

SAC GFCM
Sub-Committee on Stock Assessment

Date*	22	August	2011	Code*	HKE0711Ang
Authors*	Angélique Jadaud*, Beatriz Guijarro**, Enric Massutí* and Henri Farrugio*				
Affiliation*	(*) IFREMER, 1 rue Jean Monnet, BP 171, 34203 Sète (France); (**) IEO- Centre Oceanogràfic de les Balears, Moll de Ponent s/n, 07015 Palma de Mallorca (Spain)				
Species Scientific name*	1	<i>Merluccius merluccius</i> - HKE Source: GFCM Priority Species			
	2	Source: -			
	3	Source: -			
Geographical area*	Gulf of Lions				
Geographical Sub-Area (GSA)*	07 - Gulf of Lions				
Combination of GSAs	1				
	2				
	3				

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

Assessment form

Sheet #0

Basic data on the assessment

Code: HKE0711Ang

Date*	22	Aug	2011	Authors*	Angélique Jadaud*, Beatriz Guijarro**, Enric Massutí* and Henri Farrugio*
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Species Scientific name*	Merluccius merluccius - HKE	Species common name*	European hake
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Data Source

GSA*	07 - Gulf of Lions	Period of time*	1998-2010
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Description of the analysis

Type of data*	Size composition of catches, official landings, CPUE data from bottom trawl survey	Data source*	IFREMER and IEO
Method of assessment*	XSA and Y/R	Software used*	XSA (FLR)

Sheets filled out

B	P1	P2a	P2b	G	A1	A2	A3	Y	Other	D	Z	C
1	1	4	4	---	1	1	2	1	---	1	1	---

Comments, bibliography, etc.

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

Aldebert Y., L. Recasens and J. Leonart (1993) Analysis of gear interactions in a hake fishery: The case of the Gulf of Lions (NW Mediterranean). *Sci. Mar.*, 57(2-3): 207-217.

Aldebert Y and L. Recasens (1996) Comparison of methods for stock assessment of European hake *Merluccius merluccius* in the Gulf of Lions (Northwestern Mediterranean). *Aquat. Living Resour.*, 9: 13-22.

Bertrand, J.A., L. Gil de Sola, C. Papaconstantinou, G. Relini and A. Souplet (2002) The general specifications of the MEDITS surveys. *Sci. Mar.*, 66 (Suppl. 2): 9-17.

Bozzano A, L. Recasens and P. Sartor (1997) Diet of the European hake *Merluccius merluccius* (Pisces: Merlucciidae) in the Western Mediterranean (Gulf of Lions): *Sci. Mar.*, 61(1): 1-8.

Darby, C.D. and S. Flatman (1994) Virtual Population Analysis: version 3.1 (Windows/DOS) user guide. *Info. Tech. Ser., MAFF Direct. Fish. Res., Lowestoft*, n° 1: 85 pp.

Comments, bibliography, etc.

- French-Spanish WG (2001) Stock assessment of the French-Spanish shared stock of hake (*Merluccius merluccius*) in the gulf of Lions: a preliminary comparative approach. GFCM-SAC WG on Demersal stock assessment, Tunis 13-16 March 2001.
- French-Spanish WG (2002) Stock assessment of the French-Spanish shared stock of hake (*Merluccius merluccius*) in the gulf of Lions. Rome 20-22 March 2002.
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- French-Spanish WG (2009) Stock assessment of the French-Spanish shared stock of hake (*Merluccius merluccius*) in the gulf of Lions. Málaga, 30 November-4 December 2009.
- García-Rodríguez M. and A. Esteban (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: 116 pp.
- Mellon-Duval C., de Pontual H. Métral L. and Quemener L., (2010) Growth of european hake (*Merluccius merluccius*) in the Gulf of Lions based on conventional tagging. *ICES J. Mar. Sci.*, 67: 62-70.
- Morales-Nin B., G.J. Torres, A. Lombarte and L. Recasens (1998) Otolith growth and age estimation in the European hake. *J. Fish. Biol.*, 53: 1155-1168.
- Morales-Nin B. and J. Moranta (2004) Recruitment and post-settlement growth of juvenile *Merluccius merluccius* on the western Mediterranean shelf. *Sci. Mar.*, 68(3): 399-409.
- de Pontual H., M. Bertignac, A. Battaglia, G. Bavouzet, P. Moguedet and A.-L. Groison (2003) A pilot tagging experiment on European hake (*Merluccius merluccius*): methodology and preliminary results. *ICES J. Mar. Sci.*, 60: 1318–1327.
- Recasens L., A. Lombarte, B. Morales-Nin and G.J. Torres (1998) Spatiotemporal variation in the population structure of the European hake in the NW Mediterranean. *J. Fish. Biol.*, 53: 387-401.

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Assessment form

Sheet B
Biology of the species

Code: HKE0711Ang

Biology

Somatic magnitude measured (LH, LC, etc)*				Total length	Units*	centimeters
Sex	Fem	Mal	Both	Unsexed		
Maximum size observed	96	57	96		Reproduction season	All year (winter)
Size at first maturity			29*		Reproduction areas	Shelf & upper slope
Recruitment size					Nursery areas	Shelf

Parameters used (state units and information sources)

		Units	Sex			
			female	male	both	unsexed
Growth model	L_{∞}	cm	100.7	72.8		
	K	years-1	0.236**	0.233**		
	t0		-	-		
	Data source	Tagging experiments**				
Length weight relationship	a				0.0085*	
	b				2.97*	
M			vector***	vector***		
sex ratio (mal/fem)			*			

Comments

(*) from new biological parameters estimated from data collected in the GSA 7 (2003-2010) by IFREMER for the DCF. These parameters were length-weight relationship, sex-ratio and maturity ogive and were computed using inbio (R scripts developed by IEO).

(**) growth parameters, especially the estimations of K, come from tagging experiments developed by IFREMER Sète in the Gulf of Lions (Mellon-Duval et al., 2010) and considering Linf from Aldebert & Recasens (1996).

(***) from PRODBIOM (Abella et al., 1997) :

Age	MEAN
0	0.88
1	0.43
2	0.33
3	0.25
4	0.22
5	0.20
6	0.19
7	0.18
8+	0.17
Mean	0.36

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Assessment form

Sheet P1

General information about the fishery

Code: HKE0711Ang

Data source*	IFREMER, IEO and French and Spanish official data	Year (s)*	1998-2010
Data aggregation (by year, average figures between years, etc.)*		Average 1998-2010	

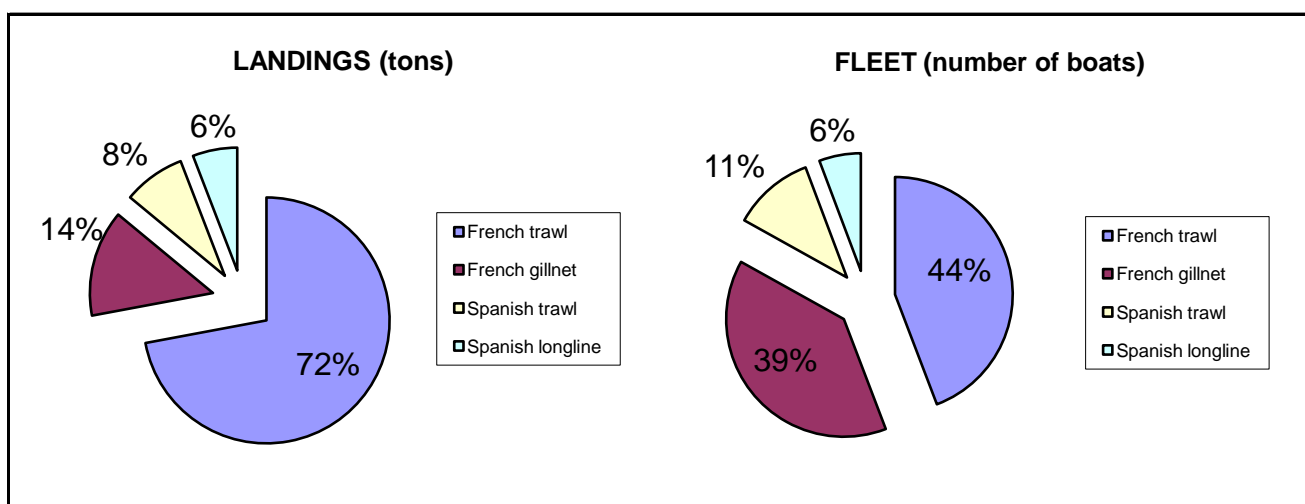
Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	FRA	07	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	HKE
Operational Unit 2	FRA	07	C - Minor gear with engine (6-12 metres)	07 - Gillnets and Entangling Nets	33 - Demersal shelf species	HKE
Operational Unit 3	ESP	07	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	HKE
Operational Unit 4	ESP	07	I - Long line (12-24 metres)	09 - Hooks and Lines	34 - Demersal slope species	HKE
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
FRA 07 E 03 33 - HKE	108	Tons	1550	<i>S. pilchardus</i> , <i>E.</i>	included	unknown	days
FRA 07 C 07 33 - HKE	95	Tons	300	<i>S. scombrus</i> , <i>T. l.</i>	not discarded	unknown	days
ESP 07 E 03 33 - HKE	27	Tons	175	<i>Solea spp.</i> , <i>Mull.</i>	included	unknown	days
ESP 07 I 09 34 - HKE	14	Tons	126	<i>L. caudatus</i> , <i>H. d.</i>	not discarded	unknown	days
Total	244		2151				

Legal minimum size	20 cm total length
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Comments



Comments

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Assessment form

Sheet P2a
Fishery by Operational Unit

Code: HKE0711Ang

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Data source*	IFREMER and French official data	OpUnit 1*	FRA 07 E 03 33 - HKE
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Time series

Year*	1998	1999	2000	2001	2002	2003
Catch	1688	1525	1347	1835	2168	2024
Minimum size	5	3	7	6	7	7
Average size Lc	17	21	20	18	17	22
Maximum size	92	89	77	80	74	65
Fleet	113	113	113	113	120	123

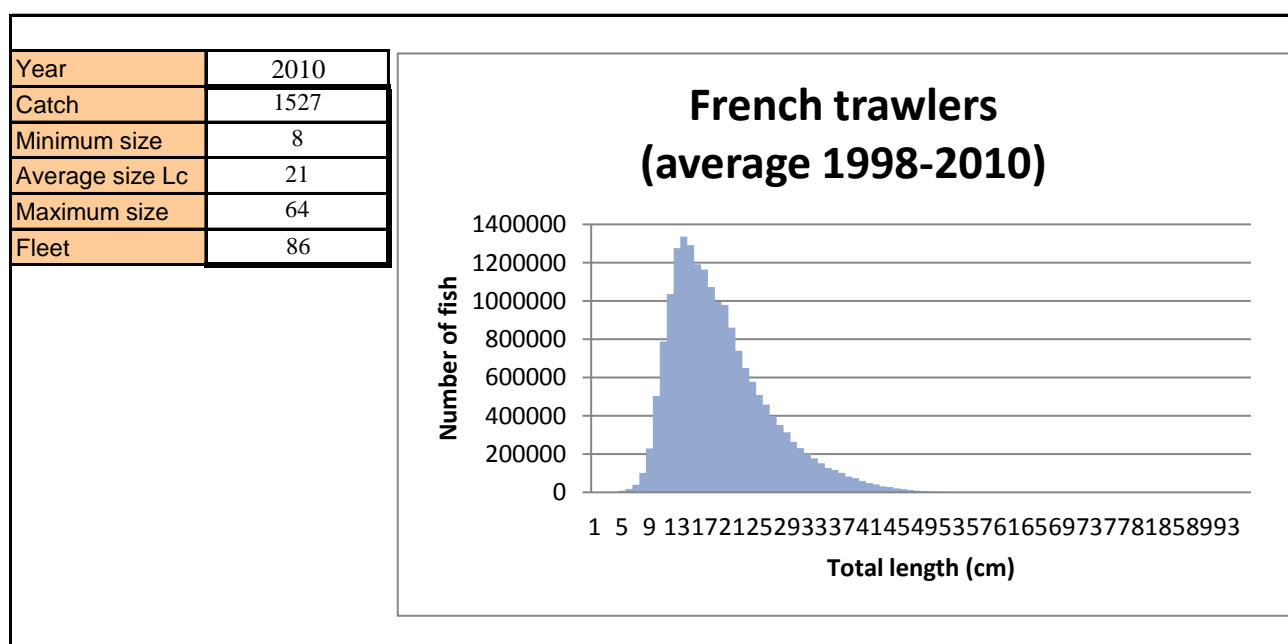
Year	2004	2005	2006	2007	2008	2009
Catch	1023	1002	1014	1282	2071	1642
Minimum size	6	7	6	5	8	3
Average size Lc	19	20	22	23	21	25
Maximum size	77	77	85	67	77	70
Fleet	121	114	111	101	86	86

Selectivity

Remarks

L25		
L50		
L75		
Selection factor		

Structure by size or age



Structure by size or age

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Assessment form

Sheet P2a
Fishery by Operational Unit

Code: HKE0711Ang

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Data source*	IFREMER and French official data	OpUnit 2*	FRA 07.C.07.33 - HKE
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Time series

Year*	1998	1999	2000	2001	2002	2003
Catch	500	500	500	500	182	248
Minimum size	13	16	18	19	17	18
Average size Lc	40	41	40	38	39	38
Maximum size	71	77	74	76	86	85
Fleet	95	95	95	95	95	95

Year	2004	2005	2006	2007	2008	2009
Catch	99	255	299	168	111	286
Minimum size	21	21	26	21	14	20
Average size Lc	38	39	40	40	39	37
Maximum size	72	72	71	67	74	72
Fleet	95	95	95	95	94	94

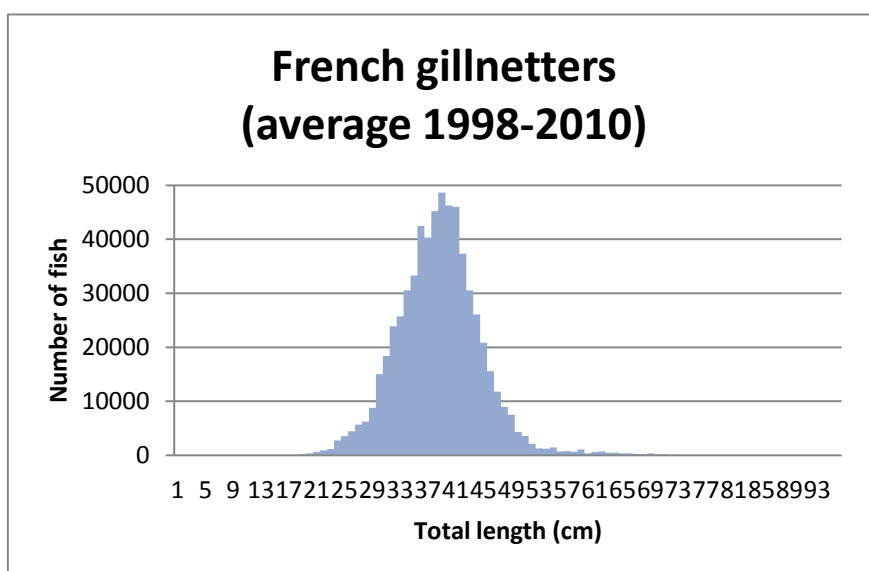
Selectivity

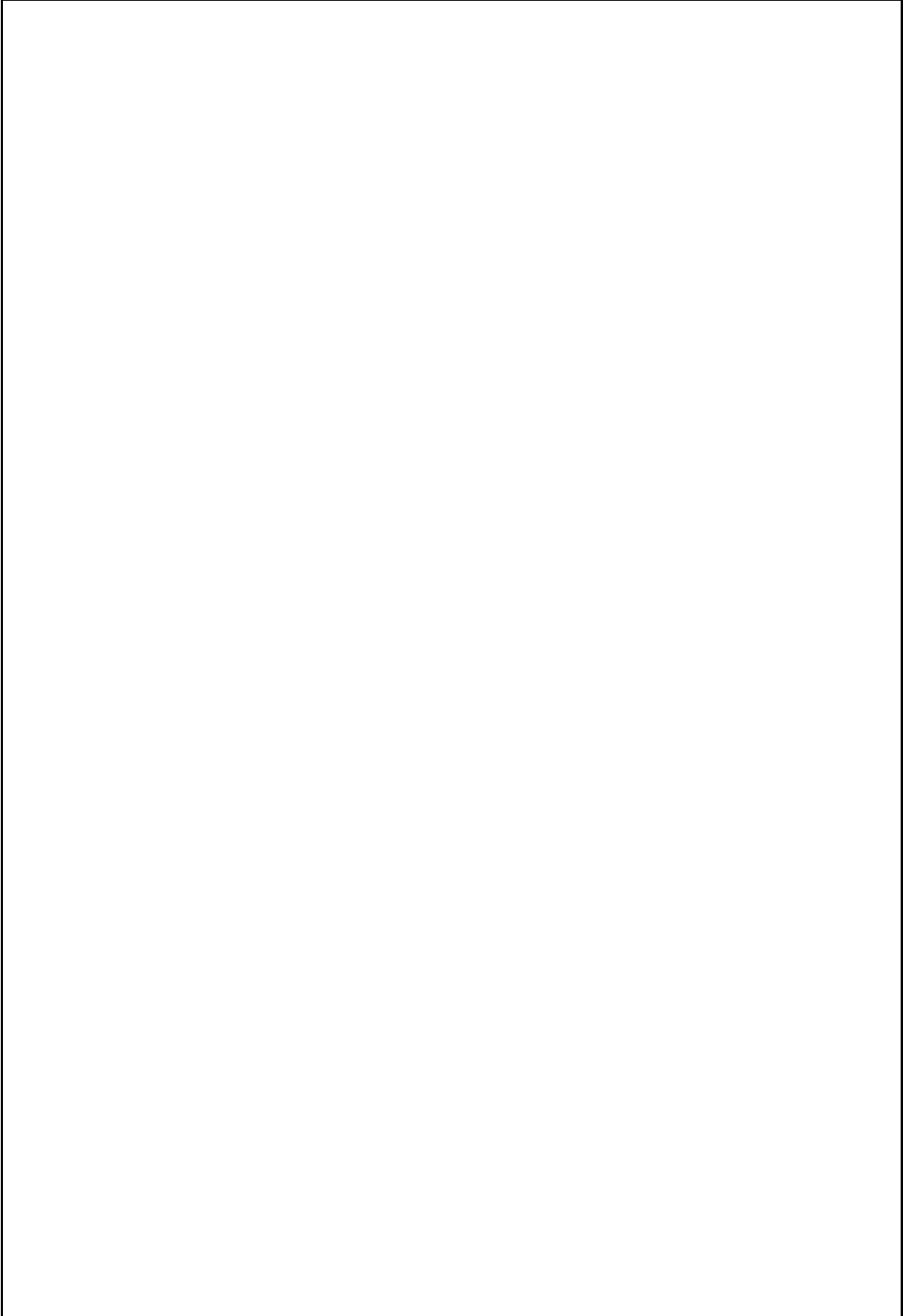
Remarks

L25		
L50		
L75		
Selection factor		

Structure by size or age

Year	2010
Catch	247
Minimum size	22
Average size Lc	39
Maximum size	68
Fleet	94





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Assessment form

Sheet P2a
Fishery by Operational Unit

Code: HKE0711Ang

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Data source*	IEO and Spanish official data	OpUnit 3*	ESP 07 E 03 33 - HKE
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Time series

Year*	1998	1999	2000	2001	2002	2003
Catch	140	279	166	196	231	206
Minimum size	5	5	5	5	5	5
Average size Lc	20	27	27	28	23	24
Maximum size	60	60	63	59	56	56
Fleet	18	17	32	30	30	28

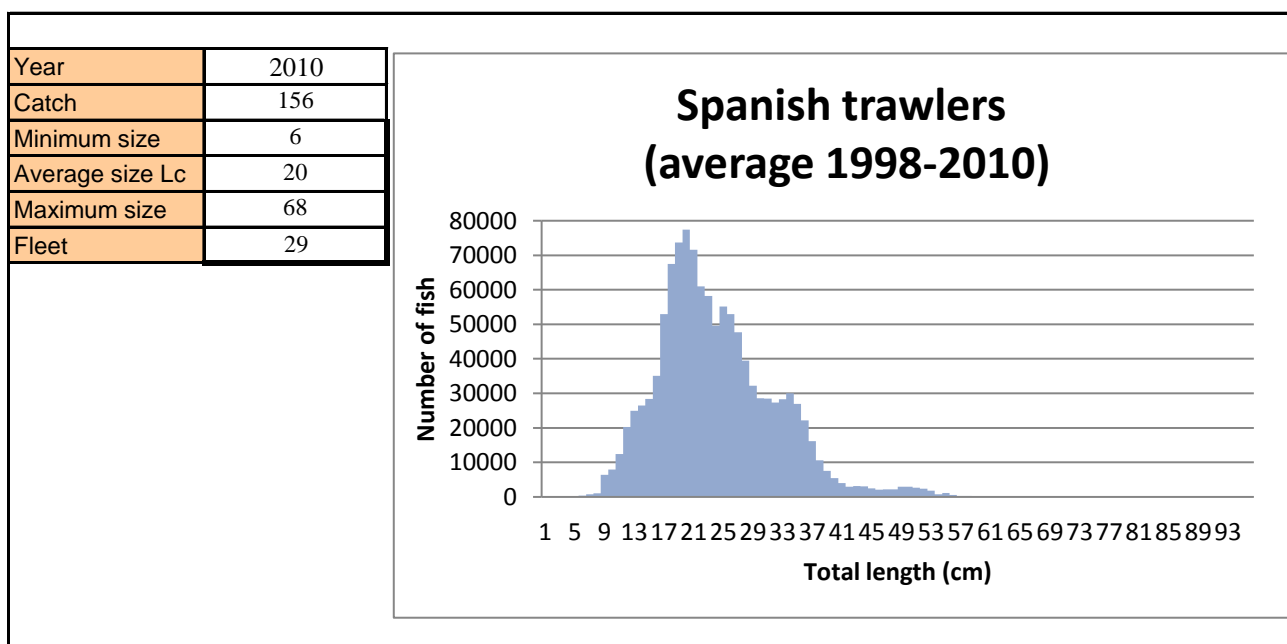
Year	2004	2005	2006	2007	2008	2009
Catch	101	125	116	107	192	258
Minimum size	5	7	7	7	10	12
Average size Lc	24	22.2	28.9	24.3	23	26
Maximum size	87	64	68	72	76	88
Fleet	29	30	28	25	30	31

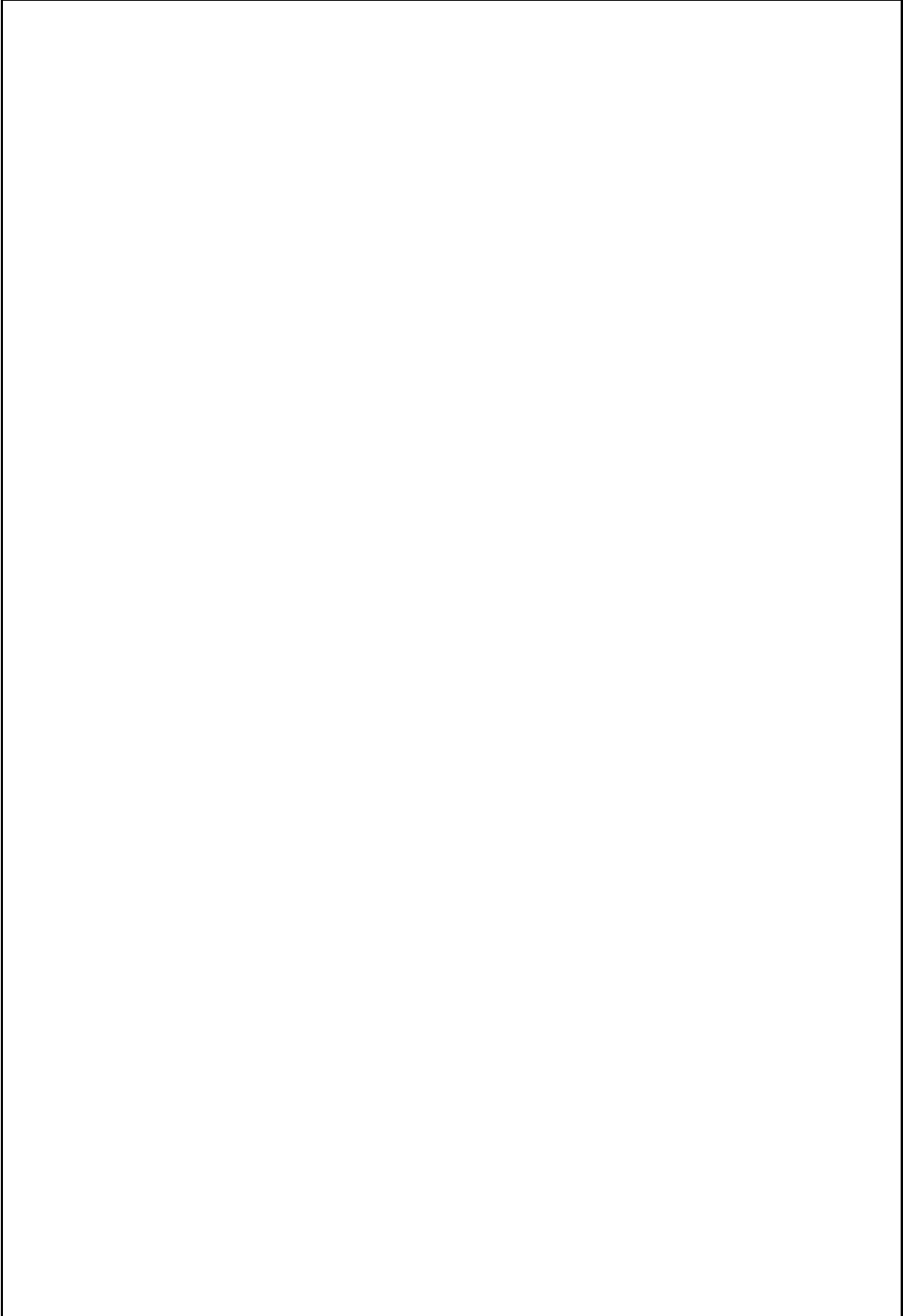
Selectivity

Remarks

L25		
L50		
L75		
Selection factor		

Structure by size or age





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Assessment form

Sheet P2a
Fishery by Operational Unit

Code: HKE0711Ang

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Data source*	IEO and Spanish official data	OpUnit 4*	ESP 07 I 09 34 - HKE
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Time series

Year*	1998	1999	2000	2001	2002	2003
Catch	101	109	285	163	146	112
Minimum size	30	30	32	30	24	23
Average size Lc	61.2	56.6	58.6	61.5	55.2	52
Maximum size	96	92	88	89	89	94
Fleet	20	20	16	18	16	13

Year	2004	2005	2006	2007	2008	2009
Catch	78	101	170	143	97	83
Minimum size	27	27	29	28	25	23
Average size Lc	47	46	48	50	49	42
Maximum size	96	94	93	92	88	86
Fleet	11	12	12	13	11	13

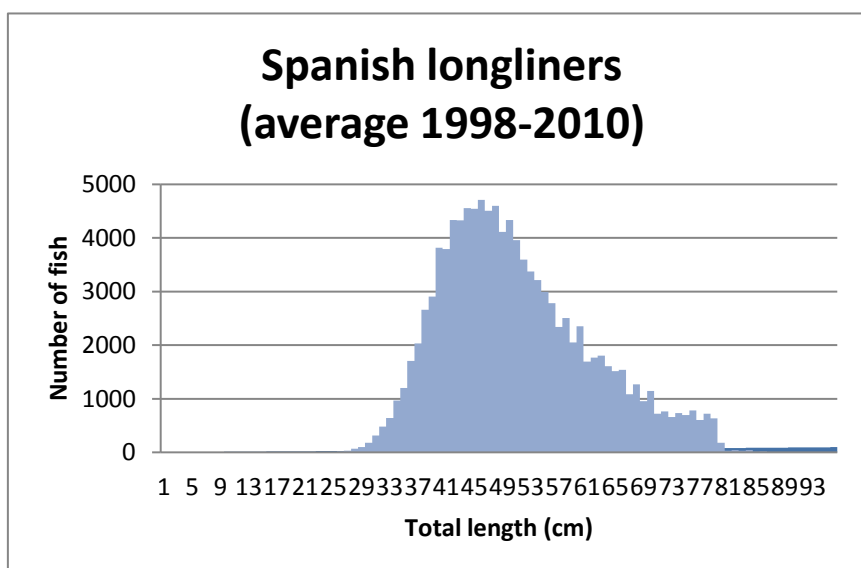
Selectivity

Remarks

L25		
L50		
L75		
Selection factor		

Structure by size or age

Year	2010
Catch	53
Minimum size	22
Average size Lc	43
Maximum size	85
Fleet	13





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Assessment form

Sheet P2b
Fishery by Operational Unit

Code: HKE0711Ang

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Data source* IFREMER

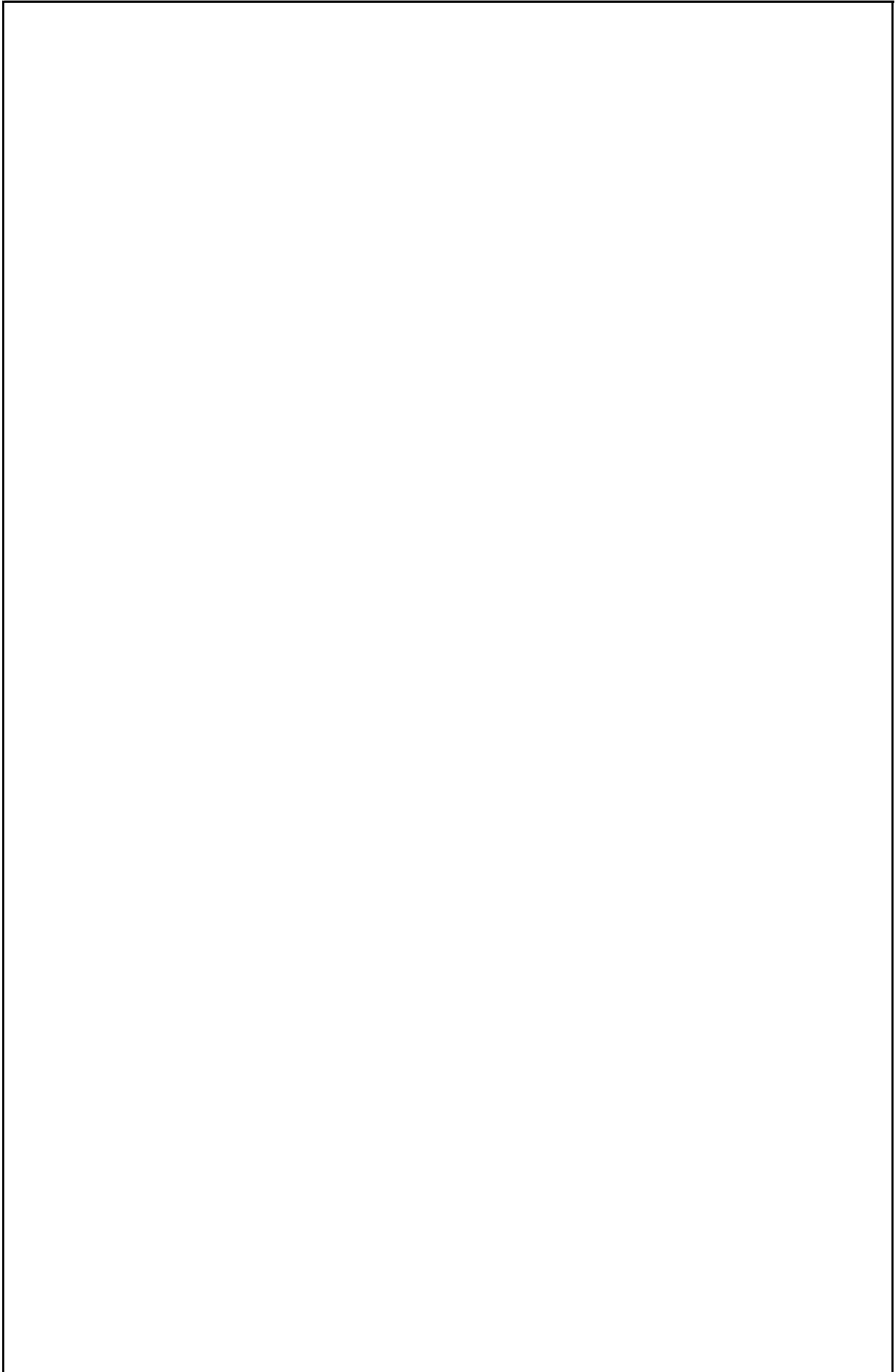
OpUnit 1*

FRA 07 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 CV: not observed
- Cod-end mesh size (bottom trawl: square 40 mm or diamond 50 mm with derogation; pelagic trawl: diamond 20 mm): not fully observed
- Fishing forbidden within 3 miles (France): not fully observed
- Time at sea: fully observed
- Freezing of the effort in the Fishery Restricted Area : not observed

Accompanying species



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Assessment form

Sheet P2b
Fishery by Operational Unit

Code: HKE0711Ang

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Data source*

IFREMER

OpUnit 2*

FRA 07 C 07 33 - HKE

Regulations in force and degree of observance of regulations

- Fishing license: fully observed
- Maximum length of net: not fully observed
- Freezing of the effort in the Fishery Restricted Area : not observed

Accompanying species

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Assessment form

Sheet P2b
Fishery by Operational Unit

Code: HKE0711Ang

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Data source*

IEO

OpUnit 3*

ESP 07 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 CV: not observed
- Mesh size in the codend (square 40 mm or 50 mm diamond with derogation): fully observed
- Fishing forbidden <50 m depth: fully observed
- Time at sea: fully observed
- Freezing of the effort in the Fishery Restricted Area : not observed

Accompanying species

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Assessment form

Sheet P2b
Fishery by Operational Unit

Code: HKE0711Ang

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Data source*

IEO

OpUnit 4*

ESP 07 I 09 34 - HKE

Regulations in force and degree of observance of regulations

- Fishing license: fully observed
- Number of hook per boat: not fully observed
- Freezing of the effort in the Fishery Restricted Area : not observed

Accompanying species

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Assessment form

Sheet A1
Indirect methods: VPA, LCA

Code: HKE0711Ang

Page 1 / 1

Sex* Both

Analysis # * 1998-2010

Time series

Data	Size	Age
(mark with X)		X

Model	Cohorts	Pseudocohorts
(mark with X)	X	

Equation used	Standard catch equation	Tuning method	Extended Survivors Analysis (XSA)
# of gears	4	Software	FLR
F _{terminal}			

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum			Recruitment	51.05	1307
Average			Average population	70.82	5046
Maximum			Virgin population		
Critical			Turnover	B/SSB	SSB
				3.36	1503
				mean-Millions	mean-Tons

Average mortality

	Total	Gear				
F ₁	1.31					
F ₂	1.25					
Z	1.72					

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

Comments

Population results as average (arithmetic mean) for the period 1998-2010:
 F1: averaged 1998-2010 Fbar 2-5; F2: averaged 1998-2010 Fbar 0-3; Z: averaged F2 + M vector (0-3); Fbar is the averaged of all F for years and ages 2-5 or 0-3
 Z has been calculated in the same way, but considering the M vector
 Tuning CPUE data:
 - Bottom trawl survey MEDITS (20 mm mesh in the cod-end): It has been used data from the French surveys

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Assessment form

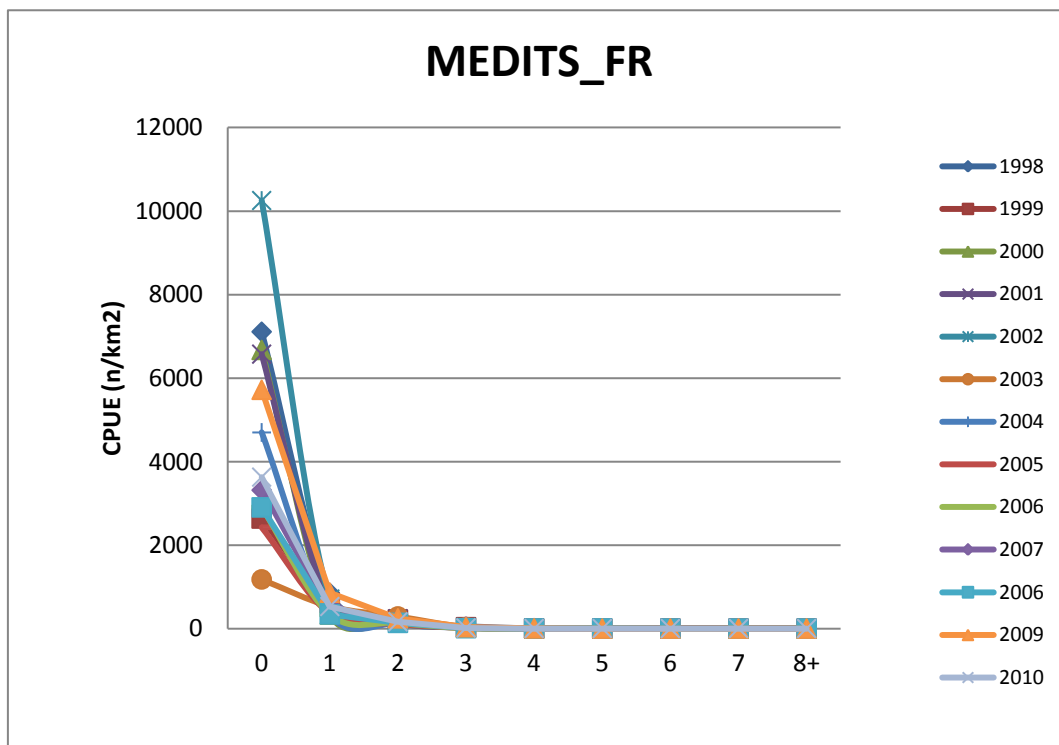
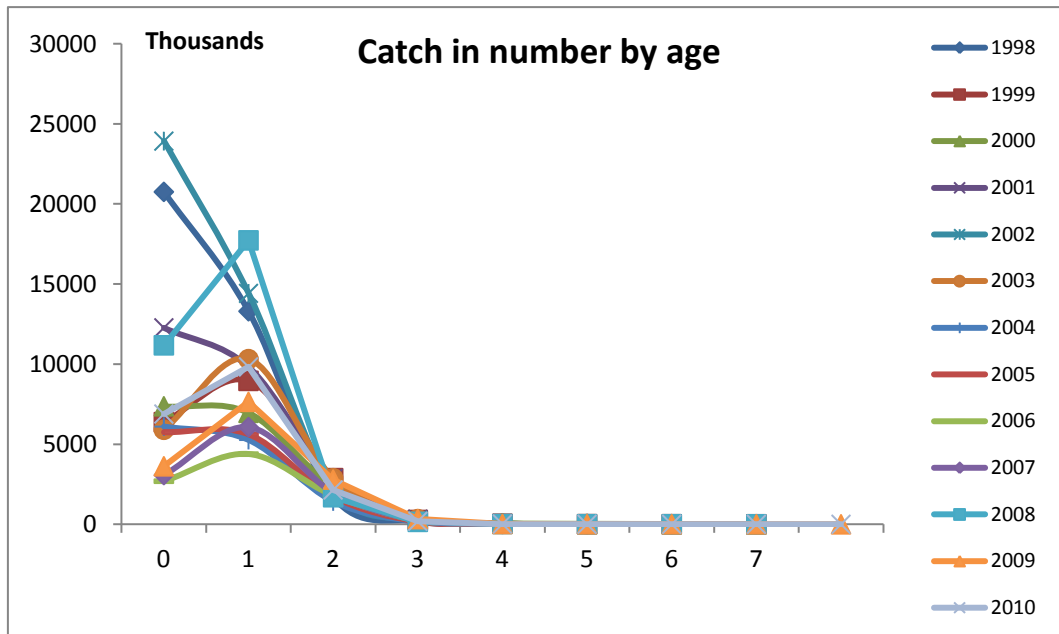
Sheet A2
Indirect methods: data

Code: HKE0711Ang

Sex*	Both	Gear*	FR trawl & gillnet, SP trawl & longline	Analysis # *	1
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Data source	Catch in numbers by age and CPUE for tuning
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Data



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Assessment form

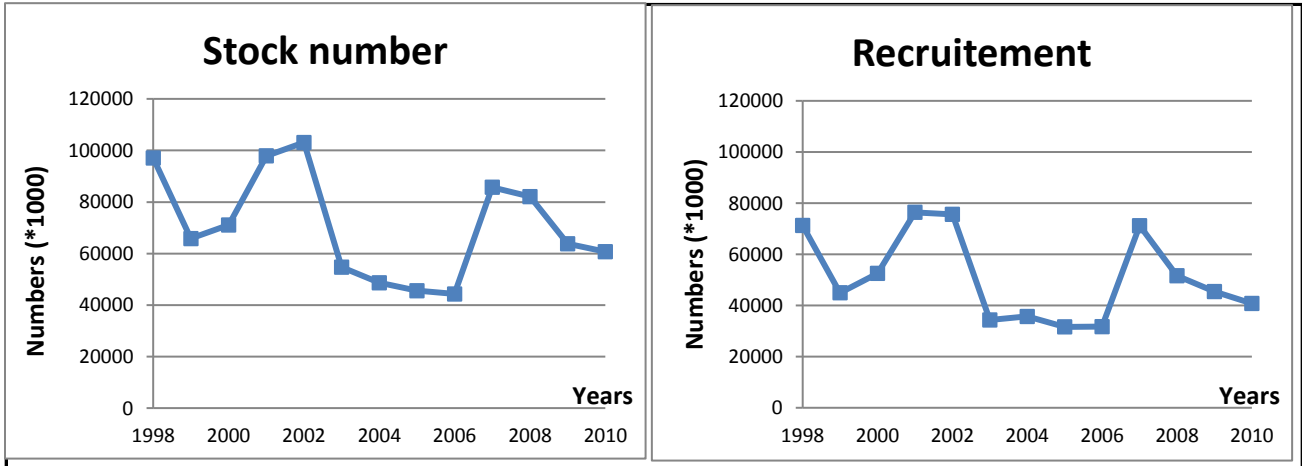
Sheet A3
Indirect methods: VPA results

Code: HKE0711Ang

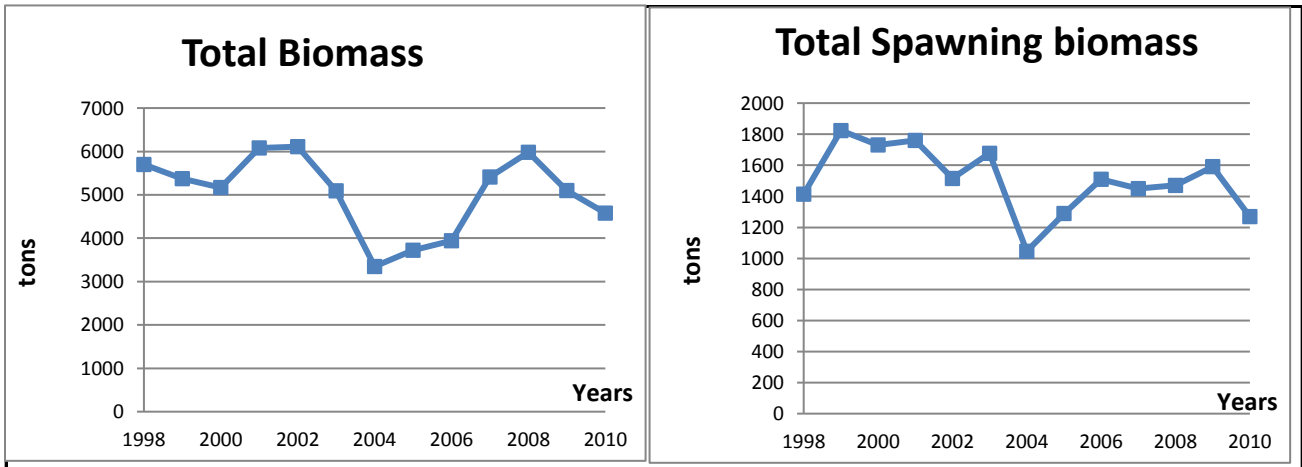
Page 1 / 2

Sex*	Both	Gear*	All	Analysis #*	1
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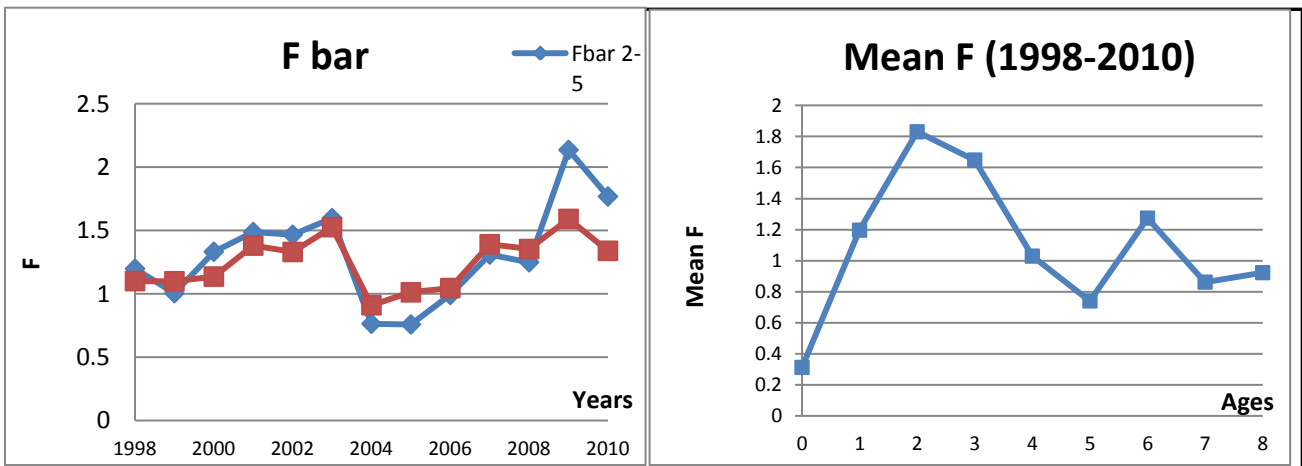
Population in figures



Population in biomass



Fishing mortality rates



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Assessment form

Sheet A3
Indirect methods: VPA results

Code: HKE0711Ang

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Sex*	Both	Gear*	All ages	Analysis #*	1
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Population in figures

AGE	Initial Numbers (* 10 ³)											
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
0	44995	52588	76470	75675	34359	35711	31667	31744	71219	51656	45471	40817
1	16216	14555	17069	23819	15984	10451	10885	9436	11435	27561	14231	16528
2	4005	3327	3856	3182	3867	2083	2555	2554	2606	2545	3634	3092
3	455	436	424	342	416	341	290	372	310	204	395	244
4	97	117	64	50	56	40	131	75	71	27	24	19
5	29	45	35	17	14	17	19	88	30	33	5	2
6	4	15	14	12	3	3	12	13	66	19	23	2
7	0	0	0	1	6	0	2	9	10	53	14	17
8+	0	0	0	1	7	1	0	9	0	0	0	0

Population in biomass

AGE	Biomass (Tons)											
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
0	1057.4	1183.2	1720.6	1702.7	962.05	803.5	791.68	857.09	2207.8	1678.8	1159.5	1122.5
1	2075.6	1906.7	2227.5	2679.6	2085.9	1301.1	1377	1273.8	1486.6	2742.3	2006.6	1933.8
2	1636.2	1399.2	1575.3	1298.1	1521.6	841.53	1052.7	1103.3	1090.5	1010.5	1435.5	1202.9
3	395.96	383.75	359	287.64	352.45	296.75	246.71	315.66	265.35	176.01	337.65	211.94
4	139.56	168.15	92.172	70.683	79.225	56.21	180.42	104.24	98.61	36.784	32.633	27.248
5	56.487	89.382	70.178	33.729	26.956	32.836	37.111	171.75	58.727	65.591	10.26	3.535
6	10.444	35.902	35.134	29.984	7.3011	8.1439	28.834	32.687	161.47	44.45	55.229	3.7021
7	1.1722	1.0186	0.5559	3.6034	26.249	2.0424	8.0042	38.954	41.631	226.66	61.639	72.241
8+	0	0.5688	0.6673	4.6999	30.517	4.753	0	43.699	0	0	0	0

Fishing mortality rates

AGE	Fishing mortality											
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
0	0.2486	0.2452	0.2864	0.6749	0.3102	0.3081	0.3308	0.1411	0.0694	0.4092	0.132	0.3036
1	1.1538	0.8982	1.2499	1.388	1.6078	0.9786	1.0197	0.8567	1.0724	1.596	1.0964	1.3356
2	1.887	1.7294	2.0938	1.7053	2.0986	1.6427	1.598	1.7794	2.2187	1.5321	2.372	1.7031
3	1.1053	1.6704	1.8916	1.5518	2.0872	0.7084	1.098	1.403	2.203	1.8745	2.7628	2.014
4	0.5539	0.9943	1.1098	1.0741	0.9882	0.5301	0.178	0.7018	0.5565	1.4188	2.385	2.0196
5	0.4727	0.9338	0.8542	1.5328	1.216	0.1714	0.1575	0.0785	0.2599	0.1688	1.0229	1.3363
6	2.7091	4.5249	2.6701	0.5708	1.6555	0.4028	0.0788	0.1423	0.0422	0.1303	0.0968	0.4476
7	1.6101	2.7623	1.7845	1.0873	1.3959	0.2635	0	0.0124	0	0	0	0
8+	1.6101	2.7623	1.7845	1.0873	1.3959	0.2635	0.0788	0.0124	0.0422	0.1303	0.0968	0.4476

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

Assessment form Sheet Y
Indirect methods: Y/R

Sex Both

Code: HKE0711Ang
Analysis #

of gears Software

Parameters used

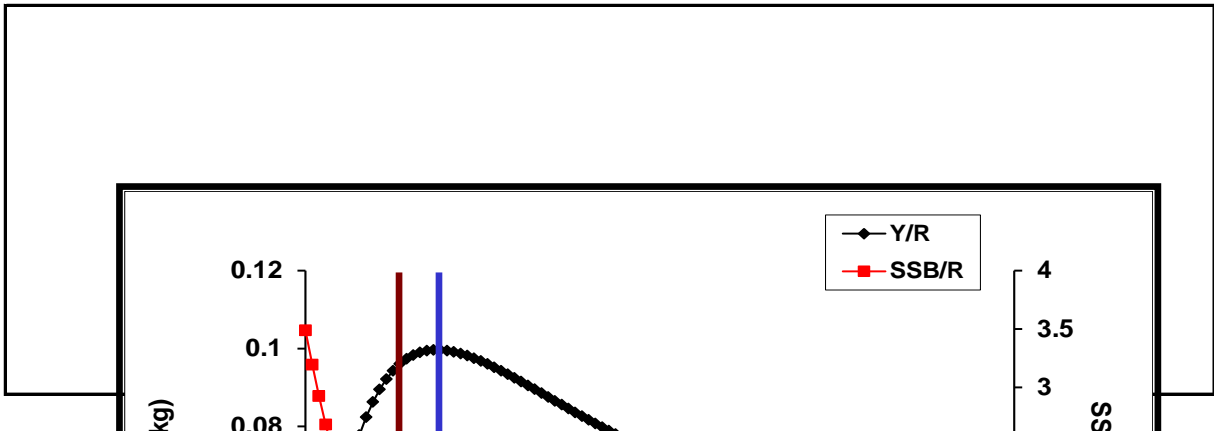
Vector F	0.28(0);1.34(1);1.87(2);2.22(3);1.94(4);0.84(5);0.22(6);0.00(7);0.22(8+) (XSA mean 2008-20
Vector M	0.88(0);0.43(1);0.33(2);0.25(3);0.22(4);0.20(5);0.19(6);0.18(7);0.17(8+)
Vector N	

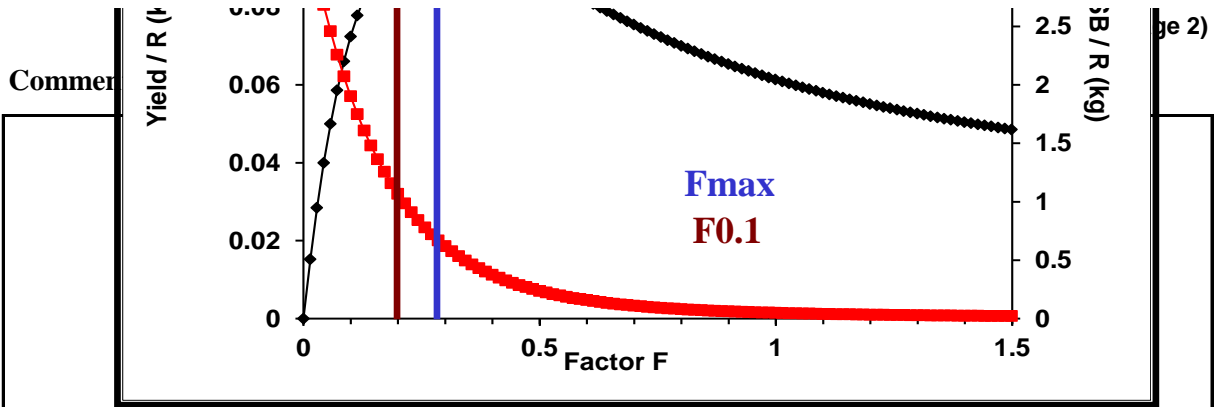
Model characteristics

Results

	Total	Gear			
Current YR	0.050				
Maximum Y/R	0.094				
Y/R 0.1	0.100				
F _{max}	0.414	0.286 (factor)			
F _{0.1}	0.271	0.186 (factor)			
Current B/R	0.092				
Maximum B/R	0.450				
B/R 0.1	0.830				

Comments





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Assessment form

Sheet D
Diagnosis

Code: HKE0711Ang

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B	5046	tons			
SSB	1503	tons			
F	1.43	absolute v	0.271		(F0.1=Reference point), Fmax=0.414
Y	0.05	kg	0.1		
CPUE					

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

Unidimensional	<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;

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

Comments

The stock is characterized by growth overexploitation with periodically higher recruitments (1998, 2002 and 2008) which ensure the sustainability of the stock at a low level of abundance.

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

Assessment form

Sheet Z

Objectives and recommendations

Code: HKE0711Ang

Management advice and recommendations*

Management advice and recommendations:

To reduce growth overfishing:

- Improve the fishing pattern of the trawl to arise the minimum length of catches equal to the minimum legal landing size
- close nursery areas at least temporally (see doc. "Nursery area for hake for the Gulf of Lions" - p33, SAC 2010 report)
- Reduce the effort of trawl, from reducing time at sea, number of fishing boats, engine power, Bollard pull and/or trawl size

To avoid recruitment overfishing:

- Reduce the effort of longline and gillnets in order to increase (or at least maintain) the SSB.
- Establish temporal closures for longline and gillnet during the period of maximum spawning (end of autumn and beginning of winter, main peak of spawning period)

Freezing of the effort in the Fishery Restricted Area

Advice for scientific research*

It is considered necessary to improve national statistics on catches and effort especially for small scale fisheries. We reiterate the importance of VMS as a valuable source of data for having precise informations on effort distribution.

Abstract for SCSA reporting

Authors Angélique Jadaud*, Beatriz Guijarro**, Enric Massuti* and Henri Farrugio* **Year** 2011

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

Source: -

Source: -

Geographical Sub-Area 07 - Gulf of Lions

Fisheries (brief description of the fishery)*

Hake (*Merluccius merluccius*) is one of the most important demersal target species of the commercial fisheries in the Gulf of Lions (GFCM-GSA07). In this area, hake is exploited by French trawlers, French gillnetters, Spanish trawlers and Spanish long-liners. Around 220 boats are involved in this fishery and, according to official statistics, total annual landings for the period 1998-2010 have oscillated around a mean value of 2250 tons (1980 tons in 2009). The fishing capacity of the GSA 07 has shown in these last 10 years a progressive decrease considering the French trawlers. The number of these trawlers decreased of about 30% on the period.

Most fleets and catches correspond to French trawlers (44 and 72%, respectively). Trawlers catches range between 3 and 92 cm total length (TL), with an average size of 20 cm TL, followed by French gillnetters (~39 and 14% respectively, ranging 13-86 cm TL and average size 39 cm TL), Spanish trawlers (~11 and 8%, respectively, ranging 5-87 cm TL, and average size 25 cm TL), and Spanish long-liners (~6 and 6%, respectively, ranging 23-96 cm TL and average size 54 cm TL). Hake trawlers fishery exploits a highly diversified species assemblage: Striped mullet (*Mullus barbatus*), Red mullet (*Mullus surmuletus*), Angler (*Lophius piscatorius*), Black-bellied angler (*Lophius budegassa*), European conger (*Conger conger*), Poor-cod (*Trisopterus minutus capellanus*), Fourspotted megrim (*Lepidorhombus boscii*), Soles (*Solea* spp.), horned octopus (*Eledone*)

Source of management advice*

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

The information used for the assessment of the stock consisted in annual size composition of catches (estimated from monthly or quarterly sampling in the main landing ports), official landings and biological parameters estimated from data collected in the GSA 7 (2003-2010) by IFREMER for the DCF. These parameters were length-weight relationship, sex-ratio and maturity ogive and were computed using inbio (R scripts developed by IEO). The growth coefficient (k) comes from tagging experiments developed by IFREMER in the area (Mellon-Duval et al, 2010). The vector of natural mortality by age was calculated from Caddy's formula, using the PROBIOM Excel spreadsheet (Abella et al., 1997). For the period of the study (1998-2010), the methodology applied was a tuned virtual population analysis (VPA), applying the Extended Survivor Analysis (XSA) method considering, as tuning fleet French MEDITS campaign indices. The software used was FLR. For 2010, a yield per recruit (Y/R) analysis was performed

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

Low abundance

Comments

The stock is characterized by growth overexploitation with productivity, higher recruitment (2008, 2009) and fish which reduce the sustainability of the stock to a low level of abundance.

Advice for scientific research*

Use this shaded area to provide additional comments on catches and effort, generalised comments, the nature and importance of the fishery, and the source of stock for the previous assessment period.

**Rapport sur la compatibilité concernant
GFCM_SCSA_StockAssessmentForms_HKE_GSA07.xls
Exécuté le 19/08/2011 13:54**

Les fonctionnalités suivantes de ce classeur ne sont pas prises en charge dans les versions antérieures d'Excel. Ces fonctionnalités seront peut-être perdues ou dégradées si vous ouvrez le classeur dans une version antérieure du programme ou si vous l'enregistrez dans un format de fichier antérieur.

Perte significative de fonctionnalité

Nb d'occurrences

Certaines cellules ont des plages de mise en forme conditionnelle qui se chevauchent. Les versions antérieures d'Excel n'évalueront pas toutes les règles de mise en forme conditionnelle sur les cellules qui se chevauchent. Ces cellules auront une mise en forme conditionnelle différente.

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[P2a 2!L17:O22](#)
[P2a 2!M24:P28](#)
[P2a 2!L24:L29](#)
[P2a 3!L17:Q22](#)
[P2a 4!L17:Q22](#)
[P2a 4!L24:O29](#)
[P2a 4!P25:P29](#)
[A3 2!K15:V15](#)

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