

Abundance of Anchovy eggs by CUFES: Inter-annual fluctuations and spatial patterns

MP. Jiménez, R. Sánchez-Leal, F. Ramos and C. González



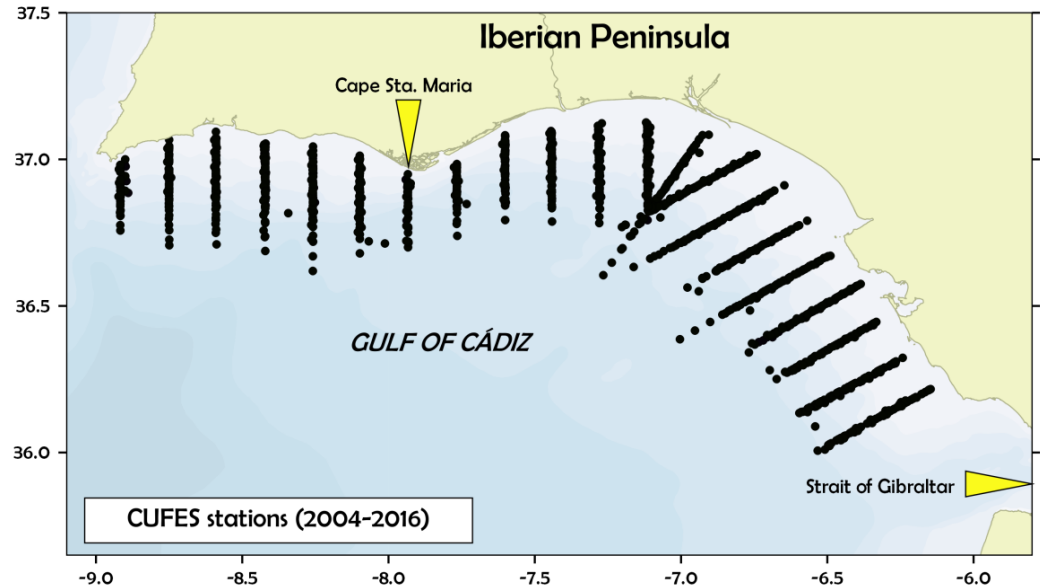
Spanish Institute of Oceanography
Cádiz (Spain)

Methodology

Continuous Underwater Fish Eggs Sampler

Survey	Year	N Station	N st. +
BOCADEVA_2004	2004	151	82
BOCADEVA_2005	2005	107	50
ECOCADIZ_2006	2006	134	93
ECOCADIZ_2007	2007	157	114
BOCADEVA_2008	2008	121	89
ECOCADIZ_2009	2009	104	86
ECOCADIZ_2010	2010	98	74
BOCADEVA_2011	2011	114	76
ECOCADIZ_2013	2013	107	68
BOCADEVA_2014	2014	153	90
ECOCADIZ_2015	2015	117	82
ECOCADIZ_2016	2016	136	116
		1499	1020

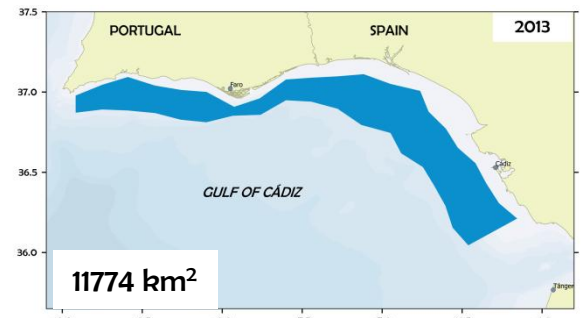
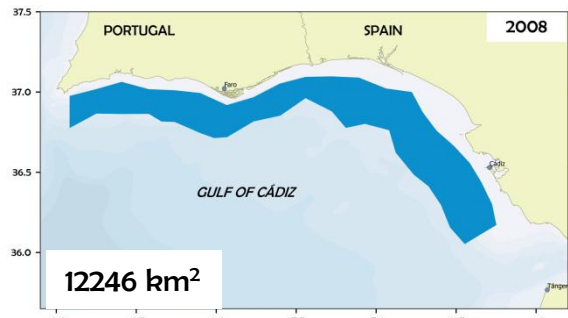
2004→2013: R/V *Cornide de Saavedra*
 2014: R/V *Ramón Margalef*
 2015-2016: R/V *Miguel Oliver*



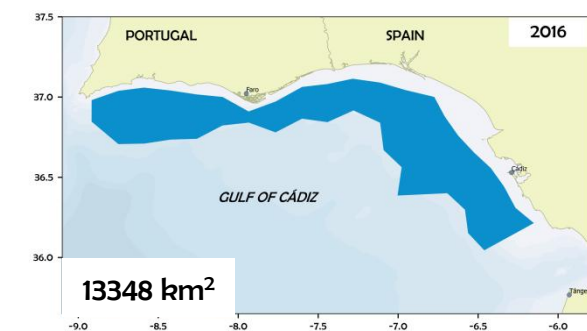
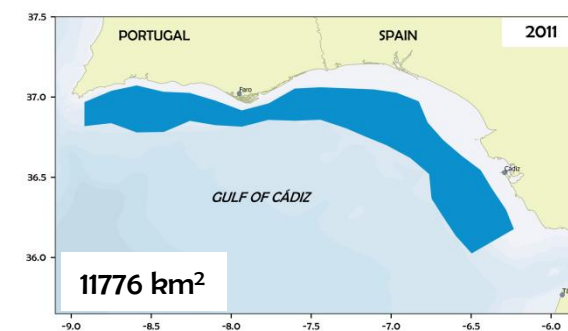
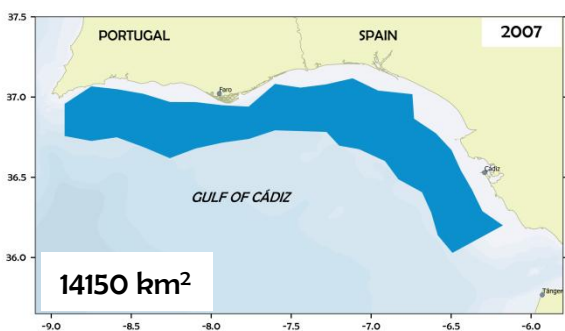
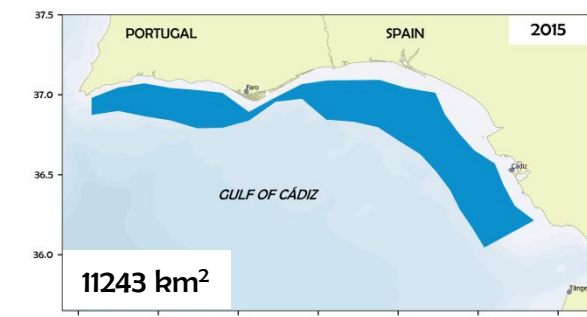
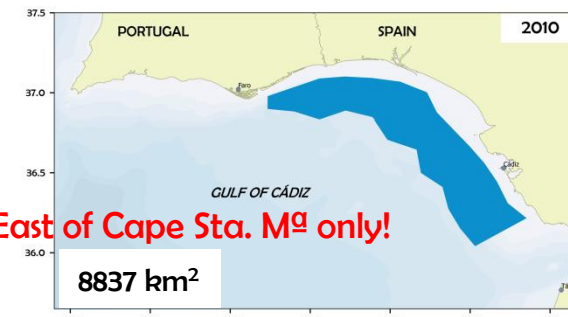
CUFES sampling

- ✓ 21 transects perpendicular to coastline (spaced 8 nm)
- ✓ samples collected every 3 nm
- ✓ 335 μ m mesh size net
- ✓ navigation speed \approx 9-10 knots
- ✓ depth sampling to 5 m from the surface
- ✓ 600 l/min flow approximately
- ✓ SST and SSS at 5 m (termosalinometer)
- ✓ plankton samples are preserved in buffered formaldehyde at 4%

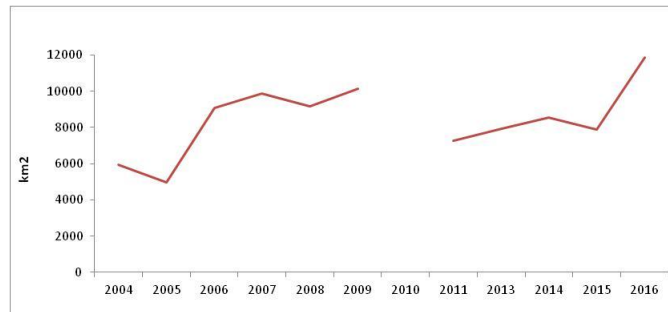
Surveyed area



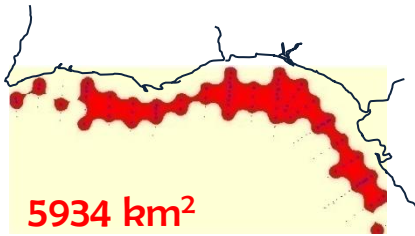
East of Cape Sta. M^a only!



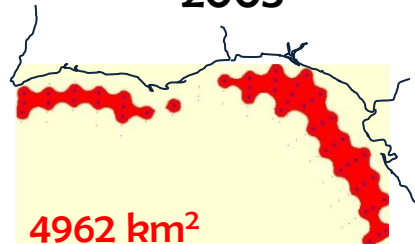
Spawning area



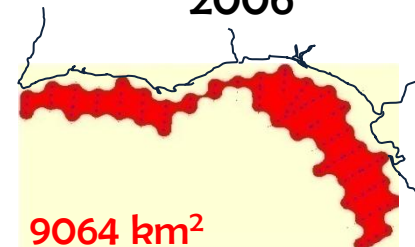
2004



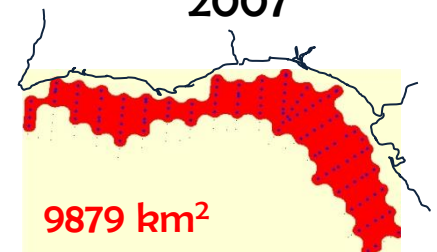
2005



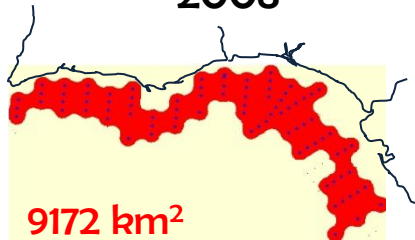
2006



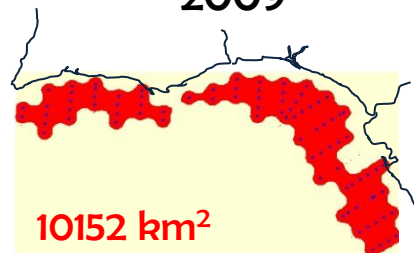
2007



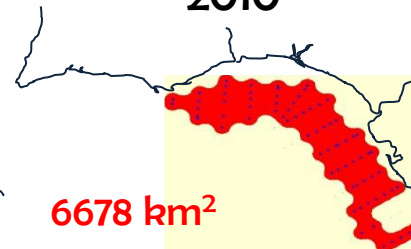
2008



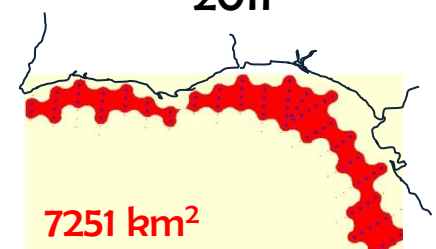
2009



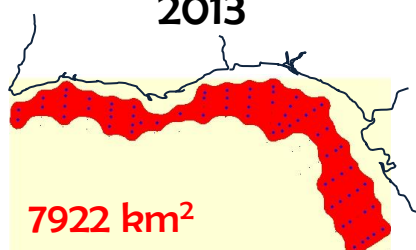
2010



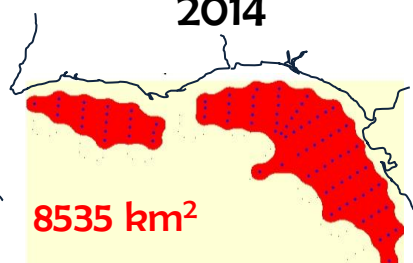
2011



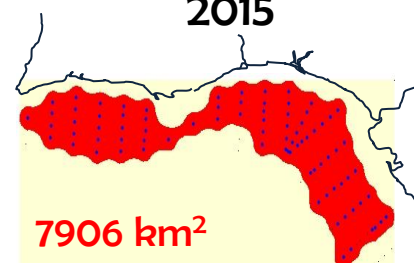
2013



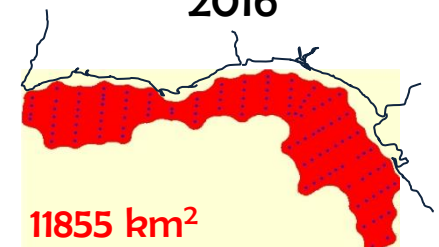
2014



2015



2016



Date of the surveys

Type		A	D	A	A	D	A	A	D		A	D	A	A
Month	Week	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
June	1													
	2													
	3													
	4													
July	1													
	2													
	3													
	4													
August	1													
	2													
	3													
	4													

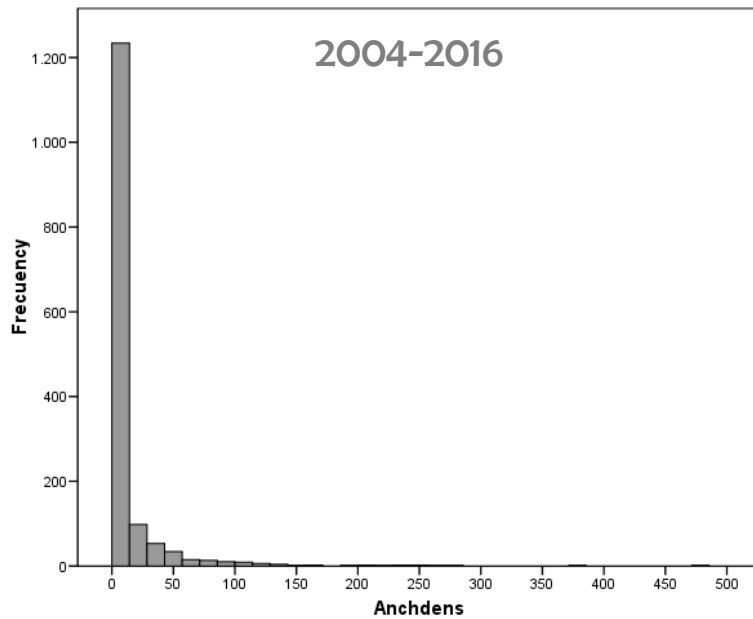
A = Acoustic survey

D = DEPM survey

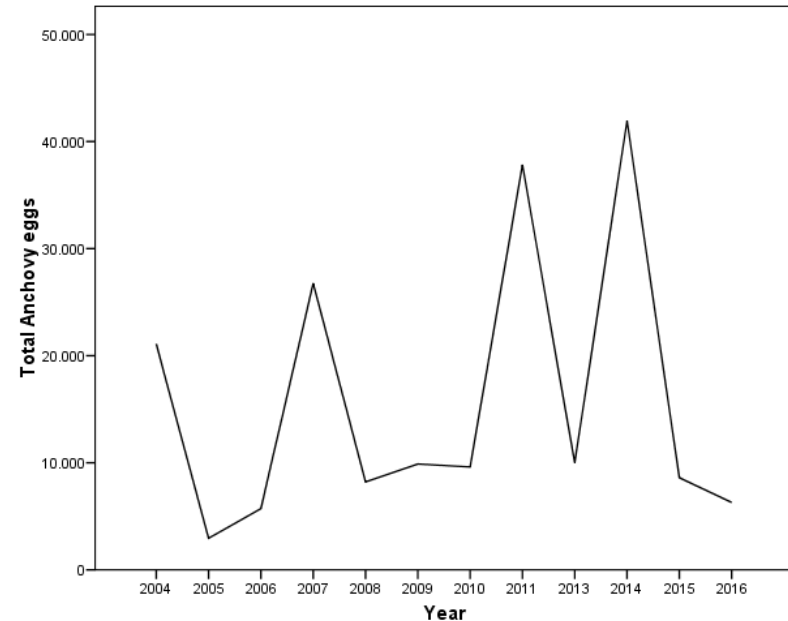
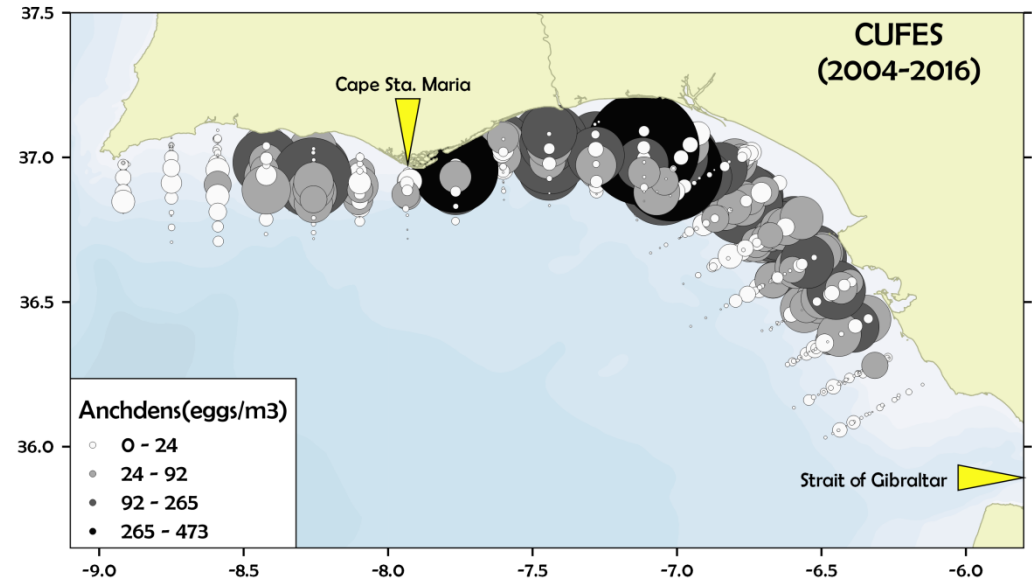
ECOCADIZ always is carried out after MEDIAS. From 2010 the MEDIAS is delayed a month and takes place from end of June to end of July.

Spatial and temporal patterns of Anchovy eggs abundance

(Anchdens = density = egg/m³)

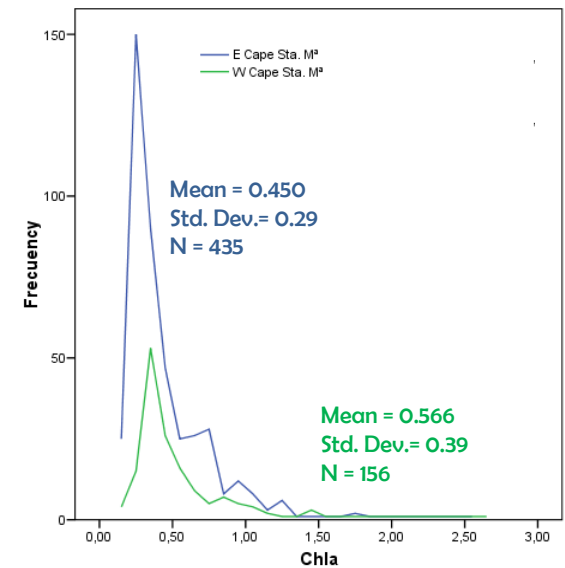
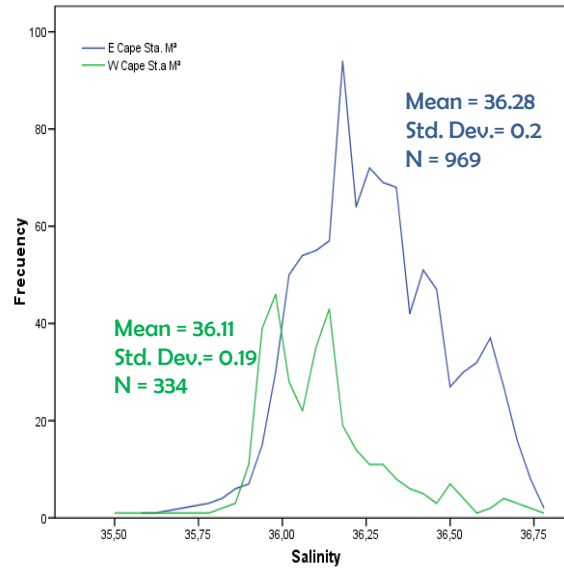
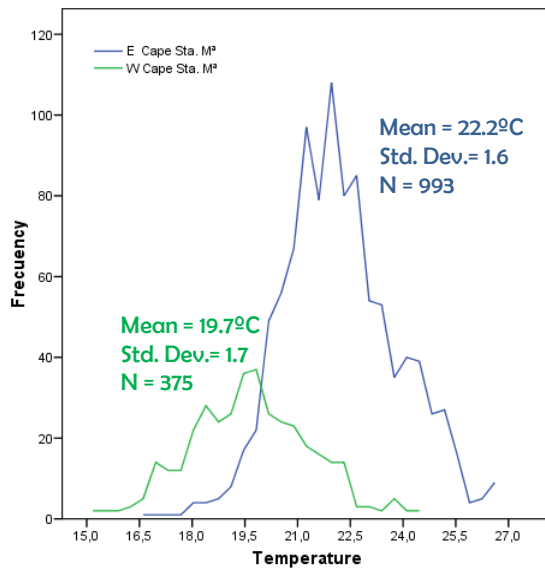
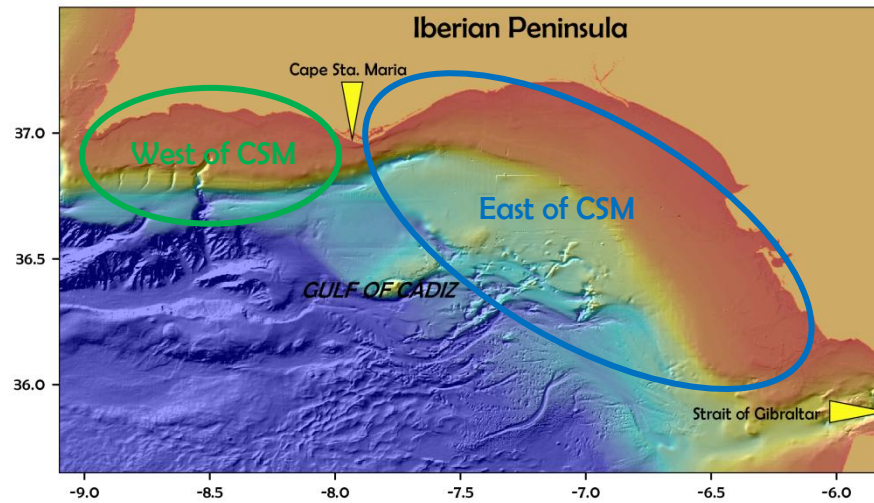


High variability between stations
(very patched eggs distribution)
→ spatial pattern

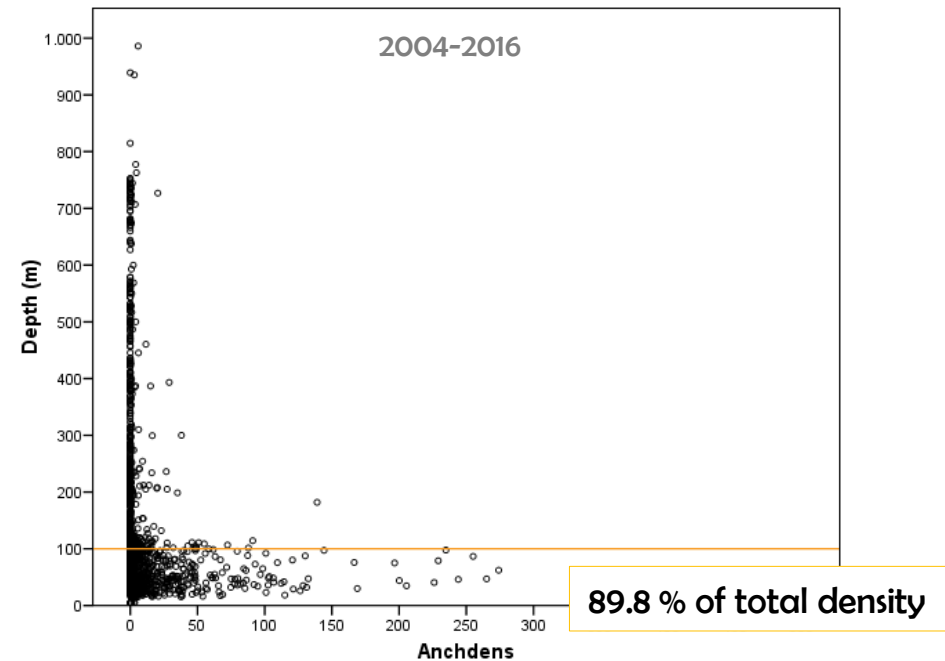
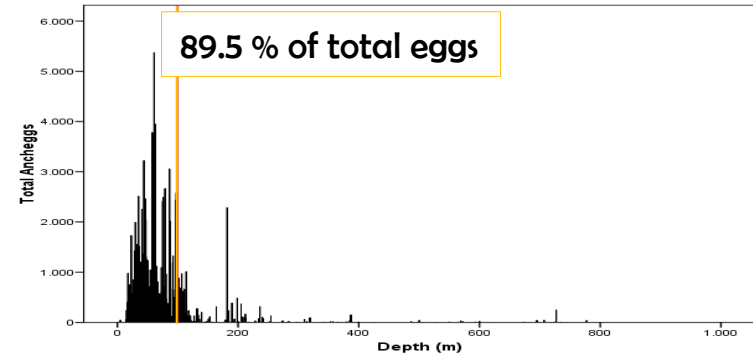
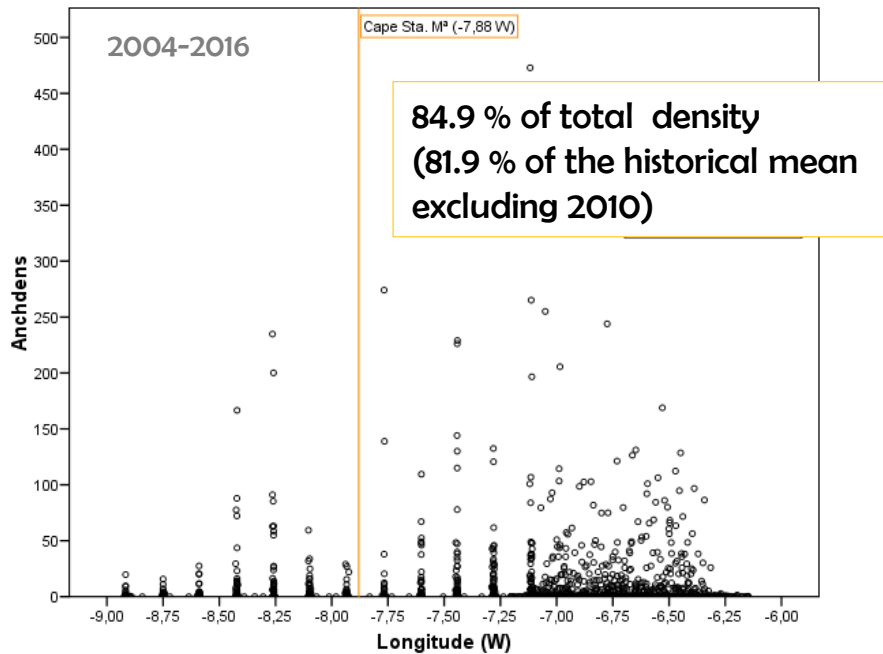


High inter-annual variability

Spatial variability

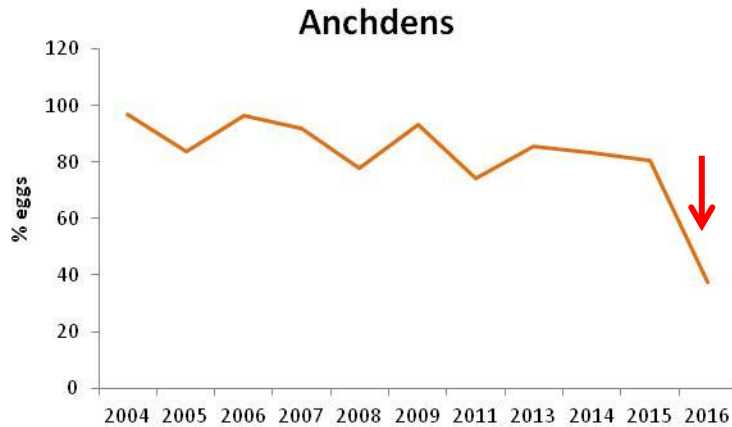


Spatial pattern of Anchovy eggs



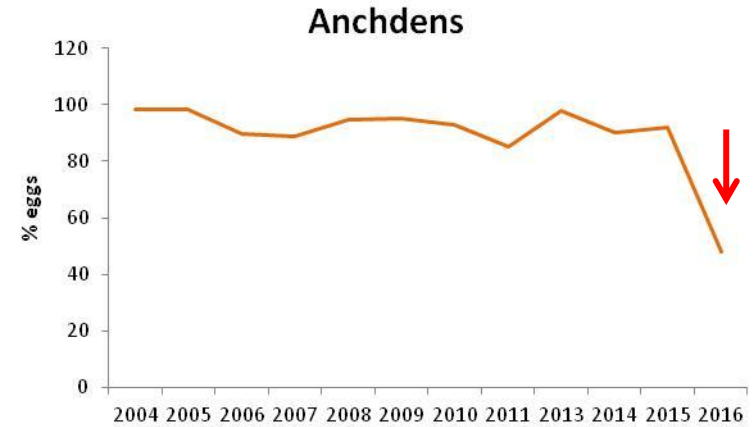
spatial pattern by stratum

(% eggs collected in stations located in estratum E)

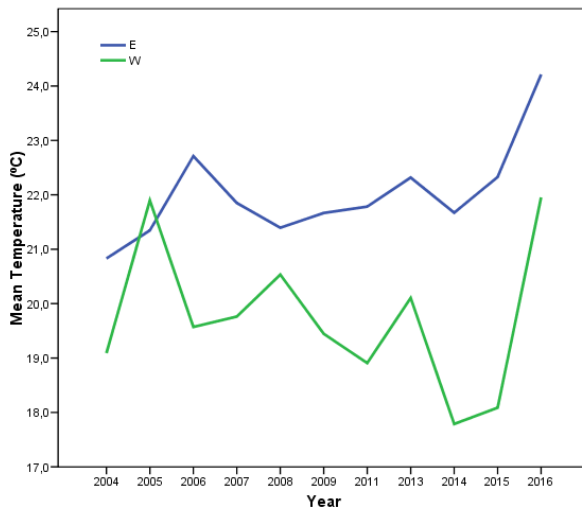


spatial pattern by depth

(% eggs collected in stations shallower than 100m depth)

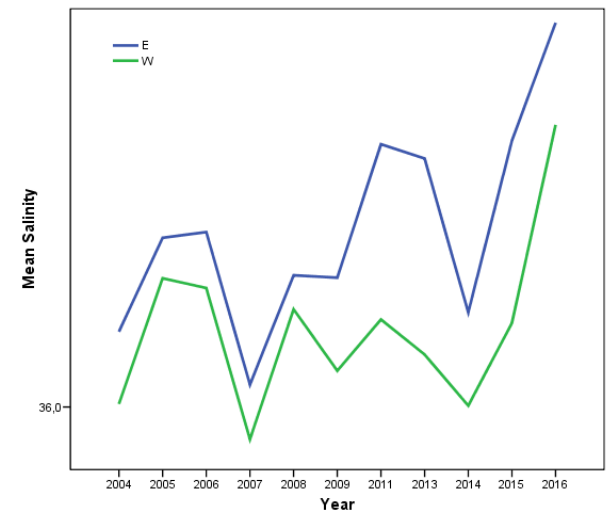


What happened in 2016?



The mean temperature registered in 2016 in the stratum W (**22.0°C**) was practically the same that the mean temperature registered from 2004 to 2015 in the stratum E (**21.7°C**).

The mean salinity was the highest in 2016 in both strata.

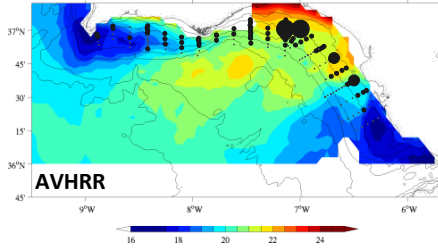


SST vs egg densities. Seasonality of the GoC SST pattern

SPRING TO AUTUMN: GoC divided in 3 sectors: -Cape S. Vicente – Guadiana River mouth: Low relative SST; -Guadiana River mouth-West of Cape Trafalgar: High relative SST; -West of Cape Trafalgar: Low relative SST.

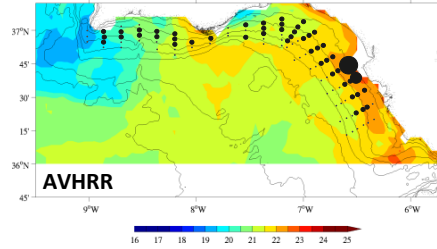
2004

10-Jun-2004 17:21:00



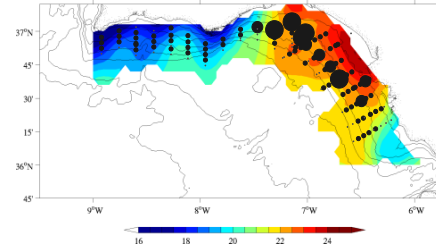
2005

15-Jun-2005 17:10:00



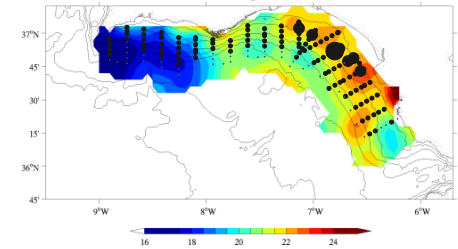
2006

2006h@TSG



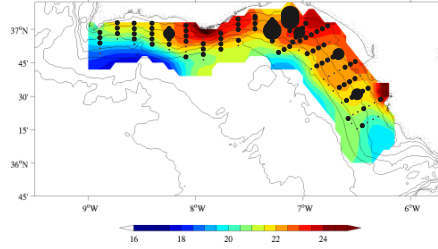
2007

2007h@TSG



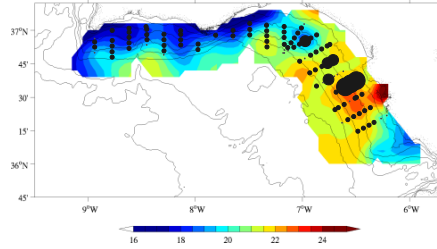
2008

2008h@TSG



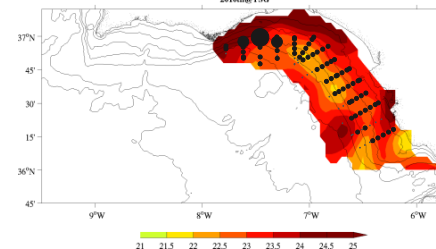
2009

2009h@TSG



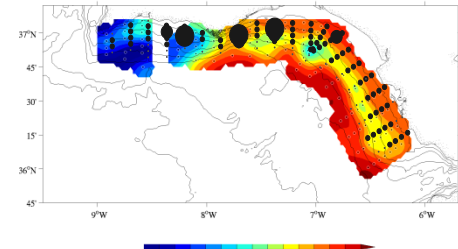
2010

2010h@TSG



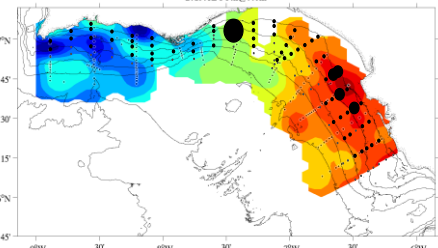
2011

BD201107h@005m



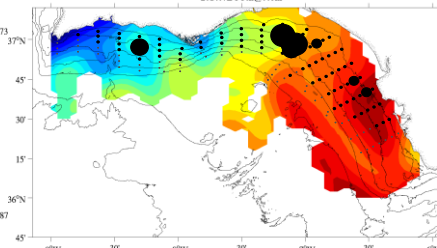
2013

201308ECoth@005m



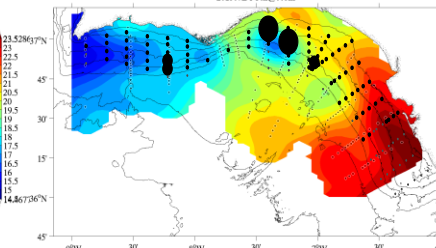
2014

201407ECoth@005m



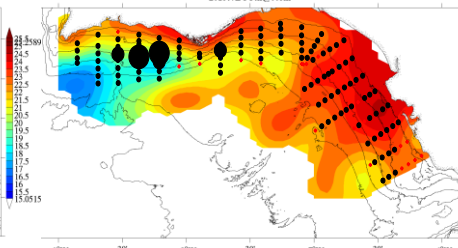
2015

201507ECoth@005m

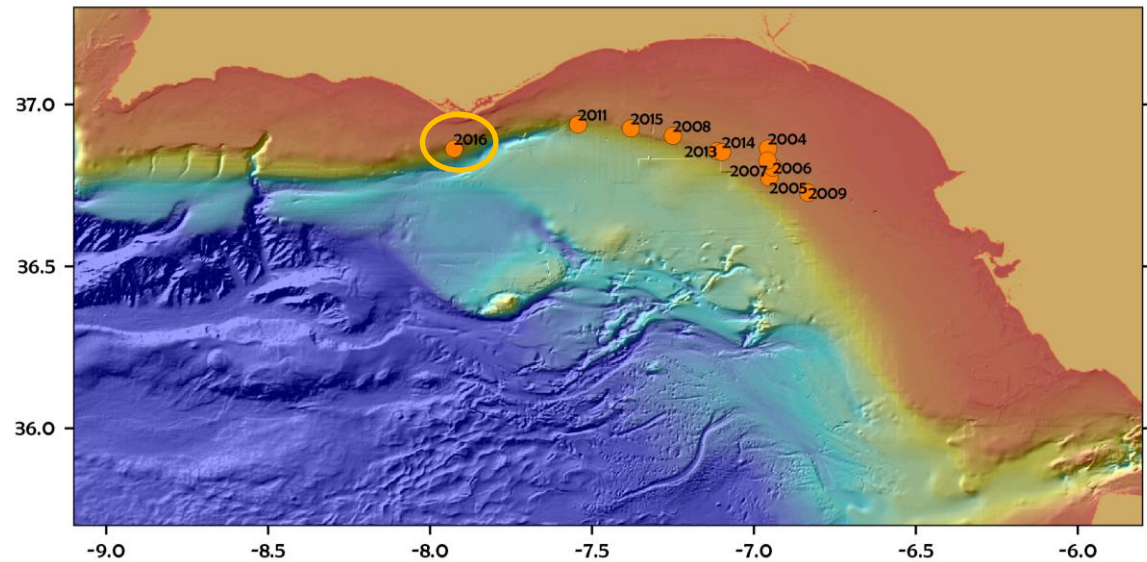
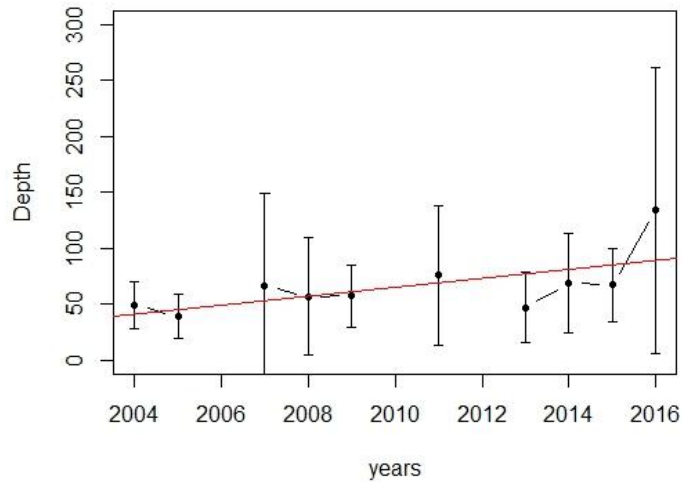
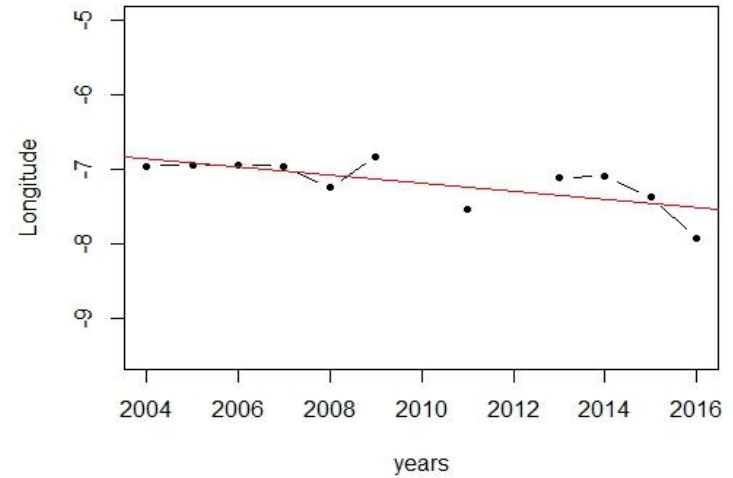
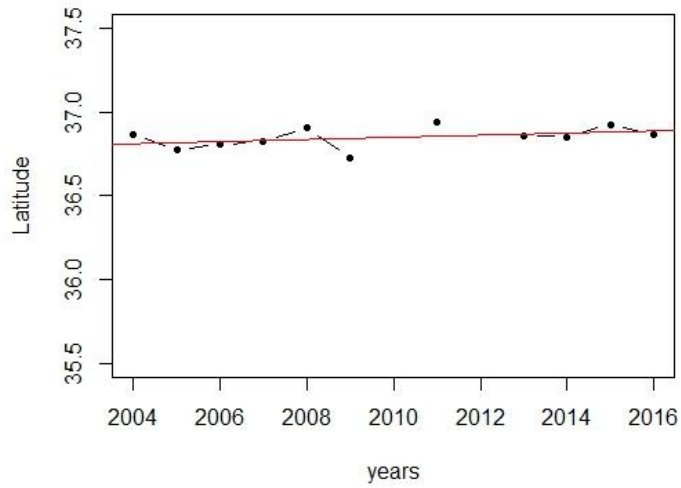


2016

201607ECoth@005m

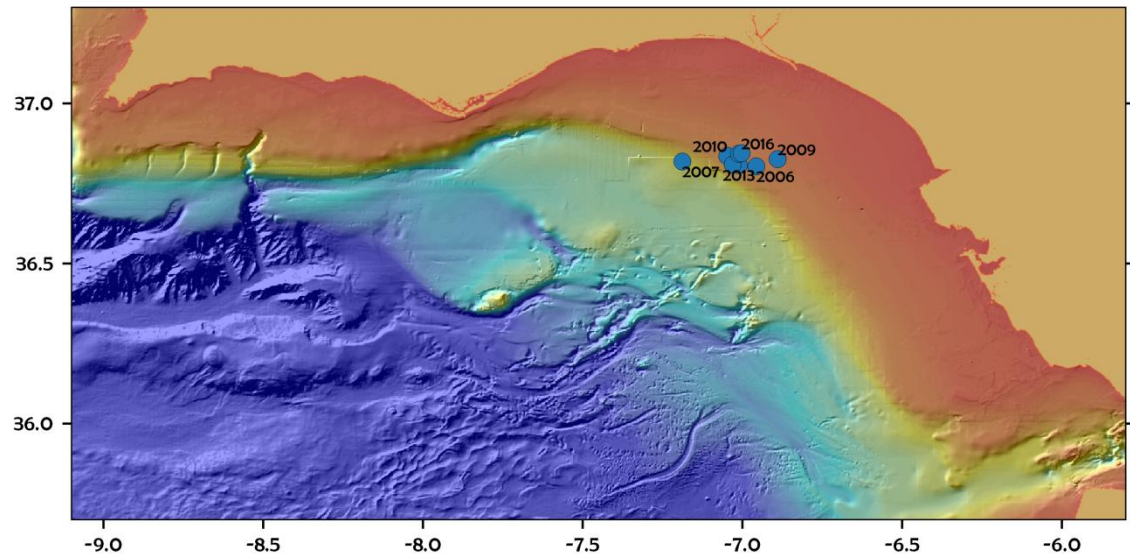
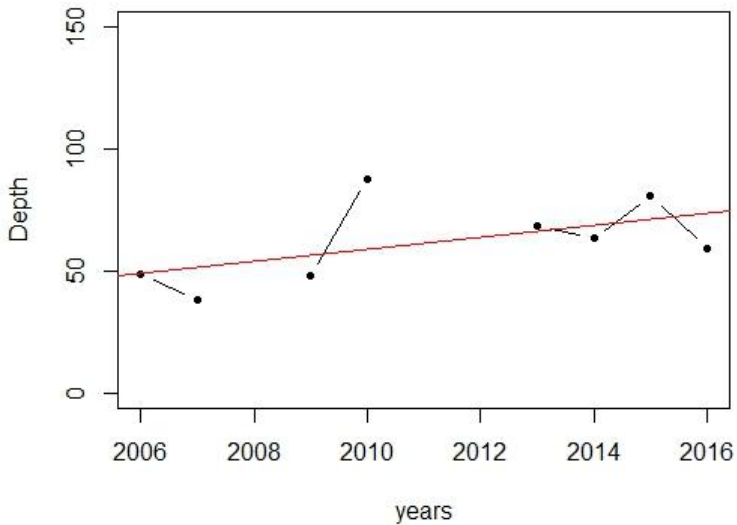
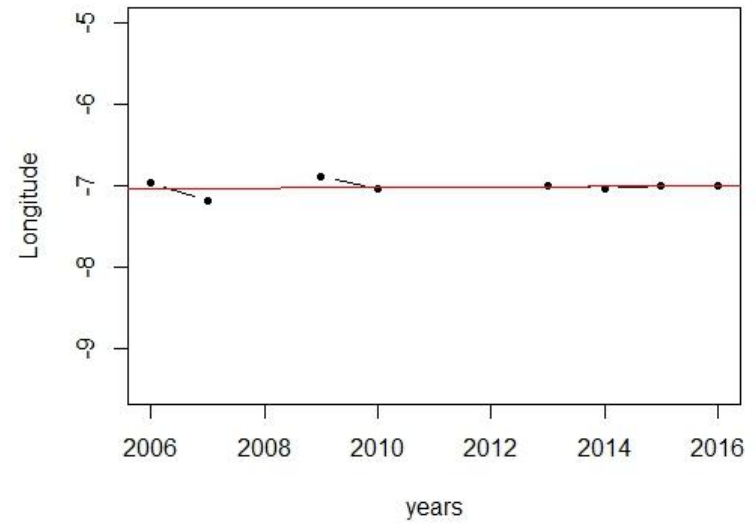
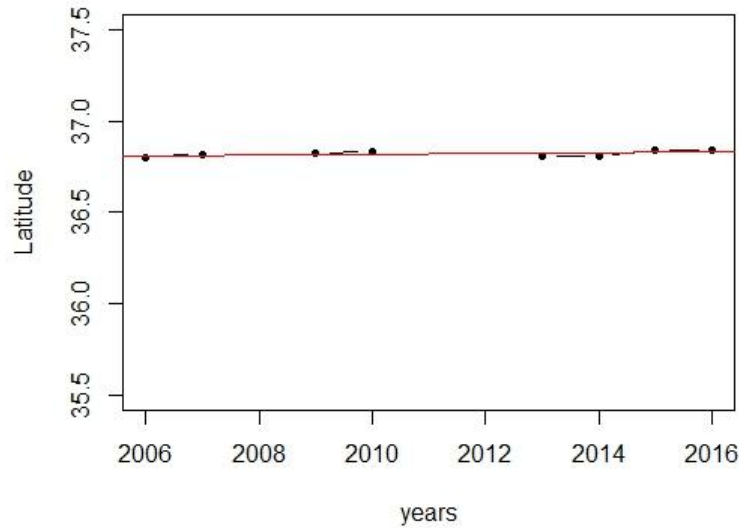


Centre of gravity of Anchovy eggs density

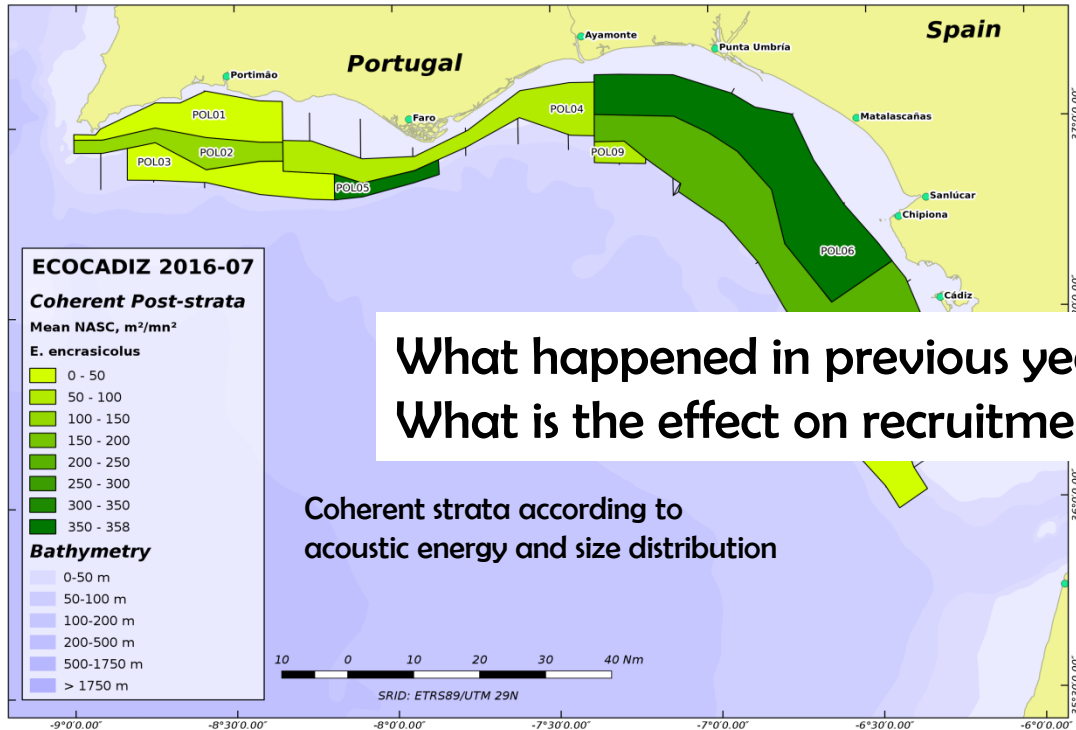
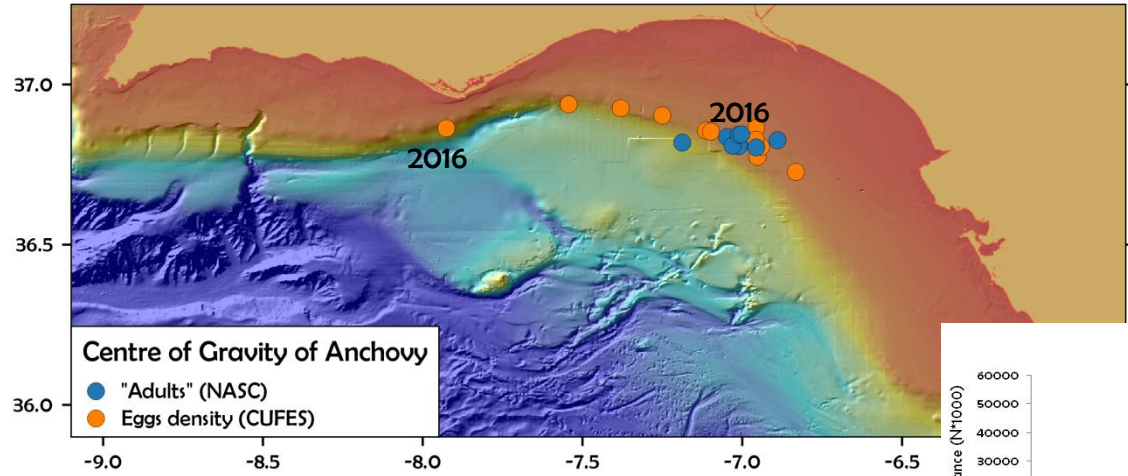


What happens with “adults” (NASC)?

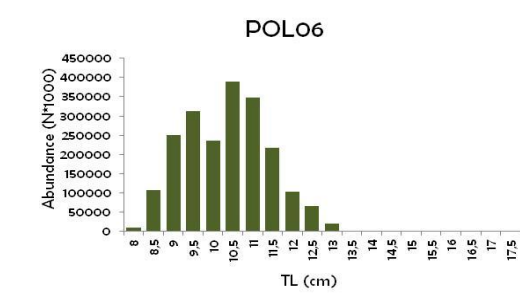
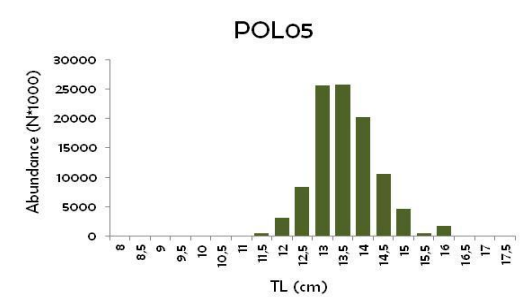
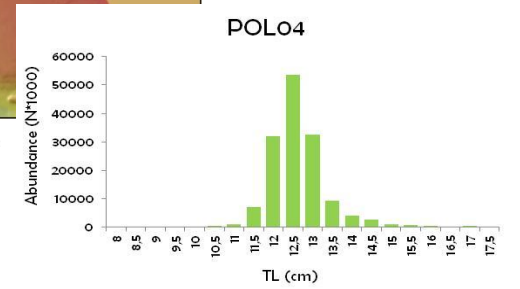
centre of gravity



Is the displacement of the spawning towards the West in 2016 caused by advective transport (currents and/or winds) or by another causes?



What happened in previous years?
 What is the effect on recruitment?



Next step: to obtain a statistical model in order to explain how the different variables affect the abundance of eggs

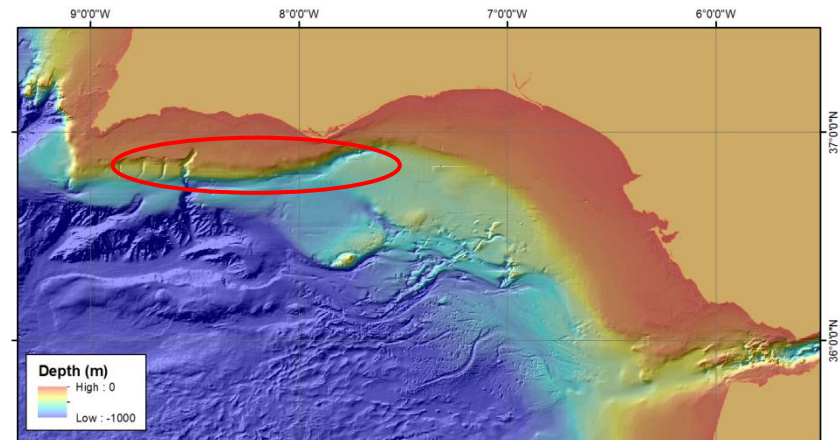
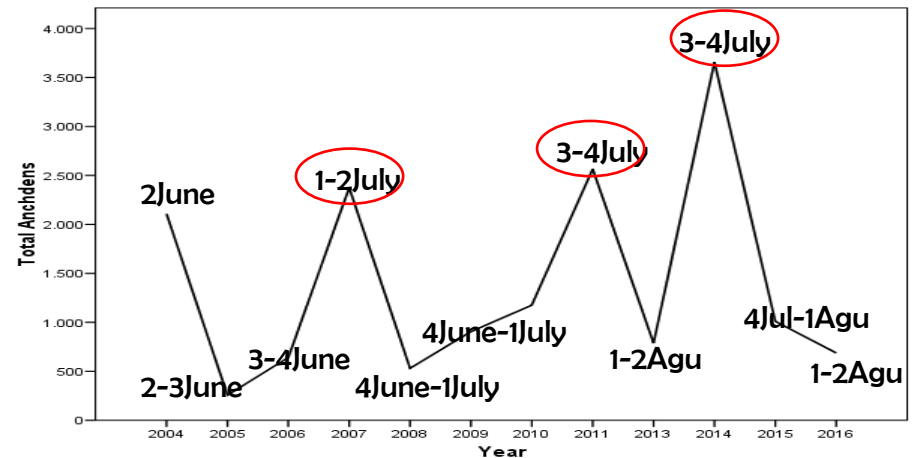
✓ Data frame non homogeneous → Not available data of the analyzed variables in all cases. To complete these lacks from satellite data is necessary. To include data of wind.

✓ Possible sources of bias:

-Dates of the survey → the surveys were carried out in different months (June, July and August) → the surveys with the highest egg abundances were carried out in July. Is this a coincidence? It is the peak spawning in July the lastest years? (Gonadosomatic index analysis)

-Time of sampling? → 24 hrs in DEPM surveys (BOCADEVA series), during the day (from 6:00 to 20:00 hrs GMT) in Acoustic surveys (ECOCADIZ series)

-Depth of the station: the presence of canyons in the East of Cape Sta. Maria → distance to the coast would be a better variable.



Thank you for your attention

