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Preliminary results of the triennial DEPM survey SAREVA0317.

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Background

SAREVA0317 is the last in the triennial survey series carried out by IEO since 1988 for the estimation of spawning stock biomass of sardine in the Iberian Peninsula (9a-8c and part of 8b subdivisions).

This survey is carried out in coordination with IPMA and AZTI in the framework of WGACEGG with standardized methodologies for surveying and laboratorial and data analyses (see ICES2017 for details on survey methodology and data analysis).

Results

SAREVA0317 survey was performed onboard R/V Vizconde de Eza from 23rd March to 15th April, with a total of 21 operative days of work (Figure 1).

Due to operational reasons, two of the planned transects in 8b subdivision could not be performed on time.

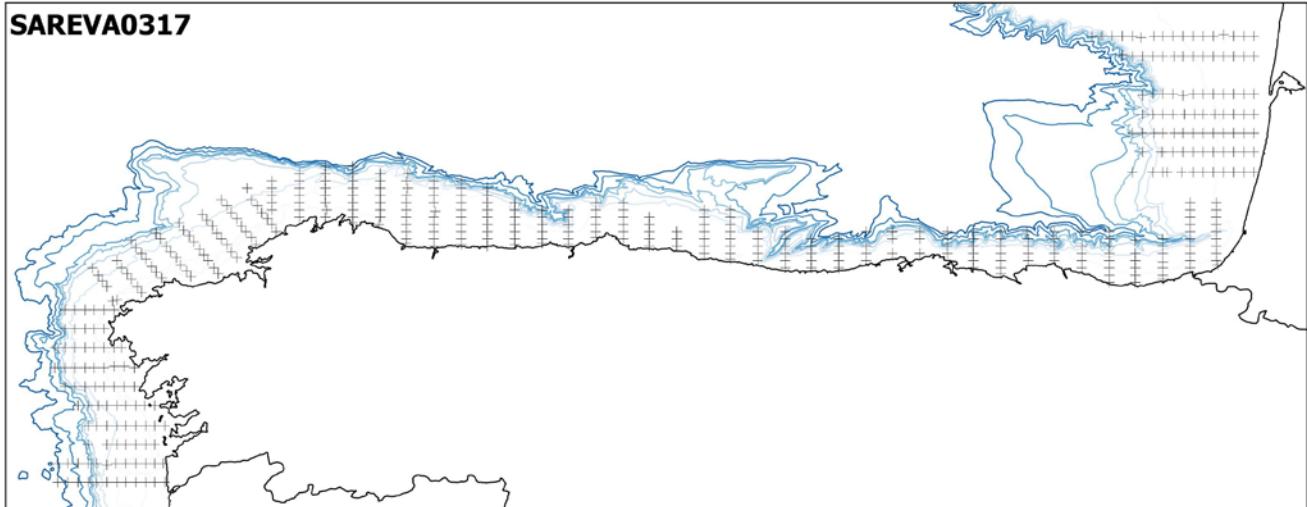


Figure 1. Sampled area during SAREVA0317 survey.

For adult parameter estimation, sardine samples were collected onboard R/V Miguel Oliver during PELACUS0317 survey (15th March-16th April).

Temperature and salinity at 10m

Along the sampling area, in every plankton station, in order to characterise hydrographical conditions, seabird 37 (coupled to the PAIROVET net, 100) or seabird25 CTD casts (437), were made (Figure 2, preliminary data at 10m depth). Physical data are still been processed and results will be presented in WGACEGG17.

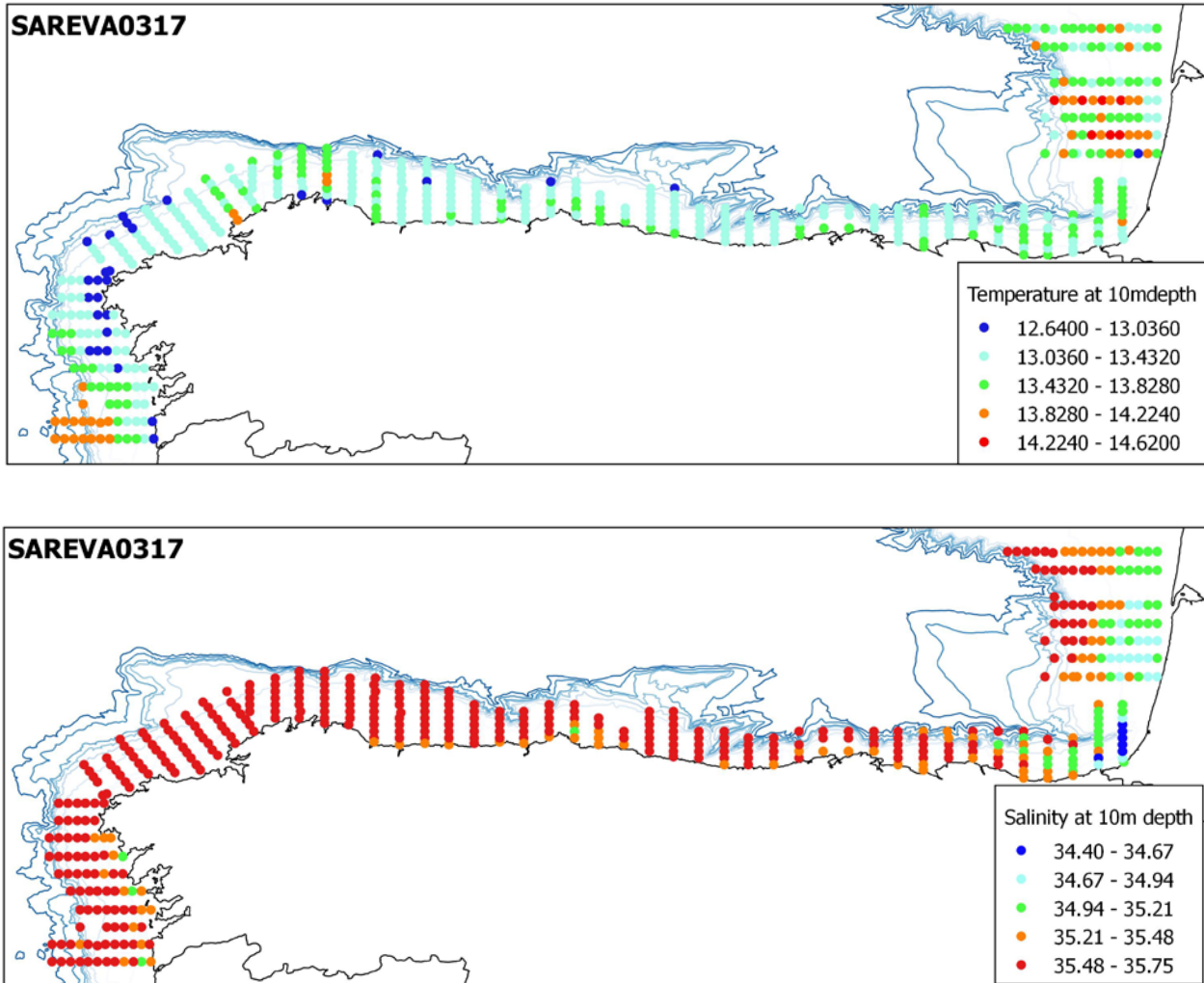


Figure 2. Preliminary data of temperature(TOP) and salinity(BOTTOM) at 10m depth from CTDs during SAREVA0317

Egg density in CUFES samples.

Spawning area was delimited with a total of 421 CUFES stations.

- **Sardine (FIGURE3)**

A total of 3414 sardine eggs were collected, with a 41% of positive stations. Highest densities were observed in South Galicia (Rias Baixas) and in the French area sampled. In the Cantabrian Sea, sardine eggs were scarce and showed a more coastal distribution.

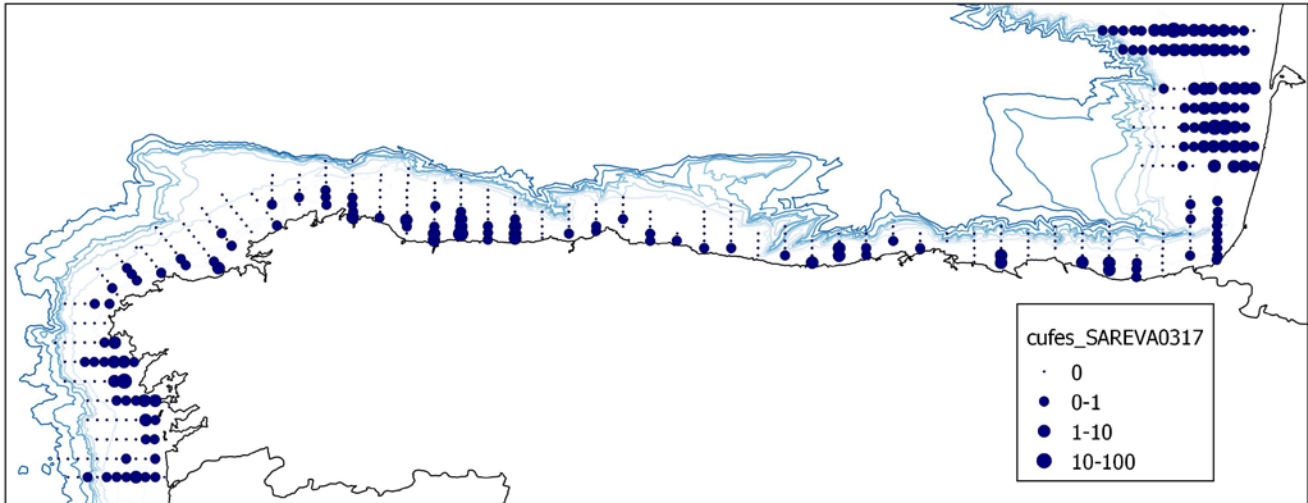


Figure 3. Sardine egg density in CUFES samples from SAREVA0317 survey.

- **Anchovy (FIGURE 4)**

A total of 47644 anchovy eggs were collected, with a 45% of positive stations. Highest densities were observed in South Galicia (Rias Baixas) and especially in the French area sampled. Anchovy eggs were practically absent between Cudillero (Asturias) and the inner part of the Bay of Biscay (8b subdivision). This fact can be due to the dates of the survey, very early for the anchovy spawning season.

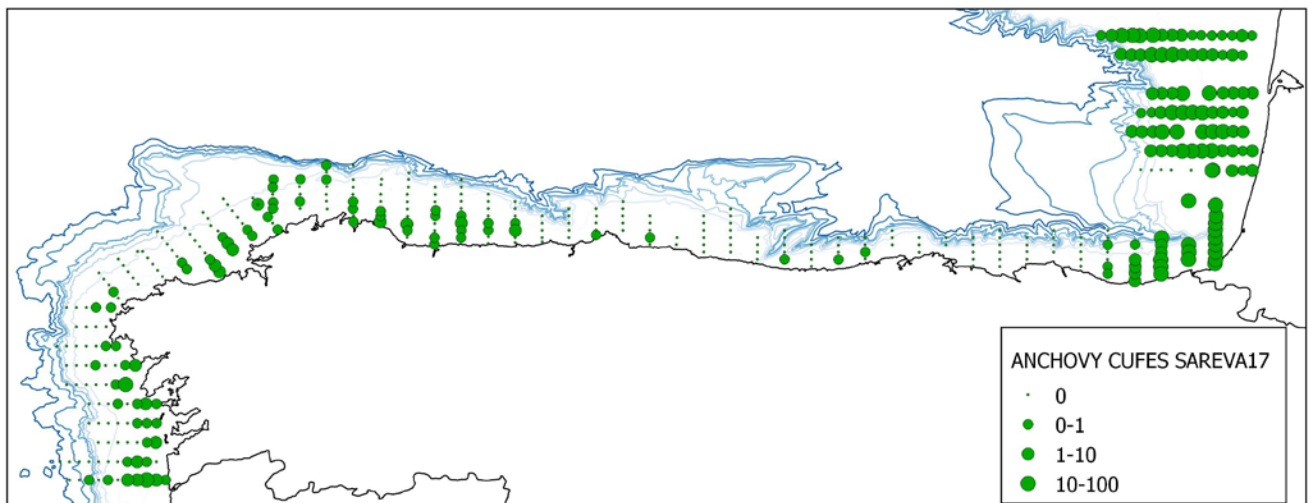


Figure 4. Anchovy egg density in CUFES samples from SAREVA0317 survey.

Egg density in CALVET sampling.

Vertical plankton samples were collected in 473 CALVET stations.

- **Sardine (FIGURE 5)**

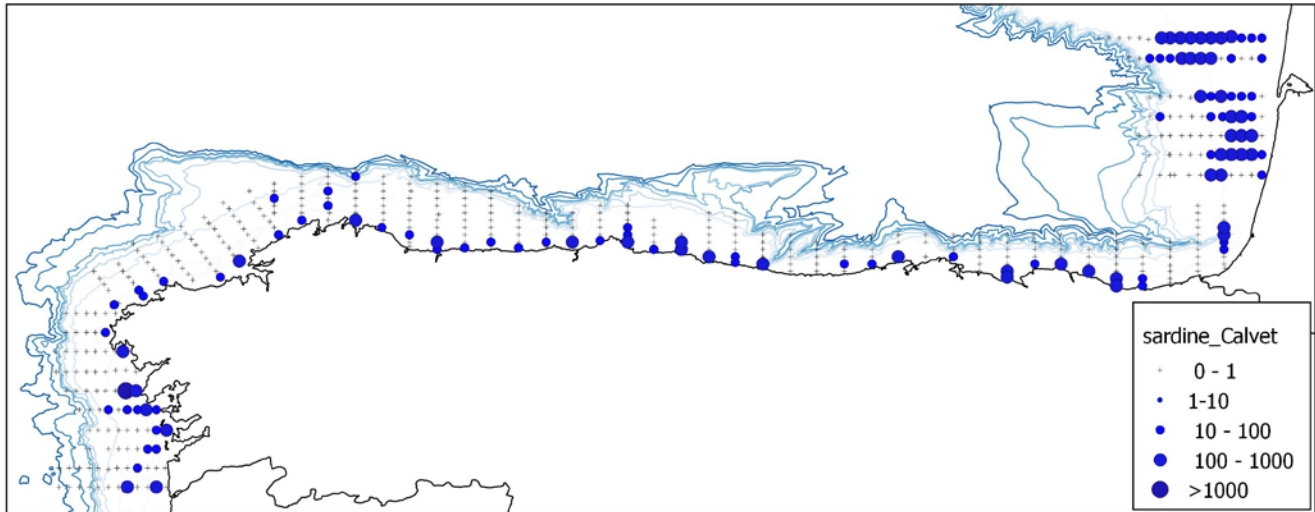


Figure 5. Sardine egg density in CALVET samples from SAREVA0317 survey.

110 of the 473 stations performed were positive for sardine, representing the 23%. The total number of eggs was 669, with an average density of 30 eggs/m² (FIGURE 5). Sardine eggs were found in the whole area, with a low density and very coastal area distribution, except for the French platform, where were more abundant and widespread distributed.

In 2014 (FIGURE 6), previous sardine DEPM survey, total CALVET stations were 522, with 28% of them positive for sardine (144). Total sardine eggs collected were 1763, with a higher density in average (59 eggs/m²). Egg distribution was not continuous in the sampled area, with some gaps in Galicia and in the Cantabrian Sea.

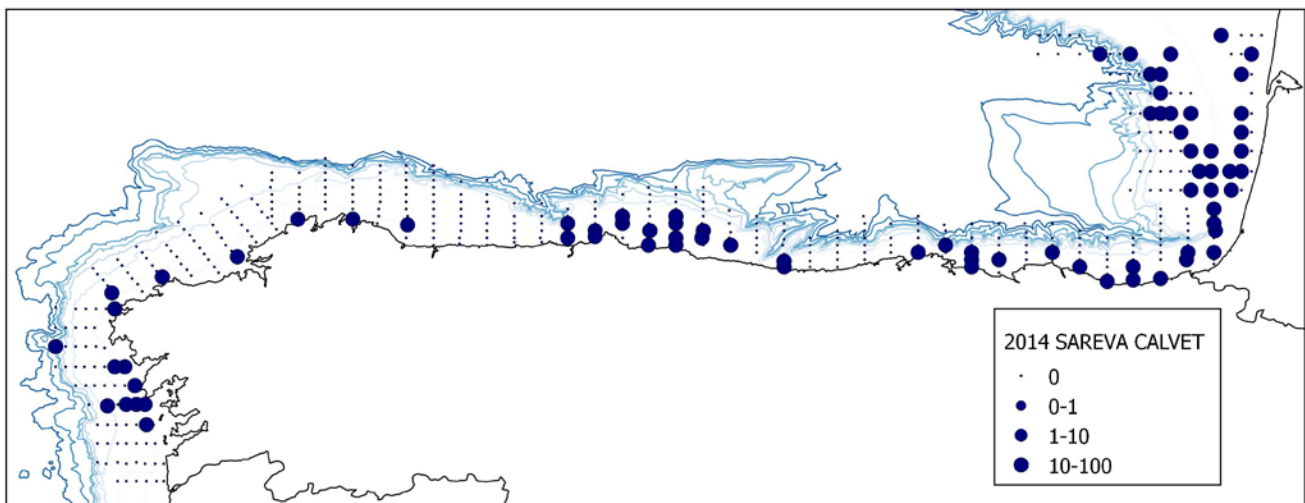


Figure 6. Sardine egg density in CALVET samples from SAREVA0314 survey.

- **Anchovy (FIGURE 7)**

109 of the 473 stations carried out were positive for anchovy eggs, representing the 23%. The total number of eggs was 1388, with an average density of 74 eggs/m² (FIGURE 5). Anchovy eggs were only present in Galicia and in the French coast, where adults of anchovy were also abundant during PELACUS0317 survey (Carrera&Riveiro, 2017, WD to this WG) .

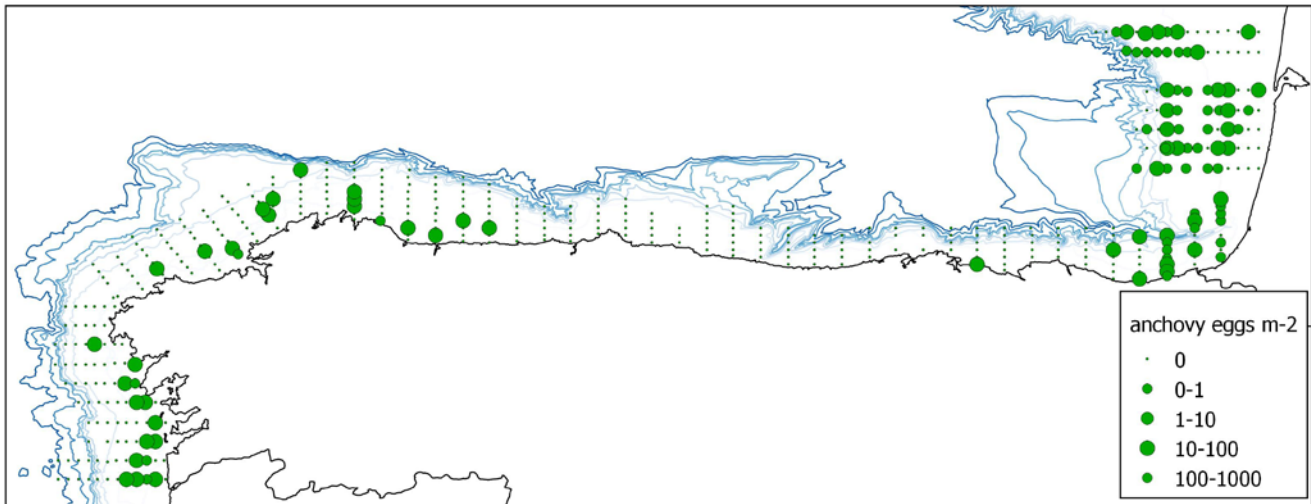


Figure 7. Anchovy egg density in CALVET samples from SAREVA0317survey

- **Mackerel (FIGURE 8)**

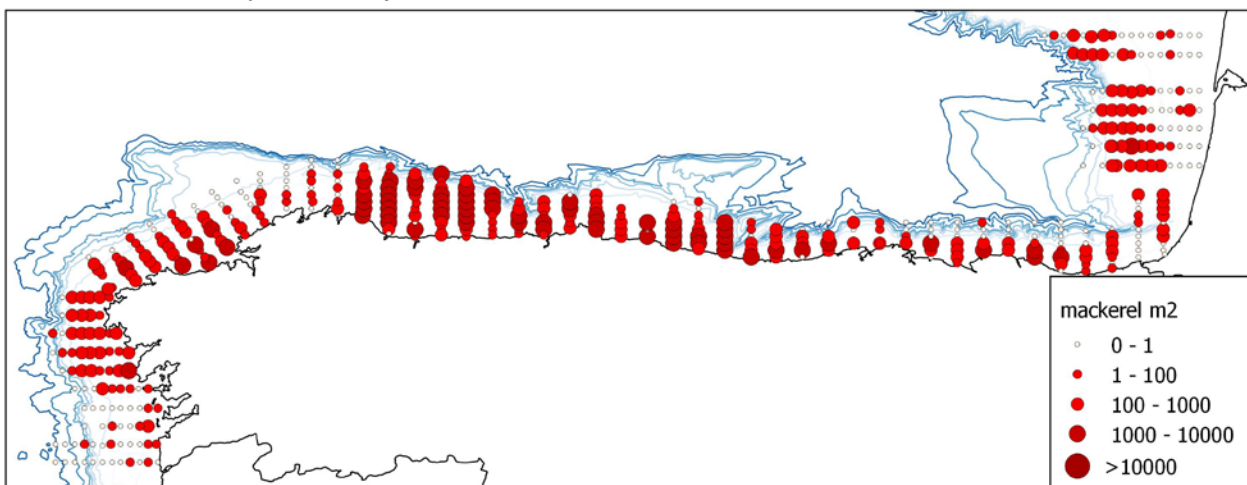


Figure 8. Mackerel egg density in CALVET samples from SAREVA0317survey

Mackerel was the more abundant and widely distributed fish species sampled along the area, with 12160 eggs counted in 310 positive stations (66%), and an average density of 519 egg/m²

- **Horse mackerel (FIGURE 9)**

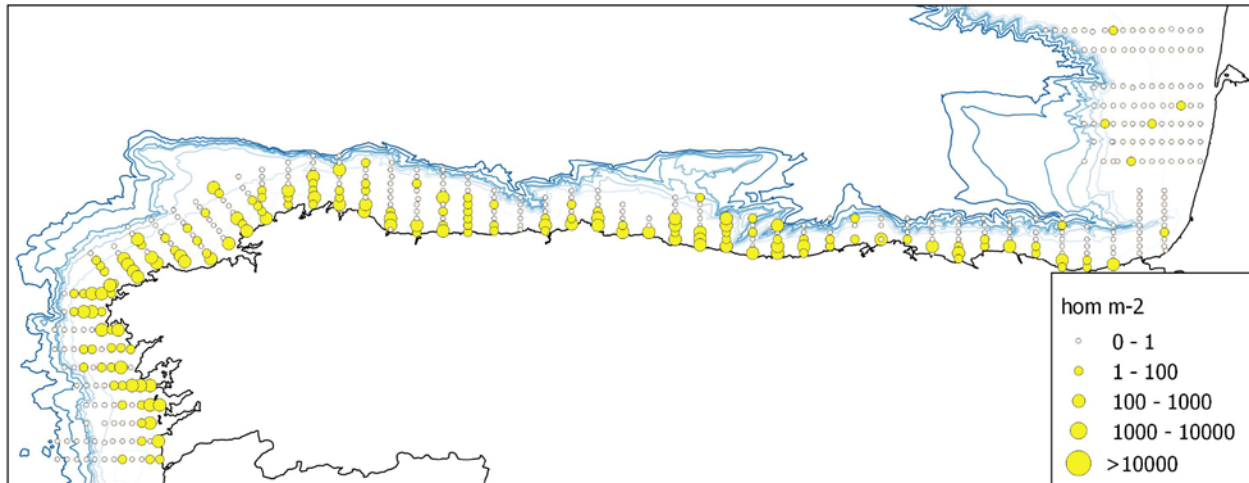


Figure 9. Horse mackerel egg density in CALVET samples from SAREVA0317survey

Horse mackerel egg distribution was restricted to Cantabrian and Galician coast, and almost disappears in the French platform. The total number of egg identified were 1072, with a 36% of positive stations and an average density of 48 egg/m².

- **Others (FIGURE 10)**

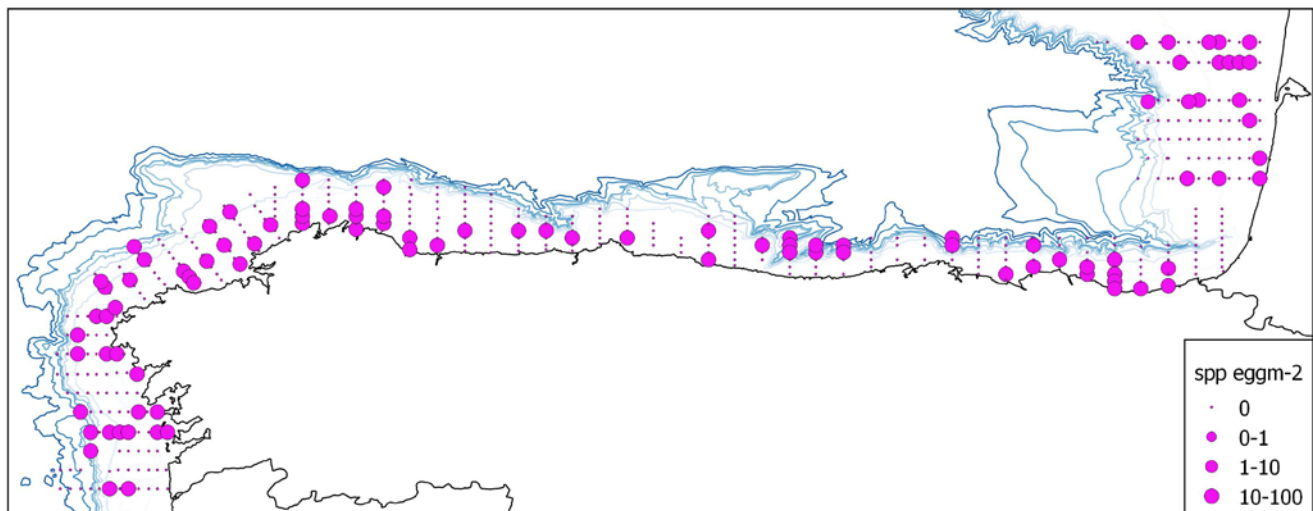


Figure 10. Spp. egg density in CALVET samples from SAREVA0317survey

Many other species share spawning area and spawning season with sardine, some of them were found during SAREVA0317 in 111 stations (23%) and with a total abundance of 456 eggs (average density of 30 eggs/m²).

P0 preliminary estimation

- **Positive area**

Sampled area was 37685 for 9a-8c and 10980 for 8b. Figure 11 shows positive sardine egg area for both strata.

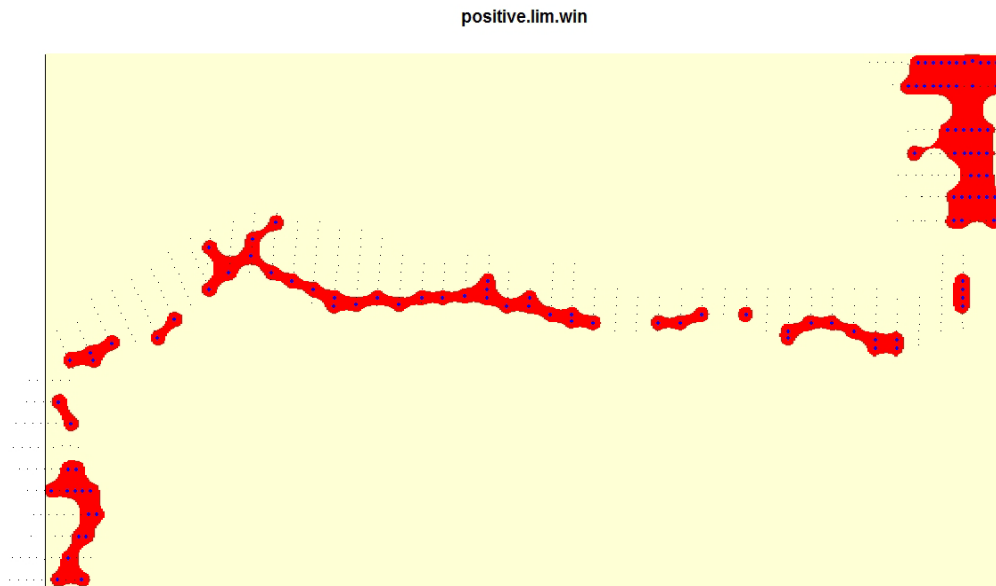


Figure 11. Positive sardine egg area in SAREVA0317 survey.

- **Temperature by strata**

Figure 12 shows temperature by strata, for 8c-9ac (stratum 3) mean temperature was 13.35°C and for 8b (stratum 4) 13.68°C.

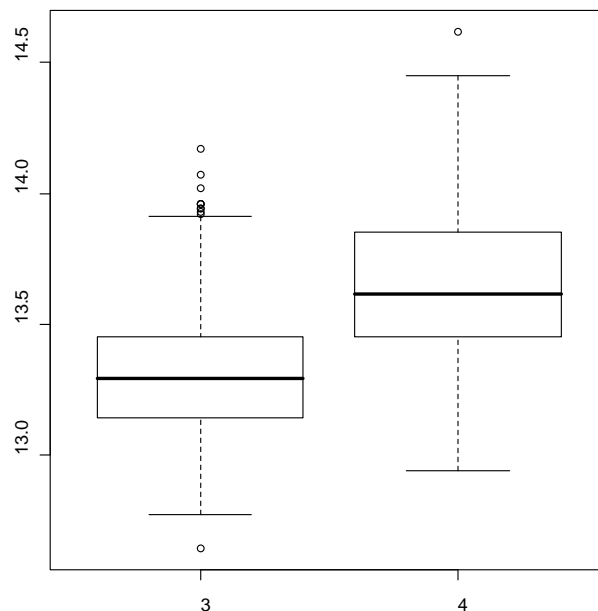


Figure 12. Temperature by strata. 3=subdivision 9aN+8c, 4=subdivision 8b sampled.

- **Mortality by strata**
We have explored 3 different scenarios of mortality.

1. *One area, one mortality*

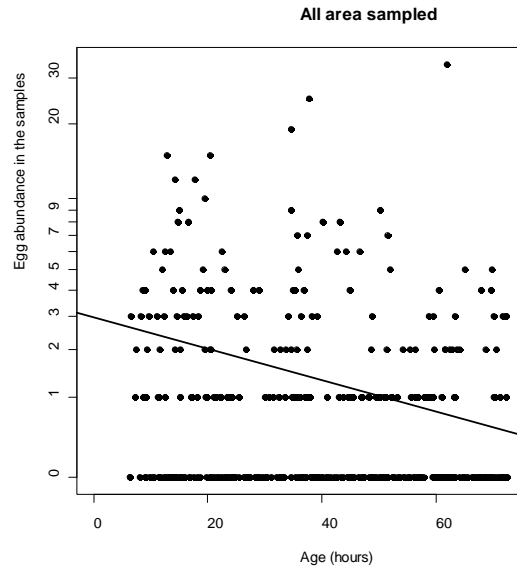


Figure 13. Observations and fit of the model for scenario 1

2. *Two areas, two mortalities*

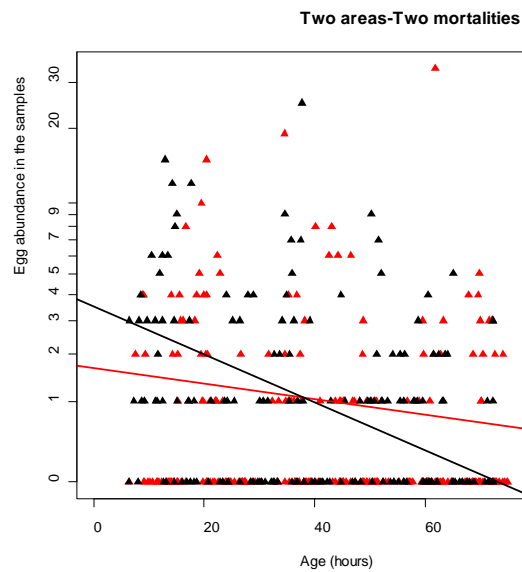


Figure 14. Observations and fit of the model for scenario 2

3. Two areas one mortality (3)

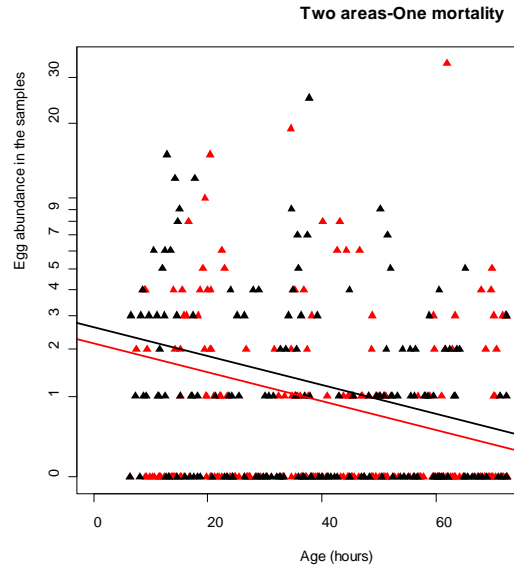


Figure 15. Observations and fit of the model for scenario 3

Table 1. Results of the different scenarios for mortality estimation

Scenario			z	zcv	Pr(> z)	p0	cv	p0Tot	area.pos	area.tot
1	Model no strata	All area	-0.014	-35.5	0.0089**	51.6	20.6	7.2302E+11	14021.43	48665.79
2	Model: 2 strata, 2 z	9a N+8c	-0.007	-94.4	0.28931	33.8	28.3	2.5825E+11	7641.546	37685.41
		8b	-0.021	-33.6	0.00295**	75.8	29.0	4.8337E+11	6379.887	10980.38
3	Model: 2 strata, 1 z	9a N+8c	-0.012	-38.2	0.0089**	43.5	22.5	3.3278E+11	7641.546	37685.41
		8b	-0.012	-38.2	0.0089**	56.3	22.4	3.5932E+11	6379.887	10980.38

Given than the model with two strata and two mortalities doesn't give significant mortality estimates for 8c-9a strata, the scenario of -two strata and one single mortality- was selected for the P0 estimation (Table 1, yellow, 3).

Preliminary 2017 value of total sardine egg production in north strata (8c+9a) 43.5eggs/m²/day, represents an increase by 13% regarding 2014 value, but still at very low levels (Figure 16).

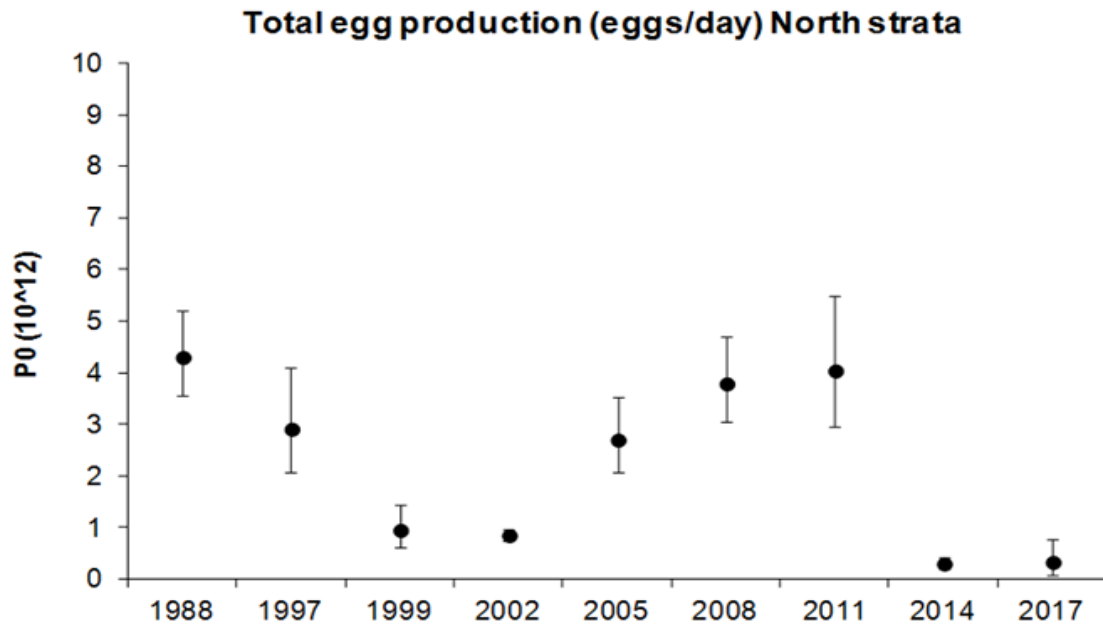


Figure 16. Sardine total egg production (eggs/m²/day) estimates for ICES 9aN+8c during the DEPM series (1988-2017).

References

- ICES. 2017. Report of the Working Group on Acoustic and Egg Surveys for Sardine and Anchovy in ICES Areas 7, 8, and 9. WGACEGG Report 2016 Capo, Granitola, Sicily, Italy. 14-18 November 2016. ICES CM 2016/SSGIEOM:31. 326 pp.
- Carrera P, Riveiro I (2017) Preliminary results of the PELACUS0317 survey: estimates of sardine abundance and biomass in Galicia and Cantabria waters. Working document for the WGHANSA 24-29/06/2017, Bilbao, Spain. 9pp.