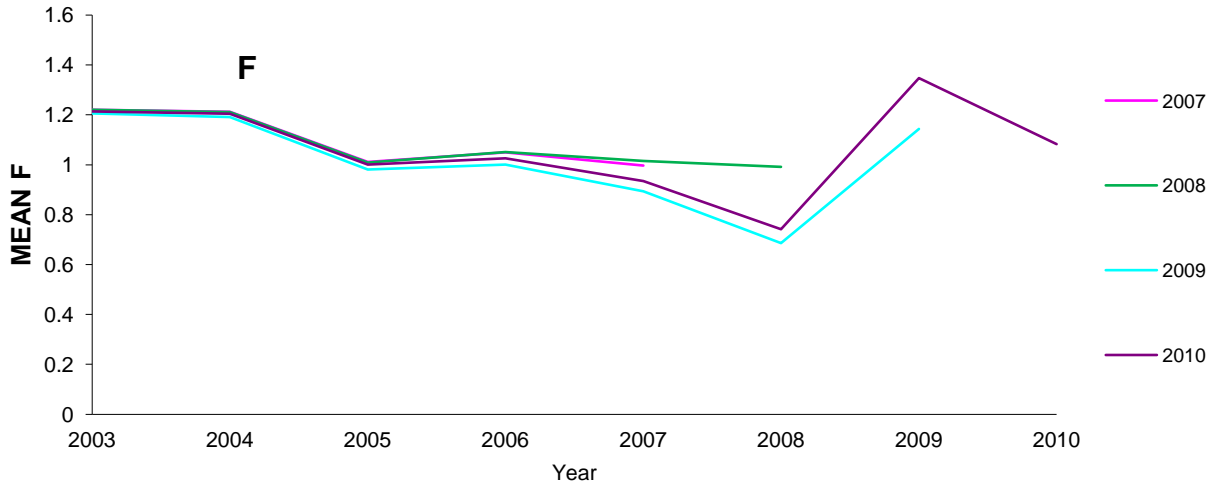
Assessment form

Sheet A3  
Indirect methods: VPA results

Code: HKE0111Pér

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Sex*	B	Gear*	Trawl	Analysis #*	Retrospective Analysis
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<b>SAC GFCM - Sub-Committee on Stock Assessment (SCSA)</b>	
Assessment form	Sheet Y Indirect methods: Y/R

Sex	B
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<b>Code: HKE0111Pér</b>	
Analysis #	Y/R

# of gears	1	Software	EXCEL
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**Parameters used**

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

**Model characteristics**

From calculated mean weights (2003-2010)	

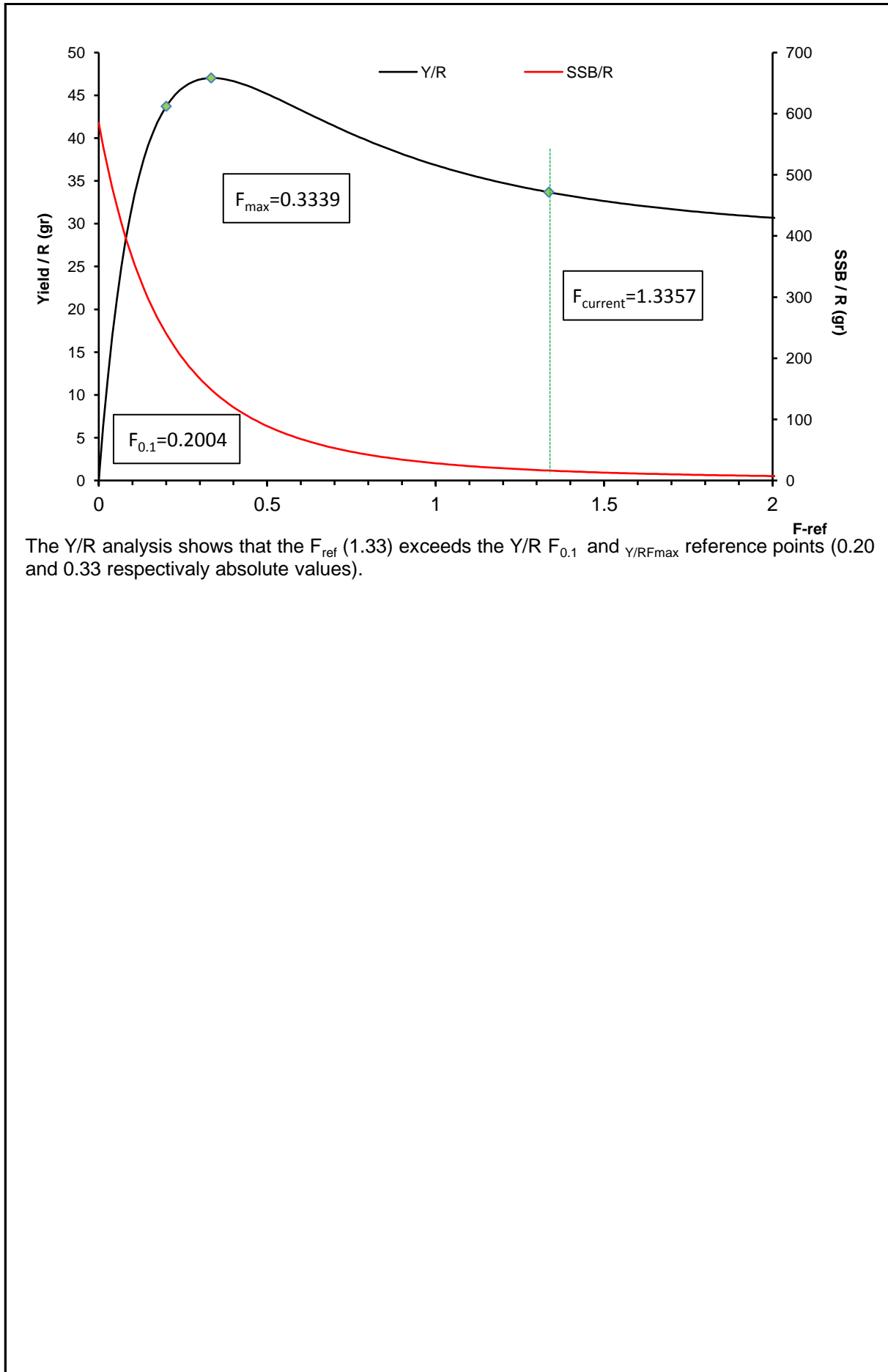
**Results**

	Total	Gear			
Current YR	33.68	gr			
Maximum Y/R	46.98	gr			
Y/R 0.1	43.7	gr			
F <sub>max</sub>	<b>0.32</b>				
F <sub>0.1</sub>	<b>0.2</b>				
Current B/R	78.24				
Maximum B/R	234.2				
B/R 0.1	322.75				
Fref = F current	<b>1.33</b>				
F0.1 (factor)	0.15				

**Comments**

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Comments



The Y/R analysis shows that the  $F_{ref}$  (1.33) exceeds the Y/R  $F_{0.1}$  and  $F_{Y/Rmax}$  reference points (0.20 and 0.33 respectively absolute values).

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

Assessment form

Sheet D  
Diagnosis

Code: HKE0111Pér

### Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B	1238	t	B mean	+	Bnow is over Bmean (1124 t)
SSB	321	t	SSBmean	+	SSB now is over the SSBmean (278 t)
F	1.33		F mean	+	Fnow is higher than Fmean (1.2)
Y	594	t	Y mean	=	Ynow is similar Ymean (448)
CPUE	24.2	kg/d	CPUEmean	=	CPUEnow is similar CPUEmean (22)

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

**Comments**

The results show a decreasing trend in the last year both in biomass and spawning stock biomass of the stock. Current Recruitment in numbers represent a 26% of the value observed two years ago (the highest in the series). Fishing mortality increasing from 2008 to 2009, decreasing slightly in the last year.

The Y/R analysis shows that the Fref (1.33) exceeds the Y/R F0.1 reference point (0.20 absolute value).

It can be concluded that the resource is over-exploited (growth over-fishing).

Code: HKE0111Pér

**Management advice and recommendations\***

Reduce growth overfishing through:

- reduce the effort of trawl
- Improve the fishing pattern of the trawl fleets.

To avoid recruitment overfishing:

- Reduce effort in trawl
- Especial surveillance in the use of 40mm square/50 diamond mesh size in the cod end in trawl gears.

**Advice for scientific research\***

A large empty rectangular box with a black border, intended for providing advice for scientific research.

## Abstract for SCSA reporting

**Authors** Pérez-Gil José Luis, González María, Torres Pedro, García Teresa, García Cristina, Baro Jorge and Melendez María José. **Year** 2011

**Species Scientific name** Merluccius merluccius - HKE  
Source: GFCM Priority Species

Source: -

Source: -

**Geographical Sub-Area** 01 - Northern Alboran Sea

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

European hake (*Merluccius merluccius* (Linnaeus, 1758)) is one of the target demersal species of the Mediterranean fishing fleets, largely exploited in GSA01 almost exclusively by trawl (88% landings) on the shelf and slope and by small-scale using gillnets (9%) and long lines (3%). The trawling fleet in the GSA01 area comprised an average of 183 boats, averaging 35 GRT and 176 HP. In 2003–2010 period the annual landings of this species averaged 448 tons in the whole area.

**Source of management advice\***

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

The state of exploitation was assessed for the period 1995-2009 by means of a VPA Separable, tuned with CPUE from commercial fleet and abundance indices from trawl survey (MEDITS). Analysis was carried out applying the Extended Survivor Analysis (XSA) method (Lowestoft suite; Darby and Flatman, 1994) over the period 1995-2010. Analysis were performed from size composition of trawl catches (obtained from on board and on port monthly sampling) and official landings, transforming length data to age data by slicing (L2AGE program).

**Stock Status\***

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

**Exploitation rate**

High fishing mortality

**Stock abundance**

Intermediate abundance

**Comments**



**Management advice and recommendations\***

Area reserved for management advice and recommendations. The content is currently obscured by a dense grid pattern.

**Advice for scientific research\***

