

SAC GFCM Sub-Committee on Stock Assessment

Date*	12	October	2010	Code*	PIL0710BIG
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Authors* BIGOT J.L., ROOS D., LE CORRE G.

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- Species Scientific name***
- 1** *Sardina pilchardus* - *PIL*
Source: GFCM Priority Species
 - 2**
Source: -
 - 3**
Source: -

Geographical area* Northwestern Mediterranean

Geographical Sub-Area (GSA)* 07 - Gulf of Lions

	1	
	2	
	3	

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

Assessment form

Sheet #0

Basic data on the assessment

Code: PIL0710BIG

Date*	12	Oct	2010	Authors*	BIGOT J.L., ROOS D., LE CORRE G.
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Species Scientific name*	Sardina pilchardus - PIL	Species common name*	European pilchard
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Data Source

GSA*	07 - Gulf of Lions	Period of time*	1993-2009
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Description of the analysis

Type of data*	Biomass by acoustic method, official landings from commercial fleet	Data source*	Ifremer - Statistical data from ministry - AMOP (producers organisation) - DCF
Method of assessment*	Acoustic Biomass estimates	Software used*	IFREMER softwares: Mowies+, Fishview, Weieval, Baracouda

Sheets filled out

B	P1	P2a	P2b	G	A1	A2	A3	Y	Other	D	Z	C
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Comments, bibliography, etc.

MASSE J., C. SCALABRIN, B. LIORZOU, A. WEILL, 1992.- Distribution and spatiotemporal description of fish school acoustic detections observed in the bay of Biscay. Note présentée au groupe de travail acoustique "Occupation de l'espace par les organismes aquatiques observés par méthode acoustiques : déterminisme et évolution". Centre ORSTOM de Montpellier, 18-20 mai 1992.

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Comments, bibliography, etc.

GUENNEGAN Y., B. LIORZOU, J.L. BIGOT, 2000.- Exploitation des petits pélagiques dans le golfe du Lion et suivi de l'évolution des stocks par écho-intégration de 1995 à 1999. CGPM Groupe de travail "petits pélagiques". Sous Comité Aménagement des Pêches. Fuengirola, Espagne, 1-3 mars 2000. 29 p.

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BEARE D., D. REID, PETITGAS, P. CARRERA, S. GEORGAKARAKOS, J. HARALAMBOUS, M. IGLESIAS, B. LIORZOU, J. MASSE, R. MUINO, 2001.- Spatio-temporal patterns in pelagic fish schools abundance and size: a study of pelagic fish aggregation using acoustic surveys from Senegal to shetland. ICES Journal of Marine Science, ICES-CM-2000/K:03: 31p.

GUENNEGAN Y., B. LIORZOU, J.L. BIGOT, 2001.- Méthodologie utilisée en écho-intégration dans le golfe du Lion : description et analyse. CGPM Groupe de travail "petits pélagiques". Sous Comité Aménagement des Pêches. Kavala, Grèce, 27-30 mars 2001. 21 p.

GUENNEGAN Y., B. LIORZOU, J.L. BIGOT, 2001.- MEDIterranée ANchois Evaluation. Analyse de l'abondance et de la répartition de l'anchois et des petits pélagiques dans le golfe du Lion. Rapport final du contrat UE/00/05 "MEDIANE". 25 p + annexes.

PETITGAS P. et al., 2001.- Aggregation patterns of commercial fish species under different stock situations and their impact on exploitation and assessment. Final report project FAIR-CT-96.1799 "CLUSTER" : 64 p + Appendixes.

PETITGAS P., D. REID, P. CARRERA, M. IGLESIAS, S. GEORGAKARAKOS, B. LIORZOU, J. MASSE, 2001.- On the relation between schools, cluster of schools, and abundance in pelagic fish stocks. ICES Journal of Marine Science, ICES J. Mar. Sci. 58, (6): pp. 1150-1160.

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GUENNEGAN Y., J. GUILLARD, J.L. BIGOT, P. BREHMER, M. COLON, Y. CHERET et B. LIORZOU, 2004. Importance de la zone côtière dans les évaluations des stocks de petits poissons pélagiques : Analyse d'une série de campagnes acoustiques et d'une expérimentation en zone côtière. CGPM groupe de travail "petits pélagiques". Sous comité Aménagement des pêches. Málaga, Espagne, 6-7 May, 2004. 17 p.

LIORZOU B., J.L. BIGOT et Y. GUENNEGAN, 2004. Evolution des stocks de sardines et d'anchois dans le golfe du Lion. CGPM groupe de travail "petits pélagiques". Sous comité Aménagement des pêches. Málaga, Espagne, 6-7 May, 2004. 11 p.

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Sheet B
Biology of the species

Code: PIL0710BIG

Biology

Somatic magnitude measured (LH, LC, etc)*					Units*	
Sex	Fem	Mal	Both	Unsexed		
Maximum size observed				22	Reproduction season	winter
Size at first maturity				13	Reproduction areas	Shelf and upper slope
Recruitment size				7	Nursery areas	Coastal, lagoons

Parameters used (state units and information sources)

		Units	Sex			
			female	male	both	unsexed
Growth model	L ∞	cm	20.4	18.9		
	K	year-1	0.31	0.34		
	t0	year	-1.158	-1.047		
	Data source	Aging (gulf of Lion)				
Length weight relationship	a					0.0325*
	b					2.4148*
M						
sex ratio (mal/fem)	46/54					

Comments

(*) In acoustic method, we don't use growth parameter. Length/weight relationships are splitted in little sardine (<13cm) and big sardine. Values given in the above table are for big sardine. Values for little one's are:

a = 0.0017

b = 3.5645

(***)sex ratio change every year

2002 : 30/70

2003 : 45/55

2004 : 46/54

2005 : 44/56

2006 : 52/48

2007 : 44/56

2008 : 41/59

2009 : 46/54

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Assessment form

Sheet P1

General information about the fishery

Code: PIL0710BIG

Data source*	IFREMER	Year (s)*	2009
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Data aggregation (by year, average figures between years, etc.)*	period average : 2004-2009
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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	31 - Small gregarious pelagic	PIL
Operational Unit 2	FRA	07	H - Purse Seine (12-24 metres)	02 - Seine Nets	31 - Small gregarious pelagic	PIL
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
FRA 07 E 03 31 - PIL	20	Tons	7000	<i>Anchovy</i>	not discarded		nb boats
FRA 07 H 02 31 - PIL	10	Tons	1500	<i>Anchovy</i>	not discarded		nb boats
Total	30		8500				

Legal minimum size	7cm total length
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Comments

The 30 boats are those that specify are pelagic ones. In the gulf of Lion, 92 trawlers are operating and catch occasionally sardine. Catches referred to the whole fleet, even if this year of them are targetting in small pelagic species

The number of trawlers change every month in function of the targeted specie

7000 tonnes for trawlers is the mean from 2004 to 2009

1500 tonnes for purse seiners is the mean from 2004 to 2009

Comments



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Sheet P2a
Fishery by Operational Unit

Code: **PIL0710BIG**

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Data source*	IFREMER and French official data	OpUnit 1*	FRA 07 E 03 31 - PIL
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Time series

Year*	1998	1999	2000	2001	2002	2003
Catch	8050	7850	9650	10337	7036	6106
Minimum size						
Average size Lc						
Maximum size						
Fleet	(113)	(113)	(113)	(113)	56(123)	50(123)

Year	2004	2005	2006	2007	2008	2009
Catch	6825	7435	8301	11000	5740	2720
Minimum size						
Average size Lc						
Maximum size						
Fleet	50(121)	50(114)	50(111)	50(101)	30(92)	20(92)

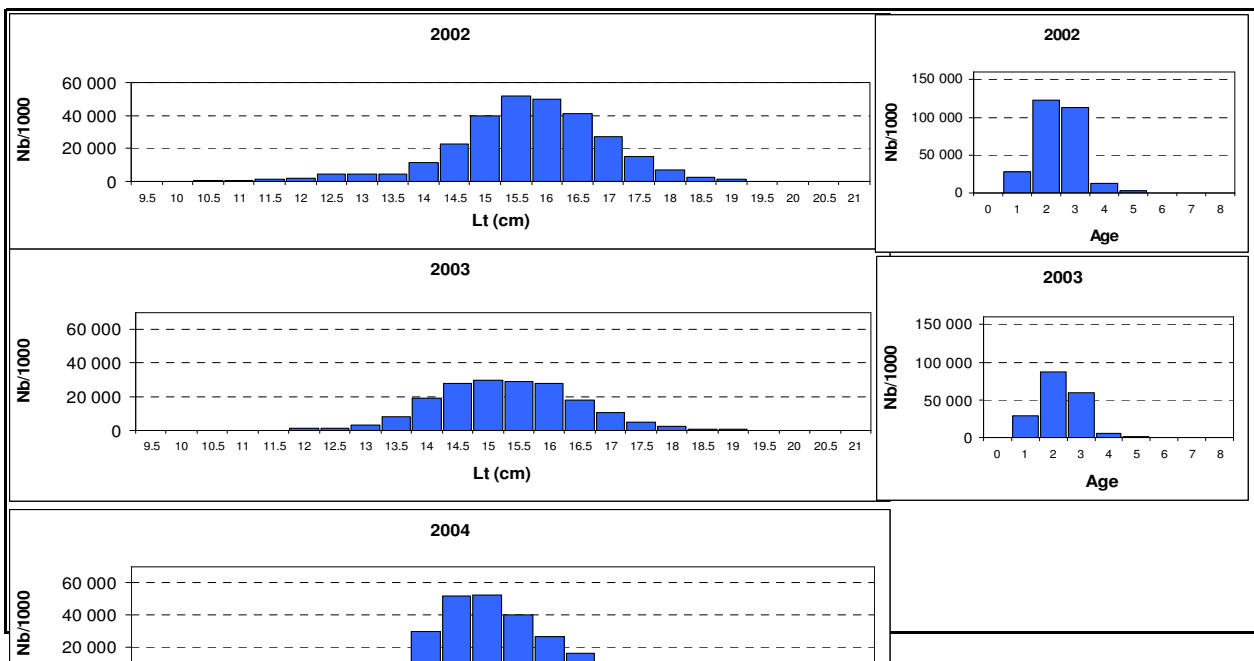
Selectivity

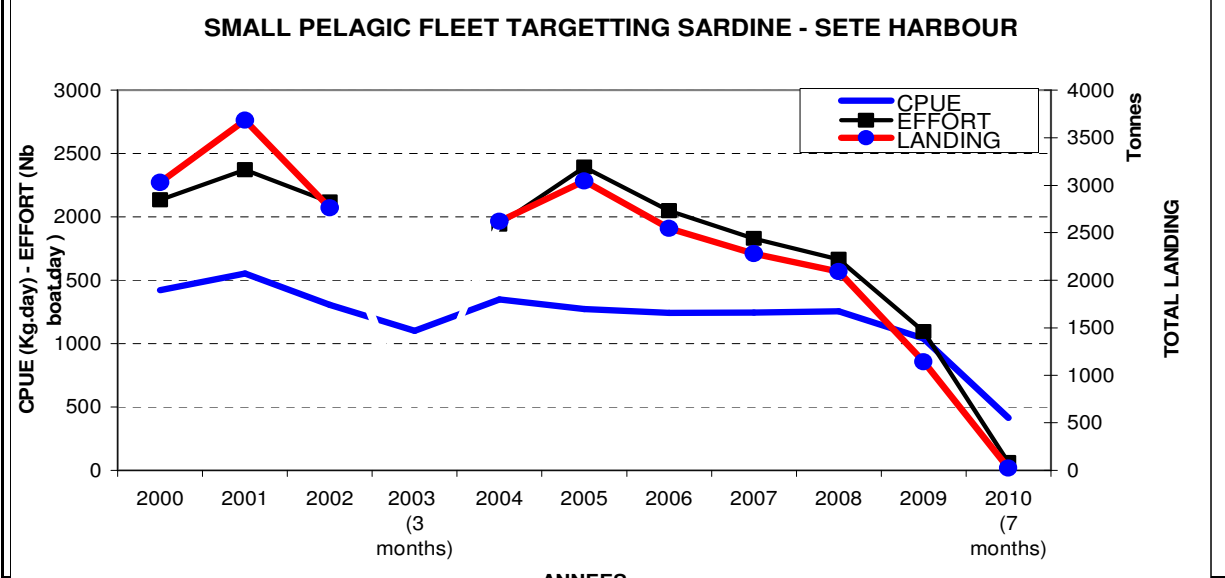
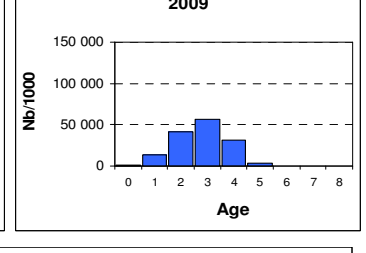
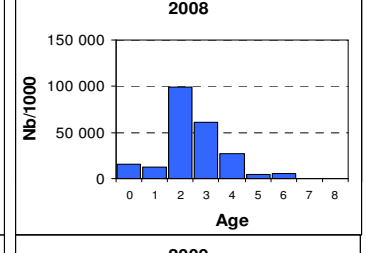
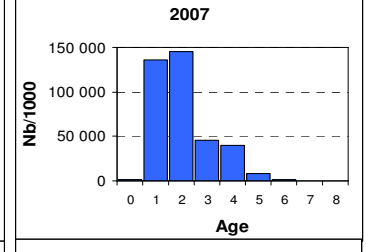
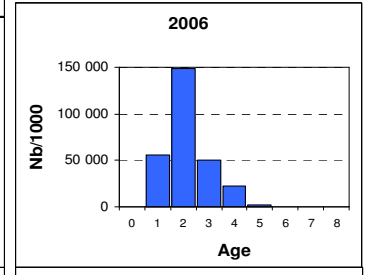
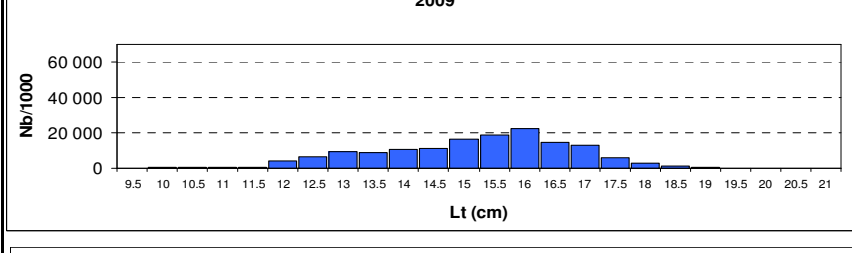
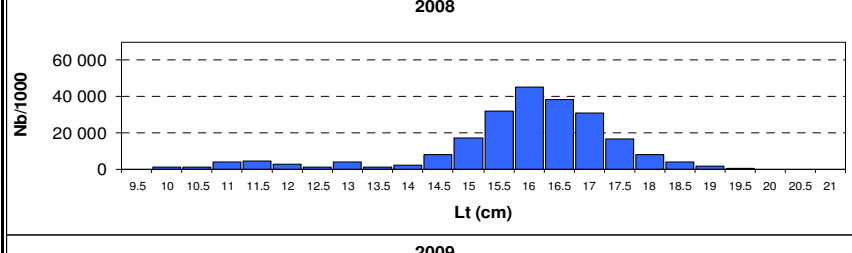
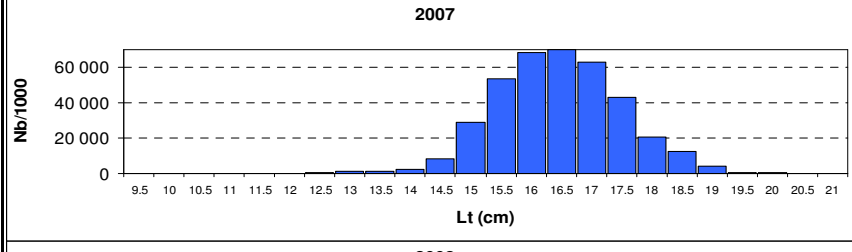
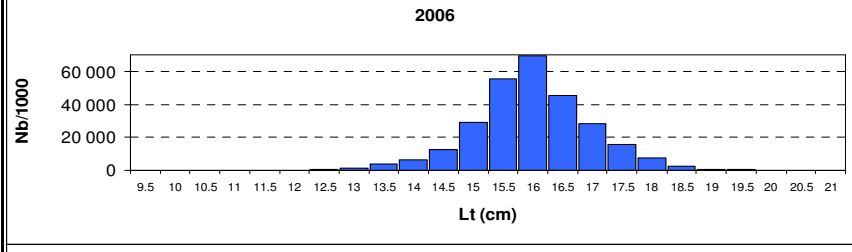
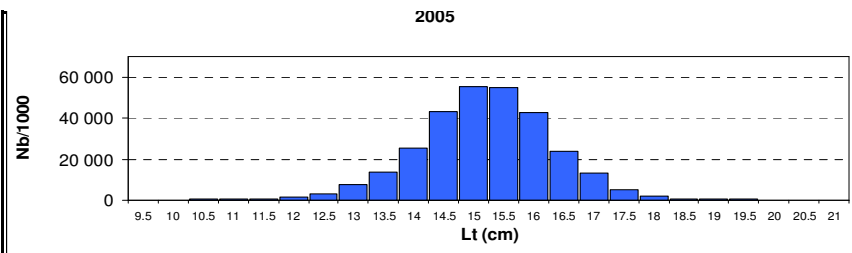
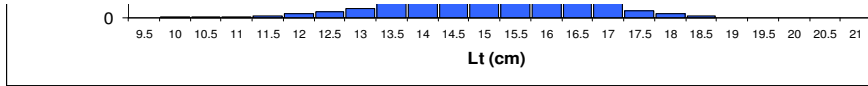
Remarks

* eg : in 2009, 92 boats can catch but 20 regulars

L25		Note : Effort is noted "number of boat which targeted the anchovy (number of boat administratively authorized to catch anchovy)"
L50		
L75		
Selection factor		

Structure by size or age





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Sheet P2a
Fishery by Operational Unit

Code: PIL0710BIG

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Data source*	IFREMER and French official data	OpUnit 2*	FRA 07 H 02 31 - PIL
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Time series

Year*	1998	1999	2000	2001	2002	2003
Catch	1950	2150	2350	1611	727	1005
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Year	2004	2005	2006	2007	2008	2009
Catch	668	2037	2083	2340	1000	900
Minimum size						
Average size Lc						
Maximum size						
Fleet	(16)	(18)	(19)	14(16)	11(23)	10(23)

Selectivity

Remarks

L25		
L50		
L75		
Selection factor		

Structure by size or age



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Sheet P2b
Fishery by Operational Unit

Code: PIL0710BIG

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Data source* IFREMER and administration

OpUnit 1*

FRA 07 E 03 31 - PIL

Regulations in force and degree of observance of regulations

National regulations :

Exclusive licence for trawling, with numerus closus (both small pelagics and demersals) - fully observed

Engine power limited for trawlers to 318 kW or 430 hp - not observed

Length of fishing trawlers less 25 meters - fully observed

Fishing effort limitation :

(no fishing saturday and sunday, autorised hours trip : 3.00am – 8.00pm) - fully observed

Trawling forbidden from coast until 3NM - not fully observed

Professional organisations regulations :

Additional hollydays days : in average 40 days/year - fully observed

Accompanying species

European anchovy (*Engraulis encrasicolus*)

Atlantic mackerel (*Scomber scombrus*)

Chub mackerel (*Scomber japonicus*)

Atlantic horse mackerel (*Trachurus trachurus*)

Mediterranean horse mackerel (*Trachurus mediterraneus*)

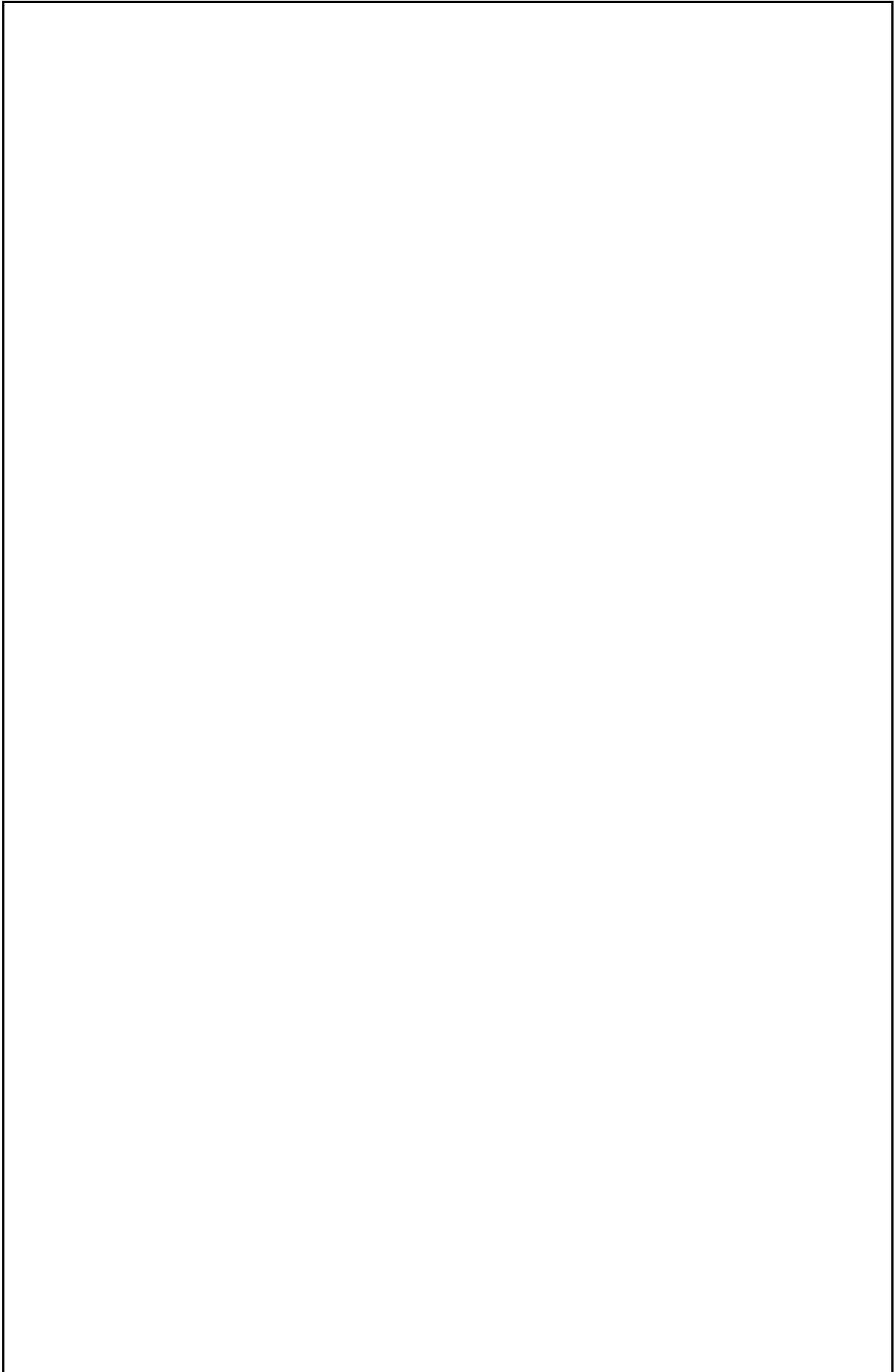
Round sardinella (*Sardinella aurita*)

Sprat (*Sprattus sprattus*)

Seabreams (*Pagellus spp.*)

Blue whiting (*Micromesistius poutassou*)

European hake (*Merluccius merluccius*)



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Sheet P2b
Fishery by Operational Unit

Code: PIL0710BIG

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Data source* IFREMER and French official data

OpUnit 2*

FRA 07 H 02 31 - PIL

Regulations in force and degree of observance of regulations

Purse seiners :

National regulations

Licence for purse seiner, with numerus closus

European regulations

(EC) 1967/2006 - Dedicated Gestion Plan in progress

Accompanying species

European anchovy (*Engraulis encrasicolus*)

Atlantic mackerel (*Scomber scombrus*)

Chub mackerel (*Scomber japonicus*)

Atlantic horse mackerel (*Trachurus trachurus*)

Mediterranean horse mackerel (*Trachurus mediterraneus*)

Round sardinella (*Sardinella aurita*)

Sprat (*Sprattus sprattus*)

Seabreams (*Pagellus spp.*)

Blue whiting (*Micromesistius poutassou*)

European hake (*Merluccius merluccius*)

Other assessment methods

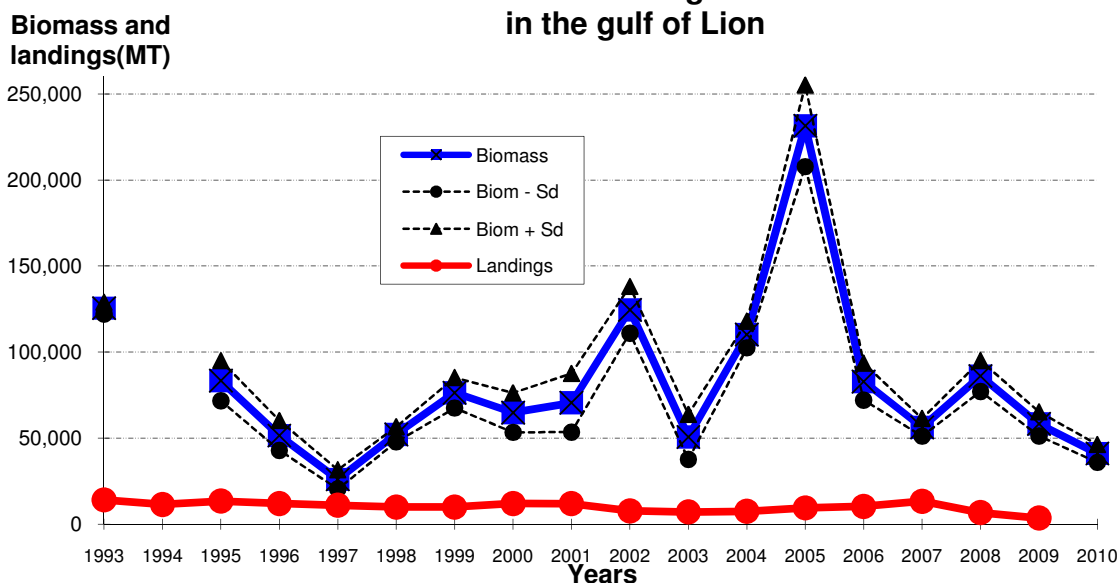
The stocks of the main species of small pelagics in the gulf of the Lion are evaluated annually. The objective is to provide some advices to administrations and the profession on the state of resources in view of a durable exploitation. The pelagic species studied are anchovy and sardine in priority but also mackerels, horse mackerels, sardinella and sprat when present. The different species don't have the same biology and behaviour (life span, reproduction period, habitat,...). Also, the catches data and specific fishing effort collected by producer organisations are not sufficiently precise to permit an indirect approach of the stock assessments.

The solution chosen in the gulf of Lion is to use direct assessment method of stocks by echo - integration while completing them with indicators of the fishing activity. At this end, PELMED surveys are performed at daytime in July. Transects are prospected, perpendicular to the coast at a speed of 8 knots, from 15-20m depth until the offshore break. Pelagic and bottom trawling operations are performed to identify species met along transects. Population structures are identified by size and age. The acoustic assessment results are completed by an analysis of catches and fishing effort to improve the fisheries diagnoses. The stocks of the main species of small pelagics in the gulf of the Lion are evaluated annually. The objective is to provide some advices to administrations and the profession on the state of resources in view of a durable exploitation. The pelagic species studied are anchovy and sardine in priority but also mackerels, horse mackerels, sardinella and sprat when present. The different species don't have the same biology and behaviour (life span, reproduction period, habitat,...). Also, the catches data and specific fishing effort collected by producer organisations are not sufficiently precise to permit an indirect approach of the stock assessments.

The global species biomass estimated during Pelmed surveys showed strong fluctuations according to years. In 2005, the level of accessible biomass of small pelagic fishes (all species) was around 472000 tons, highest level of 1993–2008 period. Mainly, the presence of a rich inshore zone of small sardines and an offshore zone of anchovy and biggest sardines was observed. But for some years this spatial distribution did not occurs.

After an upward trend of sardine from 2003 to 2005, up to 231000 MT, sardine biomass return at a mean level of 70 000 MT from 2006 to 2009. This value decrease in 2010.

Biomass and landings of sardine in the gulf of Lion



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Sheet D
Diagnosis

Code: PIL0710BIG

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B					
SSB					
F					
Y					
CPUE					

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

Unidimensional	<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;

Bidimensional	Exploitation rate		Stock abundance			
	<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

The assessment provided here is entirely dependent on the assumption of Acoustic biomass providing unbiased estimates of the absolute level of biomass at sea.

Pelmed08 survey was extended to the Catalan Sea in GSA06, including Ebro Delta, and Pelmed 2009 and 2010 to Barcelona.

Updated indicators :

1) Stock

- Estimated total biomasses was around 50,000 T for both 2009 and 2010 surveys. These biomasses levels were into the regular range of the time series for the Gulf of Lion (between 50,000 T and 100,000 T in 1993-2010 period);
- Large sardine (>12,5 cm) biomasses dramatically decrease since 2005 (> 200 000 T) to reach its lower level in 2010 (< 5000 T);
- Small sardine (<12,5 cm) showed important recruitment since 2008 and they represent in 2009 and 2010 more than 80% of biomasses.

2) Fishery:

- Exploitation rates of acoustic estimated biomasses varied annually between 5 to 25% during the last ten years. Trawlers targeted fishes size >14.5 cm corresponding to age 2+.
- Trawlers effort and catches were progressively reduced in the first half of 2009 period, and almost stopped their activity since the end of 2009 until now;
- In 2010, fishery effort on sardine was limited to an exploratory activity. Catches were characterized by low CPUE, small sardines mixed with a lot of small sprats. The landings had low commercial values.

3) Population, demographic and biological parameters obtained in 2009 and 2010 periods present some alterations:

- 80 % of biomasses was composed by age 0.
- Age 0 in 2008-2009 do not produce abundances as high as expected for age 1 and 2 in 2009-2010 period;
- Few fishes had survived after 2 years in 2010 (<1%) and larger sardine (> 17cm) are composed in more than 60% by females.
- Condition index, growth rate, and size at first maturity decrease sensitively and quickly these 3 last years;
- Very low and depleted biomass of adult (age 1+) wasn't in accordance with high recruitments levels observed in this stock since 2008, suggesting an important external spawning biomass contribution to GFL stock.

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Sheet Z

Objectives and recommendations

Code: PIL0710BIG

Management advice and recommendations*

The stock seems to be highly unbalanced in 2009 and 2010, with a very low abundance (less than 10% of the total biomass) of commercial-sized sardines (groups 1+). Even if total biomass was not very much lower than the average level of the last decade, most of the recorded biomass consisted of 0-group sardines, and even these showed a mean size and condition factor appreciably below the values usually found for this stock. Besides, for two years in a row, these recruits have almost completely disappeared from the stock, with very few survivors the following year.

The system of the Gulf of Lyons shows important signs of disequilibrium since 2008, with important reductions and changes in structure of the stocks of sardine and anchovy, and an unusually high abundance of sprat.

The same patterns are found in the commercial activity. The fleet does not manage to capture any significant amounts of sardine, and the commercial activity has almost stopped since the end of 2009, being limited to an exploratory activity in 2010.

All these signs indicate that the production capacity of the stock, and its potential to sustain an economic activity, is severely hampered, and it is essential to allow it to recover, by preventing the addition of additional sources of mortality to this already depleted population.

Therefore, the WG recommends:

- To strongly reduce fishing effort on sardine in the Gulf of Lion, such as the case already applied by the fishery in an adaptive behavior in the first six months of 2010,
 - To formalize and establish a protocol of "sentinel" activity for fishermen, and produce monthly spatio-temporal observations to describe the evolution of the system,
 - To respect the European regulation on minimum length size of catch (11cm, UE 1976/2006) to protect age 0,
- until constate a balanced stock, and significant sardine biomass in age 1+ (by grow and/or immigration)

Gulf of Lion small pelagic fisheries are multispecies and effort on sardine cannot be separated from effort on anchovy, so that most of the management decisions have to be taken, considering both species.

Advice for scientific research*

Abstract for SCSA reporting

Authors

BIGOT J.L., ROOS D., LE CORRE G.

Year

2010

Species Scientific name

Sardina pilchardus - PIL

Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area

07 - Gulf of Lions

Fisheries (brief description of the fishery)*

Source of management advice*

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

Stock Status*

Exploitation rate

Moderate fishing mortality

Stock abundance

Low abundance

Comments

The assessment provided here is entirely dependent on the assumption of Acoustic biomass providing unbiased estimates of the absolute level of biomass at sea.

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- In 2010, fishery effort on sardine was limited to an exploratory activity. Catches were characterized by low CPUE, small sardines mixed with a lot of small sprats. The landings had low commercial values.

Management advice and recommendations*

The stock seems to be highly unbalanced in 2009 and 2010, with a very low abundance (less than 10% of the total biomass) of commercial-sized sardines (groups 1+). Even if total biomass was not very much lower than the average level of the last decade, most of the recorded biomass consisted of 0-group sardines, and even these showed a mean size and condition factor appreciably below the values usually found for this stock. Besides, for two years in a row, these recruits have almost completely disappeared from the stock, with very few survivors the following year.

The system of the Gulf of Lyons shows important signs of disequilibrium since 2008, with important reductions and changes in structure of the stocks of sardine and anchovy, and an unusually high abundance of sprat.

The same patterns are found in the commercial activity. The fleet does not manage to capture any significant amounts of sardine, and the commercial activity has almost stopped since the end of 2009, being limited to an exploratory activity in 2010.

All these signs indicate that the production capacity of the stock, and its potential to sustain an economic activity, is severely hampered, and it is essential to allow it to recover, by preventing the addition of additional sources of mortality to this already depleted population.

Therefore, the WG recommends:

- To strongly reduce fishing effort on sardine in the Gulf of Lion, such as the case already applied by the fishery in an adaptive behavior in the first six month of 2010,
 - To formalize and establish a protocol of "sentinel" activity for fishermans, and produce monthly spatio-temporal observations to describe the evolution of the system,
 - To respect the European regulation on minimum length size of catch (11cm, UE 1976/2006) to protect age 0,
- until constate a balanced stock, and significant sardine biomass in age 1+ (by grow and/or immigration)

Gulf of Lion small pelagic fisheries are multispecies and effort on sardine cannot be separated from effort on anchovy, so that most of the management decisions have to be taken, considering both species.

Advice for scientific research*

