

Anchovy in Division 9a (ane.27.9a). Overview.

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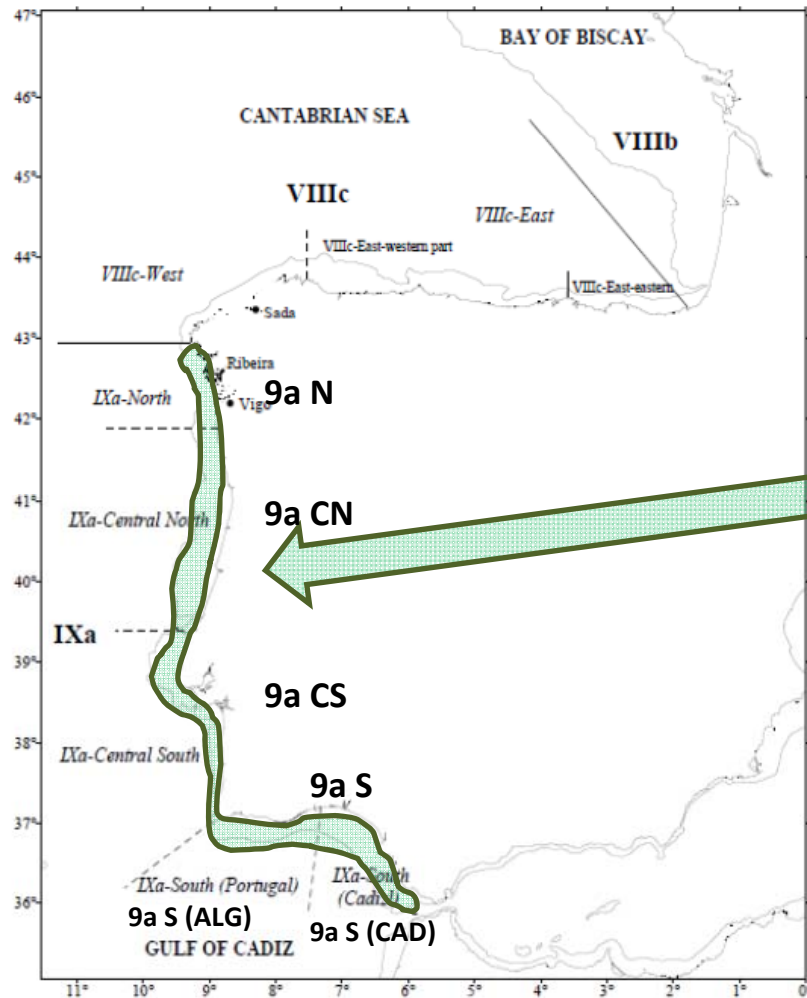
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ICES WKPELA-2018 Data Evaluation Workshop. ICES HQ. Copenhagen, 04-06 December 2017.



Ane.27.9a. Stock identity and structure.



For management purposes, the European anchovy present in the Atlantic is separated in two distinct stock units:

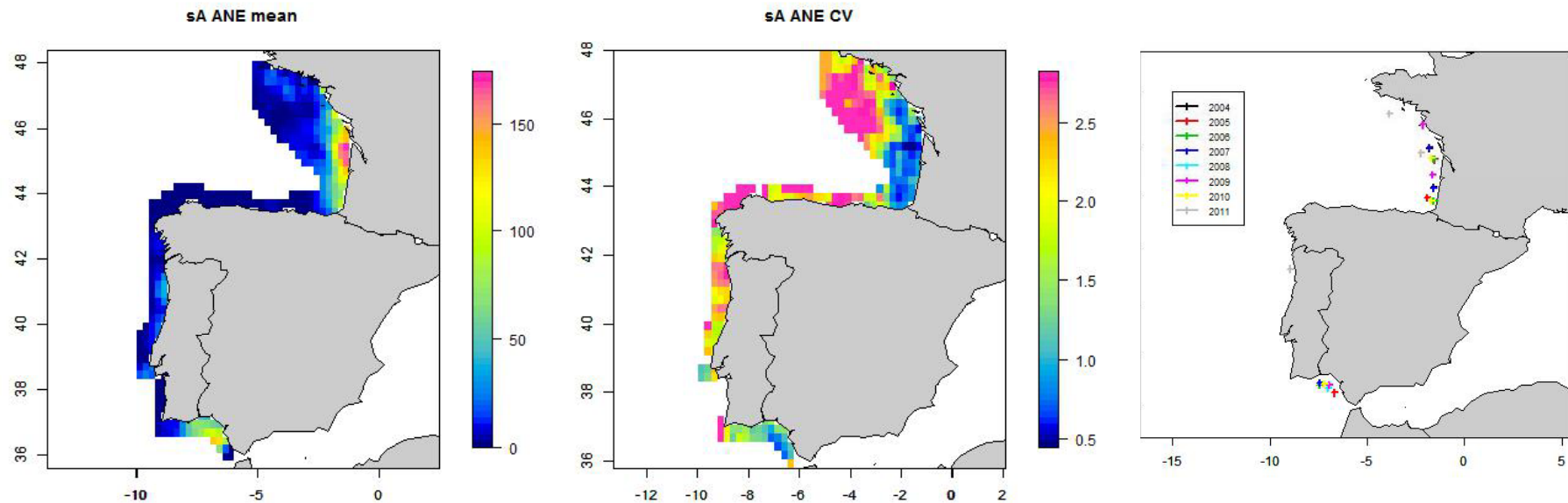
-ane.27.8. Bay of Biscay anchovy (BoB, ICES Sub-Area 8).

- ane.27.9a. Anchovy in Division 9a (ICES Division 9a: Spanish Galician coast, Portuguese coast and Spanish waters of the Gulf of Cadiz, GoC).

- (Originally) The stock limits were essentially based on administrative considerations.

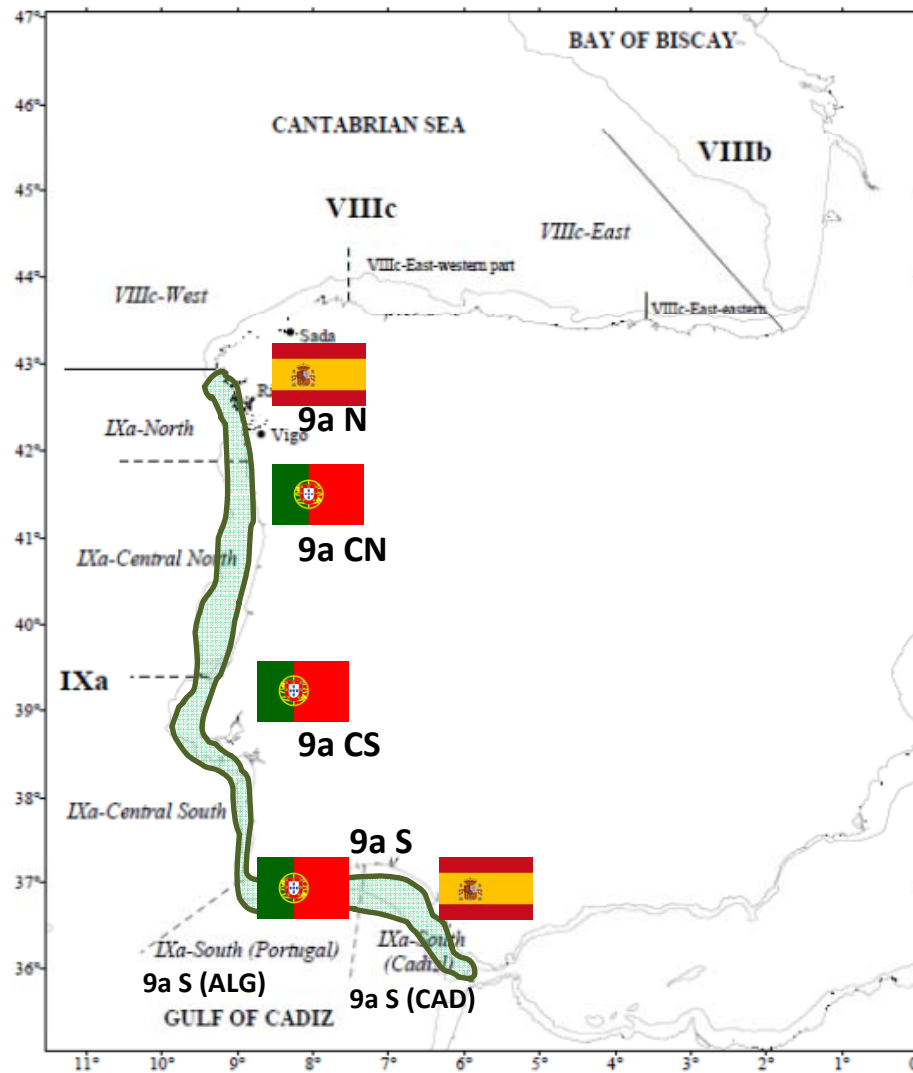
- Both the homogeneity of the ane.27.9a stock and the extent of mixing between the two stocks is still uncertain.

Ane.27.9a. Anchovy spatial distribution.



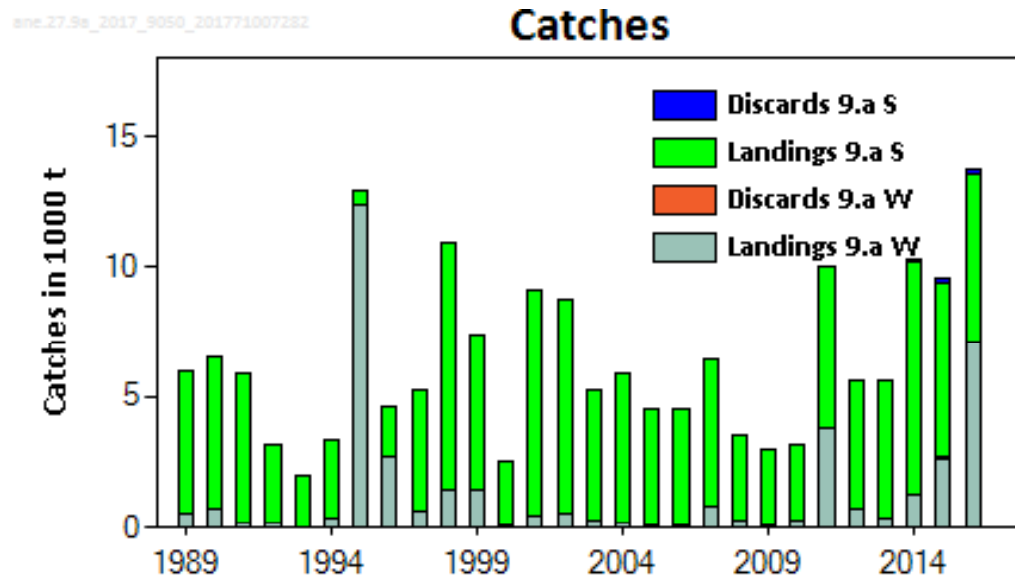
- **Core habitats** (areas of recurrent highest concentration & low CVs & gravity centers):
 - French shelf south of 47°N, close to the Gironde estuary (45°N, ICES Sub-area 8b).
 - Spanish waters of the GoC (ICES Sub-division 9a South, 9a S (CAD)). Highly recurrent gravity centers.
- **Secondary habitats** (areas of medium to low mean abundances & high CVs):
 - North of BoB (47°N).
 - North of Portugal (41°N)
- Others locations: Northern Spain and NW BoB are areas of a very low mean abundance and high inter-annual variability.

Ane.27.9a. Spatial distribution of the fishery.



- Ane_27_9a:
International fishery harvested by Spain (9a N and 9a S (CAD)) and Portugal (9a CN-CS-S (ALG))

Ane.27.9a. Recent series of Landings/Discards/Catches.



- The bulk (> 80% on average) of the fishery in 9a S (CAD). Peaks in landings in the West only when anchovy is abundant there (sardine is historically the target species).
- Purse-seine (PSP_SPF_0_0_0): the main responsible for the anchovy fishery (c.a. >95% catches on average).
- Discards (by PS, OBT) may be considered negligible through the Division. Notwithstanding the above, they are estimated and summed to landings to provide catches since 2014 on.

Ane.27.9a. Fishery data. Length (LFD) sampling. Data availability.

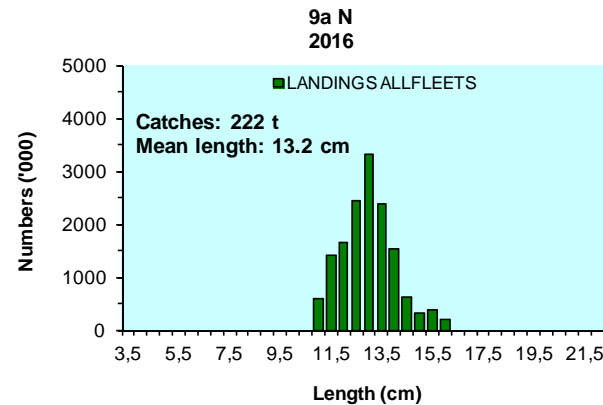
		SUB-DIV	QUARTER	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
W	9a N	Q1																														
		Q2																														
		Q3																														
		Q4																														
	9a CN	Q1																														
		Q2																														
		Q3																														
		Q4																														
	9a CS	Q1																														
		Q2																														
		Q3																														
		Q4																														
9a S (ALG)	Q1																															
	Q2																															
	Q3																															
	Q4																															
9a S (CAD)	Q1																															
	Q2																															
	Q3																															
	Q4																															

SARDINE is the target species. Anchovy is not a priority fishing species (unless it is abundant).

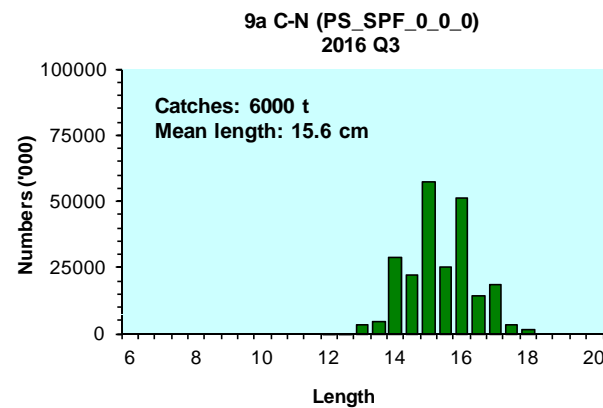
ANCHOVY is the target species.

- Coverage and intensity of the length sampling of landings is very variable through the Division and depends on the resource availability and commercial interest.
- LFDs sampled on a monthly basis, but are provided by subdivision/quarter/métier to ICES WGHANSA.

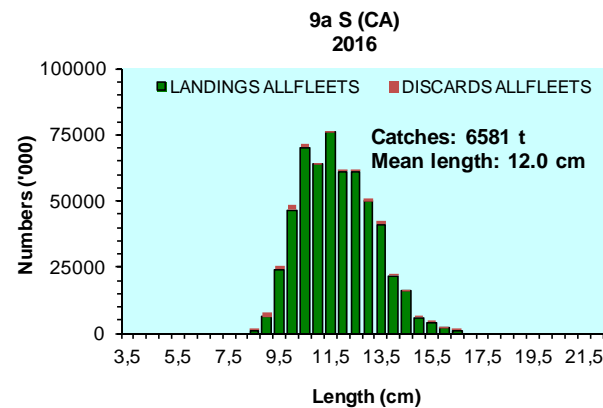
Ane.27.9a. Fishery data. Length (LFD) sampling. A recent example.



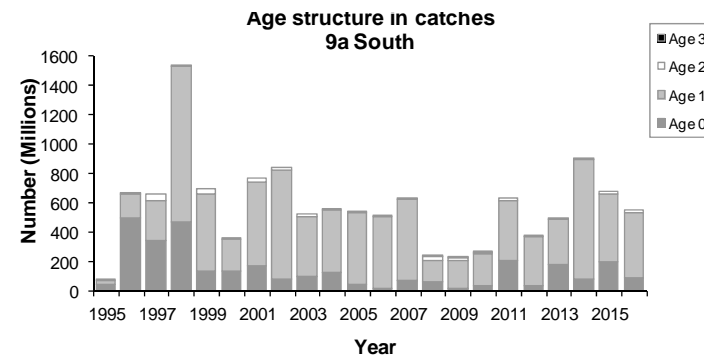
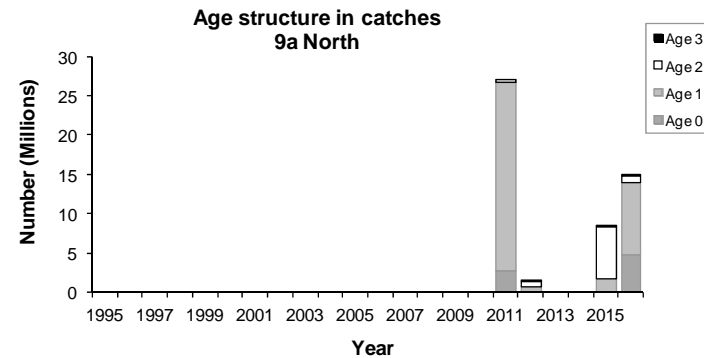
- North-western anchovies in the Division are larger than their southern relatives.



- Minimum landing size:
 - 9a N (ES), 9a CN-9a CS-9a S (PT): **12 cm.**
 - 9a S (ES): **10 cm.**

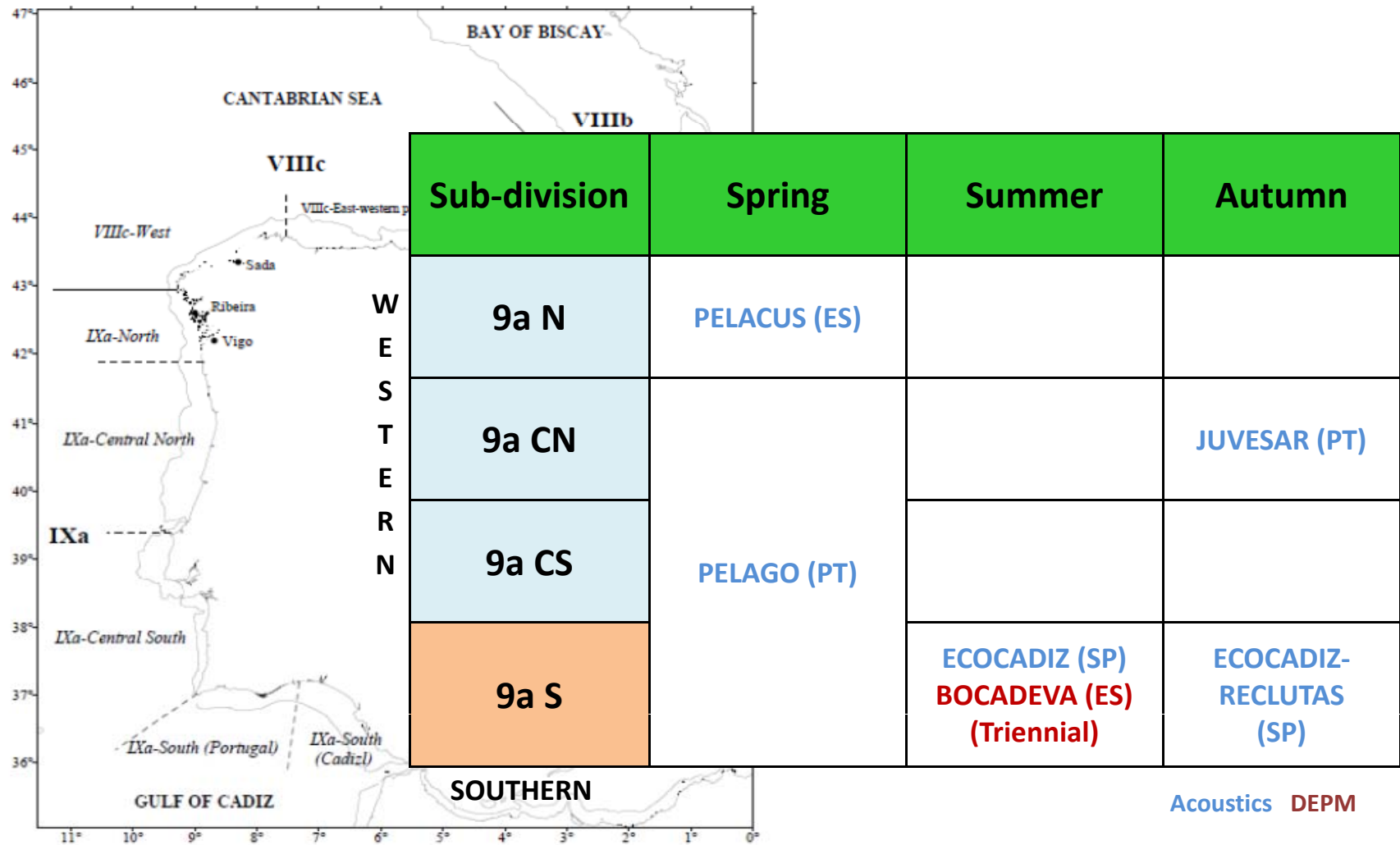


Ane.27.9a. Fishery data. Age sampling. Age structure of catches.



- Only available for the fishery in the 9a N and 9a S (CAD) subdivisions.
- Age 0 to Age 3 present in the fishery.
- The bulk of the fishery composed by (mainly) Age 1 and Age 0 groups. Age 2+ are incidental.
- Northern anchovies are larger and heavier than southern ones for the same age.

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.

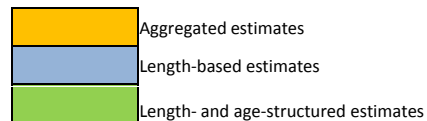
BOCADEVA series (DEPM summer estimates) filled the gaps in 2008 and 2011.

Ane.27.9a. Pelagic surveys providing anchovy population estimates. Data availability.

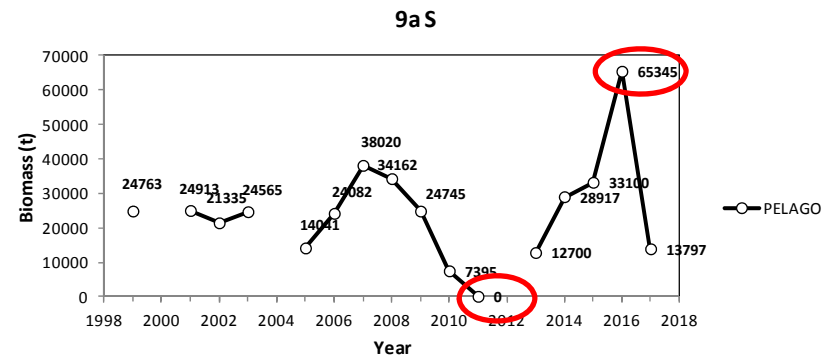
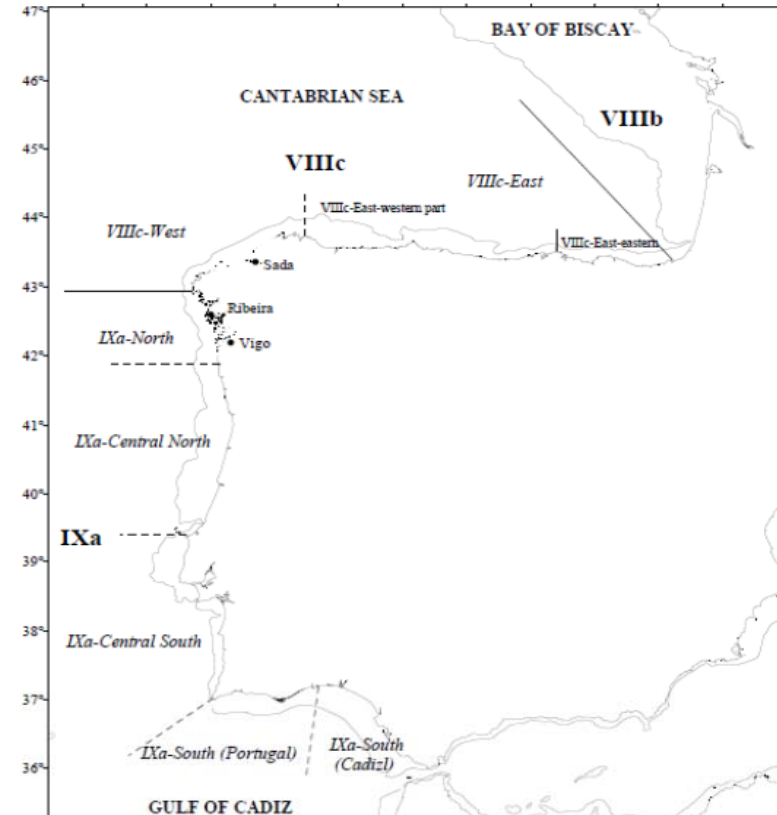
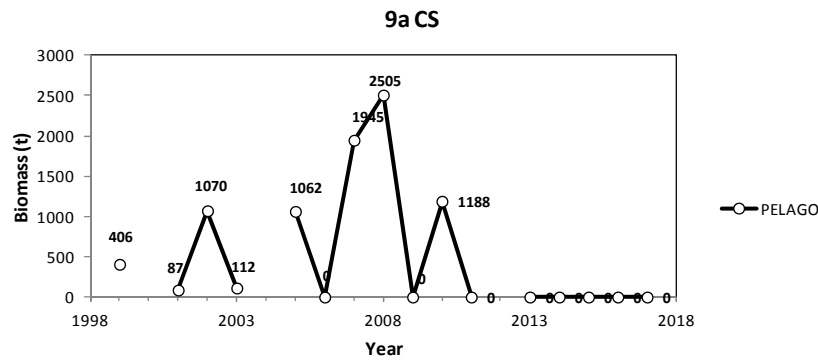
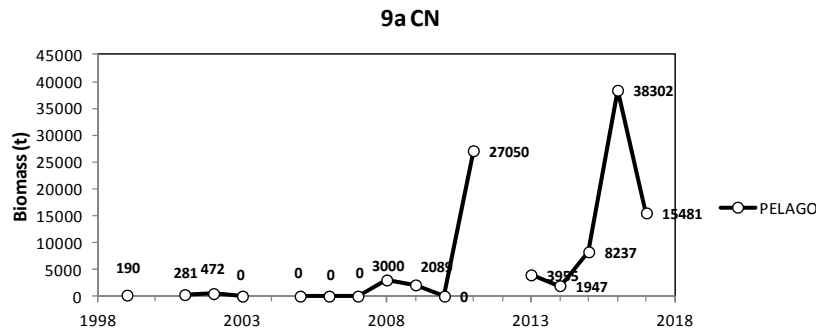
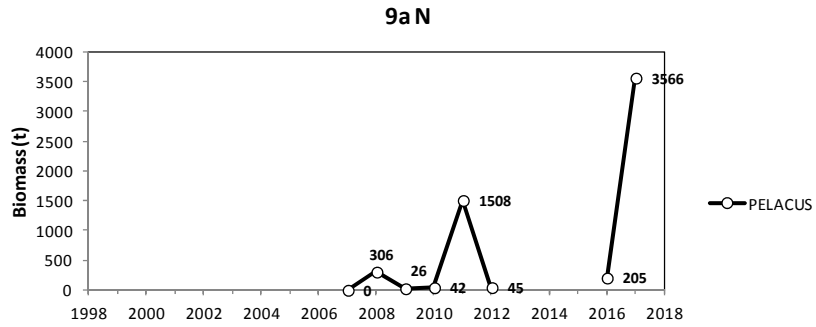
SURVEY	SUB-DIVISION	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
PELACUS	9a N																										
PELAGO	9a CN																										
	9a CS																										
	9a S (ALG)																										
	9a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

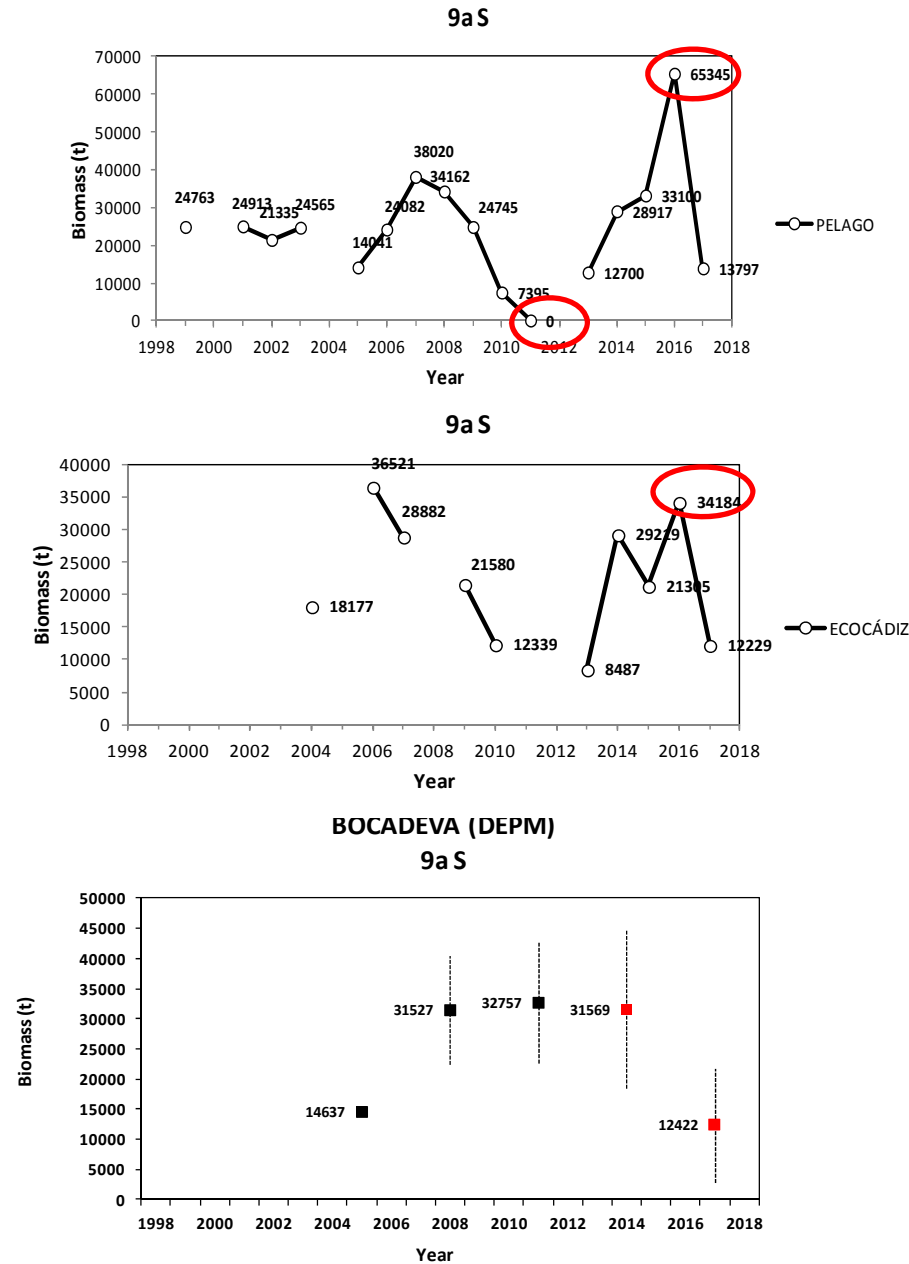
SURVEY	SUB-DIVISION	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
SAR (AUT)	9a CN																											
	9a CS																											
	9a S (ALG)																											
	9a S (CAD)																						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



Ane.27.9a. Surveys 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”?

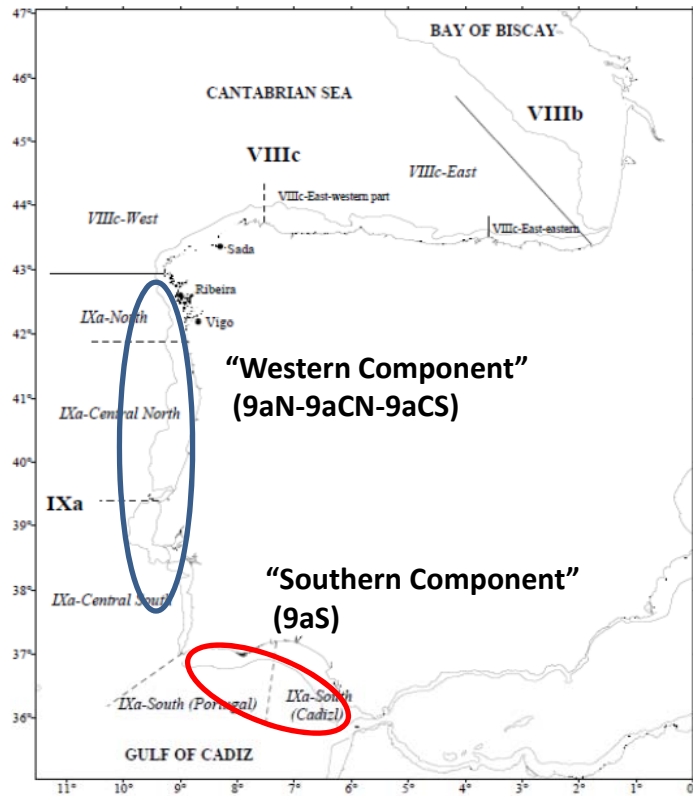
Ane.27.9a. Qualitative Stock assessment.

- 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 (ICES, 2016).
Assessment type	Survey based assessment without catch advice (ICES, 2017b)
Input data	Commercial landings, ages and length frequencies from landing sampling. Survey indices for 9.a South: SAR Q2/PELAGO, ECOCÁDIZ, 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).
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 (WGHANSA)

Ane.27.9a. The two stock components approach. A proposal.



- The anchovy fishery and their exploited populations are spatially separated and with independent dynamics (via their recruitment pulses).
- Southern component: stable population, relatively independent of the remaining populations. Core habitat (for spawning and recruitment).
- Western component: latent populations, which only develop under suitable environmental conditions. Secondary habitats.
- Populations from both components exhibit morphological segregation pattern (and in some life-history traits) and, probably, different genetic structure.
- Survey trends-based qualitative assessment is carried out considering this spatial explicit monitoring.

• **ICES SIMWGW 2015 did not consider these evidences enough to consider 2 different stocks.**

• **ICES WGHANSA still support the idea of two different “stocks” for the above reasons.**

• **Stock identity : an important issue.**

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 *PELAGO* spring acoustic estimate & *ECOCADIZ* summer acoustic estimate & *BOCADEVA* summer depm estimate .

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

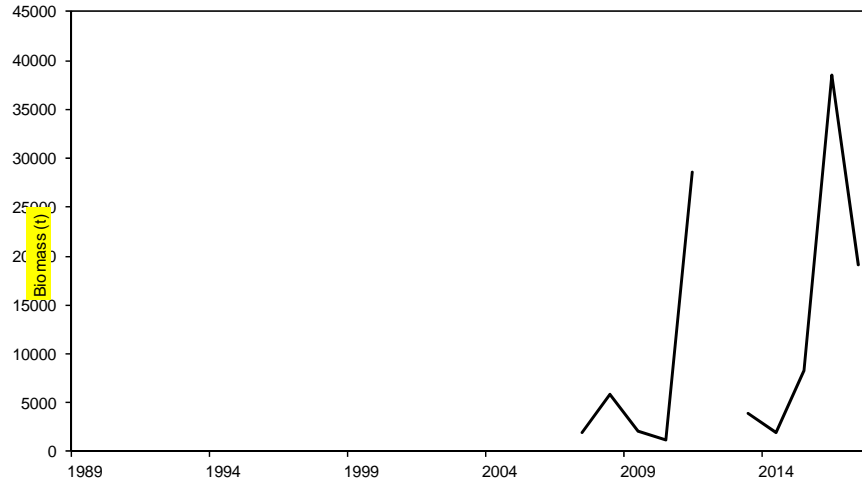
- Uncertainties/difficulties found in the acoustic assessment of the 9aS(CAD) in some years.
- Gaps in the *ECOCADIZ* series, filled triennially by *BOCADEVA*.
- Searching for a way of achieving an “average picture” of the population level.

Problems:

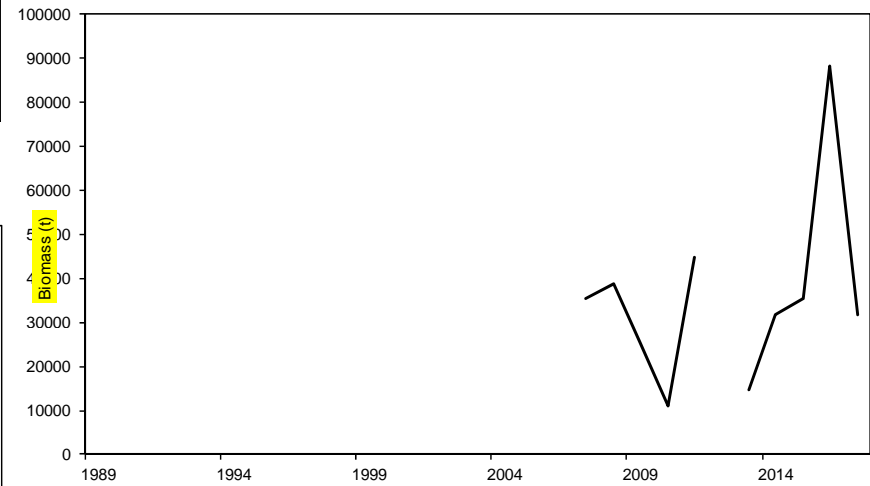
- In the moment of the provision of advice by ICES (late June), summer surveys estimates are not yet available. The resulting indicator for the assessment year is incomplete, computed only with the *PELAGO* spring estimate. The value for that year is then re-computed in the next year meeting with all 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.**

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

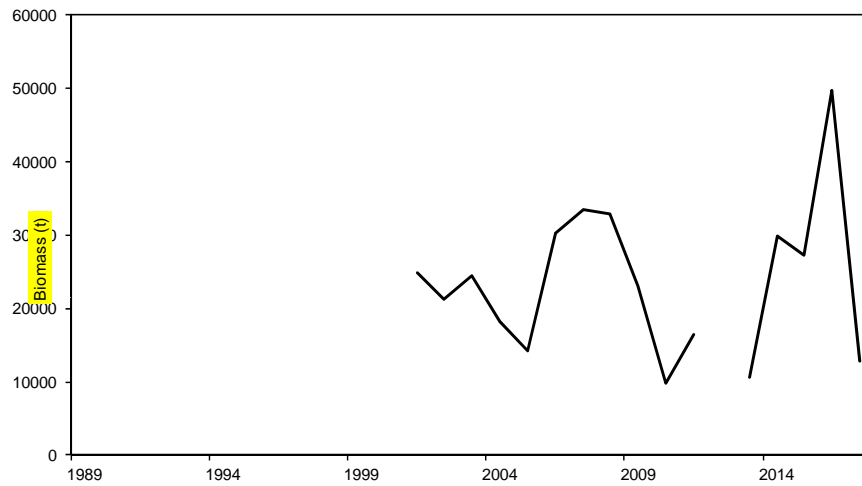
9a West Stock size indicator



Div 9a Stock size indicator



9a S Stock size indicator



Ane.27.9a. Analytical-Statistical Stock assessment to be explored & benchmarked.

- A benchmark process will start in 2018:
 - Postponed several times because shortage of personnel.
 - Benchmarked for the first time.
 - Data Evaluation WK in December 2017: to fix data.
 - Benchmark WK in February 2018 (WKPELA 2018): **to explore an analytical assessment (Gadget).**

Margarita's presentation