SAC GFCM
Sub-Committee on Stock Assessment

Date*	17	October	2011		Code*	ANE0711BIG

Authors*

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Species Scientific name*

1 *Engraulis encrasicolus - ANE*
Source: GFCM Priority Species

2
Source: -

3
Source: -

Geographical area*

Northwestern Mediterranean

Geographical Sub-Area (GSA)*

07 - Gulf of Lions

Combination of GSAs
1
2
3

Code: ANE0711BIG

Date*	17	Oct	2011	Authors*	BIGOT Jean Louis, Jean Hervé BOURDEIX, David ROOS

Species Scientific name*	Engraulis encrasicolus - ANE	Species common name*	

Data Source

GSA*	07 - Gulf of Lions	Period of time*	1993-2011

Description of the analysis

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

Sheets filled out

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

Comments, bibliography, etc.

The stocks of the main species of small pelagics in the gulf of the Lion are evaluated annually by acoustics (Survey PELMED carried out in July. The survey data is described in the sheet "Other".

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Comments, bibliography, etc.

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GUENNEGAN Y., GUILLARD J., BIGOT J.L., B LIORZOU., CHERET Y., COLON M., FARRUGIO H., BREHMER P., 2004. "Variabilite spatio-temporelle des populations de poissons de la zone littorale observee par acoustique", Actes du Colloque « Rhône Méditerranée", C.O.M. 6-7 Mai, 2004 Marseille.

Code: ANE0711BIG

Biology

Somatic magnitude measured (LH, LC, etc)*				Units*	

Sex	Fem	Mal	Both	Unsexed		
Maximum size observed	18.5	17	18.5	18.5	Reproduction season	Spring-Summer
Size at first maturity	9*	9*	9*	9*	Reproduction areas	Shelf and upper
Recruitment size	5	5	5	5	Nursery areas	Shelf and upper

Parameters used (state units and information sources)

		Units	Sex			
			female	male	both	unsexed
Growth model	$L\infty$	cm				19.1
	K	year-1				0.35
	t0	year-1				-1.45
	Data source	Aging (Gulf of Lions)				
Length weight relationship	a					0.0058
	b					2.9883

M					

sex ratio (mal/fem)	32/68

Comments

(*) Size of first maturity is done on July 2009

(**) Length-weight relationship is calculated on July 2010

(***) sex ratio change every year
2002 M/F 49/51
2003 M/F 47/53
2004 M/F 47/53
2005 M/F 46/54
2006 M/F 37/63
2007 M/F 36/64
2008 M/F 40/60
2009 M/F 42/58
2010 M/F 32/68

Comments

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Data source*	IFREMER - Statiscal data from ministery - AMOP (producers organisation) - DCF	Year (s)*	2010
Data aggregation (by year, average figures between years, etc.)*	Period average 2005-2010		

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	31 - Small gregarious pelagic	ANE
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
FRA 07 E 03 31 - ANE	20	Tons	2960	PIL	YES	YES	Nb boats
			*				
Total	20		2960				

Legal minimum size	9 cm total length

Comments

Exploitation rates of acoustic estimated biomasses were stable around 10%, except 18-20% for 2007-2008 yea

(*) Average from 2005 to 2010

Comments

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Data source*	IFREMER - Statiscal data from ministery - AMOP (producers organisation) - DCF	OpUnit 1*	FRA 07 E 03 31 - ANE

Time series

Year*	1999	2000	2001	2002	2003	2004
Catch	5000	6000	4769	6941	7073	4497
Minimum size						
Average size Lc						
Maximum size						
Fleet	(113)	(113)	(113)	56(123)	50(123)	50(121)

Year	2005	2006	2007	2008	2009	2010
Catch	2249	2605	4133	4003	2460	2307
Minimum size						
Average size Lc						
Maximum size						
Fleet	50(114)	50(111)	50(101)	30(92)	20(92)	20(92)

Selectivity

L25	
L50	
L75	
Selection factor	

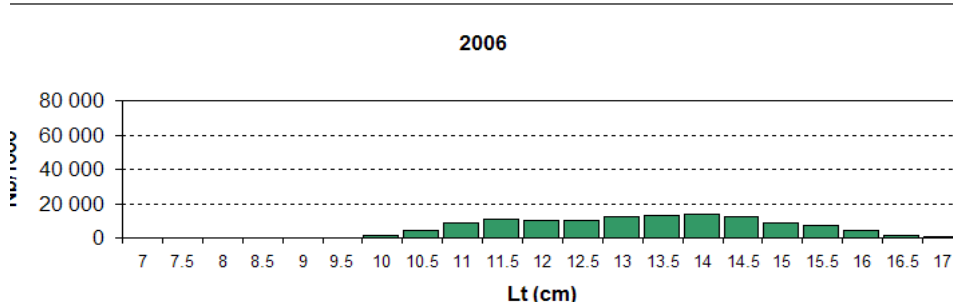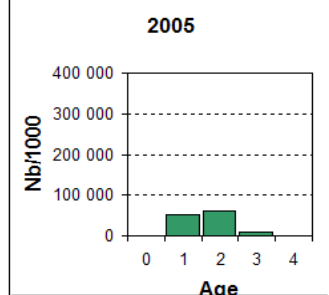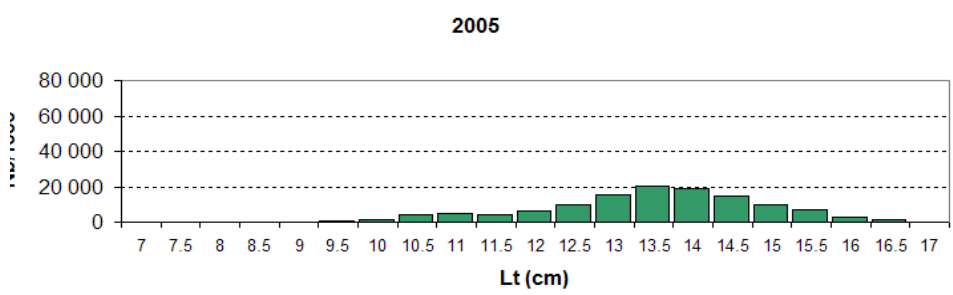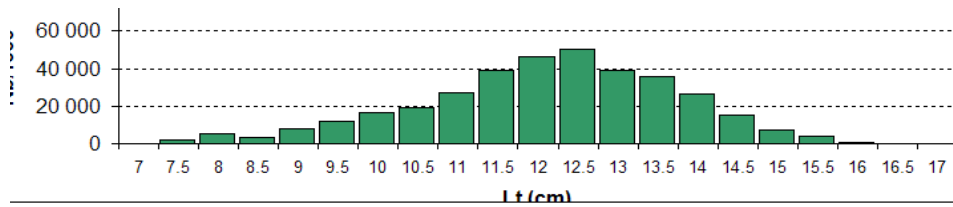## Remarks

Note : Effort is noted "number of boat which targeted the anchovy (number of boat administratively authorized to catch anchovy)"

Structure by size or age

2005

2006

2007

2008

2009

2010
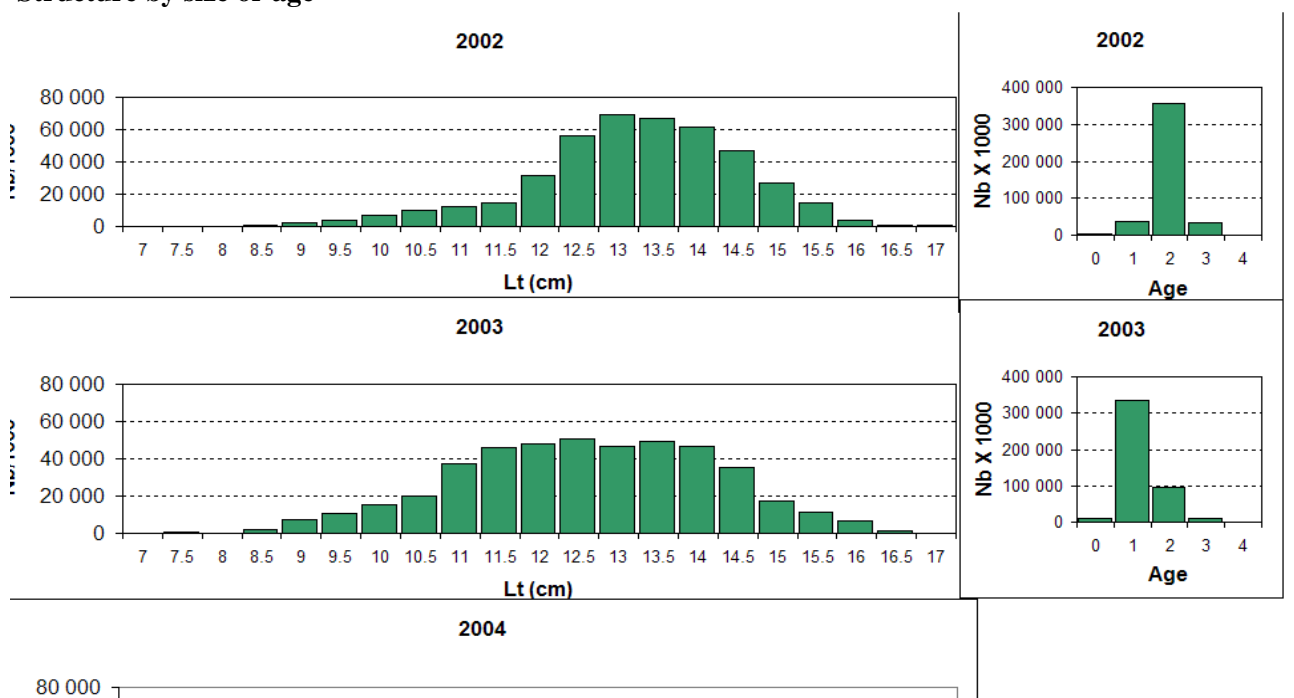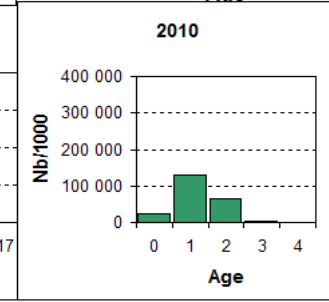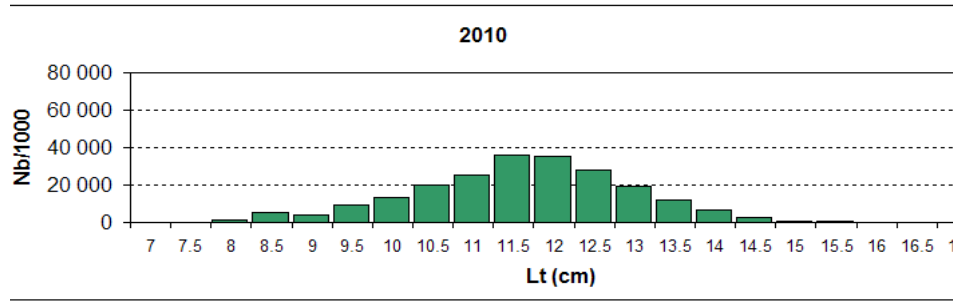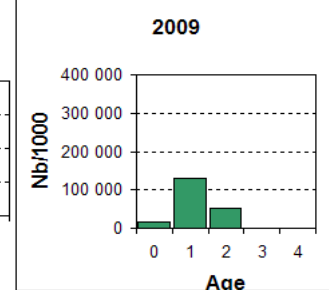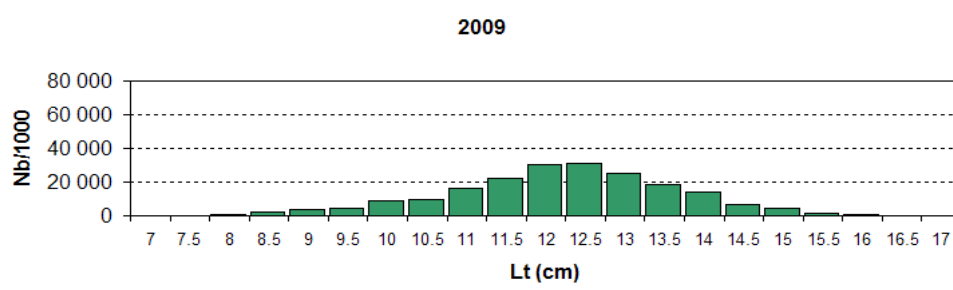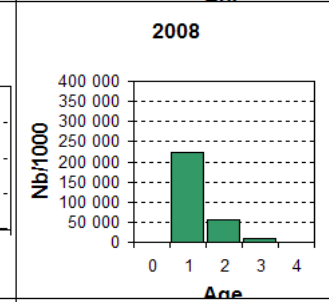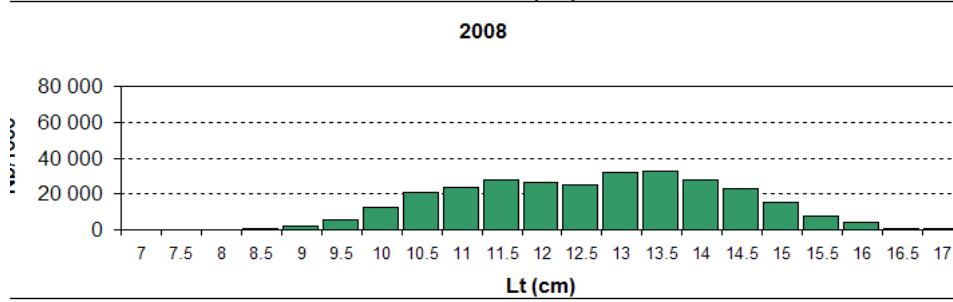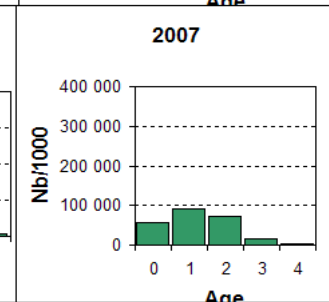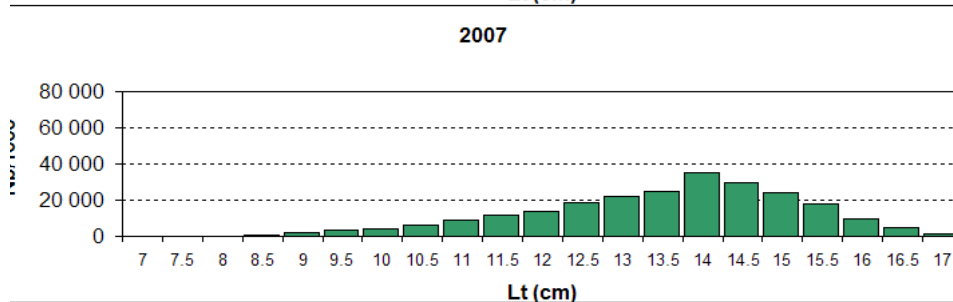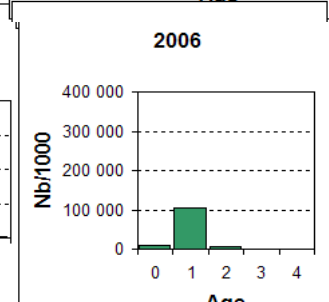
SAC GFCM - Sub-Committee on Stock Assessment (SCSA)	
Assessment form	**Sheet P2b**
	Fishery by Operational Unit

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Data source*	IFREMER - Statiscal data from ministery - AMOP (pr	OpUnit 1*	FRA 07 E 03 31 - ANE

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

Accompanying species

European pilchard (*Sardina pilchardus*)
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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Sex*	M+F

Analysis # *	**ICA**

Time series

Data	Size	Age
(mark with X)		

Model	Cohorts	Pseudocohorts
(mark with X)		

Equation used		Tunig method	
# of gears		Software	
$F_{terminal}$			

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum			Recruitment		
Average			Average population		
Maximum			Virgin population		
Critical			Turnover		

Average mortality

	Total	Gear						
F_1								
F_2								
Z								

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

Comments

Extract from results published in FP6 - 44294 SARDONE PROJECT (2010) :
"A - ICA model
No pertinent results were obtained with ICA model because the times series were too short and the age composition of catches and surveys, as well as the growth and mortality parameters, were still considered to be too preliminary as to allow this type of analysis. Conventional age-structured models such as VPA and Cohort Analyses work particularly well when long time series of catches at age and associated indices of abundance are available for several ages. The conventional usage of age-structured models that add-up catches at age on year-class basis working backwards (i.e. starting with the most recent years) faces particular difficulties when only a few age-groups are present in the catch and when the natural mortality is uncertain (as in our case). For the Gulf of Lions, the completion of the revision of the historical data before 2002 is desirable. In addition, the slow growing rates, basically equal to sardine, suggest low natural mortalities if the approach of Abella is followed (see below). But the age composition from surveys suggests somewhat higher M (of about 1 or 1.2). For this reason just an experimental trial in a spread sheet was implemented as a way of analysing the potential fitting of the data. Further development is to be carried out when accurate age structuring and growth parameters would allow better guessing of the natural mortality of the stock."
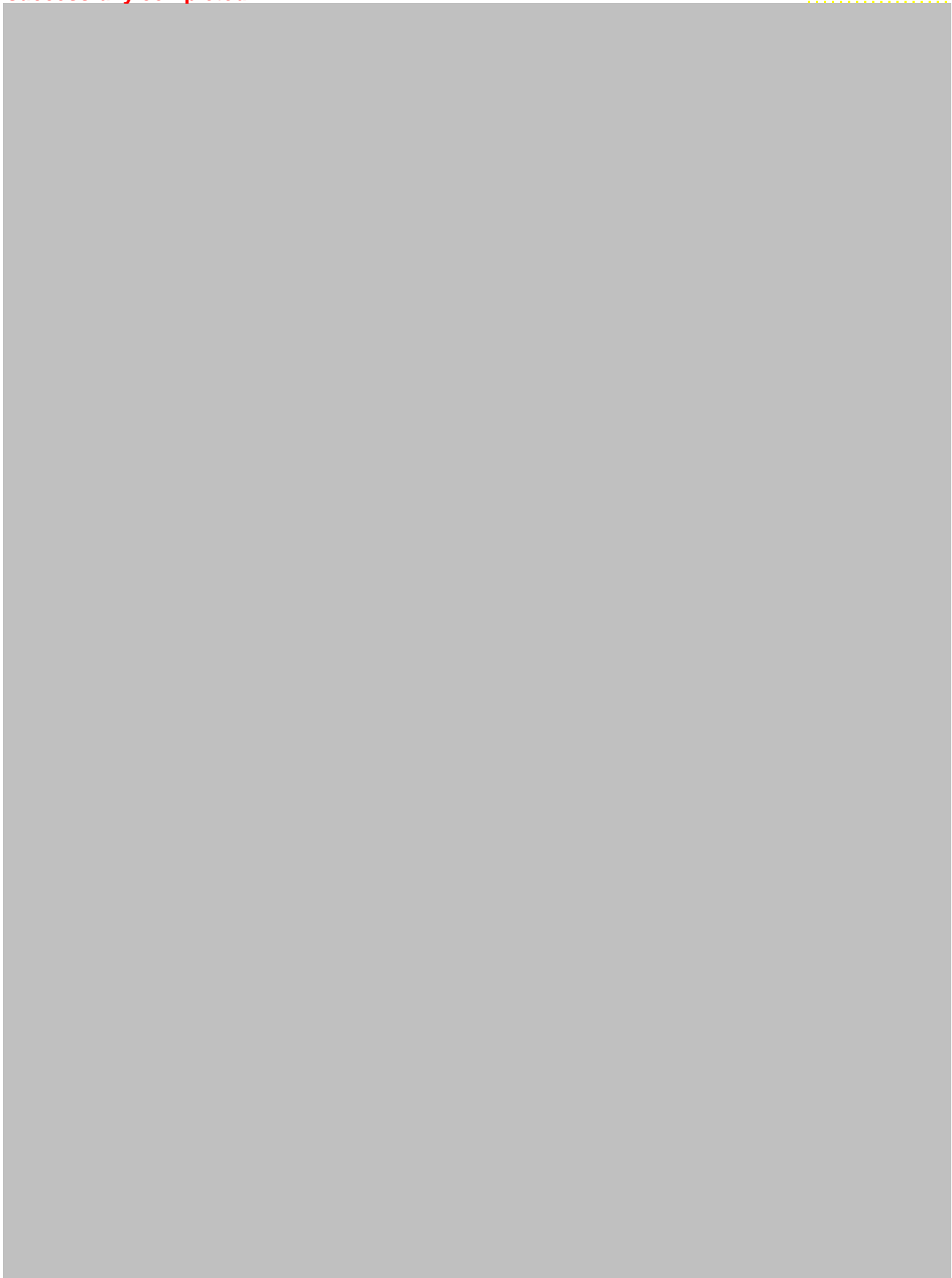
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**Other assessment methods**

The stocks of the main species of small pelagics in the gulf of the Lion are evaluated annually in July by acoustics (Survey PELMED). 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. Nevertheless some additional exploratory analysis based on the population at age estimates from the survey and the age composition of catches was presented the past year, but those results were considered too preliminary as to be adopted (see next page).

The solution chosen for 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. In the current assessment just a direct comparison of the level catches to the level of biomass of the stock was carried out.

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.
After a downward trend from 2001 peak until 2005 (18000 MT), anchovy biomass increased a little between 2005 and 2011 whith a positive trend and a mean of 26 000 tons.

**Biomass and landings of anchovy
in the gulf of Lion**
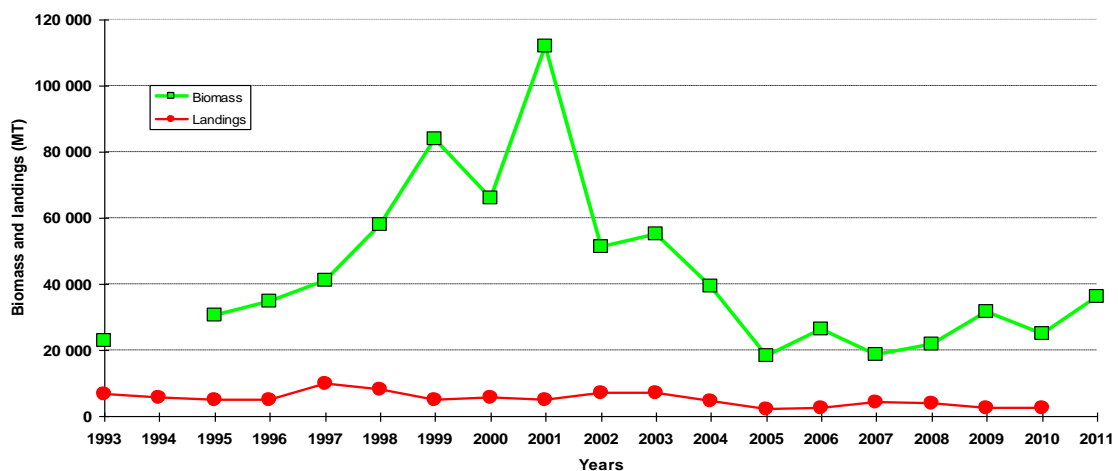
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Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B					
SSB					
F					
Y					
CPUE					
Catch/Ac	0.12				Average ratio of catches to Acoustic biomass for the last three years

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

○	? - (or blank) **Not known or uncertain**. Not much information is available to make a judgment;
○	U - **Underexploited, undeveloped or new fishery**. Believed to have a significant potential for expansion in total production;
○	M - **Moderately exploited**, exploited with a low level of fishing effort. Believed to have some limited potential for expansion in total production;
◉	F - **Fully exploited**. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;
○	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;
○	D - **Depleted**. Catches are well below historical levels, irrespective of the amount of fishing effort exerted;
○	R - **Recovering**. Catches are again increasing after having been depleted or a collapse from a previous;

Unidimensional (left side label)

Bidimensional

Exploitation rate	Stock abundance	
○ No or low fishing	○ Virgin or high abundance	○ Depleted
◉ Moderate fishing	○ Intermediate abundance	○ Uncertain / Not assessed
○ High fishing mortality	◉ Low abundance	
○ 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. In support of the catchability assumption it is worthwhile mentioning however that a DEPM carried out in June 2007 on the Gulf of lion by Palomera et al (2007) gave a spawning biomass of about 21000 t, a value very close to the acoustic biomass estimate provided by PELMED for that year.

The evolution of the biomass of this stock provided by acoustic is almost consistent with that being recorded in GSA06 by the acoustic survey (ECOMED in SGMED-09-02 June 2009 WG report) and to the analysis of catches in that area (VPA). Given the uncertainties about the potential connection of the anchovy population in these two GSA areas and the parallel decrease of anchovy biomass in the two regions, this hypothesis should be considered at a supra-GSA scale.

Updated indicators :

1) Stock :
    - Estimated total biomasses was 33,000 T in 2009, 25,000 T in 2010 and 36000 T in 2011 surveys. These biomasses levels were into the regular range of last part of the time series for the Gulf of Lion (between 20,000T and 35,000T in 2005-2011 period). Previously, it was a sequence with higher range of biomasses (1997 to 2004, 40,000 T to 80,000 T)
    - Modale length class progressively decrease since 2005 to 2011 to reach to 10-13 cm in 2009-2011 (vs 13-14.5 cm before)
    - Large anchovy (>15 cm) quasi disappear in 2009-2011, which are common during before 2007 (maximum length observed 18 cm in the gulf of Lion)

2) Fishery :
    - Exploitation rates of acoustic estimated biomasses were stable around 10%, except 18-20% for 2007-2008 years
    - Trawlers targeted fishes size >13 cm before 2007, corresponding to age 1 and 2, with annual variability. Current modal class was < 13cm from 2009. Age 0 was not targeted, except in 2007 (25% of landing)
    - Trawlers effort and catches were progressively reduced from 2005 to 2010, and almost stopped their activity. Current fishery effort on anchovy was limited to a exploratory activity. Catches were characterized by stable CPUE
    - From 2009, low commercial value for anchovy combined with mixed catches (small anchovy and small sprat) reduce the attractiveness for anchovy

3) Population, demographic and biological parameters obtained in 2009-2010 periods present some alterations:
    - More 60 % of biomasses was composed by age 1,
    - Age 1 in 2008-2009 do not produce abundances as high as expected for age 2 and 3 in 2009-2010 period;
    - Few fishes had survived after 2 years in 2010 (<1%) and larger anchovy (>14cm) are composed in more than 60% by females.
    - Condition index, growth rate, and size at first maturity decrease significantly and quickly these 3 last years.

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Management advice and recommendations*

The stock seems to be highy unbalanced in 2009, 2010 and 2011, with a very low abundance of commercial-sized anchovy (groups 2+). Even if total biomass was not very much lower than the average level of the last six years (20,000 – 25,000 T), most of the recorded biomass consisted of 1-group anchovy, and even these showed a mean size and condition factors appreciably below the values usually found for this stock.

The low market status and the low catchability of the anchovy in the gulf of Lions do not justify a high fishing pressure and this have allowed a low exploitation rate during the last two years, particularly in 2010. Historically the economic value of the anchovy is variable and is the main factor affecting the level of fishing effort. This value is currently low however an increase of the price could produce an increase of the exploitation on ages 1+ in the short term preventing the biomass of large spawners (2 +) to increase significantly.

The system of the Gulf of Lions shows important signs of desequilibrium since 2008, with important reductions and changes in structure of the stocks of sardine and anchovy, and an unusually high abundance of sprat.
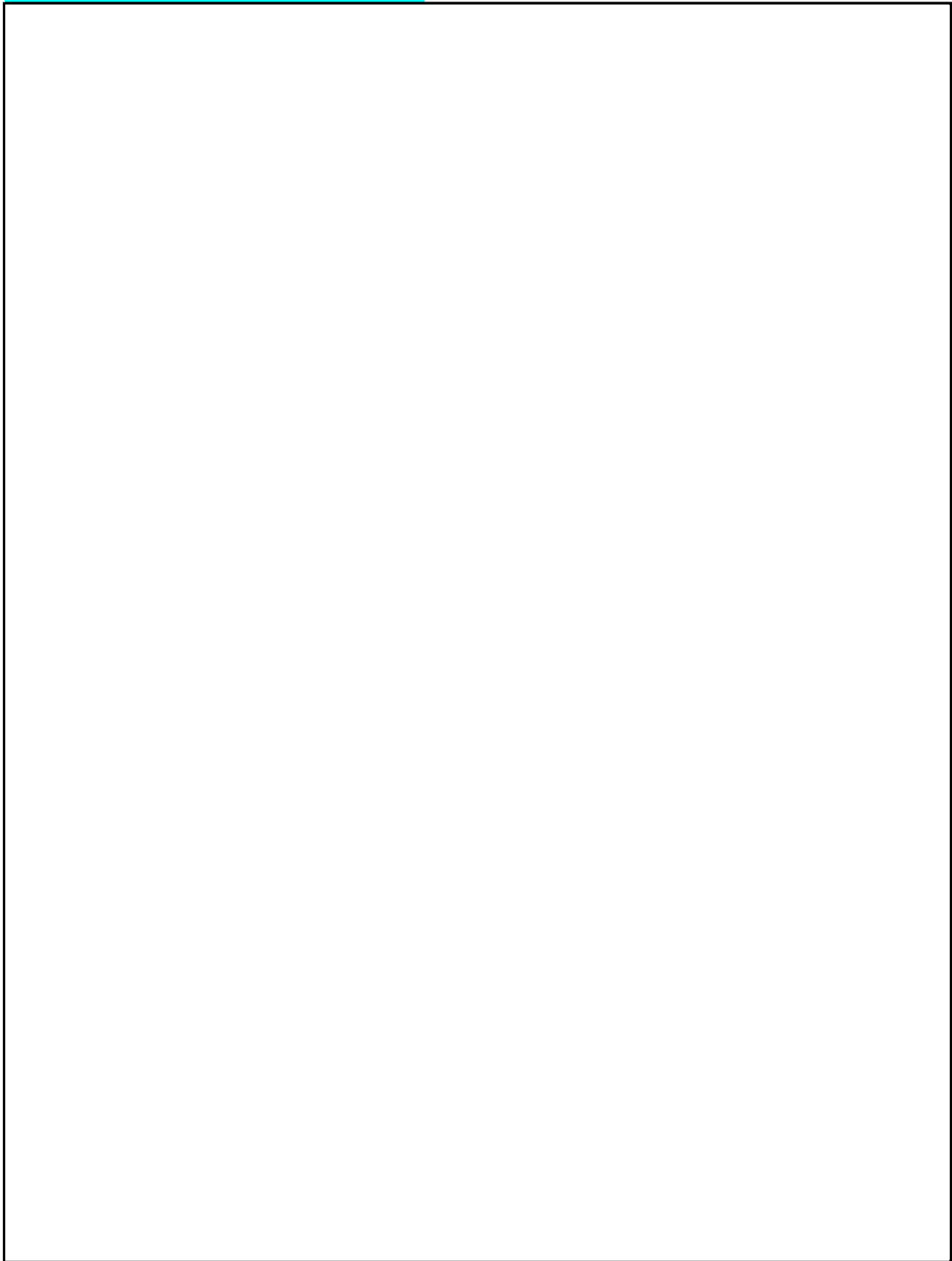
All these signs indicate that the production capacity of the stock, and its potential to sustain an economic activity, is severely hampered, and it is essential to allow it to recover, by preventing the addition of additional sources of mortality to this already depleted population.

Therefore, the WG recommends:
  Not to increase fishing effort.

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

Advice for scientific research*

Abstract for SCSA reporting

Authors   BIGOT Jean Louis, Jean Hervé BOURDEIX, David ROOS

Year   2011

Species Scientific name   Engraulis encrasicolus - ANE

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*

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

Exploitation rate

Moderate fishing mortality

Stock abundance

Low abundance

Comments

Management advice and recommendations*

Advice for scientific research*