

# Anchovy in Division 9a (ane.27.9a). 5) Surveys series.

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IPMA

Instituto  
Português  
do Mar e da  
Atmosfera

ICMAN  
Instituto de Ciencias Marinas de Andalucía

CSIC  
Consejo Superior de Investigaciones Científicas

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ICES  
CIEM

## Ane.27.9a. Stock assessment.

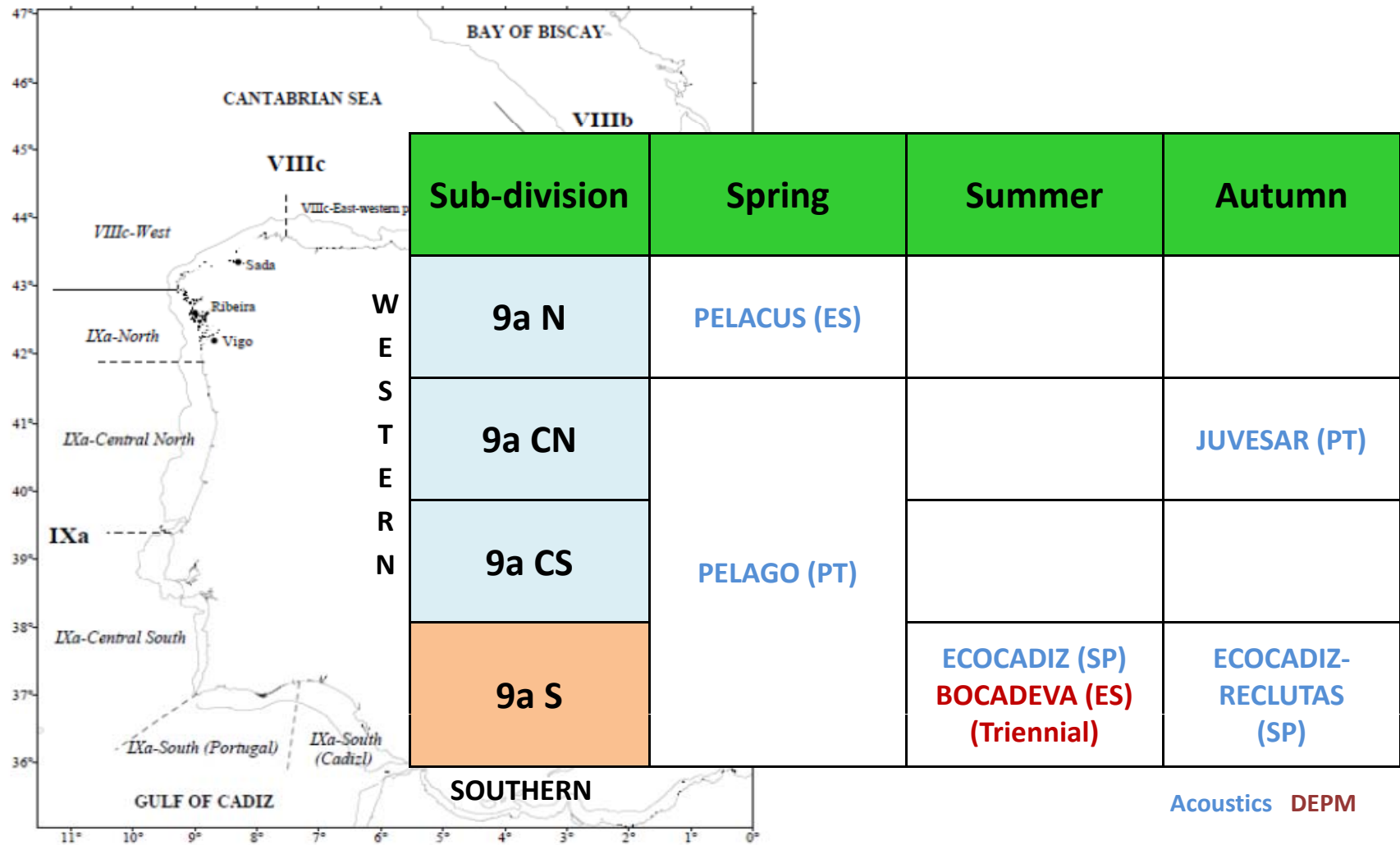
- No analytical assessment.
- Qualitative stock assessment: A survey biomass trend-based assessment (without catch advice). ICES Stock Data Category 3.

**Table 5** Anchovy in Division 9.a. Basis of assessment and advice.

ICES stock data category	3 ( <a href="#">ICES, 2016</a> ).
Assessment type	Survey based assessment without catch advice (ICES, 2017b)
Input data	Commercial landings, ages and length frequencies from landing sampling. <b>Survey indices for 9.a South: SAR Q2/PELAGO, ECOCADIZ, and BOCADEVA (triennial DEPM survey). Survey indices for 9.a West: acoustic spring surveys PELACUS (Subdivision 9.a North) and SAR Q2/PELAGO (Subdivision 9.a Central–North, Central–South)</b>
Discards and bycatch	Discard estimates are available for some fisheries since 2014 and are considered negligible.
Indicators	None.
Other information	JUVESAR and ECOCADIZ-RECLUTAS surveys have very short time-series at the moment. These surveys aim at obtaining recruitment indicators potentially useful for advice in the future.
Working group	Working Group on Southern Horse mackerel, Anchovy and Sardine ( <a href="#">WGHANSA</a> )

- A benchmark process will start in 2018:
  - Data Evaluation WK in December 2017: to fix data.
  - Benchmark WK in February 2018 (WKPELA 2018): to explore an analytical assessment (Gadget).

# Ane.27.9a. Pelagic surveys providing anchovy population estimates.



## Ane.27.9a. Pelagic surveys providing anchovy population estimates.

Method	Acoustics										DEPM	
Survey	PELACUS		SAR (Q1-Q2)/PELAGO		SAR (Q4)	JUVESAR	ECOCADIZ		ECOCADIZ-RECLUTAS	BOCADEVA		
Institute (Country)	IEO (Spain)		IPMA (Portugal)		IPMA (Portugal)	IPMA (Portugal)	IEO (Spain)		IEO (Spain)	IEO (Spain)		
Subareas	9a N		9a CN-9a S		9a CN-9a S	9a CN	9a S		9a S	9a S		
Year/Quarter	Q1	Q2	Q1	Q2	Q4	Q4	Q2	Q3	Q4	Q2	Q3	
1998					Nov							
1999			Mar									
2000					Nov							
2001			Mar		Nov							
2002			Mar									
2003			Feb		(Nov)							
2004				(Jun)			Jun					
2005				Apr	(Nov)					Jun		
2006				Apr	(Nov)		Jun					
2007				Apr	Nov			Jul				
2008		Apr		Apr	(Nov)					Jun		
2009		Apr		Apr			Jun		(Oct)			
2010		Apr		Apr				(Jul)				
2011		Apr		Apr							Jul	
2012		Apr							Nov			
2013	Mar			Apr		(Nov)		Aug				
2014	Mar			Apr		(Nov)		Jul	Oct		Jul	
2015	Mar			Apr		Dec		Jul	Oct			
2016	Mar			Apr		Dec		Jul	Oct			
2017	Mar			Apr				Jul			Jul	

**2008-2017:** period with spring estimates (*PELACUS* & *PELAGO*) for the whole Division. One gap in 2012.

*ECOCADIZ* series (summer estimates) shows gaps in 2008, 2011 and 2012.

*BOCADEVA* series (DEPM summer estimates) filled the gaps in 2008 and 2011.

## ***Ane.27.9a. Surveys methods. Surveys' Standardisation.***

**ICES Working Group on Acoustic and Egg Surveys for Sardine and Anchovy in areas 7, 8 and 9 (WGACEGG). Since 2005 on.**

### **Relevant ToRs:**

- Coordination and standardization of the surveys (updated surveys protocols).
- Development and standardization of data processing methods for DEPM and acoustics for surveys in Atlantic and Mediterranean waters (MEDIAS group : Mediterranean acoustic survey group).
- Ensure QA/QC (Quality Assurance/Quality Control) procedures are in place: Develop an independent SISP (Series of ICES Surveys Protocols) for the data collection and product specification conducted under the auspices of WGACEGG (in progress).

*Ane.27.9a. Surveys methods. Vessels.*



*RV Cornide de Saavedra (IEO\_ES)*



*RV Noruega (IPMA\_PT)*



*RV Thalassa (IFREMER\_FR)*



*RV Conhecimento (IPMA\_PT)*

Many different vessels



*RV Miguel Oliver (SGP\_ES)*



*RV Emma Bardán (SGP\_ES)*



*RV Ramón Margalef (IEO\_ES)*

## Ane.27.9a. Surveys methods. Vessels.

Year/survey	PELACUS	SAR (Spring)/PELAGO	ECOCADIZ	BOCADEVA	SAR (Aut)	JUVESAR	ECOCADIZ-RECLUTAS
1983							
1984							
1985							
1986	CS	NR					
1987	CS						
1988	CS	NR					
1989							
1990	IP						
1991	CS						
1992	CS						
1993	CS						
1994							
1995	NR	NR					
1996	CS						
1997	TH	NR					
1998	TH	NR			NR		
1999	TH	NR			NR		
2000	TH	NR			NR		
2001	TH	NR					
2002	TH	NR					
2003	TH	NR			NR		
2004	TH		CS				
2005	TH	NR		CS	NR		
2006	TH	NR	CS		NR		
2007	TH	NR	CS		NR		
2008	TH	NR		CS	NR		
2009	TH	NR	CS				
2010	TH	NR	CS				
2011	TH	NR		CS			
2012	TH						EB
2013	TH	NR	CS		NR		
2014	MO	NR	MO	MO	NR		RM
2015	MO	NR	MO		NR		RM
2016	MO	NR	MO		NR		RM
2017	MO	NR	MO	MO			RM

CS: Cornide de Saavedra

EB: Emma Bardán

IP: Ignat Pavliuchenkov

MO: Miguel Oliver

NR: Noruega

RM: Ramón Margalef

TH: Thalassa

Vessels' replacements through the series

Standardisation phase

2nd Systematic phase. Includes 9a S (CAD)

Consolidation phase

PELAGO surveys

## *Ane.27.9a. Surveys methods. Equipment (most recent)*

	NORUEGA	CORNIDE DE SAAVEDRA	THALASSA	MIGUEL OLIVER	RAMÓN MARGALEF
<b>Launch. year</b>	1978	1970	1997	2007	2011
<b>Length (m)</b>	47.50	66.70	73.65	70.00	46.70
<b>Beam (m)</b>	13.75	11.25	14.90	14.40	10.50
<b>GRT (t)</b>	693	1113	2803	2495	988
<b>Main engine</b>	n.a	Combustion (2 engines)	Diesel-electric	Diesel-electric	Diesel-electric
<b>Power</b>	1500 HP	1500+750 HP	2000 kW	2000 kW	900 kW
<b>Propeller</b>	n.a	Controllable-pitch (CPP)	Fixed-pitch (FPP)	Fixed-pitch (FPP)	Fixed-pitch (FPP)
<b>Transducers</b>	Hull mountd.	Hull mountd.	Hull mountd.	Hull mountd.	Hull mountd.
<b>Fishing gear</b>	Pelagic trawl; Bottom trawl	4 sides-pelagic trawl; Bottom trawl	Pelagic-great meshes	Pelagic-great meshes	Pelagic-Gloria HOD
<b>Doors</b>	n.a	SuberKrubb	Morgère	Apollo Poly-Ice	Apollo Poly-Ice
<b>Echosounder</b>	EK-500 38 kHz	EK-60 18/38/120/200 kHz (since 2007)	EK-60 18/38/70/120/200 kHz	EK-60 18/38/120/200 kHz	EK-60 18/38/70/120/200 /333 kHz

**Single frequency vs Multi-frequency echo-sounding**



## ***Ane.27.9a. Inter-calibration (IC) exercises.***

- **(2002: RV *Cornide de Saavedra* vs *Vizconde de Eza*: Not relevant.)**
- **2008 & 2009: RV *Thalassa* vs RV *Noruega* (*PELACUS* vs *SAR-PELAGO*): Results were considered as not conclusive (very few fishing hauls, potential sources of bias needed to be evaluated). Pending a new IC exercise?.**
- **2014: RV *Thalassa* vs RV *Miguel Oliver* (*PELACUS*): No significant between-vessels differences in mean backscattering energy, catch composition and length structure. It was concluded that *PELACUS* time-series was not affected by the change from *Thalassa* to *Miguel Oliver*.**

## ***Ane.27.9a. Inter-calibration (IC) exercises.***

### ***RV Miguel Oliver vs RV Noruega??***

*PELACUS vs SAR-PELAGO* inter-series comparability is still unknown.

### ***RV Cornide de Saavedra vs RV Miguel Oliver ???***

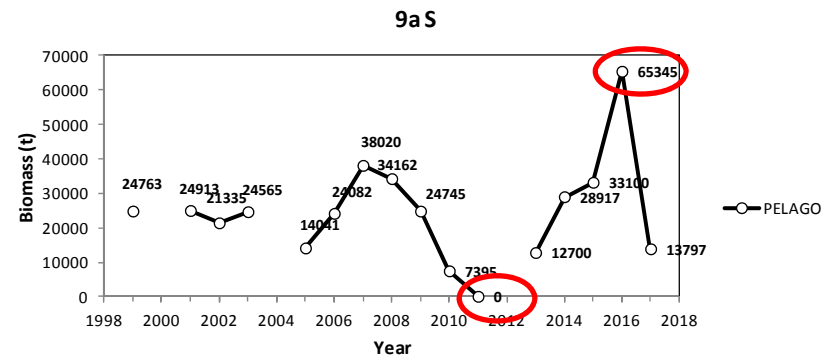
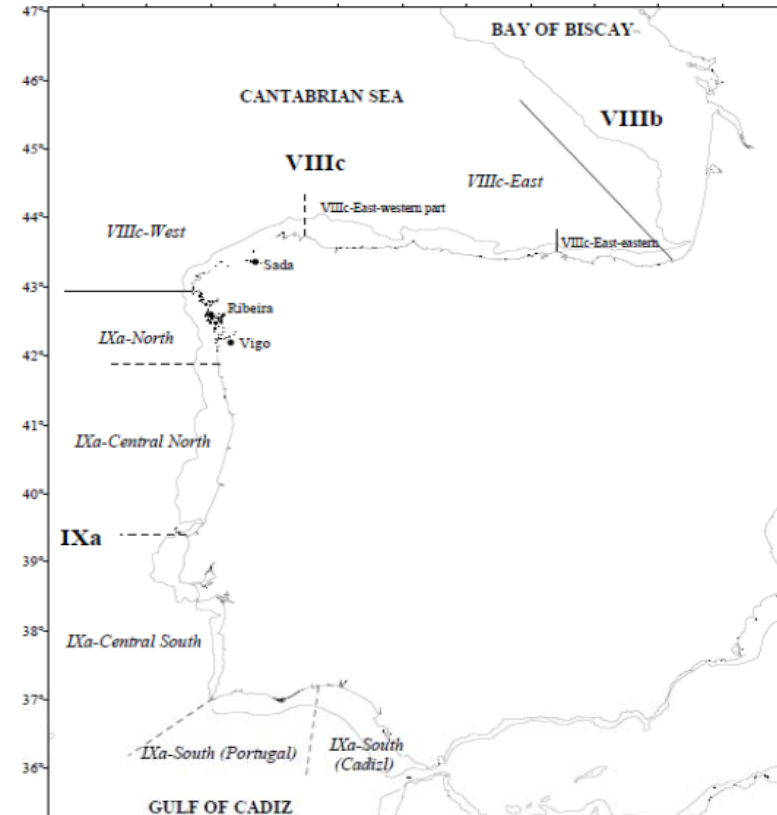
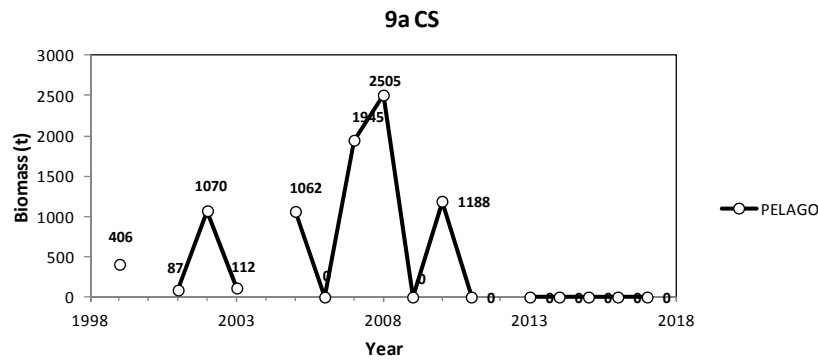
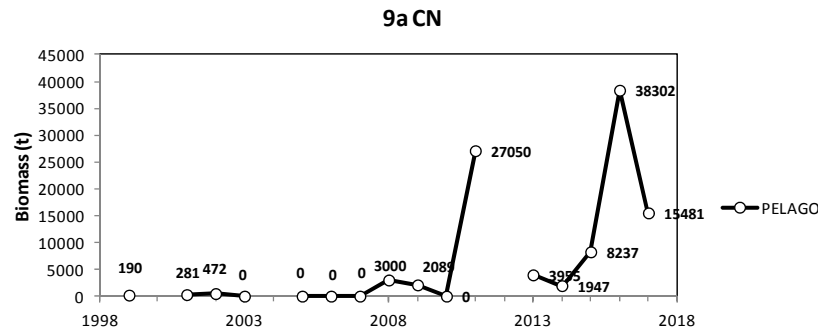
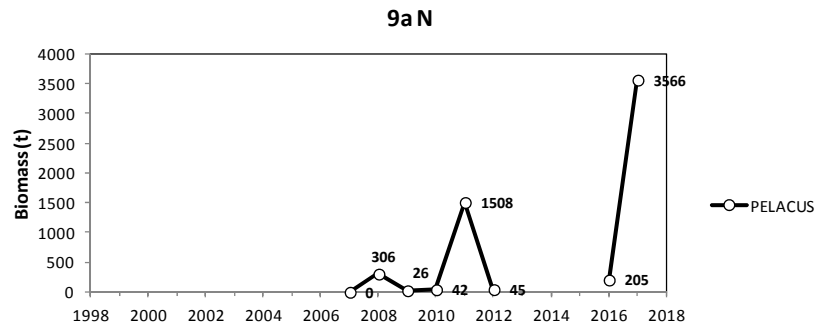
Intra-series consistency of the *ECOCADIZ* series will remain unknown. *RV Cornide de Saavedra* → “RIP”

### ***RV Cornide de Saavedra vs RV Noruega ???***

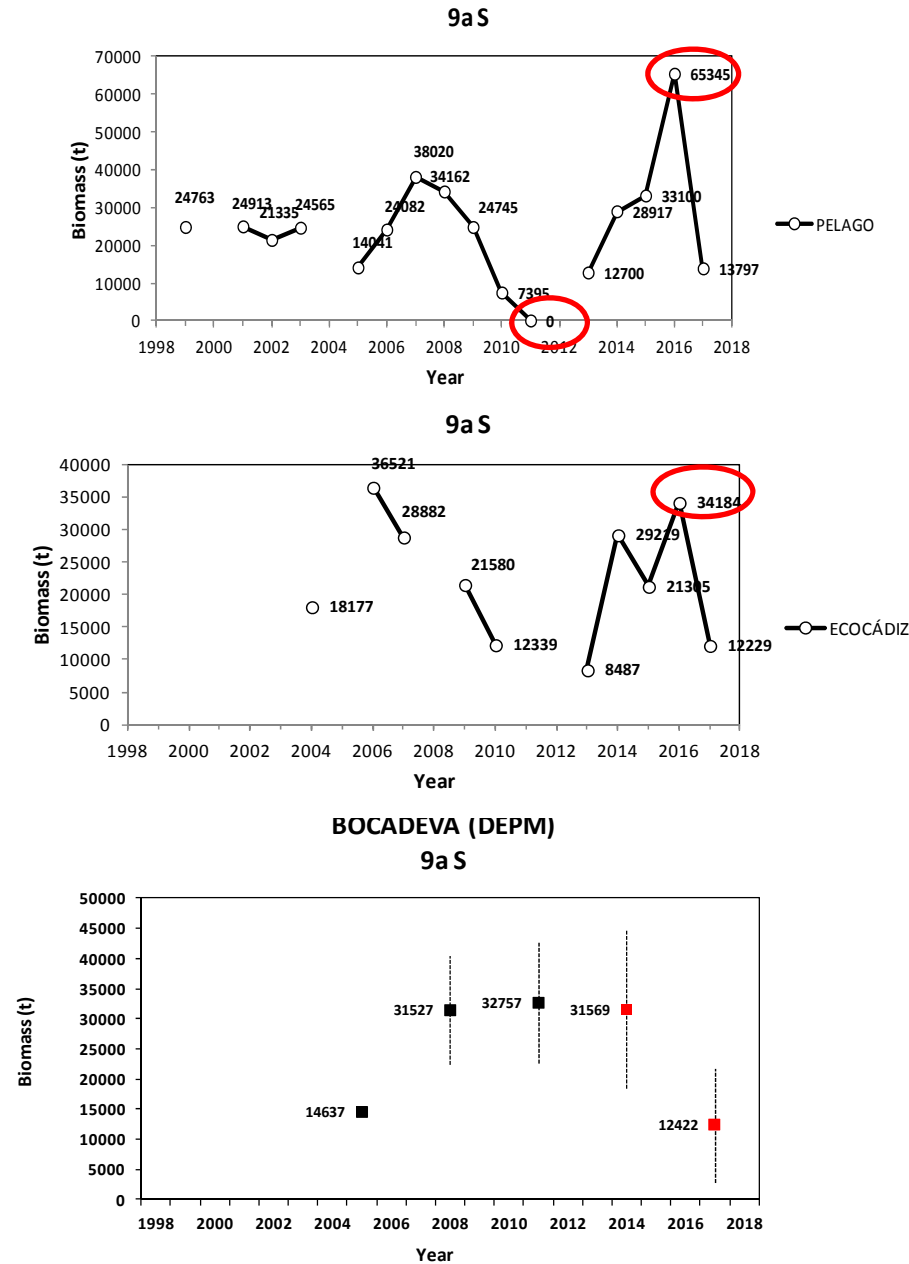
### ***RV Miguel Oliver vs RV Noruega ???***

*SAR-PELAGO vs ECOCADIZ* inter-series comparability and relative catchabilities are unknown.

## Ane.27.9a. Surveys trends. Spring acoustic surveys.



## Ane.27.9a. Surveys trends. Southern summer surveys.



- Do spring and summer surveys series exhibit similar trends in GoC or not?
- Causes for differences:
  - Strong anchovy dynamics? Possible.
  - Survey season/Time effect? 3-4 month lag. Sure.
  - Cumulated total mortality from spring to summer? Sure.
  - Differences in catchability? Probable but not assessed.
  - Problems in the detection of echoes? Sure. Very difficult in the Southern Spanish waters.
- What should be then the role to be played by the summer surveys in the trend-based analyses?...As an independent tester of the spring estimate? As a “smoothing agent”?

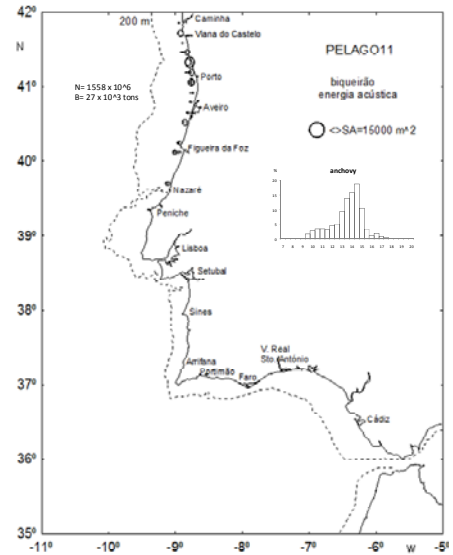
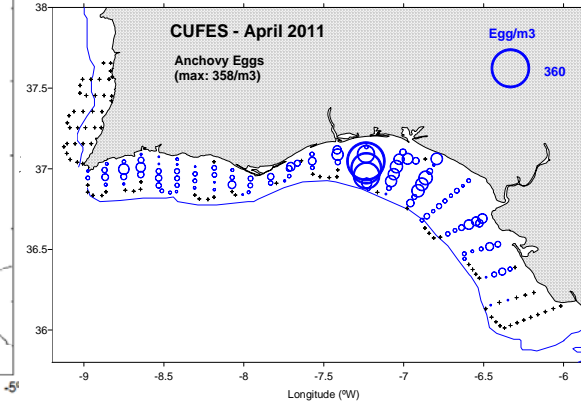
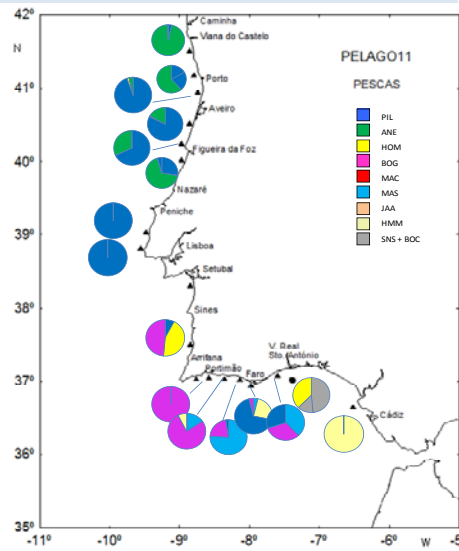
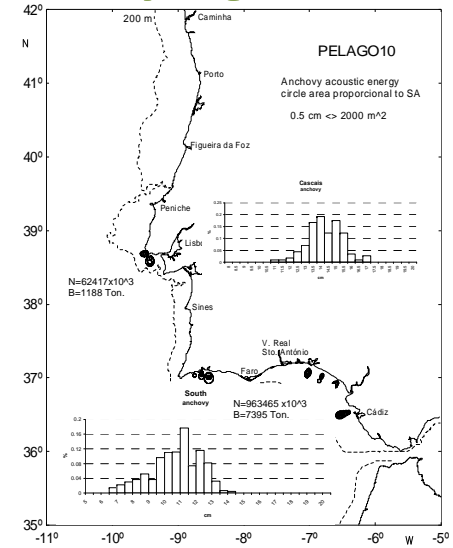
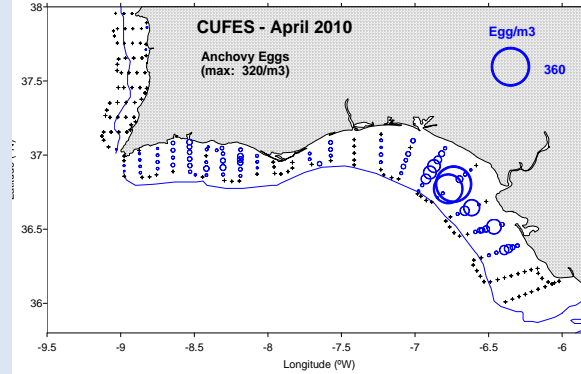
# Ane.27.9a. Shortcomings in the 9a South acoustic surveying.

- **PELAGO 2011:**

- ✓ 0 anchovies in the 9a S.
- ✓ No acoustic detection.
- ✓ No occurrence in fishing hauls...but
- ✓ A relatively high anchovy egg density by CUFES.
- ✓ Very bad weather conditions affecting echosounding and fishing?

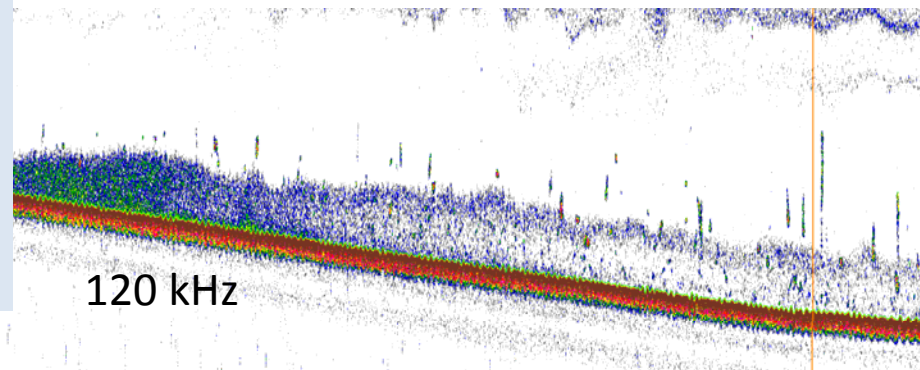
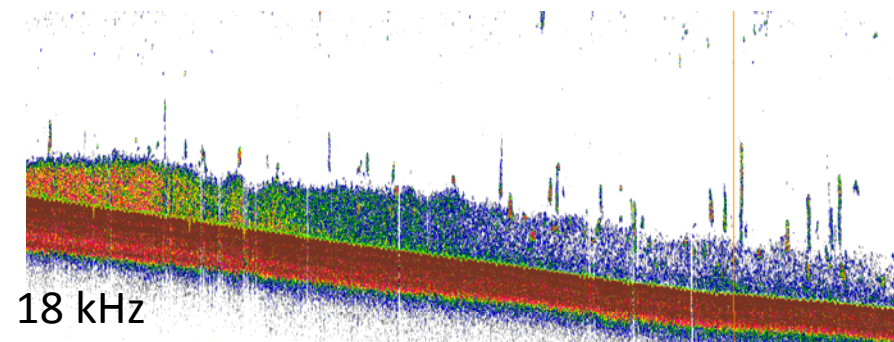
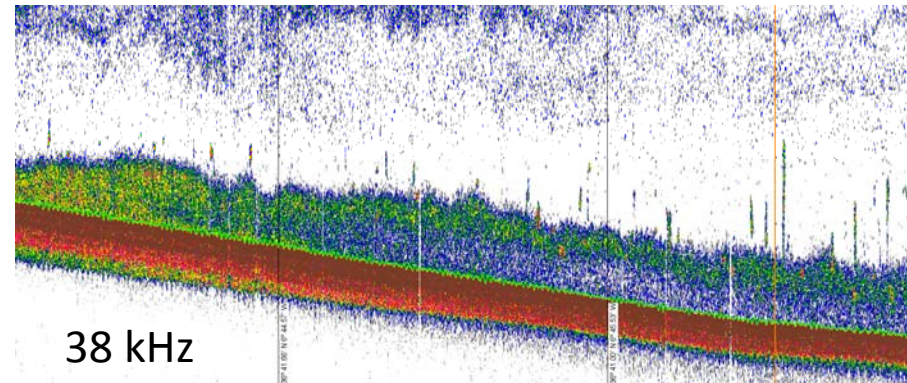
- How to handle this data point within its series?

- ICES WGACEGG 2017 : the **PELAGO 2011** estimate for 9aS should not be considered.



## *Ane.27.9a. Shortcomings in the 9a South acoustic surveying.*

- Discrimination of echo-traces very difficult in the Spanish waters of the Gulf of Cadiz.
- Anchovy schools are usually found embedded in a very dense (demersal) plankton layer. This layer may continuously extend over the inner-middle shelf of the central part of the CAD area.
- Advantages of using multi-frequency echo-sounding. Greater discriminatory power. It improves the echogram "lecture".
- *PELAGO* surveys with the 38 kHz only.



## ***Ane.27.9a. Computation of Stock (Biomass) Size Indicators.***

• **Western component** (9aN-9aCN-9aCS) : **SUM** of spring acoustic estimates from *PELACUS* + *PELAGO* surveys.

• **Southern component** (9aS) : **MEAN** of *PELACUS* spring acoustic estimate & *ECOCADIZ* summer acoustic estimate & *BOCADEVA* summer depm estimate .

Rationale (under the –strong- assumption of equal catchabilities):

- Uncertainties /difficulties found in the acoustic assessment of the 9aS(CAD) in some years (e.g. the 2011 outlier estimate and the 2016 historical record reported by *PELAGO* for 9aS).
- Gaps in the *ECOCADIZ* series, filled triennially by *BOCADEVA*.
- Searching for a way of achieving an “average picture” of the population level.

Problems:

- In the moment of the provision of advice by ICES (late June), summer surveys estimates are not yet available. The resulting indicator for the assessment year is incomplete, computed only with the *PELAGO* spring estimate. The value for that year is then re-computed in the next year meeting with all the estimates available. Not a very consistent approach.
- Serious doubts about the suitability of this computation method. A strange cocktail. Data points through the series are estimated with a different number of surveys depending on their availability.

**-In fact.....**

## ***Ane.27.9a. Computation of Stock (Biomass) Size Indicators.***

**ICES ADGANE9a (18-19/10/2016). ADG minutes:**

*“...The main concern from ADG members and reviewers was the way the survey biomass estimates were combined to reach a total estimate of biomass for Division 9.a. The method used to combine the available indices had not been presented before within the advice sheet for this stock and had not been previously used to provide advice. It was a general feeling within ADG members that the agreement on a method to combine the different survey estimates should be carefully considered and reviewed through a full benchmark process before it is used to provide advice. **ADGANE9.a recommends WGHANSA to look at methods to combine survey indices for each stock components and the way to address the western and the southern component of this stock in its next WGHANSA meeting...**”*



## Ane.27.9a. Computation of Stock (Biomass) Size Indicators.

Year	Western component	Southern component		Division 9.a	
	PELACUS+PELAGO	PELAGO	PELAGO+ECOCADIZ+BOCADEVA	PELACUS+PELAGO	Western Comp (PELACUS+PELAGO) + Southern Comp (Avgd PELAGO+ECOCADIZ+BOCADEVA)
	9.a N to 9.a CS	9.a S	9.a S	9.a N to 9.a S	
	SUM OF ESTIMATES	ESTIMATE	MEAN ESTIMATE	SUM OF ESTIMATES	
1999	596	24763	24763	25359	25359
2000					
2001	368	24913	24913	25281	25281
2002	1543	24535	24535	22877	22877
2003	152	24555	24555	24677	24677
2004			18177		18177
2005	1062	14041	14339	15103	15401
2006		2482	3002	4032	30301
2007	1945	38020	33451	59965	35396
2008	5811	34162	32845	39973	38655
2009	2115	24745	23163	26860	25278
2010	120	95	9867	8625	11097
2011	28558	0	16379	28558	44937
2012					
2013	4284	12700	10593	16655	14548
2014	1947	28917	29902	30864	31849
2015	8237	33100	27203	41337	35440
2016	38507	65345	49764	103852	88272
2017	19047	13797	12816	32844	31863

Alternative? The spring estimates only?

## ***Ane.27.9a. Computation of Stock (Biomass) Size Indicators.***

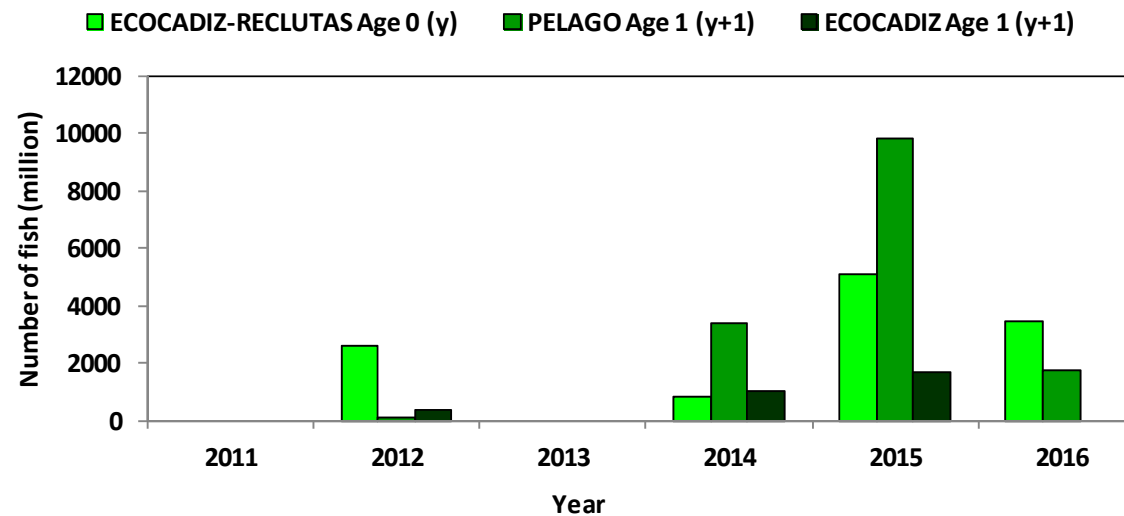
### **ICES WGACEGG 2017 (13-17/11/2017) suggestions:**

- *PELAGO 2011* estimate for 9a S should not be considered.
- The sum of *PELACUS* (9aN) and *PELAGO* (9aCN-9aCS) estimates to derive the Stock Size Indicator for the western component in the trend-based qualitative assessment is possible (as it is done with the Ibero-Atlantic sardine).
- Averaging the *PELAGO* and *ECOCADIZ* survey estimates to derive the Stock Size Indicator for the southern component in the trend-based qualitative assessment is possible since we're dealing with relative indices and trends.
- However, the DEPM *BOCADEVA* estimate should be not included in the average.
- Some problems still persist for the southern component stock indicator following the above approach :
  - It is based on one only estimate (*PELAGO* estimate) in the assessment year.
  - It is based on one only estimate (*PELAGO* estimate) is some years in the series, when *ECOCADIZ* was not conducted.

## *Ane.27.9a. Autumn acoustic surveys.*

- *JUVESAR* series: In 9a CN. Since 2013 on.
- *ECOCADIZ-RECLUTAS* series: In 9a S. Since (2012) 2014 on.
- Both are very short time-series at the moment. These surveys aim at obtaining recruitment indicators potentially useful for advice in the future.

**Age 0<sub>(y)</sub> vs Age 1<sub>(y+1)</sub> anchovies in 9a S**



## ***Ane.27.9a. Surveys indices for consideration in an analytical-statistical assessment.***

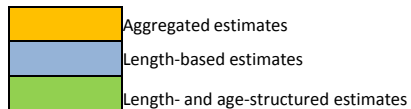
- So far all the acoustic surveys series provide population estimates without a measure of bias.
- DEPM-BOCADEVA SSB estimates are provided with a CV estimate.
- Size composition (LFD) of the estimated population in numbers and biomass are available from all the acoustic surveys.
- Age-structured estimates are available for the whole series of *PELACUS* (spring in 9a N), *ECOCADIZ* (summer in 9a S), *JUVESAR* (autumn in 9a CN) and *ECOCADIZ-RECLUTAS* (autumn in 9a S) acoustic surveys series. Age structure from *PELAGO* (spring in 9a CN, 9a CS, 9a S) are provided since 2013 on.
- DEPM-BOCADEVA SSB estimates are provided without size composition and age structure.

## Ane.27.9a. Surveys indices for consideration in an analytical-statistical assessment.

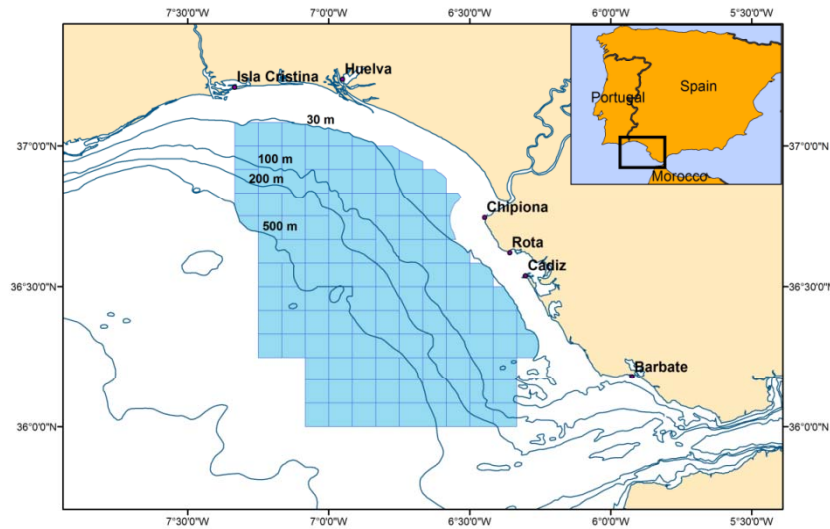
SURVEY	SUB-DIVISION	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
PELACUS	9a N																											
	9a CN																											
PELAGO	9a CS																											
	9a S (ALG)																											
	9a S (CAD)																											
	9a S (ALG)																											
ECOCADIZ	9a S (ALG)																											
	9a S (CAD)																											

SURVEY	SUB-DIVISION	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
BOCADEVA	9a S (ALG & CAD)																											

SURVEY	SUB-DIVISION	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
SAR (AUT)	9a CN																											
	9a CS																											
	9a S (ALG)																											
	9a S (CAD)																											
JUVESAR	9a CN																											
ECOCADIZ-RECLUTAS	9a S (ALG)																											
	9a S (CAD)																											



## ***Ane.27.9a. Surveys indices for consideration in an analytical-statistical assessment. Potential of the ARSA (autumn) bottom-trawl indices.***



- ARSA autumn survey = IBTS survey in Spanish GoC (9a S (CAD)).
- Long series : since 1997 on.
- Relative indices (cpue): number and g/trawling hour).
- Absolute indices (swept area method).
- Estimates of bias.
- Size-based estimates of the abundance relative index. LFDs for the absolute index not provided but may be computed.
- Age-structured estimates are not provided but may be computed (by applying Q4 lab+surveys ALK).

- Indices for Age 0 (juveniles) anchovies may be estimated. A longer series than the *ECOCADIZ-RECLUTAS* survey series. Its potential as an indicator of the anchovy recruitment not tested yet but it seems promising.