

BOCADEVA Series Gulf of Cadiz Anchovy DEPM surveys

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Cádiz - Vigo - Lisboa

ICES Working Group on Atlantic Fish Larvae and Eggs Surveys (WGALES)

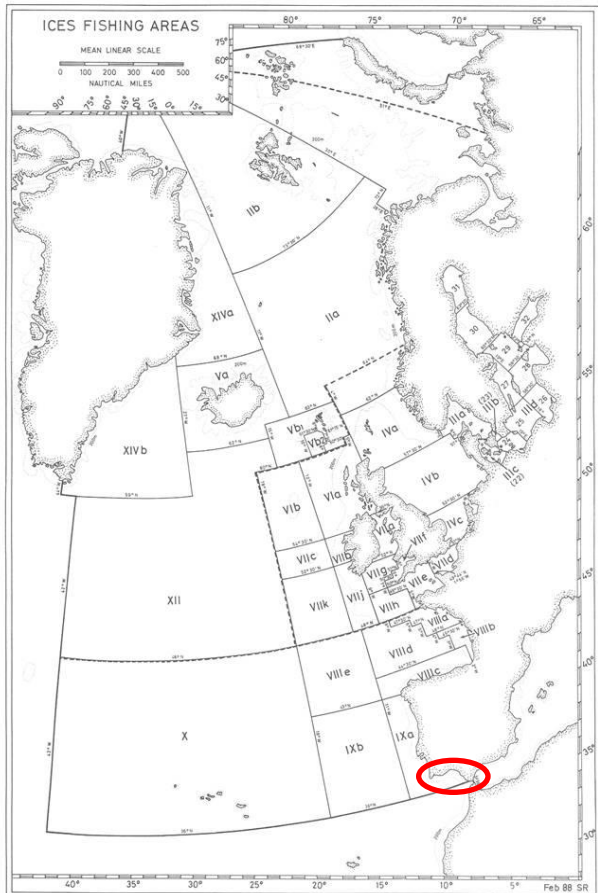
San Sebastian (Spain), 1-5 December 2014

Acronym: BOCADEVA

Study area: Gulf of Cádiz (ICES Subdivision IXa South)

Target species: *Engraulis encrasicolus* (Linnaeus, 1758)

Triennial survey



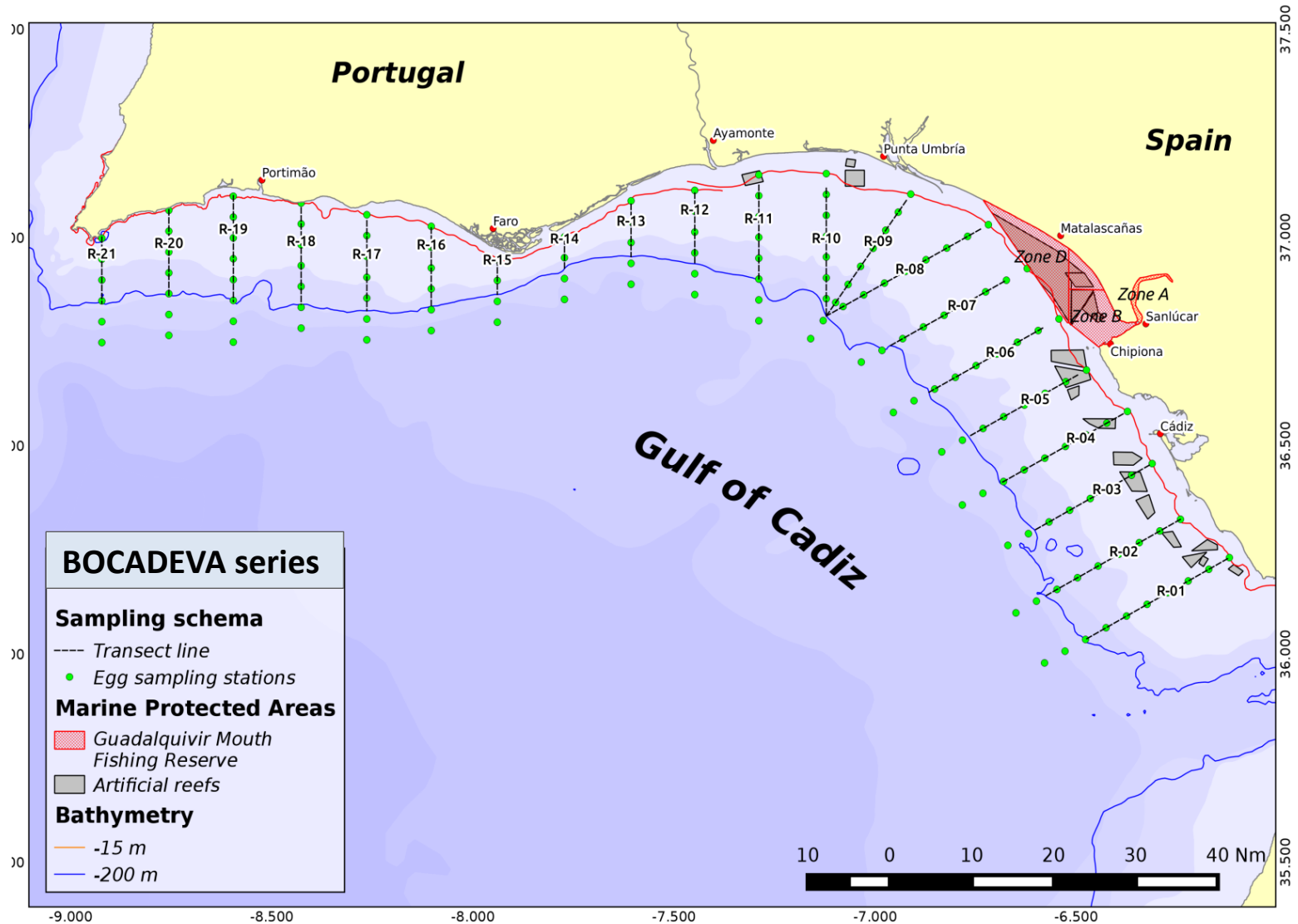
Main objective: estimation of the Gulf of Cadiz Anchovy SSB by the DEPM.

- Ichthyoplankton sampling, along a grid of parallel transects perpendicular to the coast, in order to obtain the spatial distribution of Anchovy eggs, the delimitation and calculation of the extension of the Anchovy spawning area, and the estimation of the Gulf of Cadiz Anchovy Daily Egg Production (P_0) and Total Egg Production (P_{total}).

- Adults sampling: Fishing hauls to obtain the adults spatial distribution as well as to obtain samples for the estimation of DEPM-based adult parameters: sex ratio (R), mean female weight (W), batch fecundity (F) and spawning fraction (S), within the mature component of the population.

The survey objectives also include both the obtaining of the size composition and biological characterization of other important commercial pelagic fish species in the area, and the characterization of the oceanographic and meteorological conditions in the study area during the survey.

BOCADEVA series. Sampling design



Eggs general sampling methods

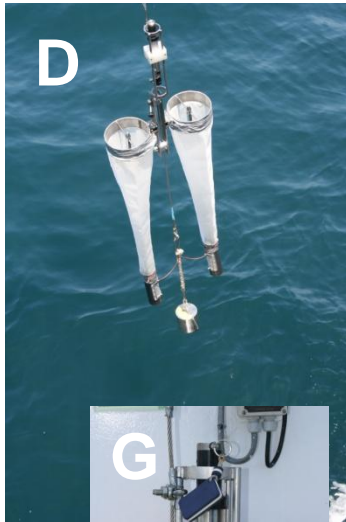
Year	2005	2008	2011	2014
Survey area	36°11'-36°50'N -6°13'--8°55'W	36°11'-36°44'N -6°13'--8°54'W	36°11'-36°59'N -6°13'--8°55'W	36°13'-36°50'N -6°07'--8°55'W
Date	10-22 June	22 June - 1 July	22-30 July	24-31 July
R/V	<i>Cornide de Saavedra</i> (IEO)			<i>Ramón Margalef</i> (IEO)
Transects (Sampling grid)	21 (8x3)			
Paironet net size	150 µm			
Sampling maximum depth (m)	100			
Hydrographic sensor	CTD SBE25, SBE25PLUS, SBE37 and mini CTD Valeport			
Flowmeter	Yes			
CUFES stations	Yes. Sampling depth 5m. 600 l/min flow			
CUFES (335µm)	3 n miles (sample unit)			
Environmental data	Temperature and Salinity			

Adults general sampling methods

Year	2005	2008	2011	2014
Survey area	36°11'-36°50'N -6°13'--8°55'W	36°11'-36°44'N -6°13'--8°54'W	36°11'-36°59'N -6°13'--8°55'W	36°11'-36°47'N -6°12'--8°54'W
Date	10-22 June	22 June - 1 July	22-30 July	24 July - 06 August
R/V	<i>Cornide de Saavedra</i> (IEO)			<i>Miguel Oliver</i>
Gears	Pelagic trawl			
Trawls time	From 06:47 to 21:00 hrs GMT	From 06:10 to 22:29 hrs GMT	From 06:52 to 20:18 hrs GMT	From 07:15 to 19:46 hrs GMT
Biological sampling:	On fresh material, on board of the R/V			
Sample size	At least 60 individuals randomly picked; up to 120 (adding batches of 10 randomly picked anchovies) if a minimum of 30 mature females were not found for spawning fraction estimation. A minimum of 150 hydrated females for batch fecundity estimation.			
Fixation and preservation	4% Phosphate buffered Formaldehyde			



Scientific equipment and sampling gears



- A. R/V *Cornide de Saavedra* (IEO)
- B. R/V *Ramón Margalef* (IEO)
- C. R/V *Miguel Oliver* (SGPM)
- D. PairoVET
- E. CUFES
- F. CTD SBE 25 Plus
- G. Mini CTD



Anchovy egg data (CUFES)

CUFES sampling	2005	2008	2011	2014
Number st	107	121	114	153
Num. Positive st	48	85	76	88
Total Anchovy eggs (in number)	2955	8219	37831	41941
Max. Number by st.	407	765	3952	5372
Mean number	29.8	67.8	331.9	341.0
Total density (eggs/m ³)	256.2	529.3	2565.1	3683.9
Max density by st (eggs/m ³)	38.5	42.7	274.1	568.3
Mean density (eggs/m ³)	2.6	4.4	22.5	24.1

Anchovy egg data (PairoVET)

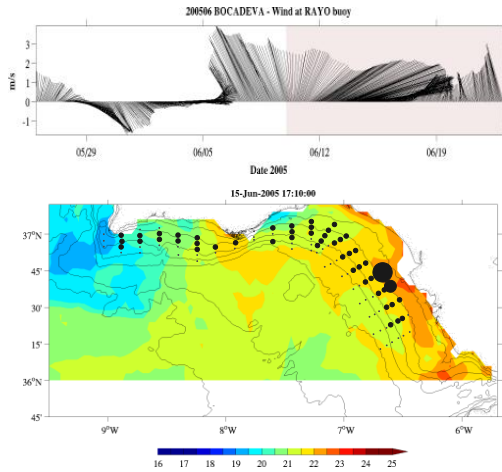
PairoVET sampling	2005(*)	2008	2011	2014
N stations	119	127	124	151
N positive stations	44	70	71	70
N total Anchovy eggs	581	1373	2387	3097
N maximum eggs	204	104	191	195
N medium eggs	4.9	10.8	19.3	20.4
Total density (eggs/m ²)	12528.6	14266.5	24721.8	33019.0
Maximum density (eggs/m ²)	4359.2	1228.7	2194.9	2024.4
Mean density (eggs/m ²)	105.3	112.3	199.4	218.7

(*) one cod-end only

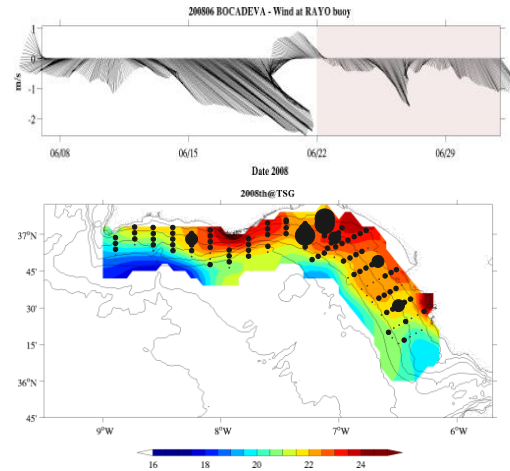
Anchovy egg density by CUFES (egg/m³)

Wind conditions and SST

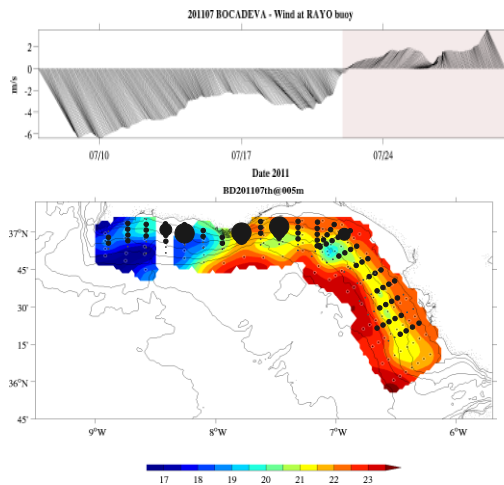
2005



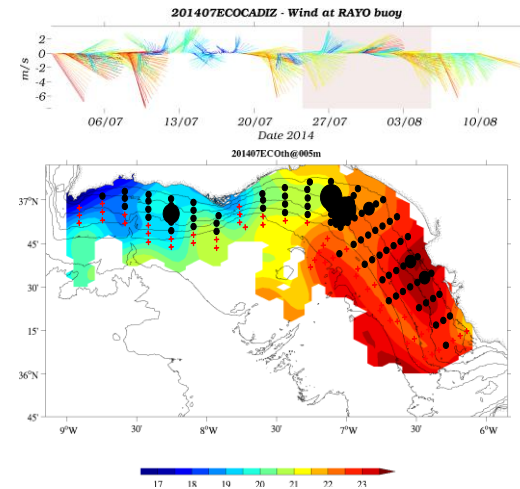
2008



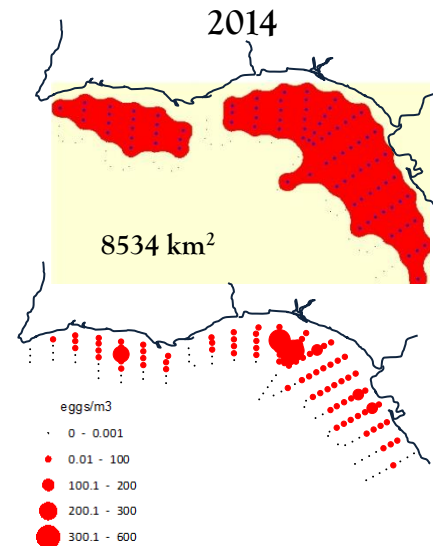
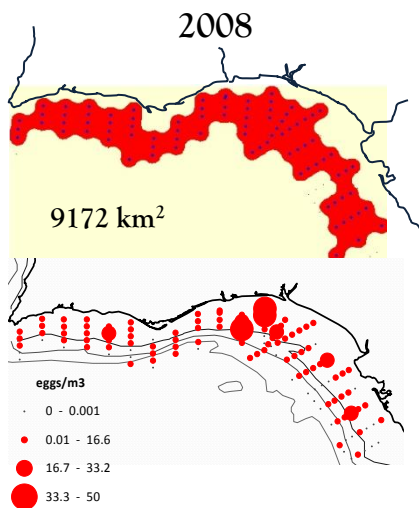
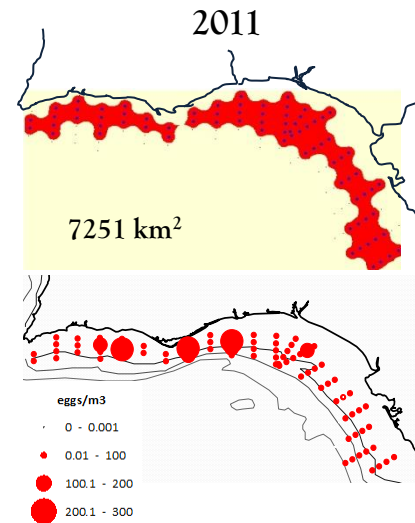
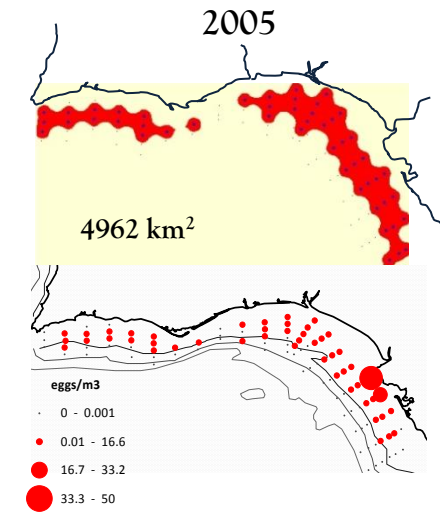
2011



2014



Anchovy spawning area (by CUFES)



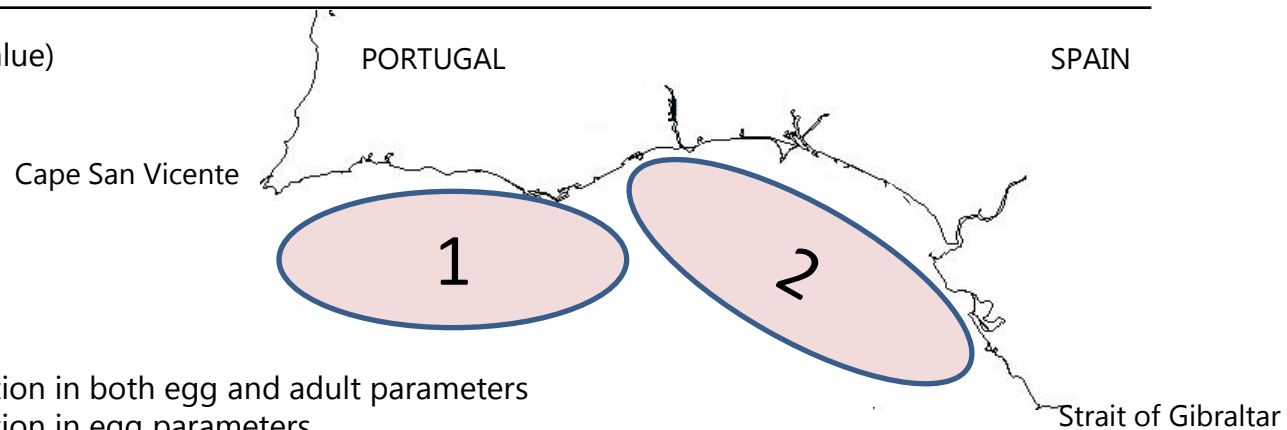
BOCADEVA series Summary

Parameters	2005	2008	2011	2014
Eggs				
P_0 (eggs/m ² /day)	51 ⁽¹⁾ - 225 ⁽²⁾	184 ⁽¹⁾ - 348 ⁽²⁾	276	313.5
P_{tot} (eggs/day) (x10 ¹²)	0.07 ⁽¹⁾ - 1.06 ⁽²⁾	0.31 ⁽¹⁾ - 1.80 ⁽²⁾	1.87	1.95
Z (day ⁻¹)	-0.94	-1.43	-0.29	-0.33
Positive area (Km ²)	1409 ⁽¹⁾ - 4729 ⁽²⁾	1690 ⁽¹⁾ - 5172 ⁽²⁾	6770	6214
Adults				
Female Weight (g)	25.5 ⁽¹⁾ 16.7 ⁽²⁾	23.7	15.2	18.22
Batch Fecundity	13820 ⁽¹⁾ 11160 ⁽²⁾	13778	7486	7502
Sex Ratio	0.53 ⁽¹⁾ 0.54 ⁽²⁾	0.53	0.53	0.54
Spawning Fraction	0.26 ⁽¹⁾ 0.21 ⁽²⁾	0.22	0.27	0.27
SSB				
Spawning Stock				
Biomass (tons)	14673	31527	32757	31569(*)

(*) Preliminary estimates (S = 2011 value)

(1) Stratum 1

(2) Stratum 2



In 2005 it was necessary poststratification in both egg and adult parameters

In 2008 it was necessary poststratification in egg parameters