



Regional Coordination Group
Mediterranean and Black Sea

19th MEDIAS Coordination Meeting report (RCG Med&BS)

2026

Final report

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MEDIAS Coordination Meeting Report

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Acronyms

CNR-IAS	Consiglio Nazionale delle Ricerche. Istituto per lo Studio degli Impatti Antropici e Sostenibilità in Ambiente Marino. Capo Granitola, Italy
CNR-IRBIM	Consiglio Nazionale delle Ricerche. Istituto per le Risorse Biologiche e le Biotecnologie Marine. Ancona, Italy
CNR-IREA	Consiglio Nazionale delle Ricerche. Istituto per il rilevamento elettromagnetico dell'ambiente, Italy
DCF	Data Collection Framework
DG MARE	Directorate-General for Maritime Affairs and Fisheries
FRIS	Fisheries Research Institute of Slovenia. Ljubljana, Slovenia
GFCM	General Fisheries Commission for the Mediterranean
GSA	Geographical Sub-Areas
HCMR	Hellenic Center of Marine Research, Greece
ICES	International Council for the Exploration of the Sea
IEO/CSIC	Centro Oceanográfico de Illes Balears (COB) Instituto Español de Oceanografía (IEO), Consejo Superior de Investigaciones Científicas (CSIC), Palma, Spain
IFREMER	Institut Français de Recherche pour l'exploitation de la Mer, France
IO-BAS	Institute of Oceanology - Bulgarian Academy of Sciences, Bulgaria
ISSG	Intersessional Subgroup
IZOR	Institute of Oceanography and Fisheries, Split, Croatia
JRC	Joint Research Center (of the European Commission)
Med & BS	Mediterranean Sea and Black Sea
MS	Member State
NIMRD	National Institute for Marine Research and Development "GRIGORE ANTIPA", Romania
RCG	Regional Coordination Group
RDB	Regional Database
RDBFIS	Regional Database Fisheries Information System
RFMO	Regional Fisheries Management Organisation
SC	Steering Committee
STECF	Scientific, Technical and Economic Committee for Fisheries

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I. Executive summary

The MEDIAS (MEDiterranean International Acoustic Surveys) Steering Committee met in Heraklion, Greece, on 28-30 April 2026, hosted by HCMR and co-chaired by Tarek Hattab from IFREMER and Marianna Giannoulaki from HCMR. The hybrid meeting was also virtually hosted on Zoom platform. Meeting participants were representatives from the European Union countries involved in acoustic surveys in the Mediterranean Sea (i.e. Croatia, France, Greece, Italy, Malta, Slovenia and Spain) and in the Black Sea (i.e. Bulgaria, Romania). One representative of EC from DG-MARE, and one representatives from RDBFIS II & RDBFIS-III projects were invited to participate. In total, 40 participants attended the meeting including 23 in-person attendees and 17 virtual participants (see list of participants in Annex I).

All participants adopted the agenda (see Annex II) of the 19th hybrid MEDIAS Coordination Meeting.

In accordance to the Agenda adopted, the main aims of the 19th MEDIAS Coordination Meeting were:

- To present the outcomes related to the MEDIAS activities carried out in 2025;
- To review and discuss information provided by EC representative;
- Update the document addressed to end users describing any changes in the sampling design or the implementation of the survey through the years;
- To review the progress of the RDBFIS database in respect to the MEDIAS data needs;
- To review data validation scheme R package;
- To review the adaptation of core **EchoR** package functions to an **RDBFIS** format, focusing on algorithmic transformation and validation of results.
- To discuss and agree on the steps forward regarding the standardization of echo-trace representation
- To discuss on a standardized methodology to combine catch data, addressing different biological sampling schemes with special reference on extreme values in biological sampling
- To update regional scale NASC maps;
- To present and interpret results associated to PhD thesis carried out based on data collected through the MEDIAS surveys;
- To establish the ToRs and plan the 20th MEDIAS meeting in 2027.

Following the agenda, during the first day activities and outcomes related to the 2025 MEDIAS acoustic surveys, carried out by the MEDIAS teams (Fig. I.1), were presented, as well as results from the pelagic trawl surveys carried out by Bulgaria and Romania in the Black Sea.

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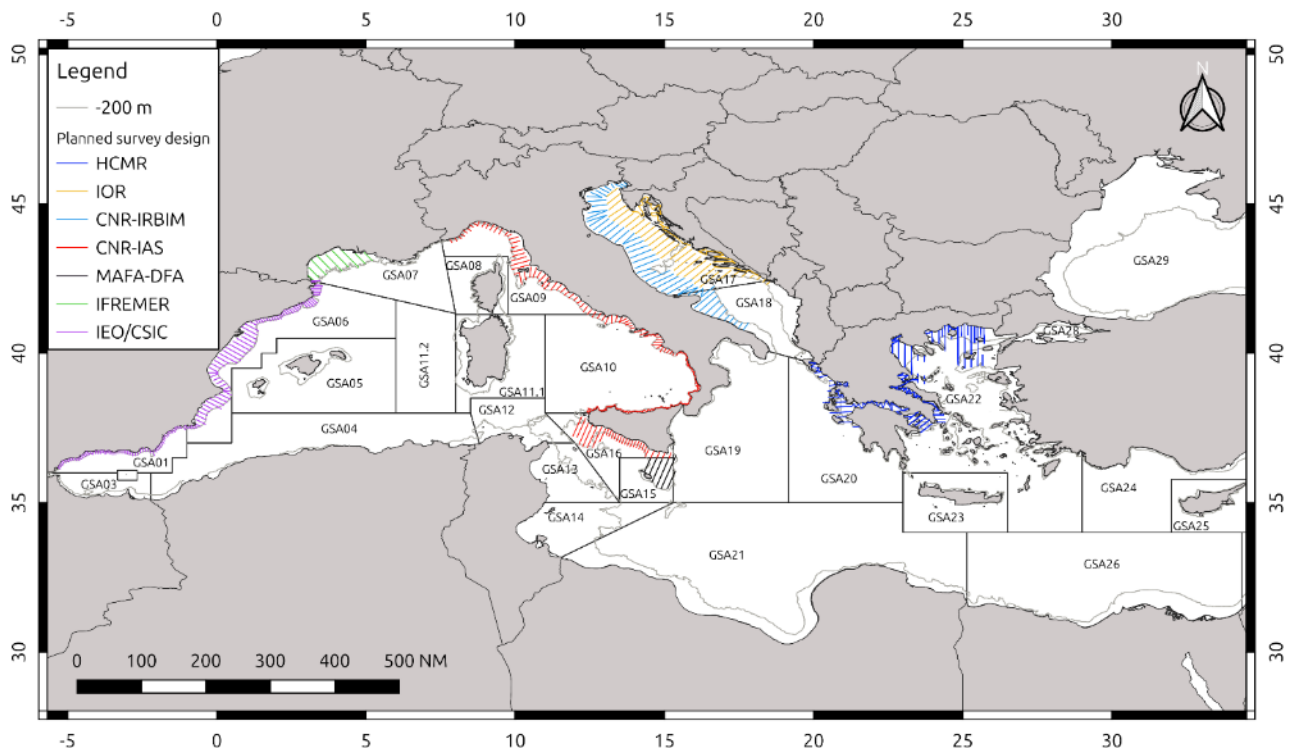


Figure I.1. Acoustic surveys performed in the MEDIAS framework during 2025.

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2. Results of the surveys carried out in 2025 in the framework of the Mediterranean International Acoustic Surveys (MEDIAS)

2.1 Presentation of the 2025 acoustic surveys in GSA 1 - Northern Alboran Sea and GSA 6 – Northern Spain (IEO)

Magdalena Iglesias, Ana Ventero, Pilar Córdoba, IEO/CSIC

a) General information on the survey

MEDIAS 2025 acoustic survey was carried out in the Mediterranean Spanish waters (GSA06, Northern Spain and GSA01, Northern Alboran Sea) from 11th July to 17th August 2025 (38 days) on board the R/V “Miguel Oliver” (70 m long, 14 m wide, 2 x 1000 kw). Target species were European anchovy (*Engraulis encrasicolus*) and European sardine (*Sardina pilchardus*).

b) Type of echosounder and frequencies in use

The equipment was composed by a split beam scientific echosounder SIMRAD EK80 operating at 18, 38, 70, 120 and 200 kHz frequencies. There was no threshold limit applied in the raw data. The threshold for processing for the assessment (38 kHz) was –70 dB. Elementary Sampling Distance Unit (EDSU) was 1 nmi, minimum bottom depth 30 m, pulse duration 1024 ms for all frequencies and ping rate was set to maximum. The surveying acoustic vessel speed was 10 knots. The Echoview software v. 16.0 was used to visualize and analyze acoustic data.

c) Calibration results

The acoustic system was calibrated at the beginning of the survey (12th July) using the standard sphere method (Demer et al., 2015) (Table 2.1.1).

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Table 2.1.1. Calibration results in MEDIAS 2025

Environment		Beam Model results					
Date	12/07/2025	Frequency	18 (kHz)	38 (kHz)	70 (kHz)	120 (kHz)	200 (kHz)
Bottom depth (m)	39	Transducer Gain (dB)	23.04	26.51	26.43	25.27	23.94
T (°C) at sphere depth	27.88	Sa corr (dB)	-0.01	-0.01	-0.09	-0.07	-0.12
S (psu) at sphere depth	37.26	Beam width atwarth (°)	10.23	6.69	6.49	6.33	6.06
Sound Velocity (m/s)	1544.2	Beam width along (°)	10.26	6.66	6.78	6.41	6.62
Pulse duration	1024	Atwarth offset (°)	-0.04	0.01	-0.2	-0.01	-0.12
		Along offset (°)	0	-0.03	-0.26	-0.07	-0.13
		RMS beam	0.05	0.09	0.09	0.10	0.16

d) Survey design

Acoustic data were collected during daytime (6:00am - 6:00pm, UTC) over a grid of systematic parallel transects perpendicular to coastline/bathymetry, covering the continental shelf (30-200 m depth) (Fig. 2.1.1). Inter-transect distance was 8 nmi in GSA06 (wide continental shelf) and 4 nmi in GSA01 (narrow continental shelf).

Acoustic data were collected and processed from 52 transects (868 nmi) in GSA06 and 59 transects (268 nmi) in GSA01 (Fig. 2.1.1 & 2.1.2), covering all the area.

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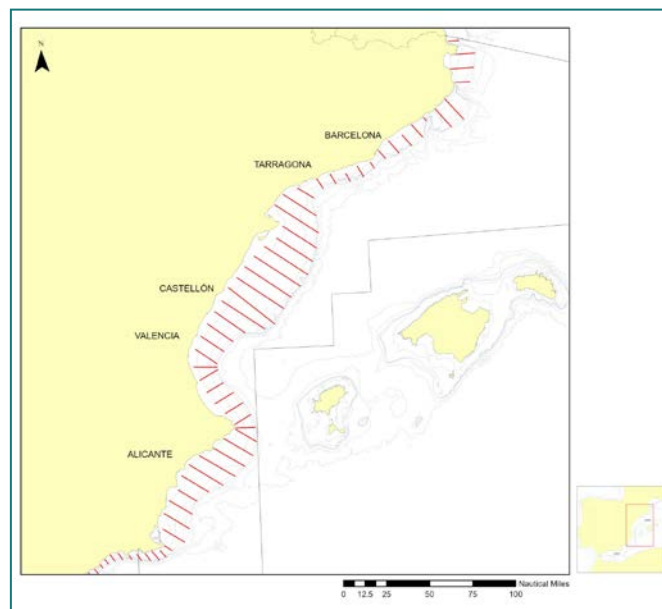


Figure 2.1.1. Acoustic survey design in GSA06: 52 transects prospected.

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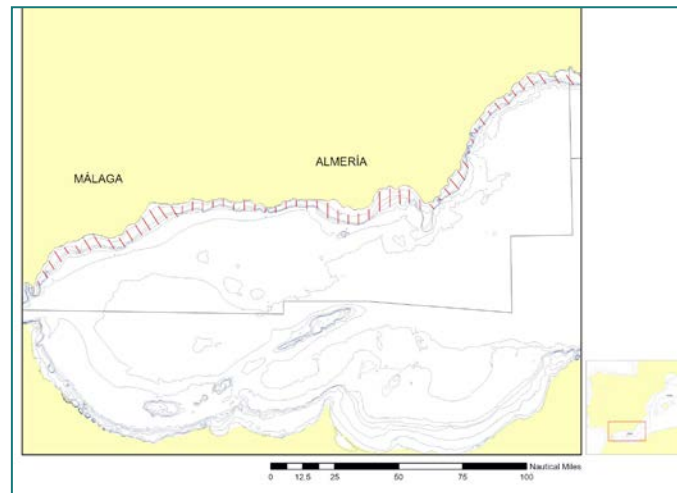


Figure 2.1.2. Acoustic survey design in GSA01: 59 transects prospected.

e) Fish sampling

Echotraces are identified with pelagic hauls. Forty-seven (47) pelagic hauls were carried out during daytime in Northern Spain (GSA06) (Fig. 2.1.3) and twenty-two (22) pelagic hauls during daytime/ night time in Northern Alboran Sea (GSA01) (Fig. 2.1.4). The pelagic net used has headline length of 63.5 m, a sideline dimension of 51 m, and a codend mesh size of 20 mm. Vessel speed was 3.5-4.5 knots during fishing. Trawls were monitored by means of SIMRAD FS70 trawl sonar for efficient monitoring of the net opening and fishing conditions and a MARPORT Speed Explorer that combines the functions of a trawl eye headline sounder with a trawl speed sensor.

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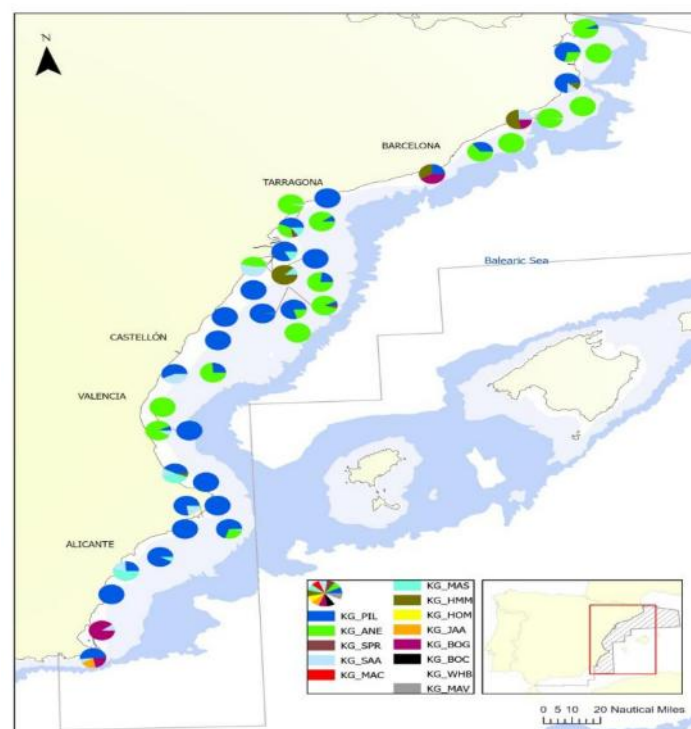


Figure 2.1.3. Pelagic hauls (47) composition (percentages in weight) carried out in GSA06 during the Spanish acoustic survey MEDIAS 2025.

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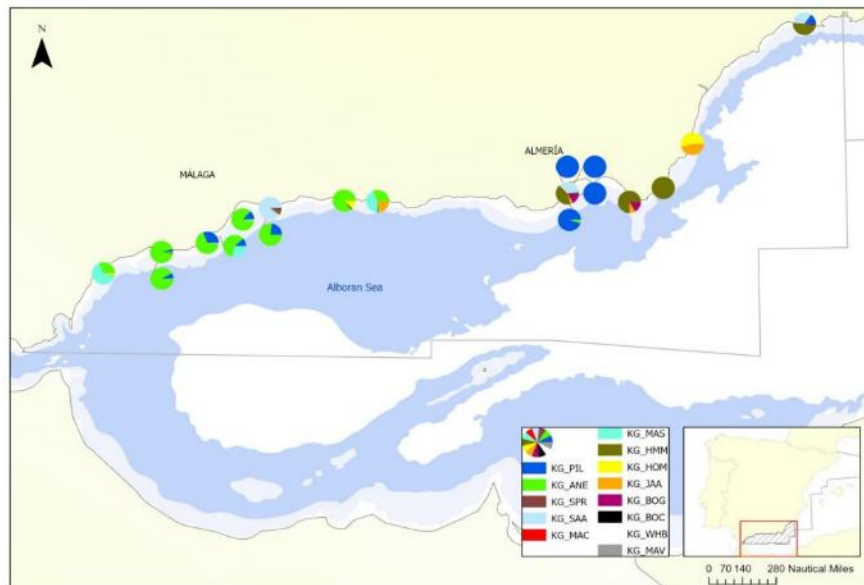


Figure 2.1.4. Pelagic hauls (22) composition (percentages in weight) carried out in GSA01 during the Spanish acoustic survey MEDIAS 2025.

f) Oceanographic parameters

In total, 124 hydrological stations were performed in GSA06 (Fig. 2.1.5) and 73 stations in GSA01 (Fig. 2.1.6), using a Seabird (SBE) 19 plus CTD, which measures conductivity, temperature, pressure, fluorescence and dissolved oxygen.

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Figure 2.1.5. CTD stations (124) in GSA06 carried out during the Spanish acoustic survey MEDIAS 2025.

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Figure 2.1.6. CTD stations (73) in GSA01 carried out during the Spanish acoustic survey MEDIAS 2025.

g) Biomass estimations of target species

The biomass estimation of sardine (*Sardina pilchardus*) and anchovy (*Engraulis encrasicolus*) in GSA's 06 and 01, as well as the associated CVs of geostatistical simulations, are reported in the table 2.1.2. The historical trend of sardine and anchovy in GSA06 and 01 are shown in figure 2.1.7 and 2.1.8. Biomass per length class for the two species is shown in figures 2.1.9 and 2.1.10 for GSA 06 and 01, respectively.

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Table 2.1.2. Estimates of biomass and CV for sardine and anchovy in GSA's 06 and 01 in MEDIAS 2025.

	GSA06		GSA01	
	Biomass (t)	CV	Biomass (t)	CV
Sardine	75102	13.5%	3219	31.6%
Anchovy	53611	12.2%	14253	29.9%

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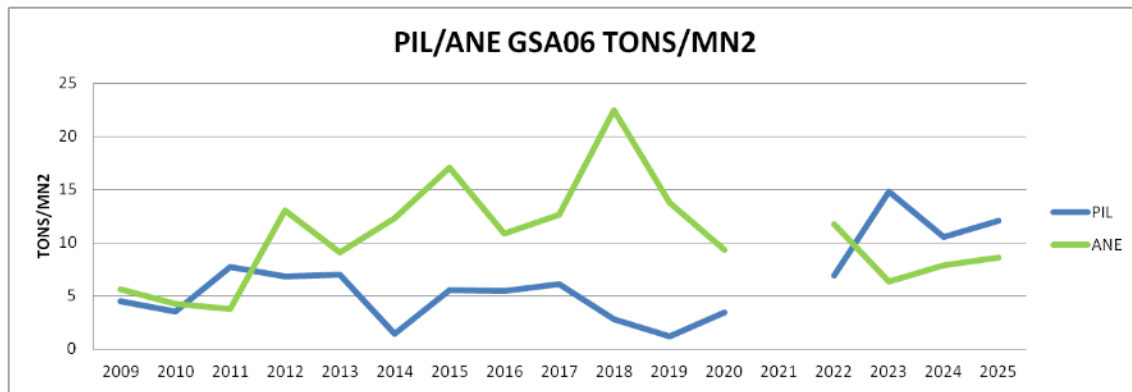


Figure 2.1.7. Historical trends in GSA06 (Northern Spain). PIL: *Sardina pilchardus*; ANE: *Engraulis encrasicolus*. Density (tons/mn2).

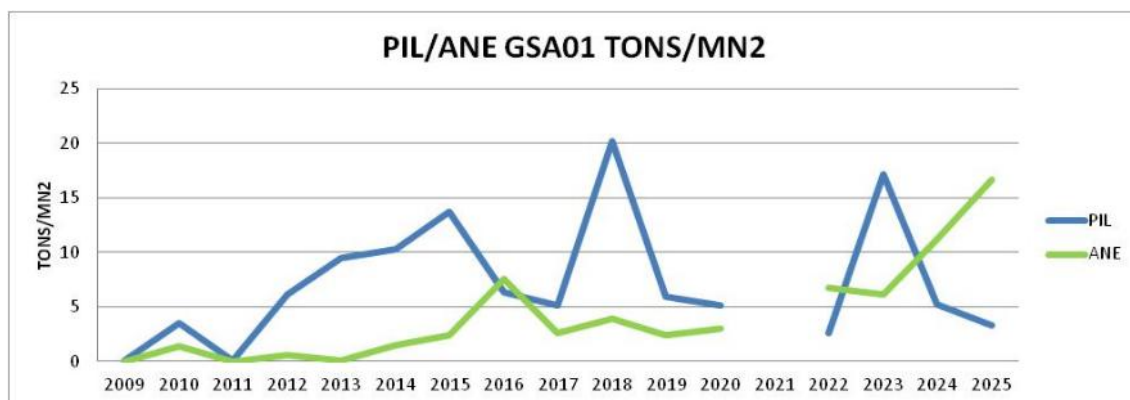


Figure 2.1.8. Historical trends in GSA01 (Northern Alboran Sea). PIL: *Sardina pilchardus*; ANE: *Engraulis encrasicolus*. Density (tons/mn2).

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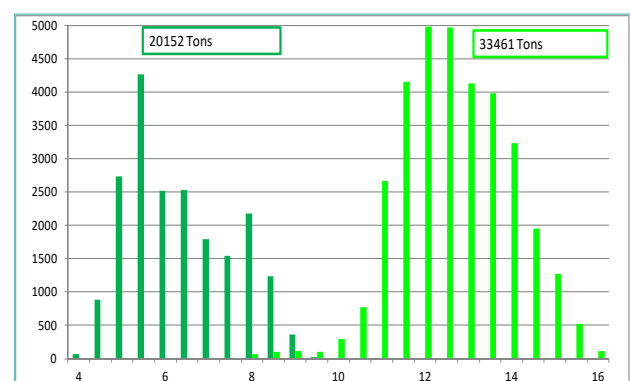
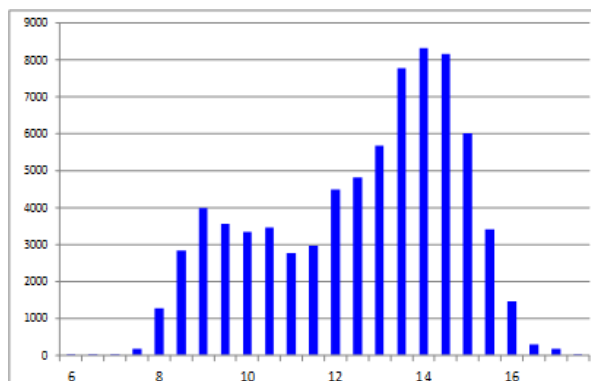


Figure 2.1.9. Sardine (left) and anchovy (right) biomass (in tons) per length class in Northern Spain (GSA06). MEDIAS 2025.

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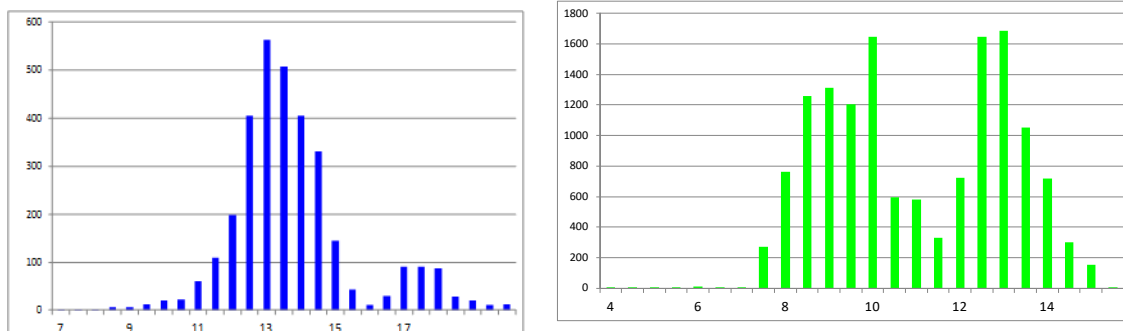


Figure 2.1.10. Sardine (left) and anchovy (right) biomass (in tons) per length class in Northern Alboran Sea (GSA01). MEDIAS 2025.

Biomass per age class was estimated for sardine and anchovy using otoliths reading and age length key was assessed. Age length key (ALK) for sardine in GSA06, MEDIAS 2025, was composed by 4 years classes (0-3). The number of otoliths readings was 1469 (pairs) (Fig. 2.1.11). In GSA01, the number of sardine otoliths readings was 544, the number of age classes were 5 (0-4) (Fig.2.1.11).

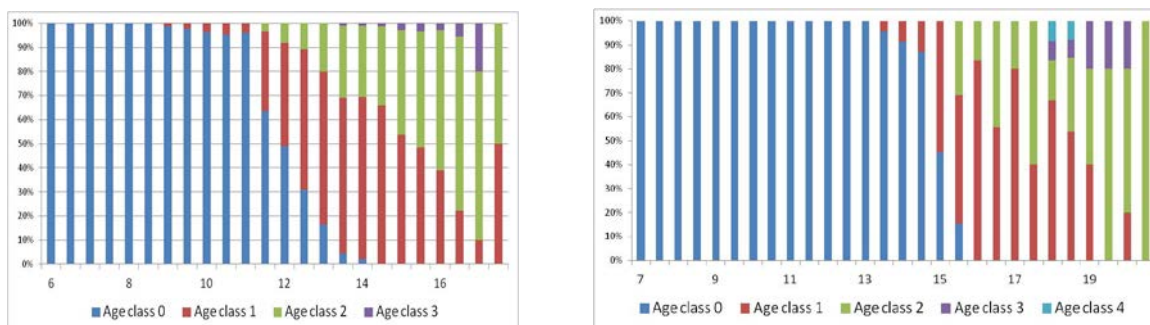


Figure 2.1.11. Sardine ALK in Northern Spain (GSA06, left) and Northern Alboran Sea (GSA01, right). MEDIAS 2025.

Age length key (ALK) for anchovy in GSA06, MEDIAS 2025, was composed by 3 years classes (0-2). The number of otoliths readings was 676 (pairs) (Fig. 2.1.12). In GSA01, the number of anchovy otoliths readings was 663 and the number of age classes observed were also 3 (0-2) (Fig.2.1.12).

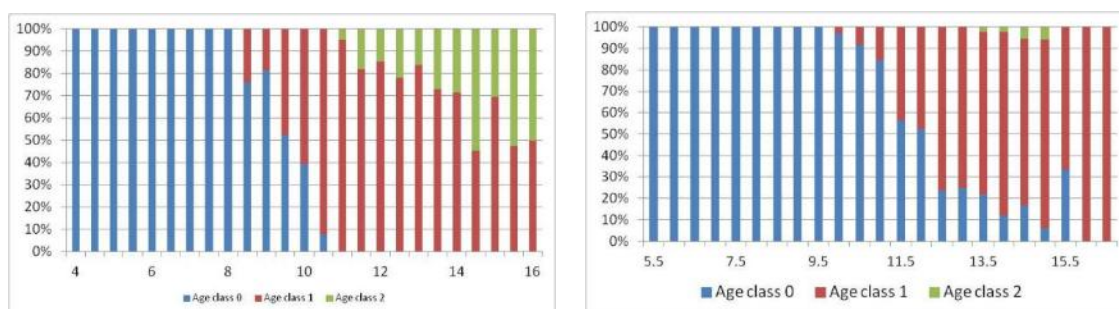


Figure 2.1.12. Anchovy ALK in in Northern Spain in GSA06 (left) and Northern Alboran Sea GSA01 (right). MEDIAS 2025.

Subsequently, biomass per age class for the two species is shown in figures 2.1.13 and 2.1.14 for GSA06 and GSA01, respectively.

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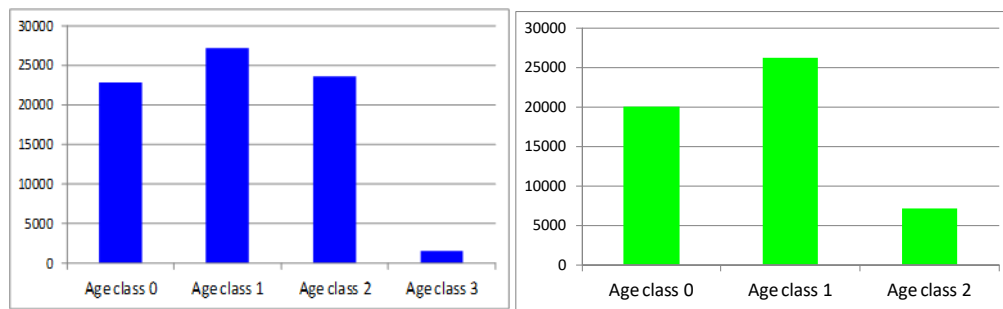


Figure 2.1.13. Sardine and anchovy biomasses (in tons) per length class in Northern Spain (GSA06). MEDIAS 2025.

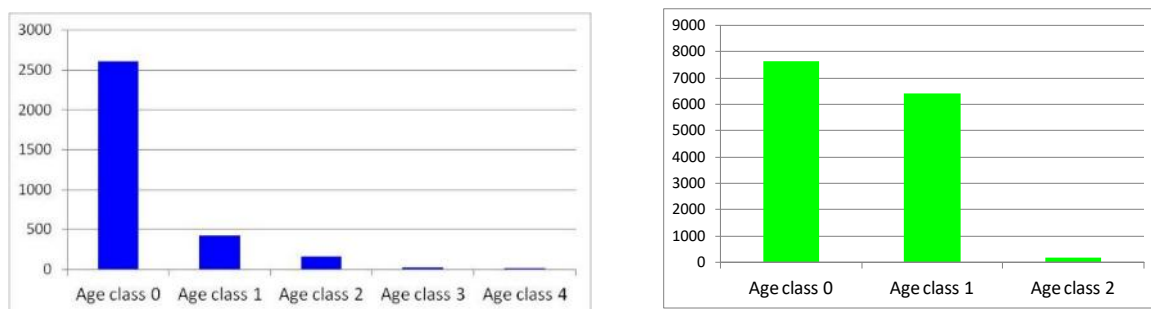


Figure 2.1.14. Sardine and anchovy biomasses (in tons) per length class in Northern Alboran Sea (GSA01). MEDIAS 2025.

h) Abundance indices of target species (spatial distribution)

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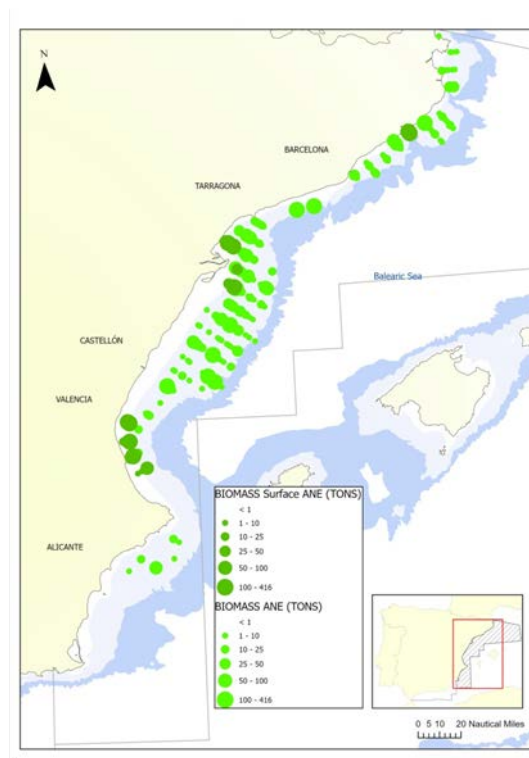
Spatial distribution of sardine abundance indices in terms of NASC (m²/mn²) in GSA 06 in 2025 is presented in Fig. 2.1.15. Sardine in the GSA06 is mainly distributed near the coast, in the area of influence of the Ebro Delta and in the areas of Castellón, Valencia and Alicante.



Figure 2.1.15. Sardine (PIL) spatial distribution in Northern Spain (GSA06) in MEDIAS 2025.

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Spatial distribution of anchovy abundance indices in terms of NASC (m^2/mn^2) in GSA 06 in 2025 is presented in Fig. 2.1.16. Anchovy in GSA06 was mainly distributed in the intermediate and deep areas of the continental shelf within the area of influence of the Ebro delta (light green). Juveniles surface layers were found near the coast (dark green).



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Figure 2.1.16. Anchovy (ANE) spatial distribution in Northern Spain (GSA06) in MEDIAS 2025.

Spatial distributions of sardine and anchovy abundance indices, in terms of NASC (m^2/mn^2) in GSA 01 in 2025 (Fig. 2.1.17 & 2.1.18, respectively). Sardine in GSA01 was mainly distributed in Malaga and Almería bays. Anchovy in GSA01 was mainly distributed in Malaga Bay.

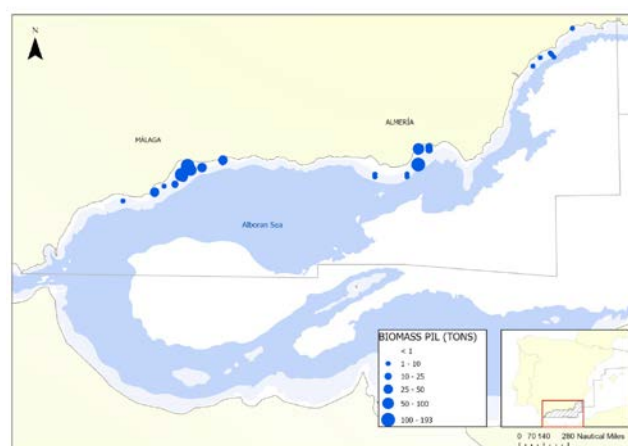


Figure 2.1.17. Sardine (PIL) spatial distribution in Northern Alboran Sea (GSA01) in MEDIAS 2025.

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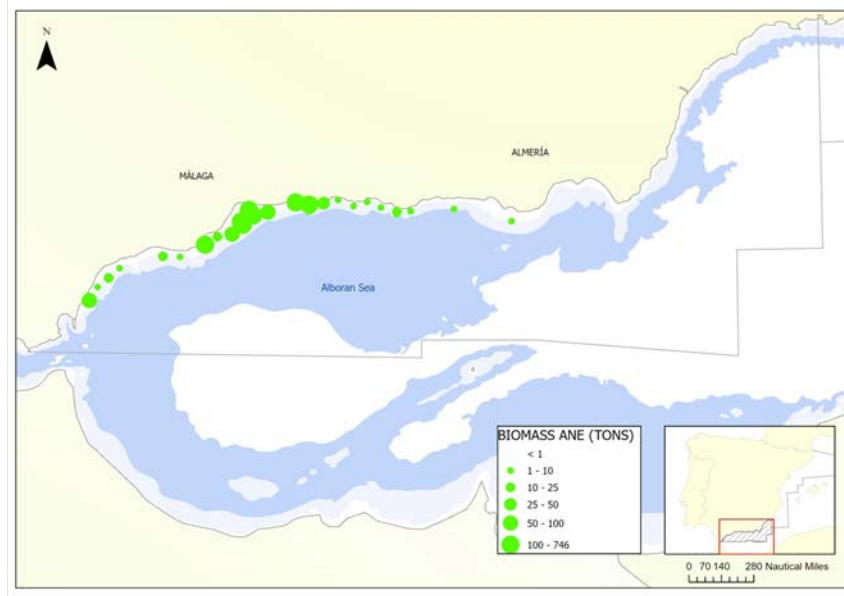


Figure 2.1.18. Anchovy (ANE) spatial distribution in Northern Alboran Sea (GSA01) in MEDIAS 2025.

2.2 Presentation of the 2025 acoustic surveys in the GSA 7 - Gulf of Lion (IFREMER)

Tarek Hattab and Jean-Hervé Bourdeix, IFREMER

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General information on the survey

The surveys took place from July 3 to August 4 2025, (lasts 33 days at sea) and covered the Gulf of Lions (3300 nm²) with the fishery Research Vessel L'Europe (29.60 m length, 469 × 2 HP).

Type of echosounders and frequencies in use

The equipment was composed by SIMRAD ER60 split beam echo sounder, with the 38, 70, 120, 200 and 333 kHz frequencies. The threshold for acquisition is −80 dB and that for processing for the assessment (38 KHz) is −60 dB. The pulse duration is 1024 ms. The surveying acoustic vessel speed is 8 knots. Additionally, the multi-beam echo sounder SIMRAD ME70 was used in order to visualize 3D echos and improve species allocation. The MOVIES 3D software was used to visualize and analyze acoustic data.

Calibration results

The acoustic system was calibrated on May 25 2025. Calibration results are shown in Table 2.2.1.

Table 2.2.1. Calibration results in MEDIAS 2025.

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Frequency (kHz)	38kHz	70kHz	120kHz	200kHz	333kHz
Echo-sounder type	ES38B	ES70_7C	ES120_7	ES200_7C	ES333_7C
Transducer serial no.	558	127	29497	288	159
Vessel	RV l'Europe	RV l'Europe	RV l'Europe	RV l'Europe	RV l'Europe
Date	25/05/25	25/05/25	25/05/25	25/05/25	25/05/25
Place	Toulon - Baie de la Garonne	Toulon - Baie de la Garonne	Toulon - Baie de la Garonne	Toulon - Baie de la Garonne	Toulon - Baie de la Garonne
Bottom depth (m)	15.16	15.16	15.16	15.16	15.16
Temperature (°C) at sphere depth	18	18	18	18	18
Salinity (psu) at sphere depth	37	37	37	37	37
TS of sphere (dB)	-42.4	-41.5	-39.6	-39	-44
Pulse duration (s)	1.024	1.024	1.024	1.024	1.024
Ping rate	0.4	0.4	0.4	0.4	0.4
Rms beam	0.06	0.09	0.16	0.14	0.11
resulting gain (dB)	26.45	27.35	25.43	26.42	24.47
Sa corr (dB)	-0.14	0.02	-0.11	-0.10	-0.04
Beam width atwarth°	6.63	6.70	6.94	7.26	7.13
Beam width along°	6.55	6.72	6.39	7.16	6.78
Atwarth offset°	-0.02	-0.04	0.01	0.09	-0.03

Survey design

The survey design is made of 9 parallel transects (min and max lengths are 13 and 42 nautical miles) perpendicular to the coastline and 12 nm apart, from the 15 m isobath to the 200 m one. In 2025 total nautical miles effectively used for acoustic analysis (minus pelagic trawls tracks and linking transects) were 268.

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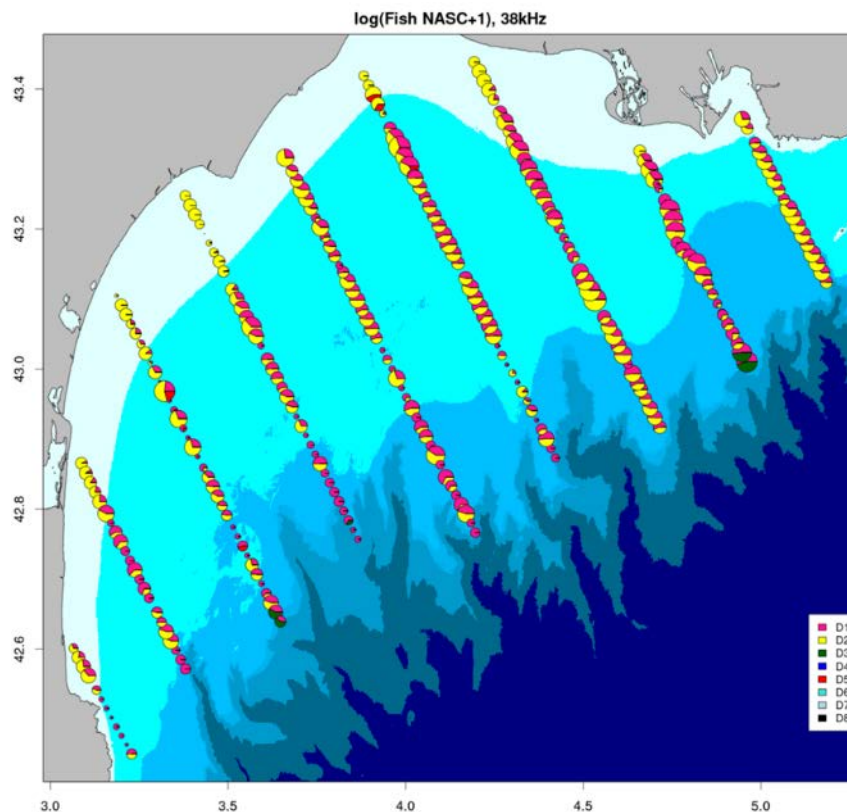


Figure 2.2.1. The survey design in GSA 7 (MEDIAS, 2025). The size of the pie charts is proportional to the $\log(\text{Fish NASC}+1)$ while the color shows the echotyping result.

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Fish sampling

Echotraces are identified with a pelagic haul. Thirty-three (33) pelagic hauls were then carried out in GSA07 to be used for the scrutinizing of the echograms (Figure 2.2.2). Each time a fish trace was observed for at least 2 nm on the echogram, the boat turned around to conduct a 30 min-trawl at 4 nm.h-l in order to evaluate the proportion of each species (by randomly sampling and sorting of the catch before counting and weighing each individual species). Acoustic recording and trawl hauls are performed during day time. The pelagic net used has headline length of 83.2m, a sideline dimension of 65.20 m and a codend mesh size of 18 mm.

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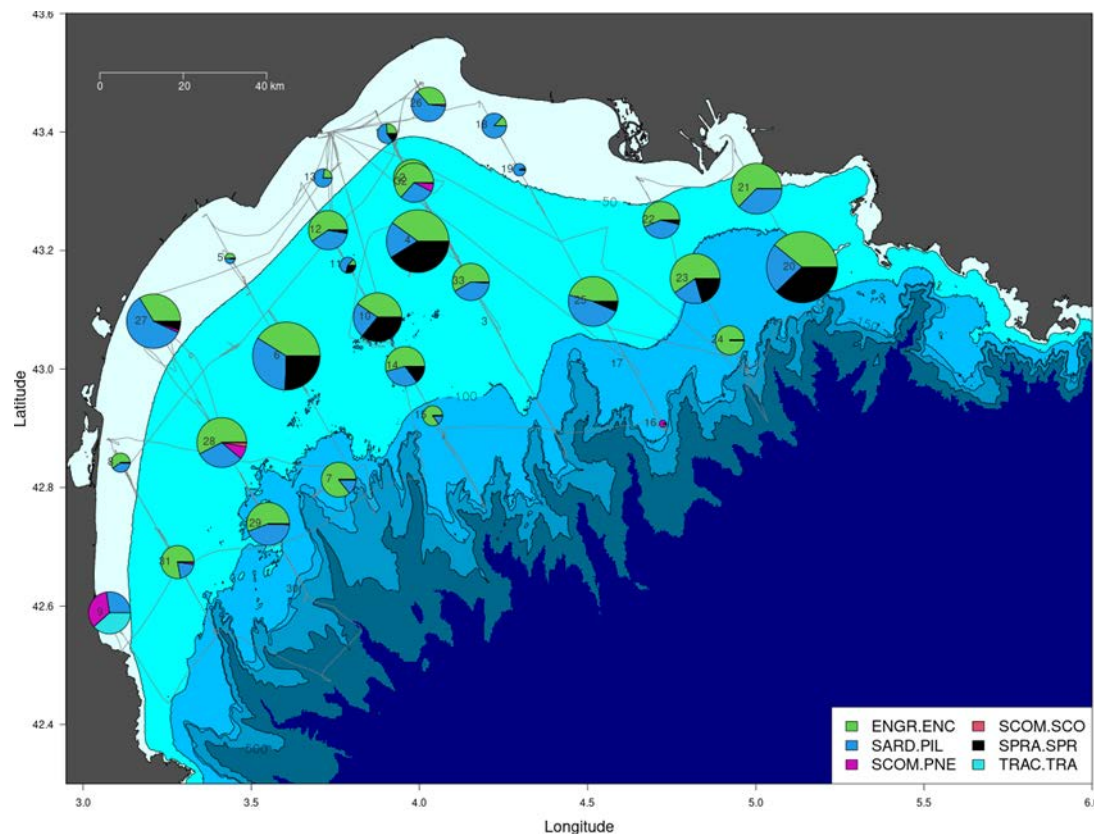


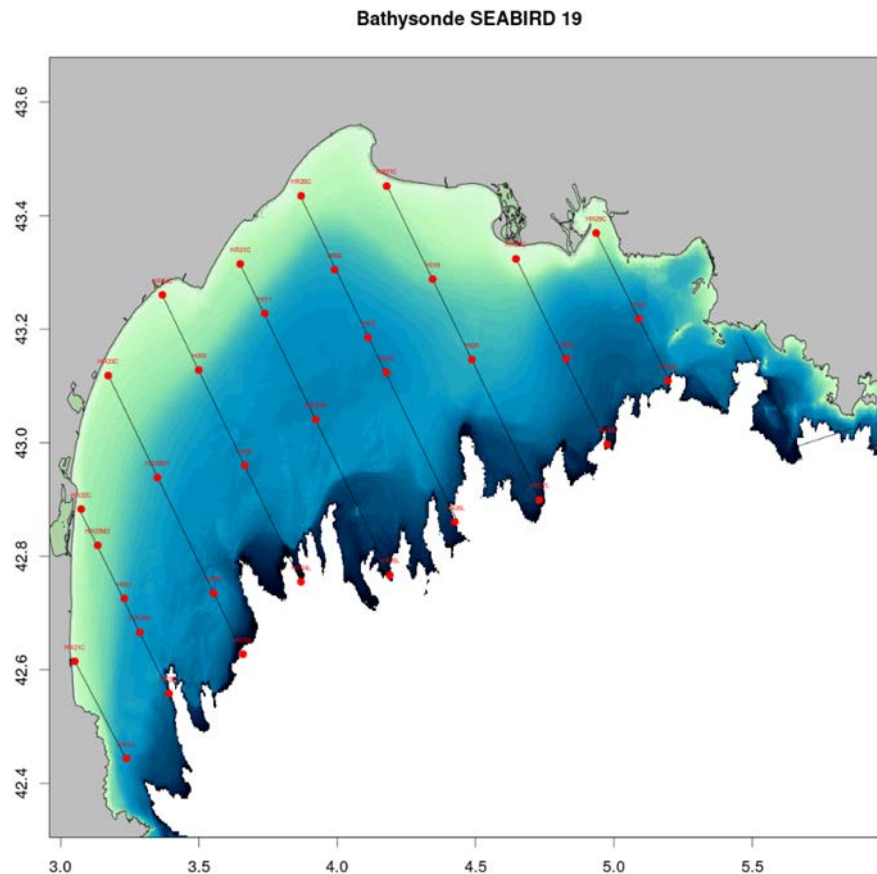
Figure 2.2.2. Catch compositions of pelagic hauls (33) carried out in GSA07 during the French acoustic survey MEDIAS 2025.

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Oceanographic parameters

Thirty-three hydrological stations have been sampled using a SBE 19plus V2 CTD which measures conductivity, temperature, pressure, fluorescence, PAR (Photosynthetically active radiation), pH, oxygen and turbidity (Figure 2.2.3). Zooplankton was sampled through WP2 vertical nets, while phytoplankton was sampled through Niskin bottles in subsurface (5m depth).

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Figure 2.2.3. CTD stations (33) carried out during the French acoustic survey MEDIAS 2025.

Biomass estimations of target species

Acoustic data analyses (stock estimation, length-weight relationships, etc.) were performed using R scripts (EchoR package). The sardine and anchovy biomasses were estimated to be respectively 38052 and 40812 ton in 2025. The CVs of geostatistical simulations were 24 % and 15 % while the CV associated to Hauls / ESDUs associations were 5.4 % and 3.9 % for respectively for sardine and anchovy.

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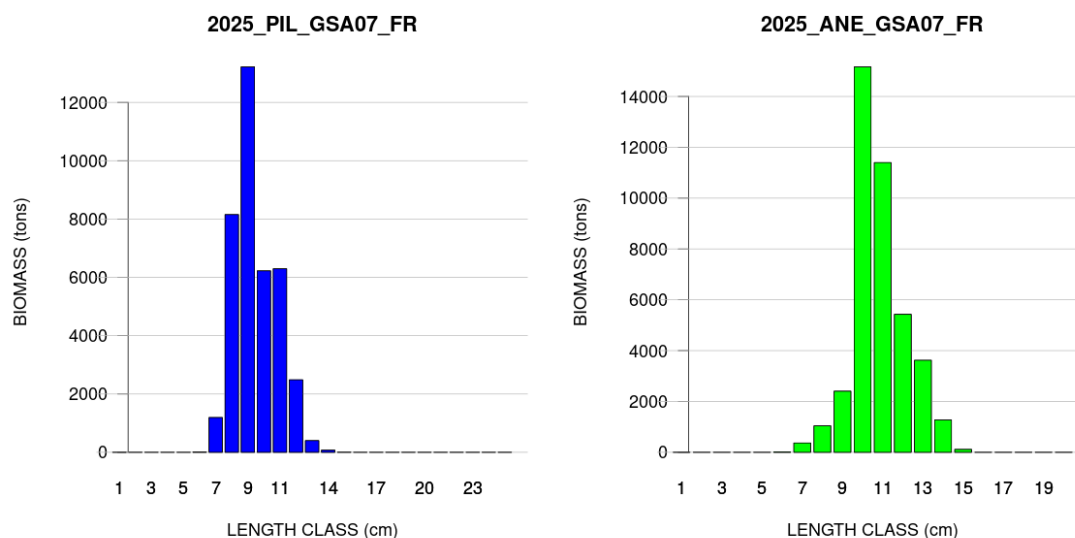


Figure 2.2.4. Biomass estimates per length classes for sardine and anchovy (MEDIAS 2025).

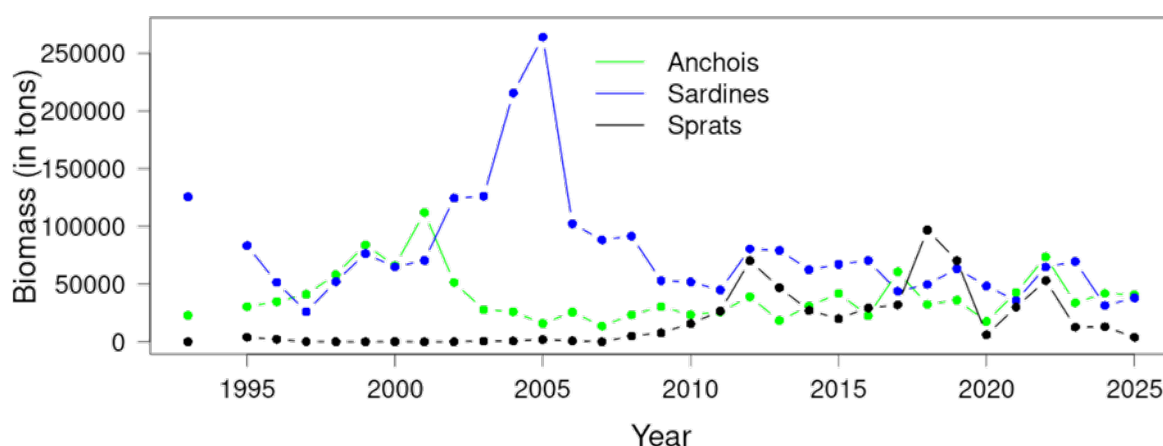


Figure 2.2.5. Long-term biomass estimates in GSA 7 for anchovy, sardine and sprat (DCF-MEDIAS estimates have started in 2009).

Biomass per age was estimated for sardine and anchovy using otoliths reading and survey specific age-length keys (Figure 2.2.6).

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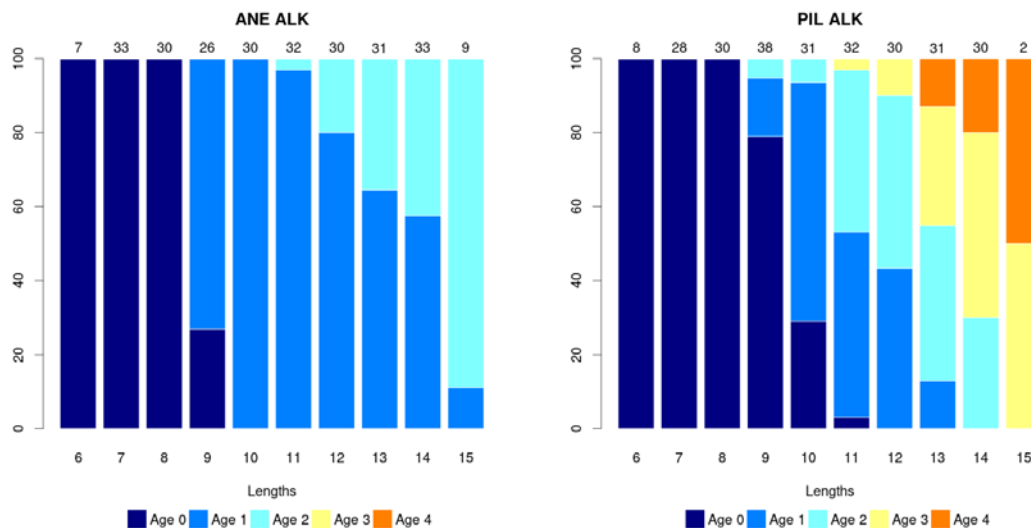


Figure 2.2.6. Age-length keys for sardine and anchovy in GSA 7 (MEDIAS 2025). The number of observations per size class are shown at the top of each bar in the barplot.

Sardine and anchovy population's age structures, estimated as biomass at age are shown in Fig 2.2.7.

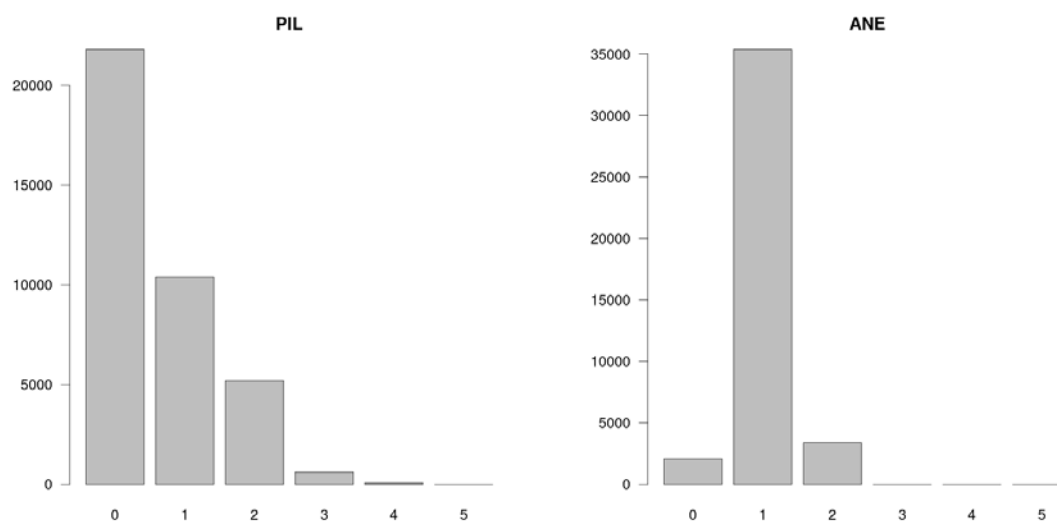


Figure 2.2.7. Biomass at age (in tons) estimates in MEDIAS 2025.

Abundance indices of target species

Spatial distributions of abundance indices of sardine and anchovy in GSA 7 during MEDIAS 2025 are shown in Fig 2.2.8.

Abundance at length estimates for sardines and anchovy are shown in Fig 2.2.9. Long-term abundance estimates are shown in Fig 2.2.10 and Fig 2.2.11.

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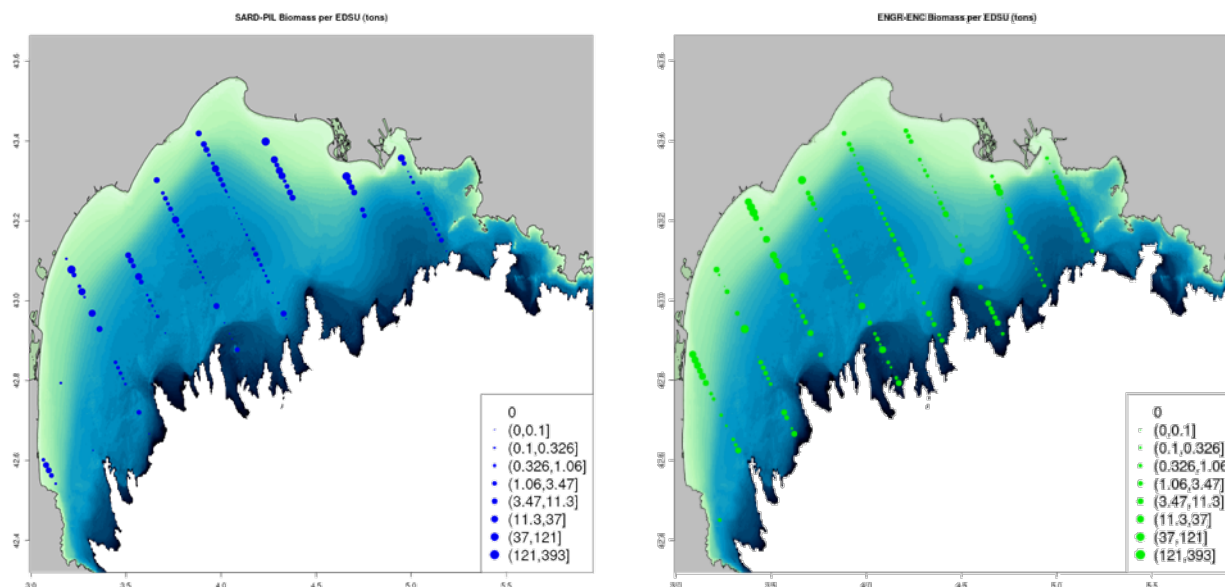


Figure 2.2.8. Spatial distributions of abundance indices of sardine (left) and anchovy (right) in GSA 7 during MEDIAS 2025.

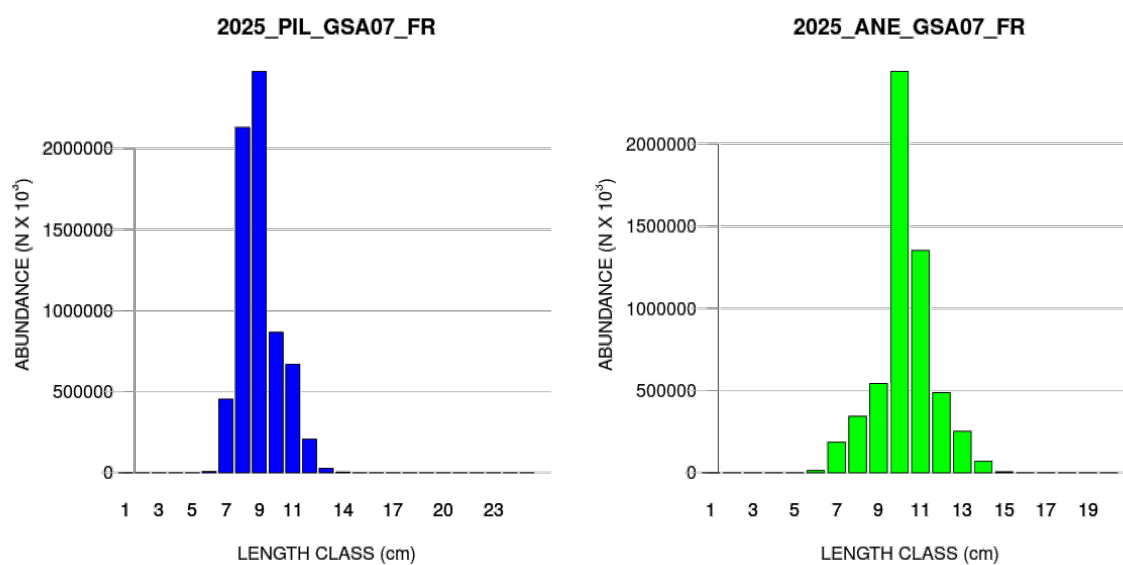


Figure 2.1.9. Abundance estimates per length classes for sardine and anchovy (MEDIAS 2025).

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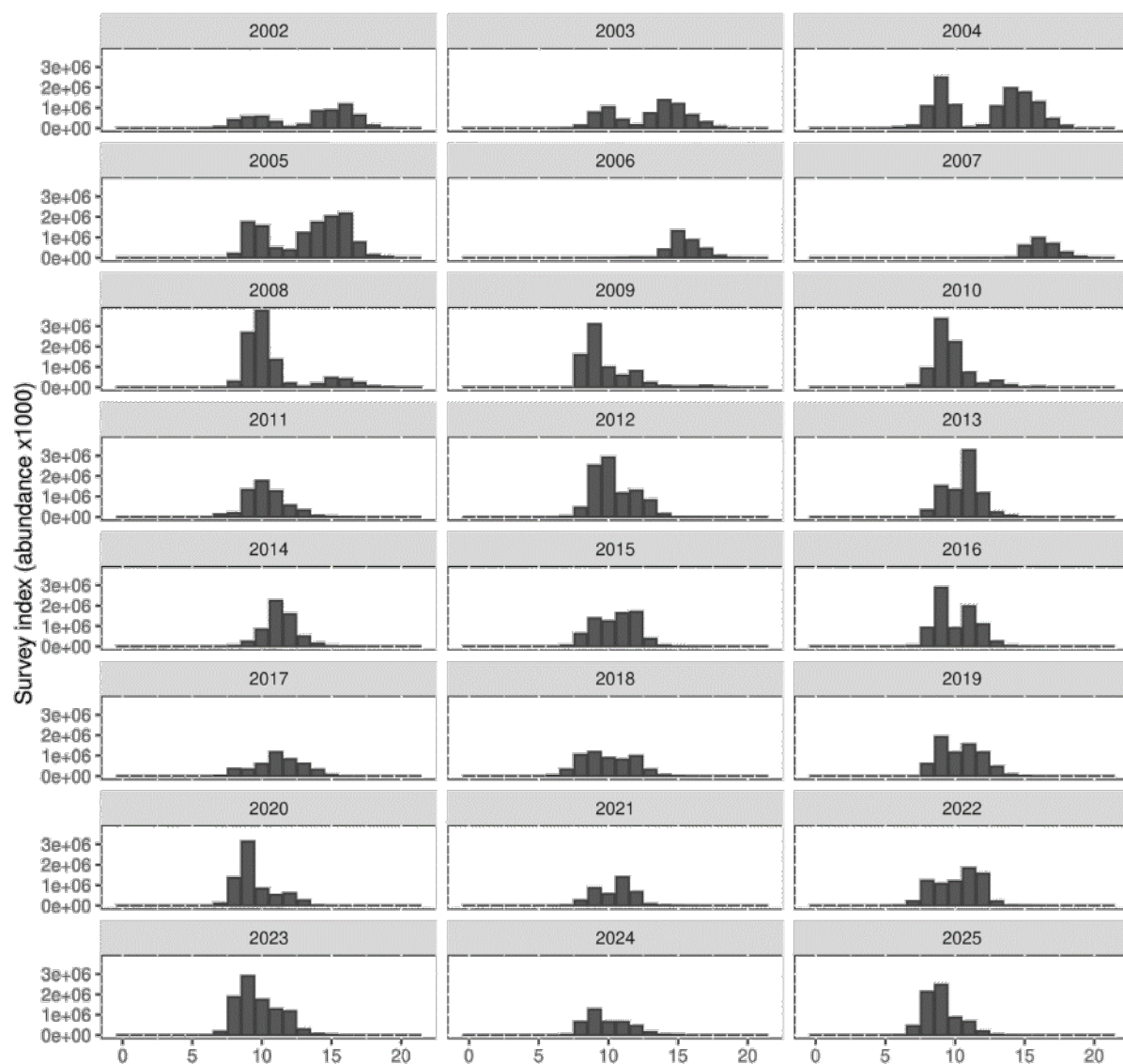


Figure 2.1.10. Length structured abundance estimates for sardine in GSA 07.

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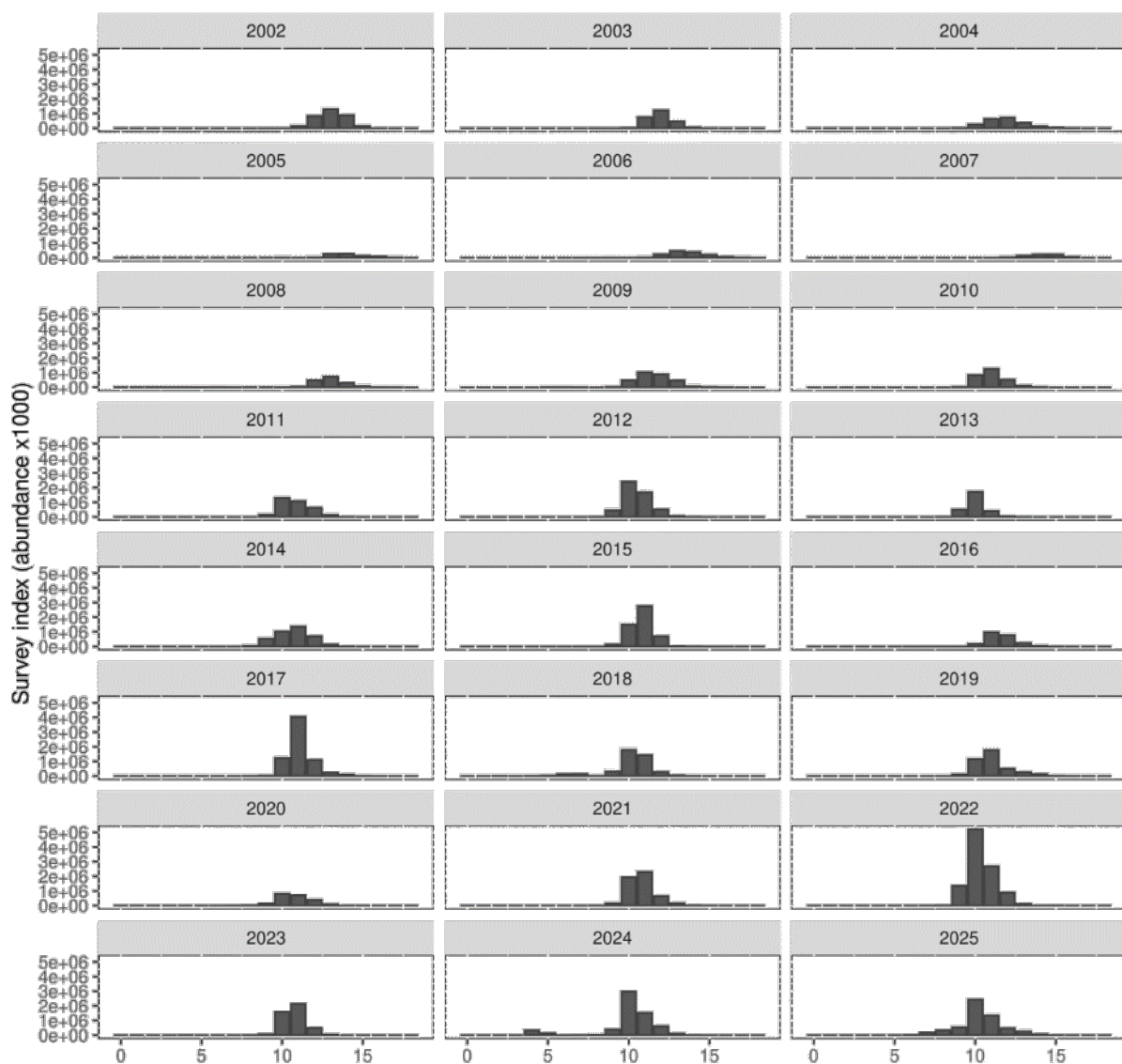


Figure 2.1.11. Length structured abundance estimates for anchovy in GSA 07.

Age-structured estimates from acoustic surveys related to sardine and anchovy populations, are shown in Fig 2.1.12 and Fig 2.1.13.

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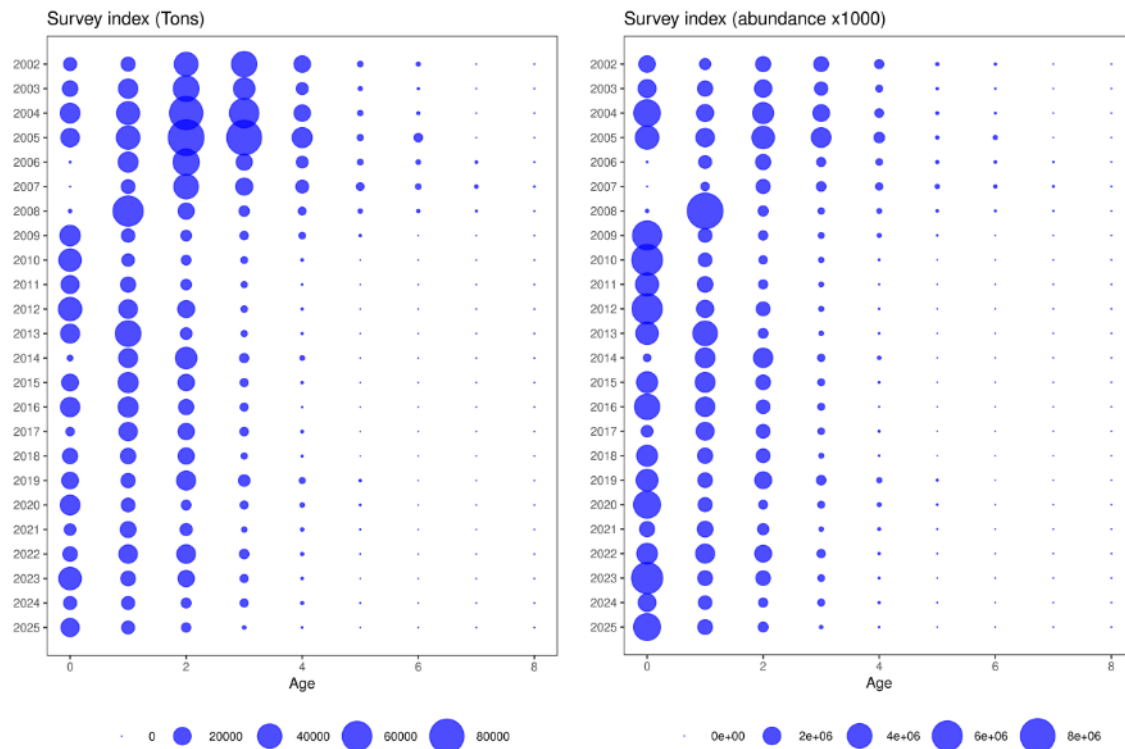


Figure 2.1.12. Age-structured estimates from acoustic surveys for sardine's population in GSA 7.

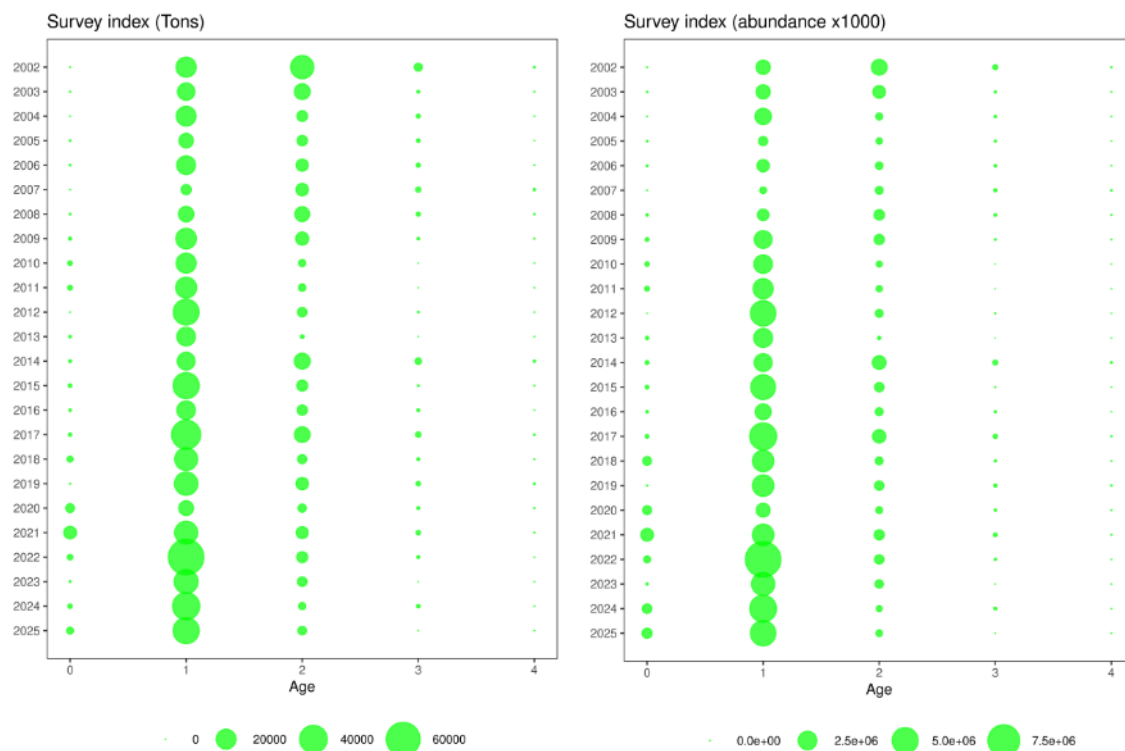


Figure 2.1.13. Age-structured estimates from acoustic surveys for anchovy's population in GSA 7.

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2.3 Presentation of the 2025 acoustic survey in GSA 9 – Ligurian and North Tyrrhenian Sea (CNR-IAS and CNR-ISMAR)

Angelo Bonanno, Gualtiero Basilone, Marco Barra, Simona Genovese, Rosalia Ferreri, Giovanni Giacalone, Ignazio Fontana, CNR-IAS

a) General information on the survey

MEDIAS 2025 in GSA 9 took place from August 26 to September 13 (lasts 18 days at sea) and covered the continental shelf in the Ligurian and North Tyrrhenian Sea (4248 nm²) with the Research Vessel "G. Dallaporta" (35.7 m length, 1086 HP).

b) Type of echosounders and frequencies in use

A SIMRAD EK80 split beam echo sounder, working at 38, 120 and 200 kHz, was used. The threshold for the assessment (38 kHz) was -60 dB. The pulse duration was 1024 ms. The mean surveying acoustic vessel speed was 9 knots. The Echoview software was used to visualize and analyse acoustic data.

c) Calibration results

The acoustic system was calibrated in the Bay of Siracusa (37°02.645 N 15°17.349 E) on August 11, 2025.

Table 2.1.14 Calibration results in MEDIAS 2025.

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Transducer Frequency	38 kHz	120 kHz	200 kHz
Transducer model	ES38-7	ES120-7C	ES200-7C
Transducer serial no.	502	480	365
Bottom depth (m)	15	15	15
Temperature at sphere depth	27.3°C	27.3°C	27.3°C
Salinity (PSU) at sphere depth	39.0	39.0	39.0
TS of Tungsten (WC-Co) sphere			
38.1mm (dB)	-42.4	-39.6	-38.9
Pulse duration (ms)	1.024	1.024	1.024
Ping interval (s)	1	1	1
RMS	0.08	0.34	0.38
Transducer gain (dB)	27.5	26.51	20.11
Sa corr. (dB)	-0.22	-0.10	-0.15
Athw. Beam angle (deg)	6.70	6.46	7.70
Along Beam angle (deg)	6.62	6.41	7.60
Athw. Offset Beam angle (deg)	0.02	0.08	-0.18
Along Offset Beam angles (deg)	0.09	-0.29	0.02

d) Survey design

The survey design is made of parallel transects perpendicular to the coastline, from the 10-20 m isobath to the 200 m one. The total length of the route covered by the survey was 922 nm,

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while the number of EDSUs effectively processed for acoustic biomass estimation (minus pelagic trawls tracks and linking transects) was 522 nm.

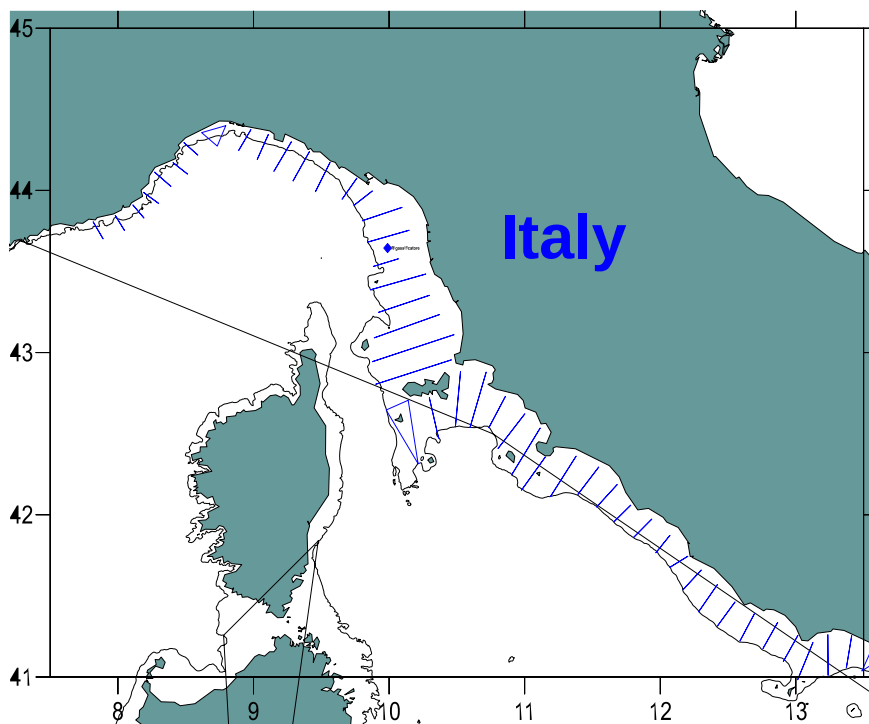


Figure 2.1.1. Acoustic survey design in GSA 9. MEDIAS 2025.

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e) Fish sampling

Pelagic fishes are identified by means of pelagic hauls. During the survey in 2025, nineteen (19) pelagic hauls were carried out in GSA 9 to be used for echograms scrutinizing (Fig. 2.1.2). The pelagic net used has a total length of 78 m (Cod end length 22 m), Cod end mesh size of 18 mm, Vertical opening of 7 m, Horizontal opening 13 m, Initial mesh size 182x800 mm and Lateral mesh size 400 mm.

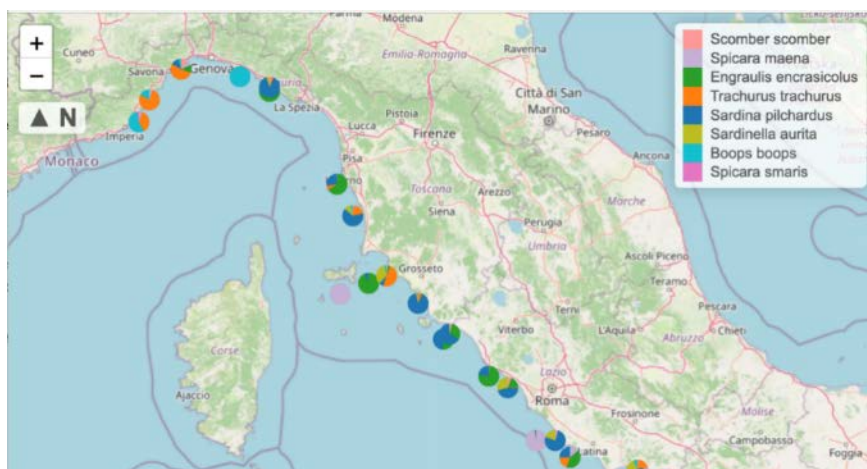


Figure 2.3.2. Map with pie charts reporting percentages in weight of anchovy, sardine, horse mackerel and other pelagic species (OPS) for the survey in GSA 9. MEDIAS 2025.

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f) Oceanographic parameters

During the survey in 2025, 32 hydrological stations have been conducted in GSA 9 using a SBE19plus CTD which measures conductivity, temperature, pressure, fluorescence, oxygen and turbidity (Fig. 2.3.3).

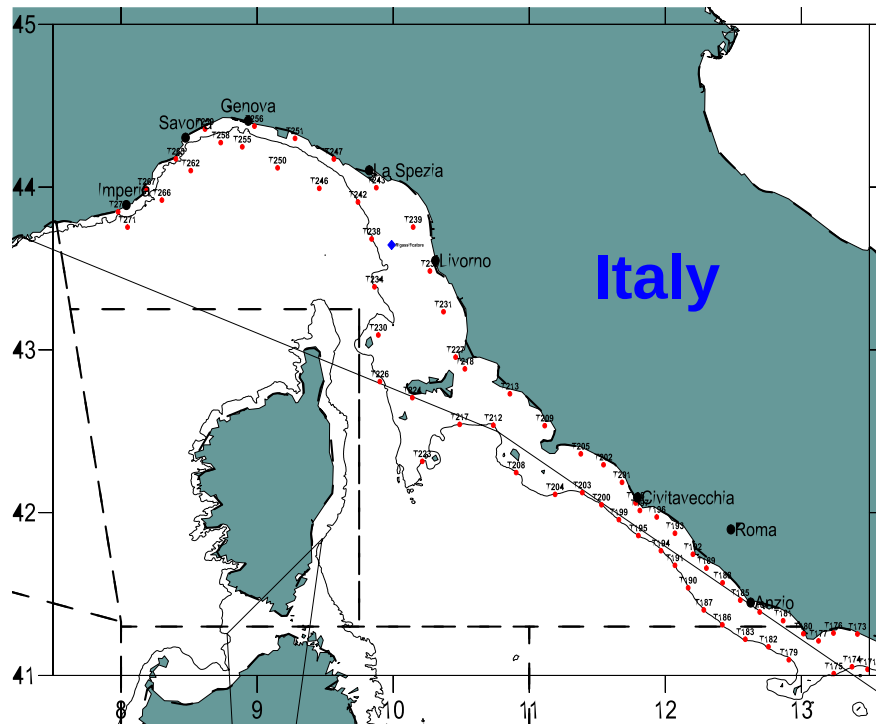


Figure 2.3.3. CTD stations performed during the echosurvey in GSA 9. MEDIAS 2025.

g) Biomass estimations of target species

The biomass estimation of sardine and anchovy in GSA 9, as well as the associated CVs of geostatistical simulations, are reported in the following table:

GSA 9		
	Biomass (t)	CV
Anchovy	10347.7	16.7
Sardine	10461.6	13.6

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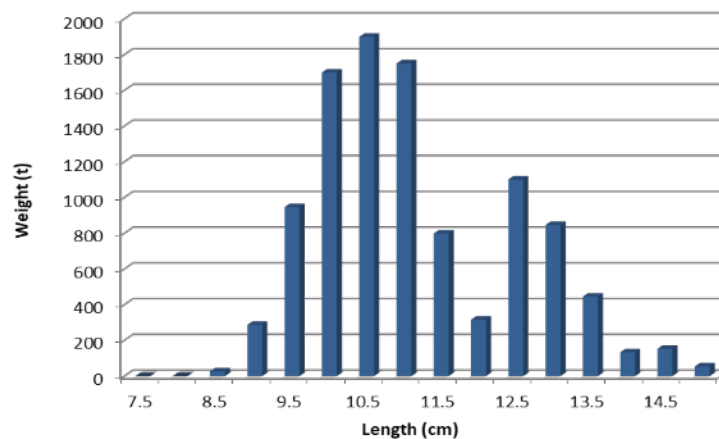


Figure 2.3.4. Sardine (PIL) biomass in tons by length (LFD) in GSA 9. MEDIAS 2025.

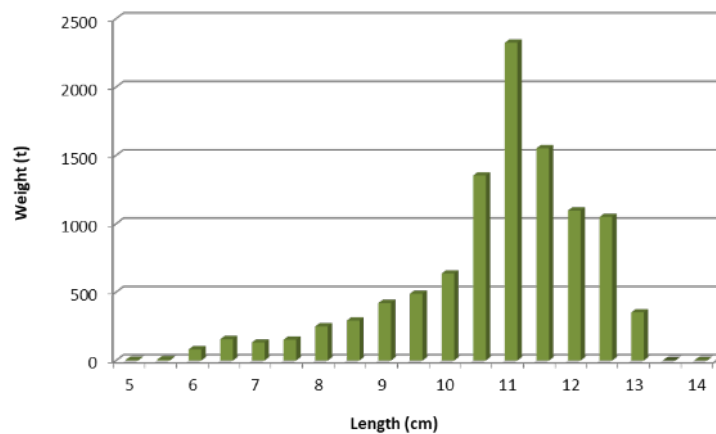


Figure 2.3.5. Anchovy (ANE) biomass in tons by length (LFD) in GSA 9. MEDIAS 2025.

Age length key (ALK) for sardine in GSA 9, MEDIAS 2025, was composed of four year classes. The number of otoliths readings was 512 (no. of individuals) (Fig. 2.3.6).

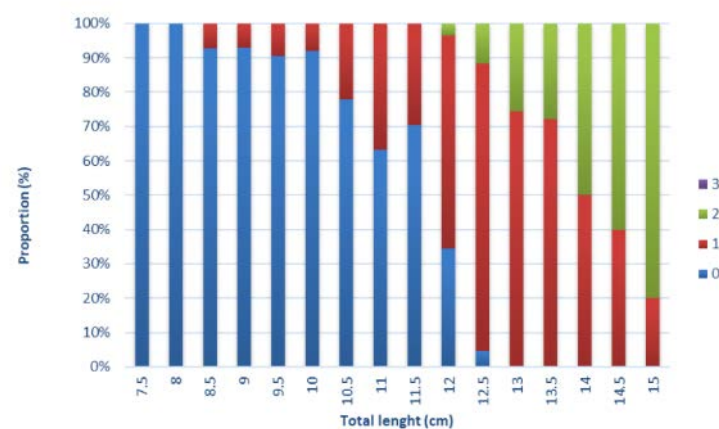


Figure 2.3.6. Sardine ALK in GSA 9, MEDIAS 2025.

Anchovy ALK in GSA 9 was composed by four year classes; the number of otoliths readings was 391 (no. of individuals).

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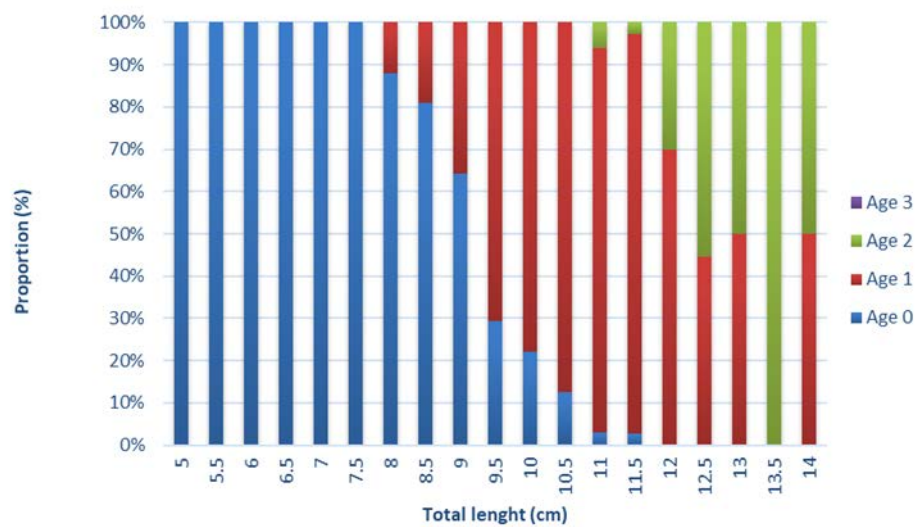


Figure 2.3.7. Anchovy ALK in GSA 9, MEDIAS 2025.

h) Abundance indices of target species

Spatial distribution of sardine and anchovy in GSA 9 in summer 2025 is shown in Fig 2.3.8 and 2.3.9.

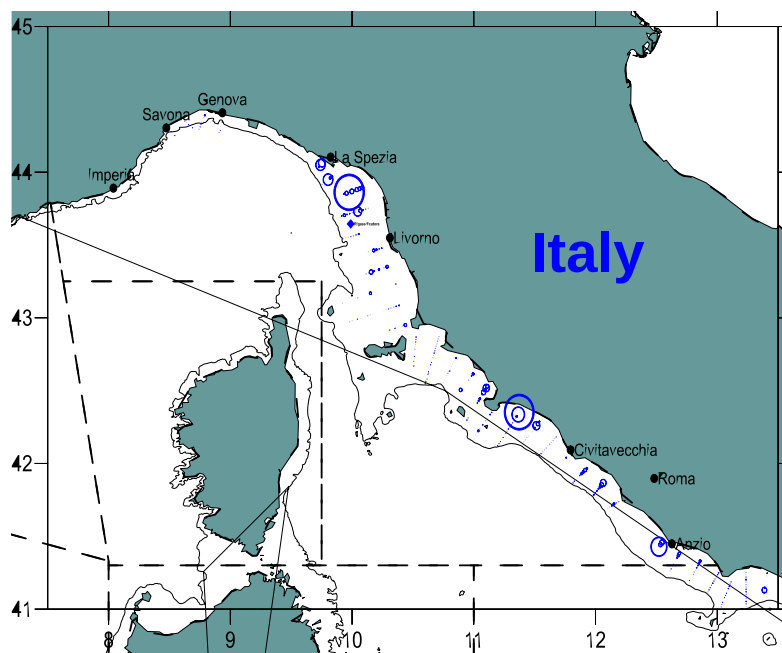


Figure 2.3.8. Sardine (PIL) spatial distribution in GSA 9. MEDIAS 2025.

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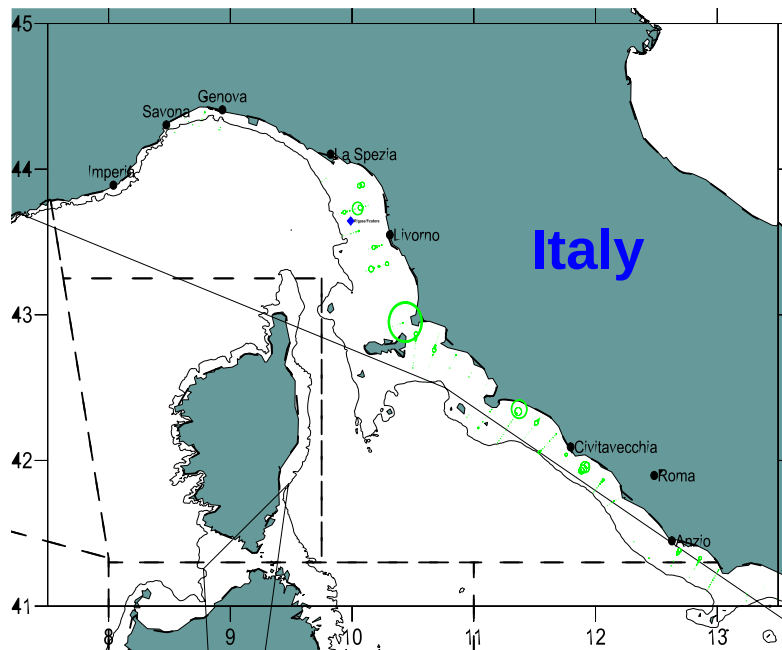


Figure 2.3.9. Anchovy (ANE) spatial distribution in GSA 9. MEDIAS 2025.

Spatial distribution of sardine and anchovy in GSA 9 in summer 2025 is shown in Figures 2.3.8 and 2.3.9.

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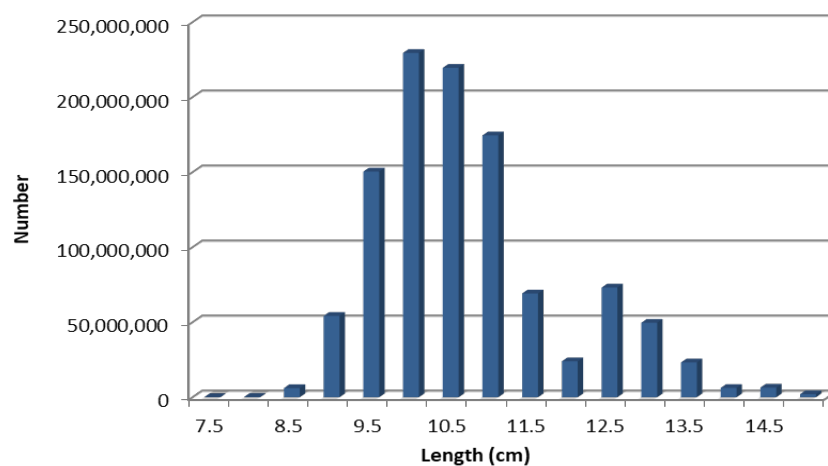


Figure 2.3.10. Sardine (PIL) abundance in numbers by length (LFD) in GSA 9. MEDIAS 2025.

Abundance of anchovy (*Engraulis encrasicolus*) estimated in GSA 9 revealed the presence of two modes centered at 7.5 and 9.5 cm (Fig. 2.3.11).

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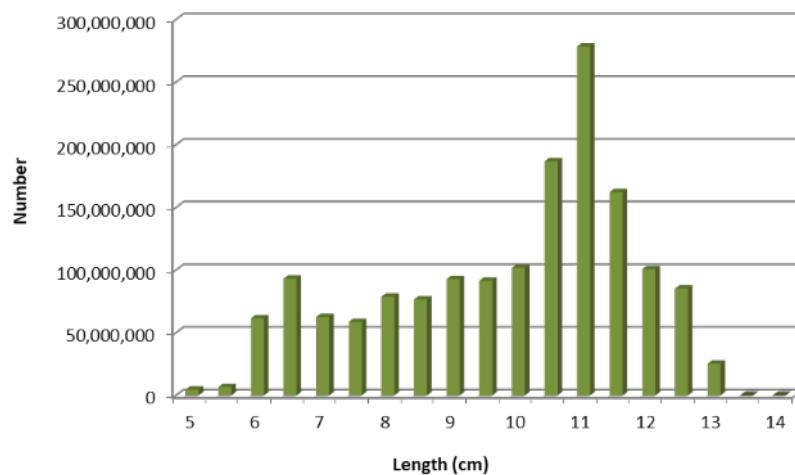


Figure 2.3.11. Anchovy (ANE) abundance in numbers by length (LFD) in GSA 9. MEDIAS 2025.

2.4 Presentation of the 2025 acoustic survey in GSA 10 – South Tyrrhenian Sea (CNR-IAS and CNR-ISMAR)

Angelo Bonanno, Gualtiero Basilone, Marco Barra, Simona Genovese, Rosalia Ferreri, Giovanni Giacalone, Ignazio Fontana, CNR-IAS and CNR-ISMAR

a) General information on the survey

MEDIAS 2025 in GSA 10 took place in the period 11 – 25 August (lasts 15 days at sea) and covered the continental shelf in the central and south Tyrrhenian sea (2708 nm²) with the Research Vessel "G. Dallaporta" (35.7 m length, 1086 HP).

b) Type of echosounders and frequencies in use

A SIMRAD EK80 split beam echo sounder, working at 38, 120 and 200 kHz, was used. The threshold for the assessment (38 kHz) was -60 dB. The pulse duration was 1024 ms. The mean surveying acoustic vessel speed was 9 knots. The Echoview software was used to visualize and analyse acoustic data.

c) Calibration results

The acoustic system was calibrated in the Bay of Siracusa (37°02.645 N 15°17.349 E) on August 11, 2025. The calibration results are reported in the section belonging to the MEDIAS 2025 in GSA 9.

d) Survey design

Most of the survey design is made of parallel transects perpendicular to the coastline, from the 10-20 m isobath to the 200 m one. Due to the narrow continental shelf along the northern coast of Sicily and the western coast of Calabria, a zig-zag transects design was adopted. The total length of the route covered by the survey was 914 nm, while the number of EDSUs effectively used for acoustic analysis (minus pelagic trawls tracks and linking transects) was 746.

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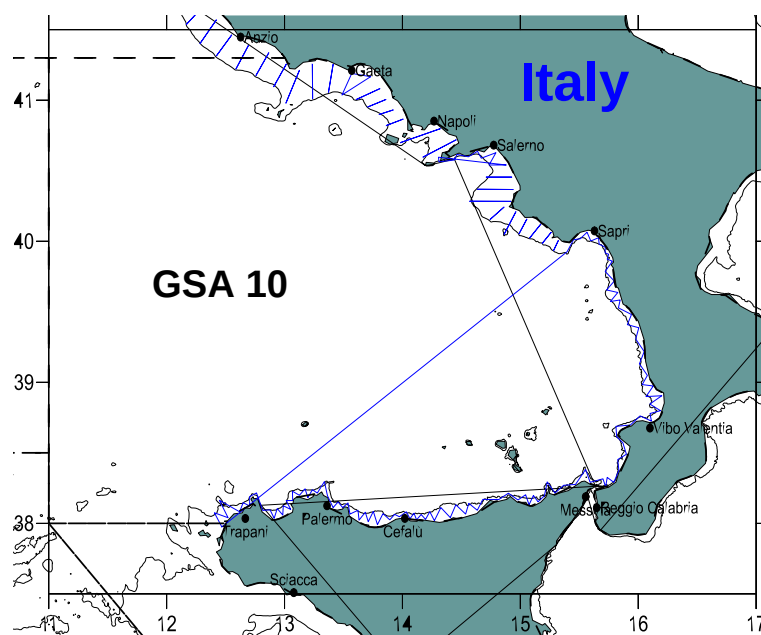


Figure 2.4.1. Acoustic survey design. MEDIAS 2025 in GSA 10.

e) Fish sampling

Pelagic fishes are identified with a pelagic haul. During the survey in 2025, twenty-three (23) pelagic hauls were carried out in GSA 10 to be used for echograms scrutinizing (Fig. 2.2.2). The pelagic net used has a total length of 78 m (Cod end length 22 m), Cod end mesh size of 18 mm, Vertical opening of 7 m, Horizontal opening 13 m, Initial mesh size 182x800 mm and Lateral mesh size 400 mm.

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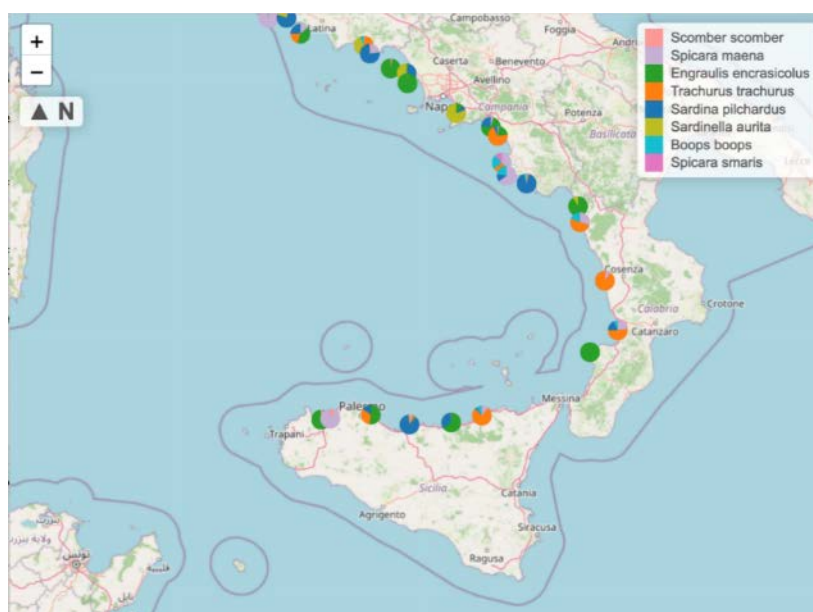


Figure 2.4.2. Map with pie charts reporting percentages in weight of anchovy, sardine, horse mackerel and other pelagic species (OPS) for the survey in GSA 10. MEDIAS 2025.

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f) Oceanographic parameters

During the survey in summer 2025, 163 hydrological stations have been conducted in GSA 10 using a SBE19plus CTD which measures conductivity, temperature, pressure, fluorescence, oxygen and turbidity (Fig. 2.4.3).

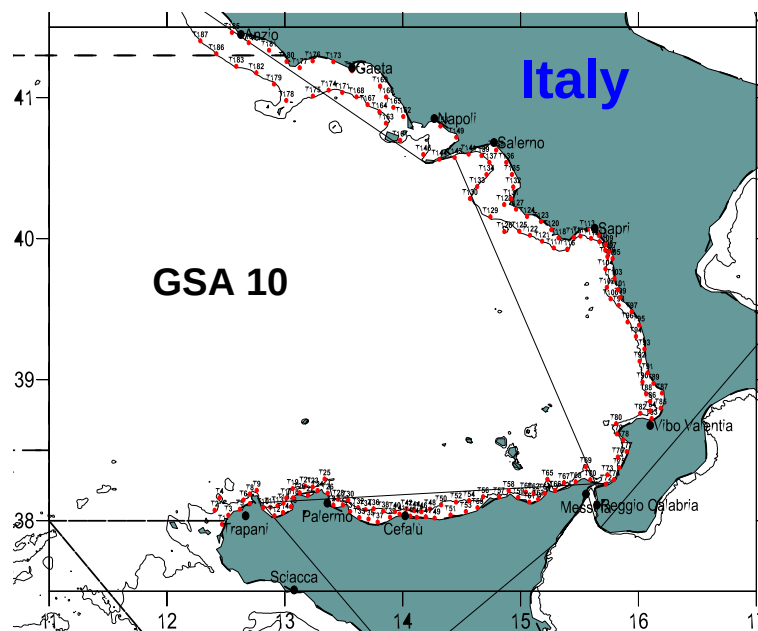


Figure 2.4.3. CTD stations performed during the echosurvey in GSA 10. MEDIAS 2025.

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g) Biomass estimations of target species

The biomass estimation of sardine and anchovy in GSA 10, as well as the associated CVs of geostatistical simulations, are reported in the following table:

	GSA 10	
	Biomass (t)	CV
Anchovy	6547.5	15.5
Sardine	4570.6	18.8

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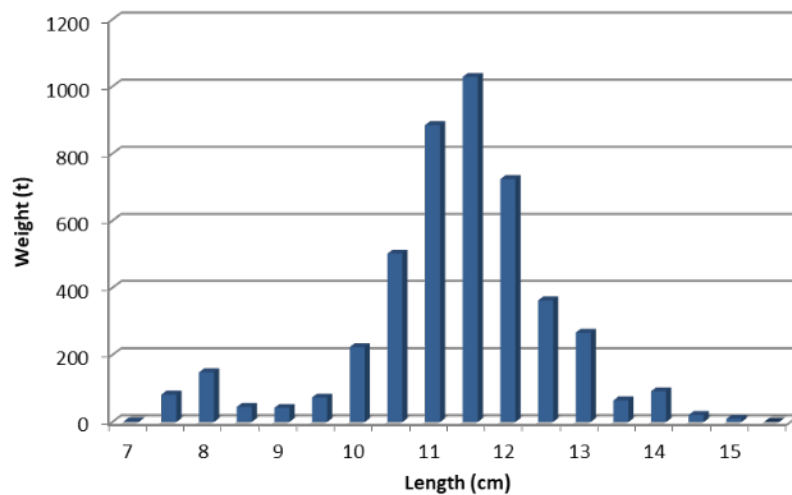


Figure 2.4.4. Sardine (PIL) biomass in tons by length (LFD) in GSAs 10. MEDIAS 2025.

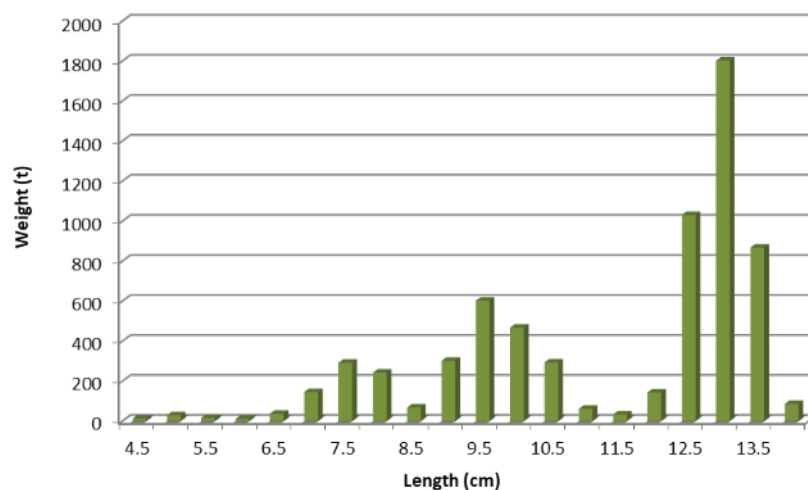


Figure 2.4.5. Anchovy (ANE) biomass in tons by length (LFD) in GSA 10. MEDIAS 2025.

Age length key (ALK) for sardine in GSA 10, MEDIAS 2025, was composed of four year classes. The number of otoliths readings was 347 (no. of individuals) (Fig. 2.4.6).

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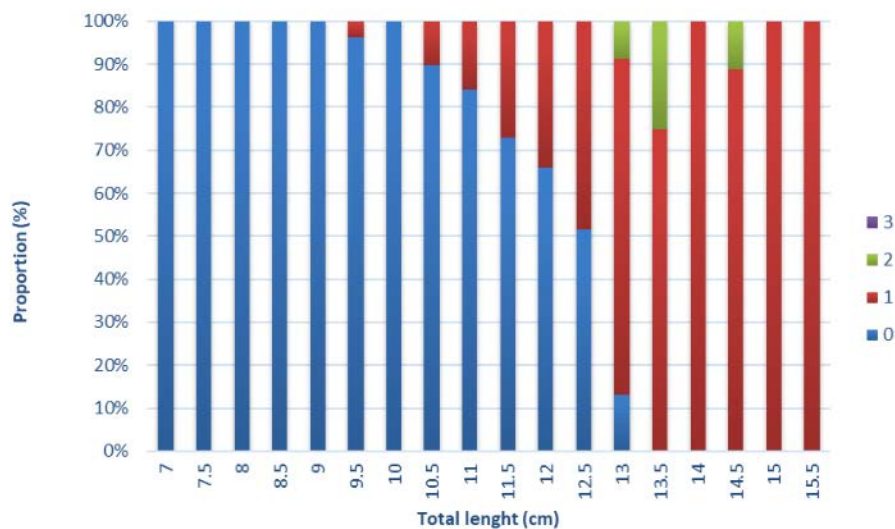


Figure 2.4.6. Sardine ALK in GSA 10. MEDIAS 2025.

Anchovy ALK in GSA 10 was composed by four year classes; the number of otoliths readings was 284 (no. of individuals).

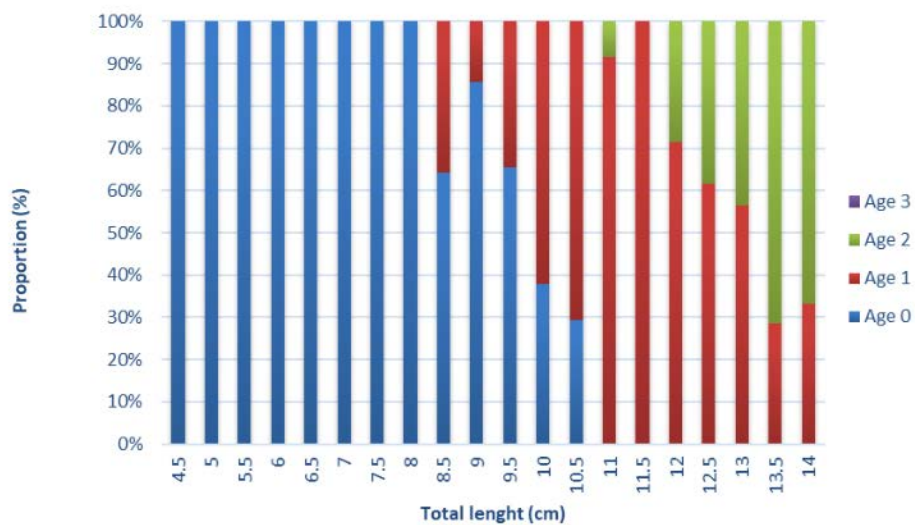


Figure 2.4.7. Anchovy ALK in GSA 10. MEDIAS 2025.

h) Abundance indices of target species

Spatial distribution of sardine and anchovy in GSA 10 during the survey in 2025 is shown in Fig 2.4.8 and 2.4.9.

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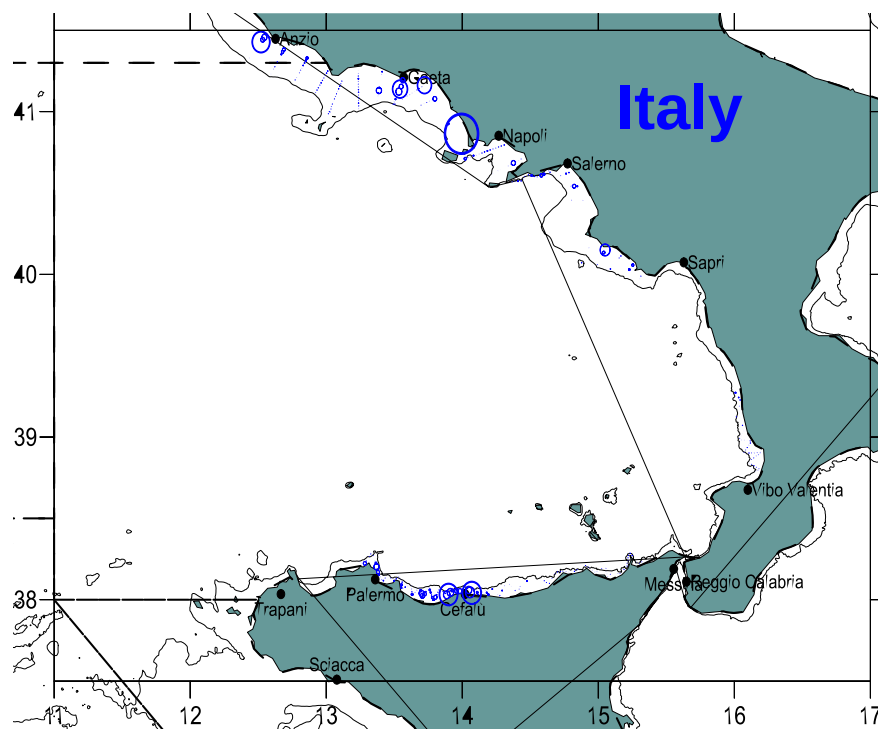


Figure 2.4.8. Sardine (PIL) spatial distribution in GSA 10. MEDIAS 2025.

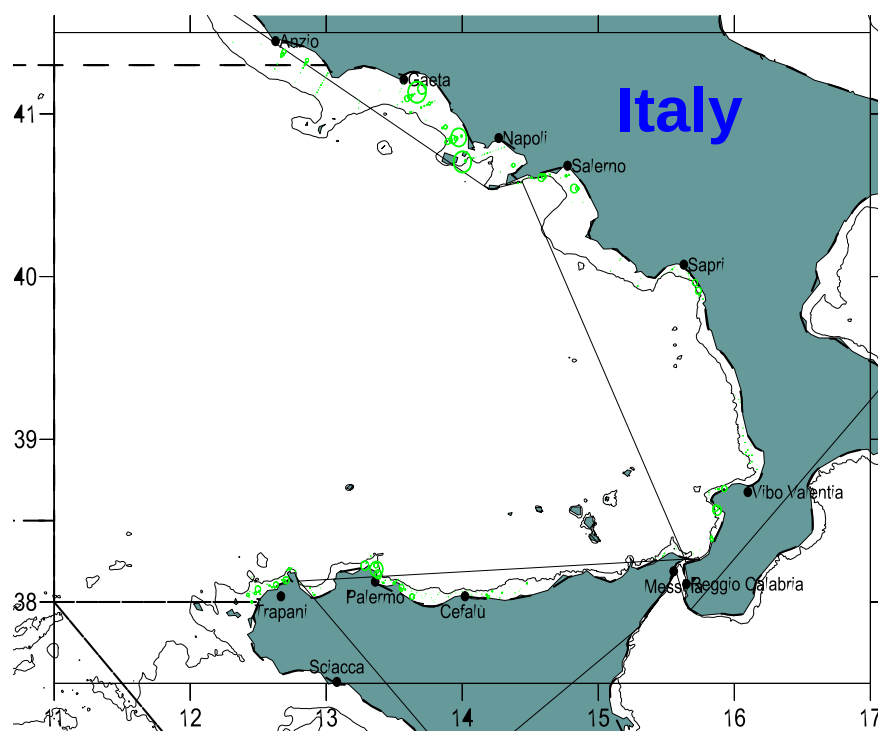


Figure 2.4.9. Anchovy (ANE) spatial distribution in GSA 10. MEDIAS 2025.

Abundance of sardine (*Sardina pilchardus*) in GSA 10 is reported in Fig. 2.4.10. During this survey, two main length modes were evident (8 cm, 11.5 cm and 13 cm) in GSA 10.

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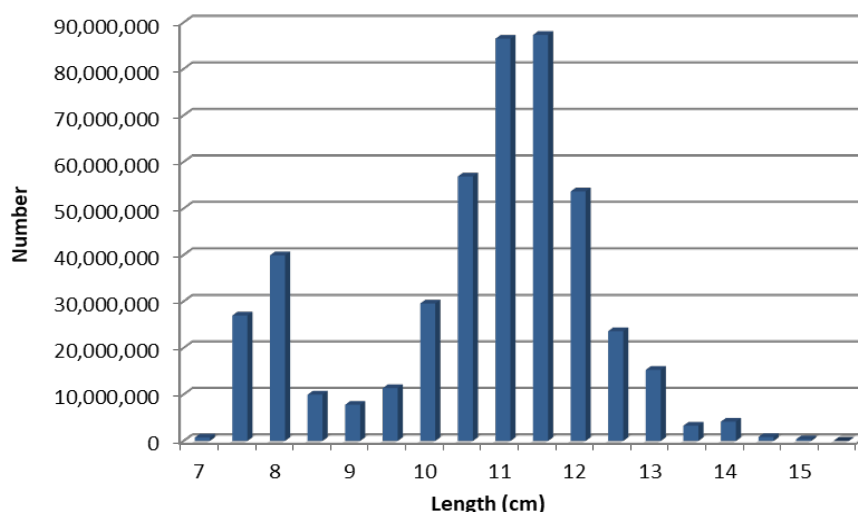


Figure 2.4.10. Sardine (PIL) abundance in numbers by length (LFD) in GSA 10. MEDIAS 2025.

Abundance of anchovy (*Engraulis encrasicolus*) estimated in GSA 10 revealed the presence of four modes centered at 5.0 cm, 7.5 cm, 9.5 cm and 13 cm (Fig. 2.4.11).

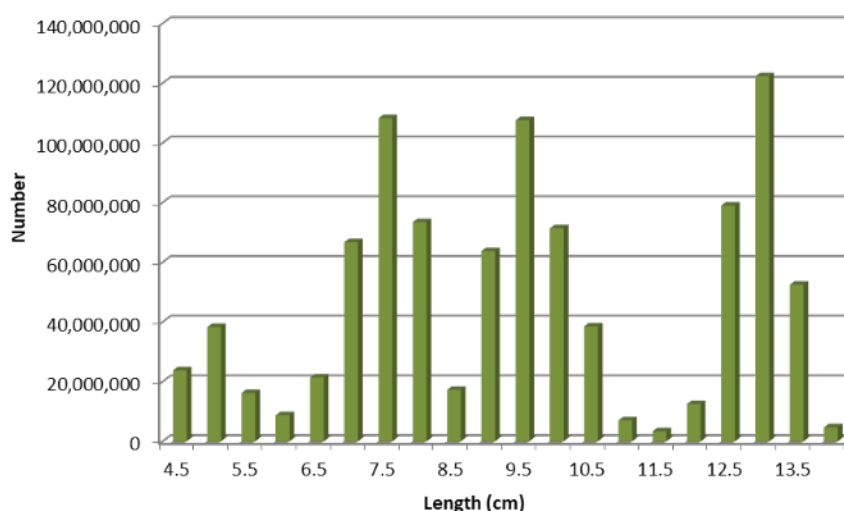


Figure 2.4.11. Anchovy (ANE) abundance in numbers by length (LFD) in GSA 10. MEDIAS 2025.

2.5 Presentation of the 2025 acoustic surveys in GSA 15 - Malta (MAFA-ARM)

Giancarmelo Ales, Michelle Mizzi, Kelly Camilleri, Marjia Gatt, Aquatic Resources Malta, ARM

a) General information on the survey

MEDIAS 2025 in GSA 15 acoustic survey was carried out from the 3rd to the 5th of September (three days at sea). It was conducted over the Malta–Sicily continental shelf using two different vessels: the R/V Gaia Blu (82.9 m length, 7888 HP), which was used for acoustic data acquisition, and the Degre

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(24 m length), which was used for biological sampling. This choice was driven by the difficulty in identifying vessels capable of conducting a complete acoustic survey. In this context, the opportunity to participate in the oceanographic campaign OurObs – Our Joint Ocean Observations for the Malta-Sicily Platform, jointly organized by Italy (National Research Council, University of Messina, University of Palermo) and Malta (MCAST and ARM), represented a suitable operational solution. The campaign was led by Simona Genovese as Chief Scientist, with the participation of Marco Barra on board. Acoustic data acquisition was one of the main activities carried out during the survey.

However, the Gaia Blu, while suitable for conducting the acoustic survey, did not include pelagic trawl hauls, which are required for the allocation of NASC values according to the MEDIAS protocol. For this reason, the use of a second vessel dedicated to fishing operations was necessary. Due to the impossibility of finding fishing vessels equipped with pelagic trawl gear, the Degre, operating with bottom trawl gear, was ultimately used to complete the sampling activities.

b) Type of echosounders and frequencies in use

The equipment consisted of a split-beam echosounder (SIMRAD EK60) operating at 38, 120, and 200 kHz. The threshold for acquisition was -80dB and the threshold adopted for biomass assessment (38 kHz) was -60 dB. The pulse duration of 1024ms. The mean surveying acoustic vessel speed was 10 knots. The Echowiew 15 software was used to visualize and analyse acoustic data.

c) Calibration results

The acoustic system was calibrated in the Gulf of Castellammare (38°08.028' N 12°56.5936' E) on August 29, 2025.

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Table 2.5.1: Calibration results in MEDIAS 2025.

Transducer Frequency (KHz)	38	120	200
Transducer model	ES38B	ES120-7	ES200-7C
Transducer Serial no.	31117	799	490
Bottom depth (m)	6.1	6.1	6.1
Temp. (C) at sph. Dep.	20.20	20.20	20.20
Salinity (PSU) at sphere depth	37.00	37.00	37.00
Speed of sound (ms ⁻¹)	1525.1	1525.1	1525.1
TS of Tungsten (WC-Co) sphere 38.1mm (dB)	-42.30	-39.84	-38.82
Pulse duration (ms)	1.024	1.024	1.024
RMS (dB)	0.43	0.28	1.34
Transducer Gain (dB)	25.24	27.71	26.21
Sa Correction (dB)	-0.02	0.08	-0.01
Athw. Beam angles (deg)	6.73	5.67	3.70
Along Beam angles (deg)	6.61	5.45	6.23
Athw. Offset Beam angles (deg)	0.02	-0.29	0.06
Along Offset Beam angles (deg)	0.03	0.10	1.35
Pulse length (s)	1.00	1.00	1.00
Transmit. Power (W)	2000.00	250.00	150.00
Time(UTC)	08:43	09:33	10:43

d) Survey design

The survey design was made of 6 parallel transects perpendicular to the coastline, from the 20-30 m isobath to the 200 m one. The total EDSU effectively used for acoustic analysis were 268.19 (Fig 2.5.1).

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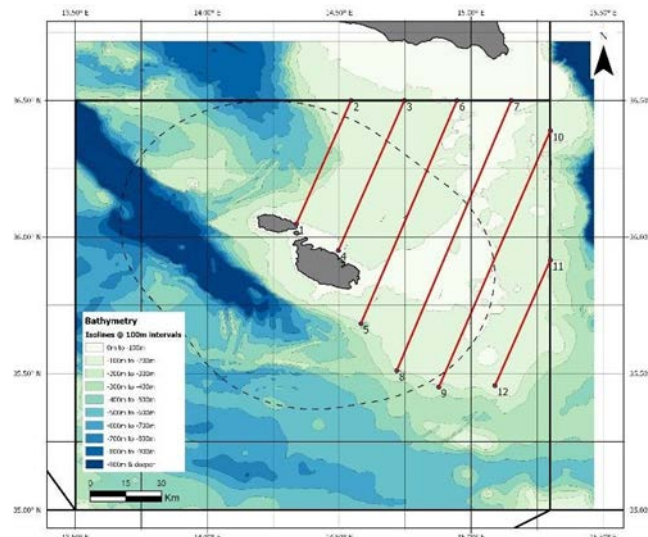


Figure 2.5.1. Acoustic survey design (show transects as lines). MEDIAS 2025.

e) Fish sampling

Pelagic fishes were identified, as far as possible, from hauls conducted during the survey. A total of ten (10) hauls were carried out in GSA 15 to be used for echogram scrutinizing (Figure 2.5.2). The hauls were conducted using a bottom otter trawl, which was operated as high as practicable in the water column to optimize sampling. The net used was a standard MEDITS bottom trawl (GOC 73), a four-panel net with a headline length of 35.70 m and a ground rope length of 40 m. The coded mesh size was 10 mm (mesh side), corresponding to approximately 20 mm stretched mesh opening. The net is designed to operate with a vertical opening of approximately 2.4–2.6 m and is equipped with floats and ballast chains. Trawl geometry was monitored using acoustic instrumentation, including SCANMAR sensors and a hydrophone system. Vessel speed during fishing operations was maintained at 3 knots. Trawls were monitored using acoustic instrumentation, including SCANMAR sensors and a hydrophone system, to ensure effective control of net geometry and overall trawl performance.

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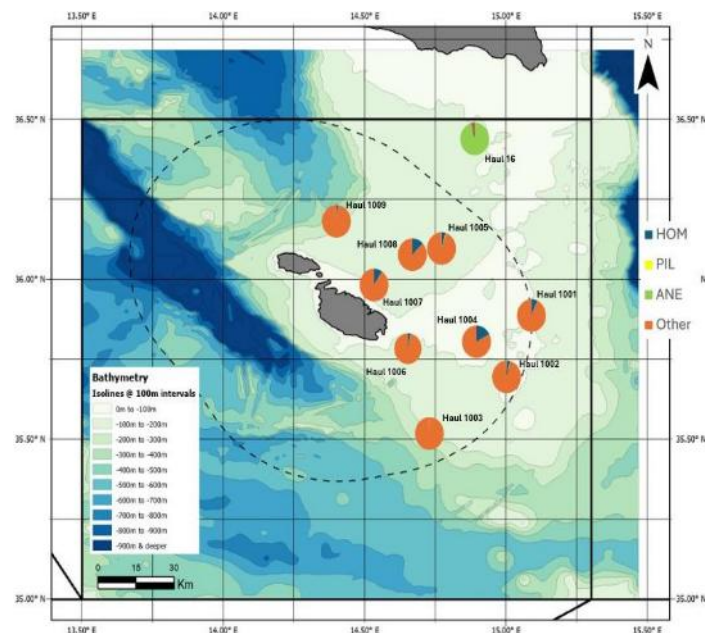


Figure 2.5.2. Map with pie charts reporting percentages in weight of anchovy, sardine, horse mackerel and other species for the survey MEDIAS 2025 in GSA 15.

f) Oceanographic parameters

During the survey, a total of 13 hydrological stations were carried out in GSA 15 using a Sea-Bird Electronics (SBE) 911plus CTD equipped with a rosette system, allowing measurement of conductivity, temperature, pressure, fluorescence, dissolved oxygen and turbidity, as well as water sampling at selected depths (Fig 2.5.3).

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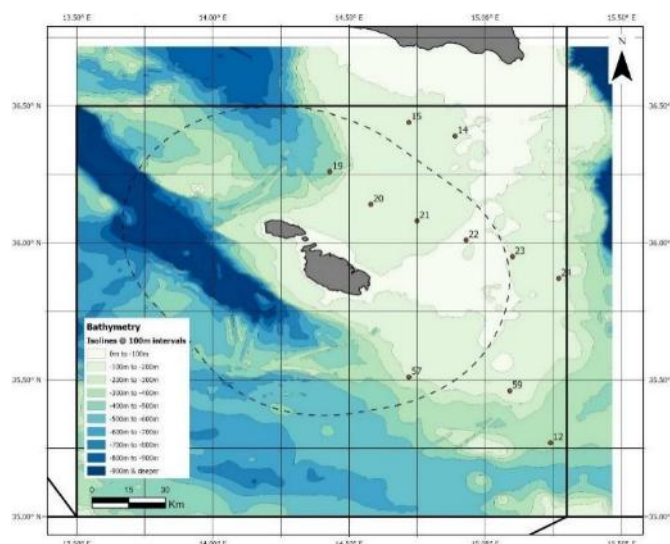


Figure 2.5.3. CTD stations (13) carried out during the acoustic survey in GSA 15. MEDIAS 2025.

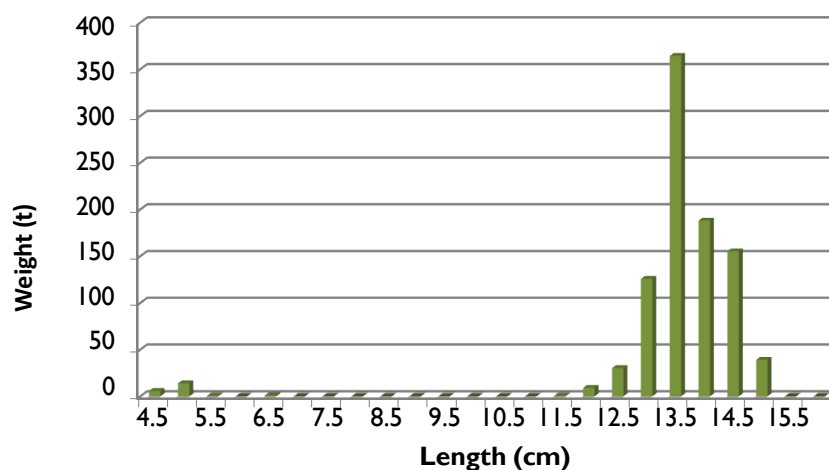
g) Biomass estimations of target species

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The biomass estimation of sardine and anchovy in GSA 15, as well as the associated CVs of geostatistical simulations, are reported in the following table:

Specie	Biomass (tons)	CV geo (%)	Surv. Area (nm ²)
ANE	884.0	50.4	2290
PIL	4.8	52.7	

Anchovy (*Engraulis encrasicolus*) biomass, expressed in tonnes by length class (Figure 2.5.4.), shows a clear concentration within the 12.5–14.5 cm range, with a peak around 13.5 cm, indicating that medium-sized individuals contribute most to the total biomass, while smaller and larger size classes display negligible contributions.



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Figure 2.5.4. Anchovy (ANE) biomass in tons by length (LFD) in GSAs 15. MEDIAS 2025

The length frequency distribution of sardine biomass (t) shows a clear concentration between 14.5 and 16.5 cm (Figure 2.5.5.), with maximum values at approximately 15.5–16 cm, highlighting the dominant contribution of larger size classes to the overall biomass.

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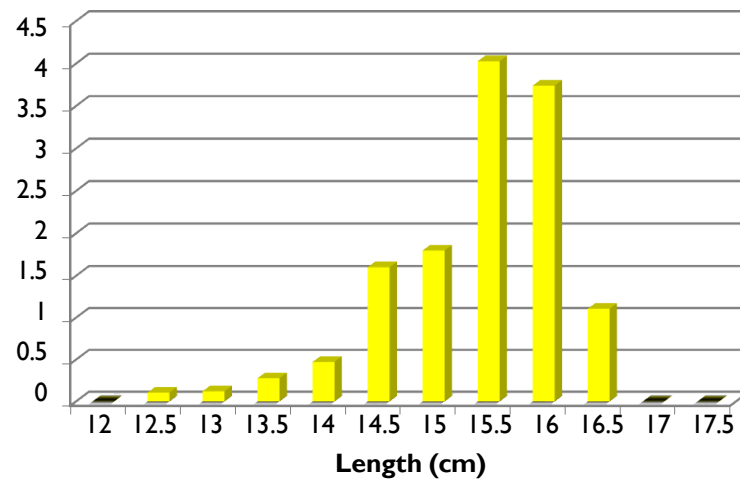


Figure 2.5.5. Sardine (PIL) biomass in tons by length (LFD) in GSAs 15. MEDIAS 2025.

Age length key (ALK) for Anchovy in GSA 15, MEDIAS 2025, was composed by four year classes. the number of otoliths readings was 501 (no. of individuals) (Fig. 2.5.6)

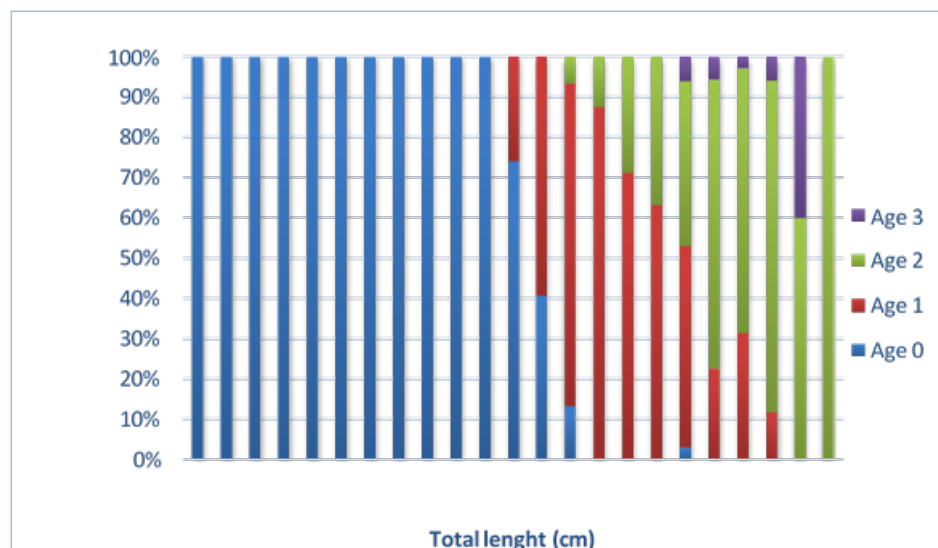


Figure 2.5.6. Anchovy ALK in GSA 15. MEDIAS 2025.

Age length key (ALK) for sardine in GSA 15, MEDIAS 2025, was composed of three year classes. The number of otoliths readings was 304 (no. of individuals) (Fig. 2.5.7).

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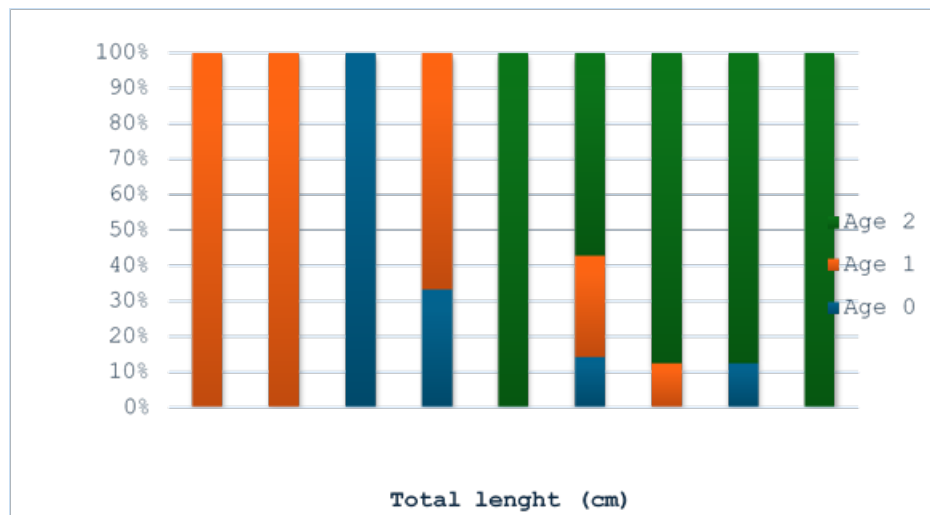


Figure 2.5.7. Sardine ALK in GSA I5. MEDIAS 2025

h) Abundance indices of target species

Spatial distribution of sardine and anchovy in GSA I5 during the survey in 2025 is shown in Fig 2.5.8 and 2.5.9.

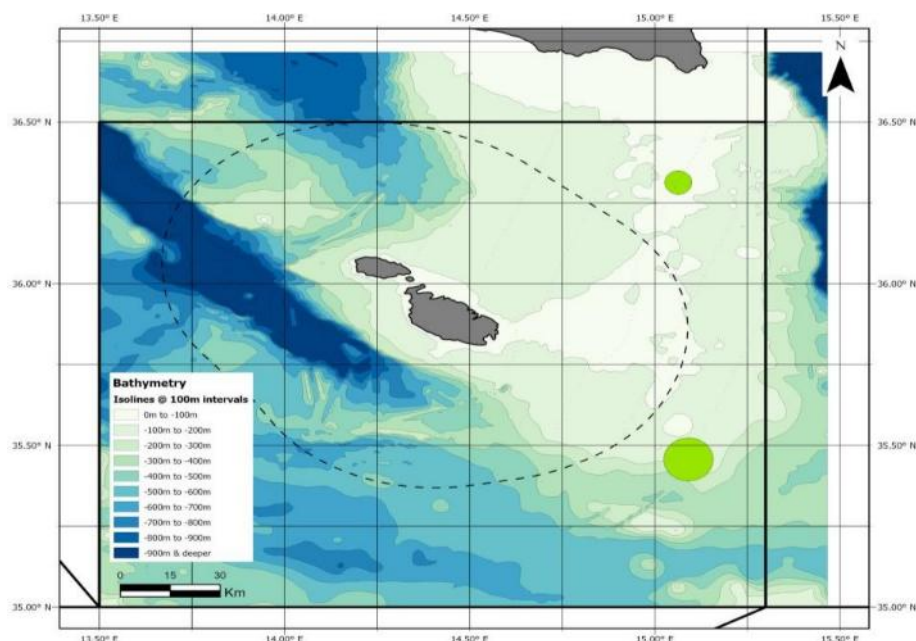


Figure 2.5.8. Anchovy (ANE) spatial distribution in GSAI5. MEDIAS 2025.

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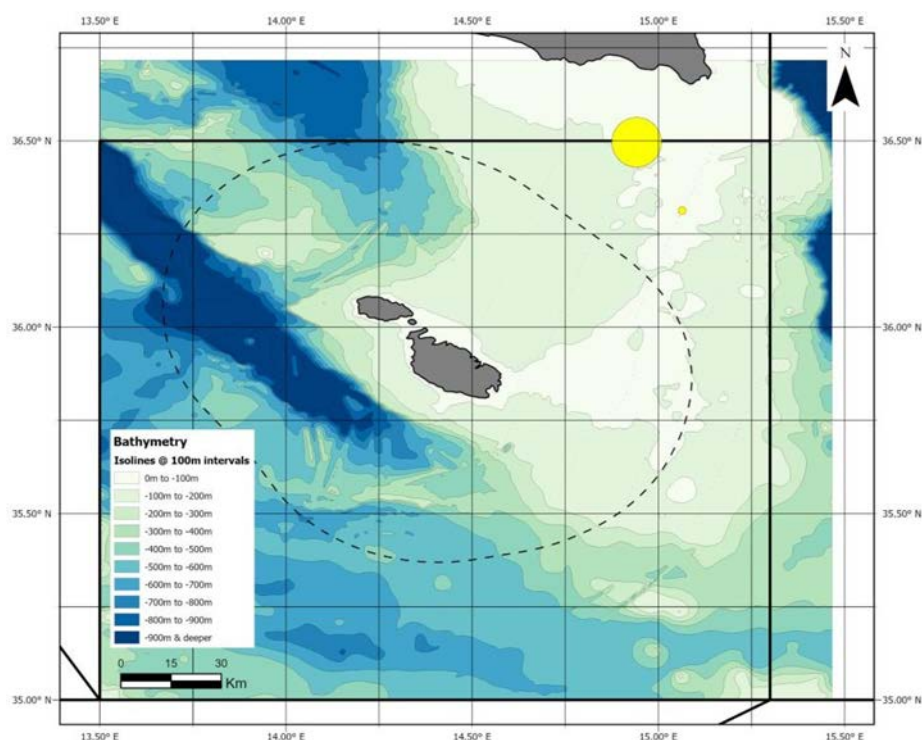


Figure 2.5.9. Sardine (PIL) spatial distribution in GSA15. MEDIAS 2025.

The abundance by length class for anchovy (*Engraulis encrasicolus*) in GSA 15 is reported in Fig. 2.1.10. The distribution exhibits a bimodal pattern, with a first peak in the smaller length classes (approximately 4.5–5.5 cm) and a second peak between 13 and 14.5 cm, while intermediate length classes are poorly represented.

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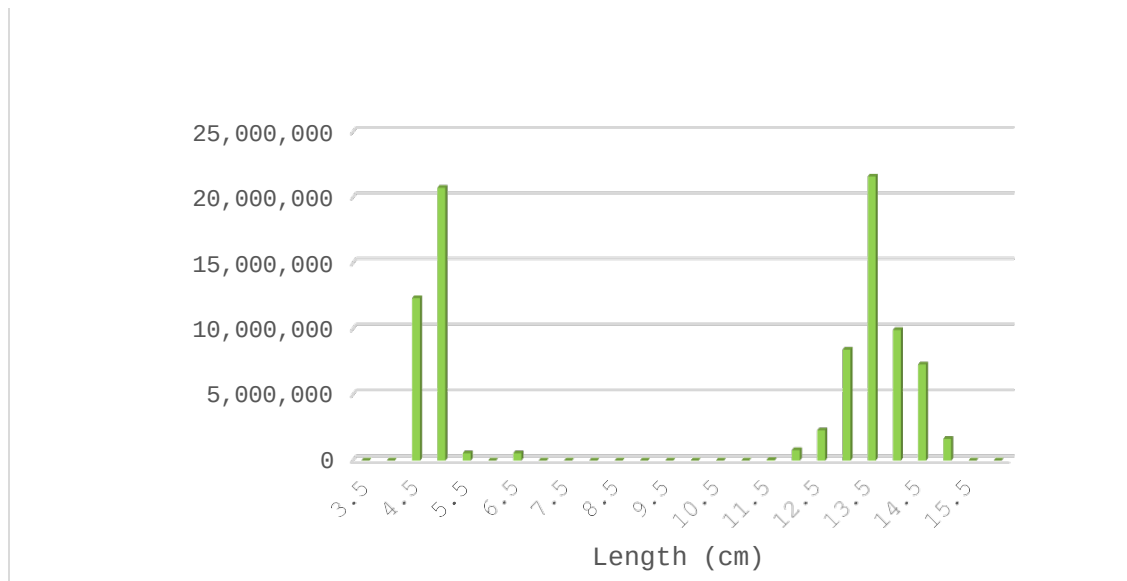


Figure 2.5.10. Anchovy (ANE) abundance in numbers by length (LFD) in GSA 15. MEDIAS 2025.

Abundance of sardine (*Sardina pilchardus*) estimated in GSA 15 revealed a unimodal distribution, with a main mode centered at approximately 15–16 cm (Fig. 2.5.11).

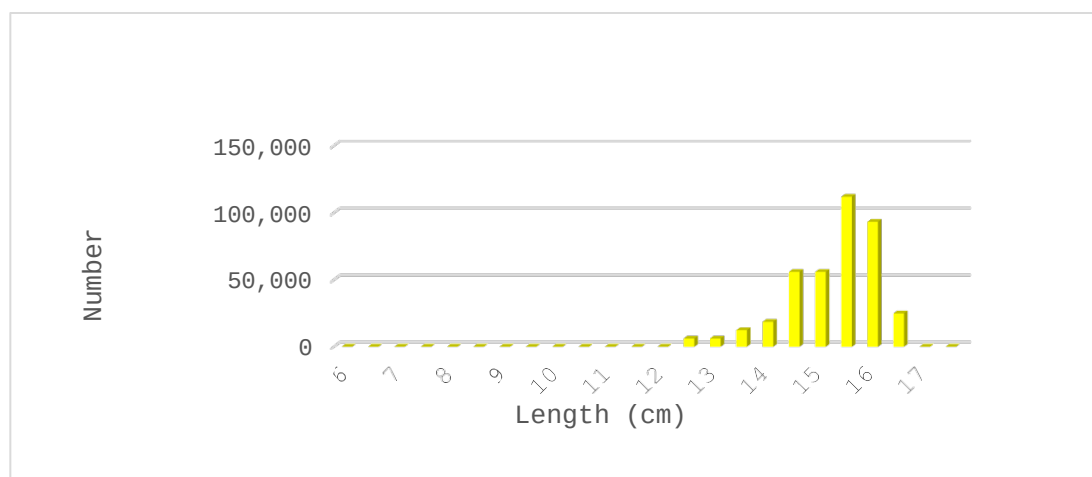


Figure 2.5.11. Sardine (PIL) abundance in numbers by length (LFD) in GSA 15 MEDIAS 2025.

2.6 Presentation of the 2025 acoustic surveys in GSA 16 - South Sicily (CNR-IAS and CNR-ISMAR)

Angelo Bonanno, Gualtiero Basilone, Marco Barra, Simona Genovese, Rosalia Ferreri, Giovanni Giacalone, Ignazio Fontana, CNR-IAS and CNR-ISMAR

a) General information on the survey

MEDIAS 2025 in GSA 16 took place in the period 1 – 11 August (lasts 11 days at sea) and covered the continental shelf along the southern coast of Sicily (3444 nm²) with the Research Vessel "G. Dallaporta" (35.7 m length, 1086 HP).

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b) Type of echosounders and frequencies in use

A SIMRAD EK80 split beam echo sounder, working at 38, 120 and 200 kHz, was used. The threshold adopted for biomass assessment (38 kHz) was -60 dB. The pulse duration was 1024 ms. The mean surveying acoustic vessel speed was 9 knots. The Echoview software was used to visualize and analyse acoustic data.

c) Calibration results

The acoustic system was calibrated in the Bay of Siracusa (37°02.645 N 15°17.349 E) on August 11, 2025. The calibration results are reported in the section belonging to the MEDIAS 2025 in GSA 9.

d) Survey design

The survey design is made of 28 parallel transects (min and max lengths are 7 and 43 nautical miles) perpendicular to the coastline, from the 10-20 m isobath to the 200 m one, and of zig-zag transects located in the easternmost part of the surveyed area. During the survey in 2025, the total length of the route covered by the survey was 812 nm, while the number of EDSUs effectively used for acoustic analysis (minus pelagic trawls tracks and linking transects) was 563.

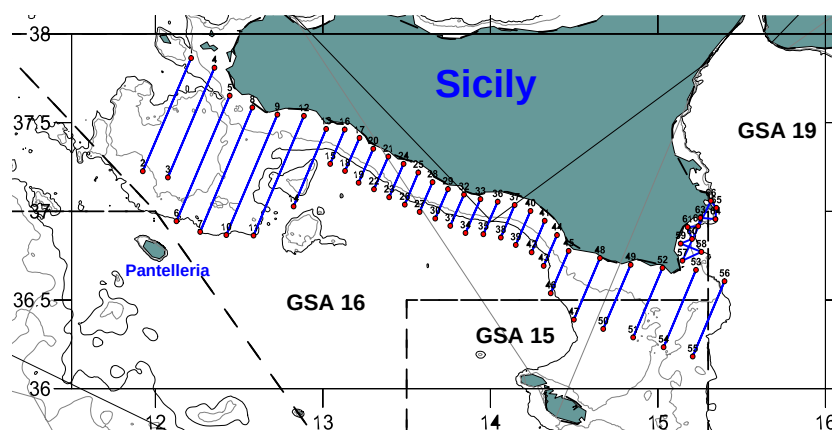


Figure 2.6.1. Acoustic survey design in GSA 16, partially covering GSA 15. MEDIAS 2025.

e) Fish sampling

Pelagic fishes are identified with a pelagic haul. During the survey in 2025, twenty-one (21) pelagic hauls were carried out in GSA 16 to be used for echograms scrutinizing. Trawl hauls performed both in GSA 16 are shown in figure 2.3.2.

The pelagic net used has a total length of 78 m (Cod end length 22 m), Cod end mesh size of 18 mm, Vertical opening of 7 m, Horizontal opening 13 m, Initial mesh size 182x800 mm and Lateral mesh size 400 mm.

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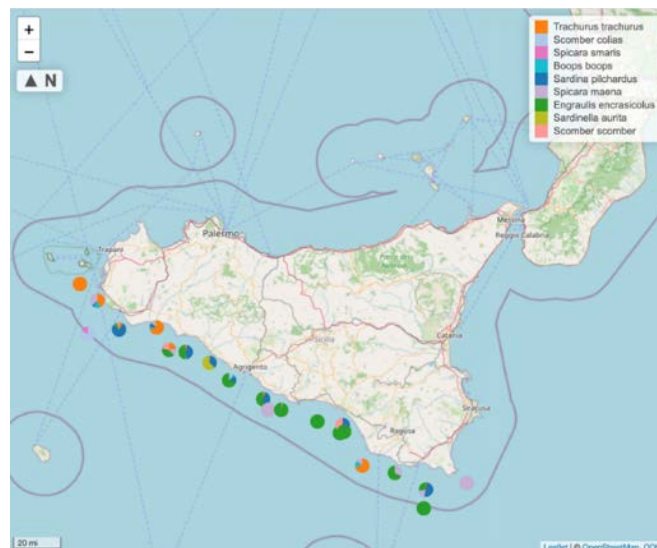


Figure 2.6.2. Map with pie charts reporting percentages in weight of anchovy, sardine and other pelagic species for hauls carried out during the acoustic survey in GSAs 15 and 16. MEDIAS 2025.

f) Oceanographic parameters

During the survey in 2025, 52 hydrological stations have been conducted in GSA 16 using a SBE19plus CTD which measures conductivity, temperature, pressure, fluorescence, oxygen and turbidity (Fig. 2.6.3).

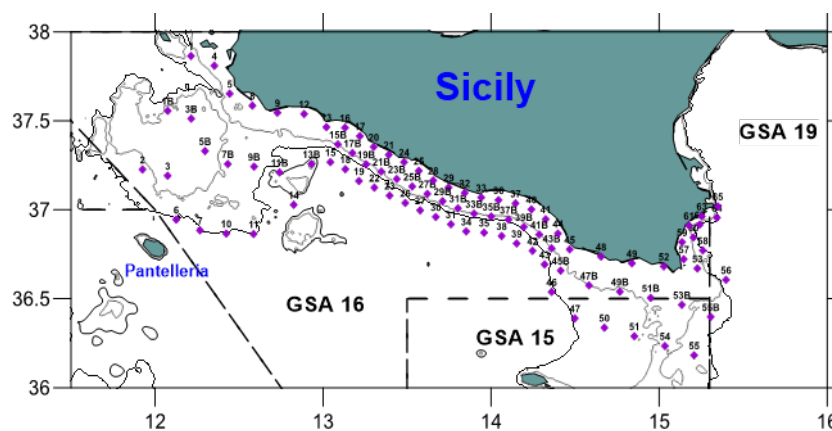


Figure 2.6.3. CTD stations performed during the echosurvey in GSAs 15 and 16. MEDIAS 2025.

g) Biomass estimations of target species

The biomass estimations of sardine and anchovy in GSA 16, as well as the associated CVs of geostatistical simulations, are reported in the following table:

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	GSA I6	
	Biomass (t)	CV
Anchovy	5892.2	16.5
Sardine	2411.2	21.1

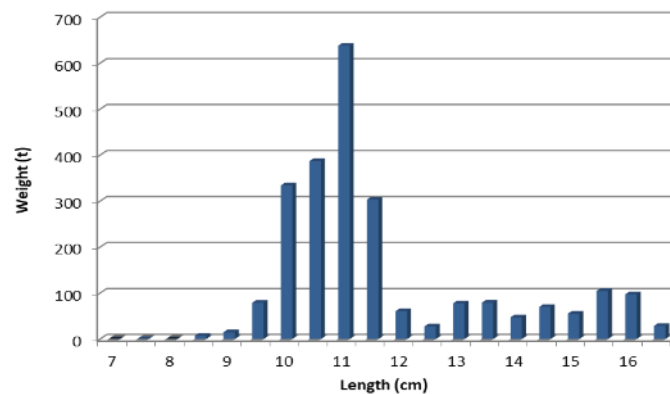


Figure 2.6.4. Sardine (PIL) biomass in tons by length (LFD) in GSA I6. MEDIAS 2025.

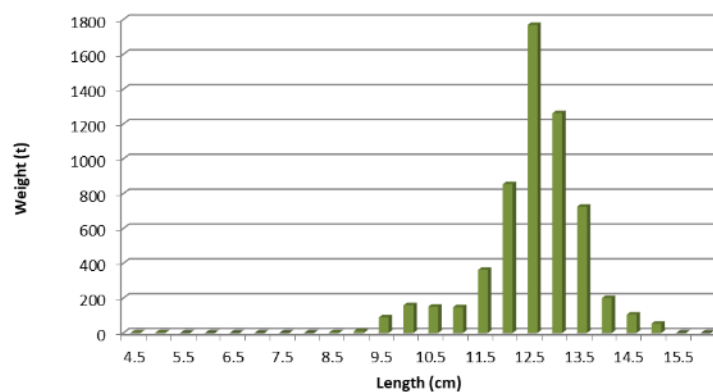


Figure 2.6.5. Anchovy (ANE) biomass in tons by length (LFD) in GSA I6. MEDIAS 2025.

Age length key (ALK) for sardine in GSA I6, MEDIAS 2025, was mainly composed of three year classes. The number of otoliths readings was 302 (no. of individuals) (Fig. 2.6.6).

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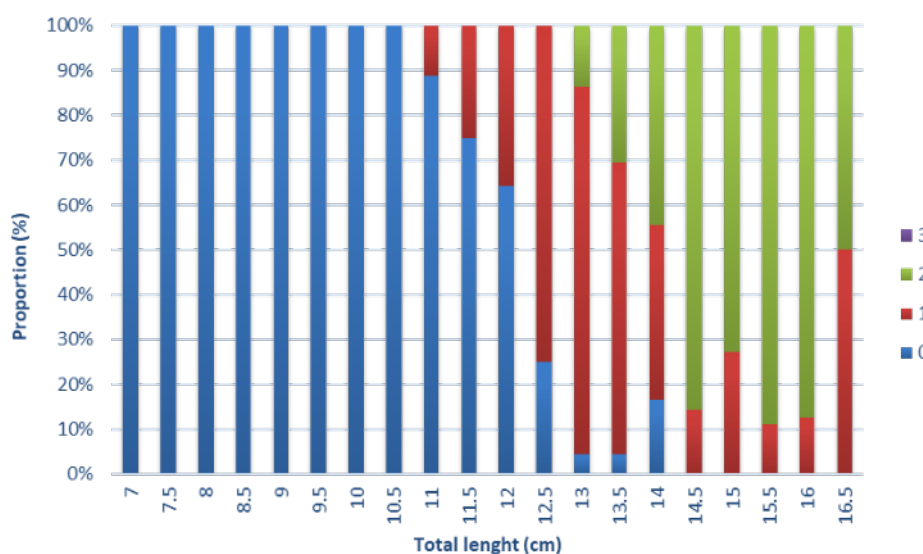


Figure 2.6.6. Sardine ALK in GSA 16. MEDIAS 2025.

Anchovy ALK in GSA 16, MEDIAS 2025, was mainly represented by three year classes; the number of otoliths readings was 584 (no. of individuals) (Fig. 2.6.7).

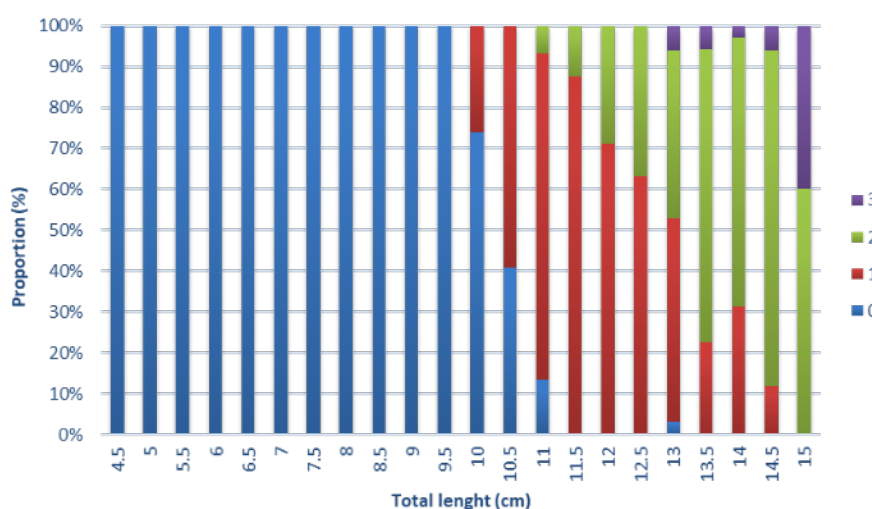


Figure 2.6.7. Anchovy ALK in GSA 16. MEDIAS 2025.

h) Abundance indices of target species

Spatial distribution of sardine and anchovy in GSA 16 during the survey in 2025 is shown in Fig 2.6.8 and 2.6.9, respectively.

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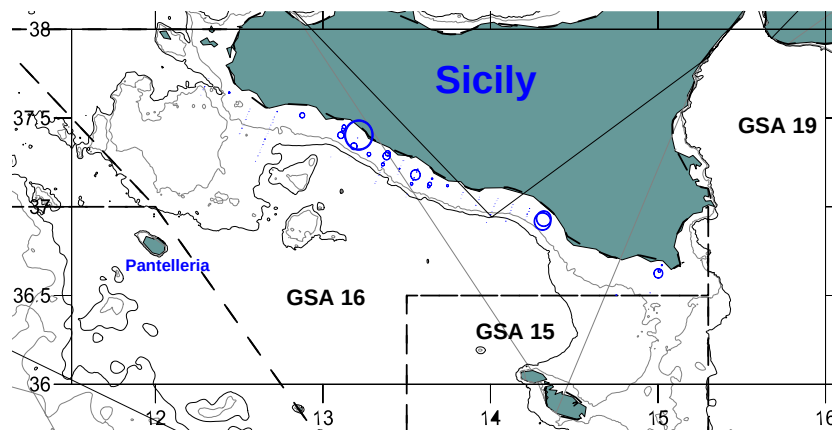


Figure 2.6.8. Sardine (PIL) spatial distribution in GSA 16. MEDIAS 2025.

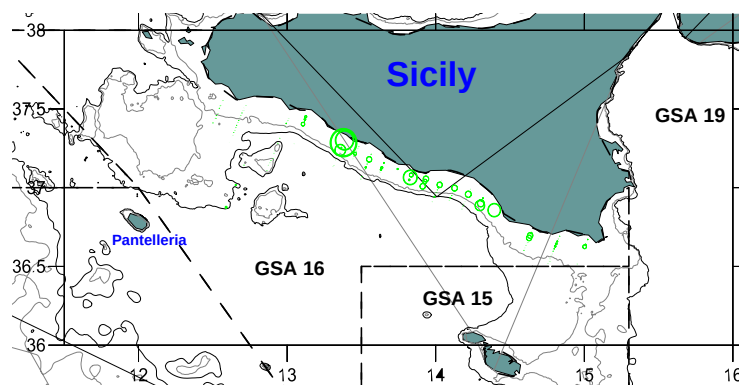


Figure 2.6.9. Anchovy (ANE) spatial distribution in GSA 16. MEDIAS 2025.

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Abundance of sardine (*Sardina pilchardus*) in GSA 16 reported in Fig. 2.6.10. During this survey, the LFD is mainly characterized by two modes centered at 10 cm and 11 cm.

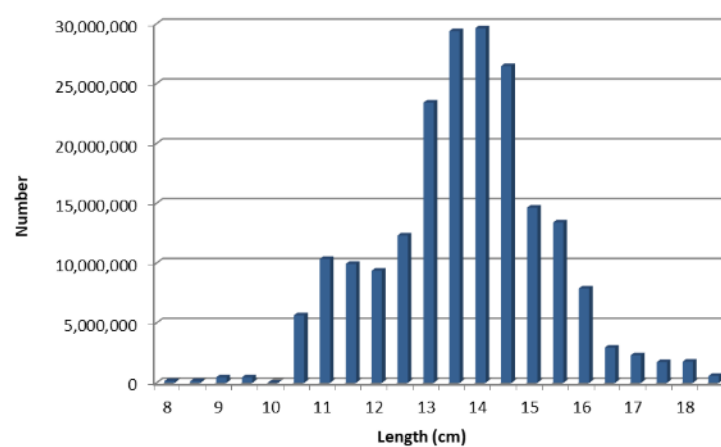


Figure 2.6.10. Sardine (PIL) abundance in numbers by length (LFD) in GSA 16, MEDIAS 2025.

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Abundance of anchovy (*Engraulis encrasicolus*) estimated in GSA 16 revealed two main modes for LFD centered at 10 cm and 12.5 cm (Fig. 2.6.11).

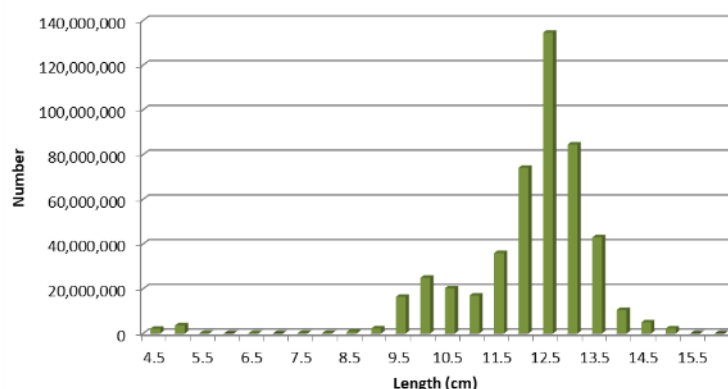


Figure 2.6.11. Anchovy (ANE) abundance in numbers by length (LFD) in GSA 16, MEDIAS 2025.

2.7 Presentation of the 2025 acoustic survey in the eastern part of GSA 17 - Northern Adriatic Sea (IZOR)

Vanja Čikeš Keč, Tea Juretić, Marija Boban, Ivona Siber, Denis Gašparević, et al., IZOR

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a) General information on the survey

The survey was conducted over 33 fieldwork days, in two periods: 17 May–8 June 2025 and 16 June–27 June 2025. From 2025 survey timing has been changed to be more harmonised with western side of Adriatic and the majority of Mediterranean, and for this and the next survey it is going to be June–July with one month before and after as buffer month. Due to a malfunction of the trawl winch that occurred on 6 June 2025, the vessel was returned by the shortest route to its home port and the expedition was suspended until 16 June 2025, when it resumed under an adjusted survey design. Since the R/V Bios Dva (length: 36m, engine power: 1200HP) was unable to continue collecting fish samples, the second part of the expedition was carried out in cooperation with a commercial trawler. Surveying along the planned transects continued with the R/V Bios Dva, as did CTD measurements and plankton sampling. Sampling of fish specimens continued using the trawler and institute fishing gear, in accordance with the procedures described in the MEDIAS manual (30-minute hauls at a speed of 4 knots, covering a total of 2 nautical miles per haul), at locations planned and coordinated with the route of the R/V Bios Dva.

b) Type of echosounders and frequencies in use

R/V BIOS DVA is equipped with SIMRAD scientific echosounder system (EK80), including GPT (38kHz) and WBT (120kHz) transceivers connected to hull-mounted transducers (ES38B and ES120-7). In line with MEDIAS Handbook, the principal frequency for the survey was 38 kHz, while 120 kHz acoustic equipment was used as complementary with aim to improve categorization of different acoustic targets. The system was operating with SIMRAD EK80 software. In order to improve the quality of acoustic

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data collected in the rough sea conditions, echosounder system is connected to the vessel's motion reference unit (MRU3).

c) Calibration results

The acoustic system on R/V BIOS DVA was calibrated few days before the survey (17.05.2025) in the Kaštela Bay using the standard WC-sphere (38.1 mm) and EK80 software. Calibration results are shown in Table 2.7.1.

Table 2.7.1. Calibration of 38 kHz scientific sounder system at R/V BIOS DVA (MEDIAS, 2025)

CALIBRATION RESULTS:	
Frequency (kHz):	ES38B
Transducer model:	30825
Serial number:	17.05.2025.
Date:	43°30,351' N
Latitude:	16°23,791' E
Longitude:	33
Bottom depth (m):	17,854
Temperature (C°):	37,382
Salinity (psu):	6,70
Beam Width Alongship:	6,68
Beam Width Athwartship:	0,00
Angle Offset Alongship:	0,02
Angle Offset Athwartship:	22,86
Transducer Gain (dB):	-0,5500
SA Correction (dB):	ES38B

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d) Survey design

Survey design in eastern part of GSA 17 (Fig. 2.7.1.) is made of two long transects adapted to geomorphology of inner sea area (channel areas between small islands), and 30 parallel transects (direction: 43°-223°) in the open Adriatic (i.e. within Croatian territorial waters and EEZ). Inter-transect distance between parallel transects is 10 NM. Parallel transect lengths are in the range from 6 to 55 NM. Number of nautical miles effectively processed for biomass estimation in 2025 was 1423.

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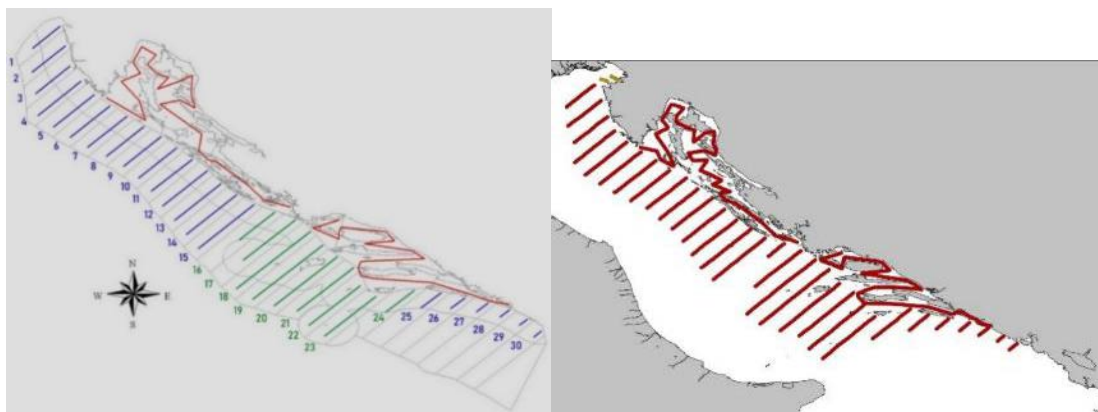


Figure 2.7.1. Planned acoustic survey design in the eastern part of GSA 17 (red transects in inner sea, green and blue transects in open sea) on the left, and the routes realized in 2025 on the right.

e) Fish sampling

59 samplings have been made by pelagic trawl with otter boards. Pelagic trawl sampling net has headline length 29.40 m and side-line lengths 24.80 m, with 18 mm mesh size in the cod-end. Trawling speed was around 4 knots (i.e. 3.5 – 4.5 knots), and haul's duration was 30 min or more. During sampling operations, trawl was monitored by Simrad ITI System, mostly indicating vertical opening 8 – 13 m. Part of the sampling (34 hauls) was done with fishing vessel Sika carrying the same net. Based on analyses and harmonization of surveys on both sides of the Adriatic, and with the aim of improving species representation in trawl samples, night-time sampling was introduced starting this year. Seven-night hauls were carried out, two of them in the same area as daytime sampling in order to obtain comparative results. Locations and species composition of samples obtained are shown in Figure 2.7.2.

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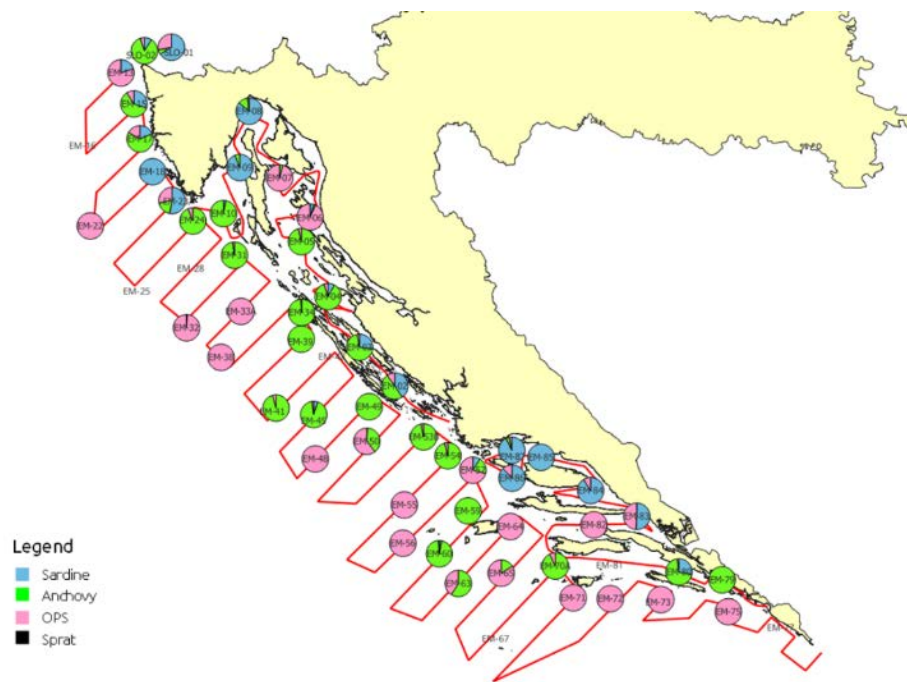


Figure 2.7.2 Pelagic hauls (59) composition (W%) carried out during the acoustic survey in the eastern part of GSA17 (MEDIAS, 2025).

f) Oceanographic parameters

Oceanographic parameters (temperature and salinity) were measured by CTD probe at 86 different locations (Fig. 2.7.3). Based on measurements made, sound speeds were calculated and used to update echosounder during survey, as well as for surveyed area oceanographic description.

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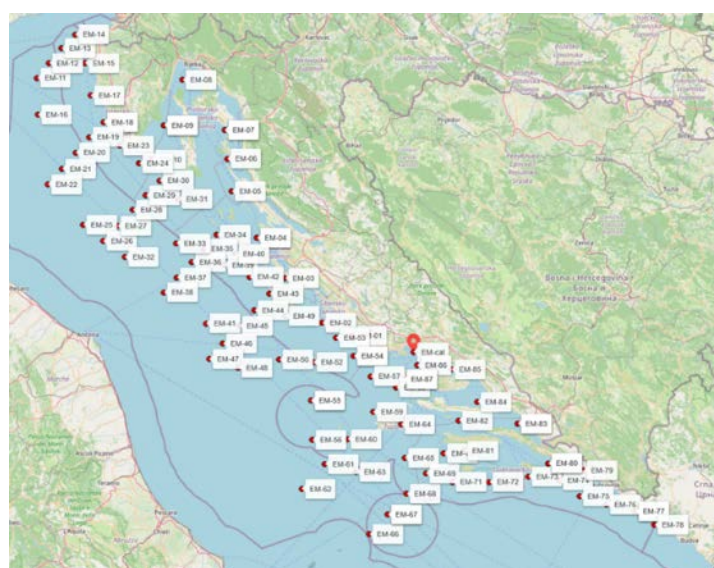


Figure 2.7.3. CTD stations (86) carried out during the acoustic survey in the eastern part of GSA17 (MEDIAS, 2025).

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g) Biomass estimations of target species

In the eastern part of GSA17 were estimated 77.544,13 tons of anchovy. Anchovy length frequency distribution was from 10 to 16 cm, mostly 13-14 cm. Also, 57.332,37 tons of sardine were estimated. Sardine length frequency distribution was from 3 to 17 cm, mostly 13-14cm. Time series of biomass estimated and average density for anchovy and sardine are shown in Figure 2.7.4. and Figure 2.7.5.

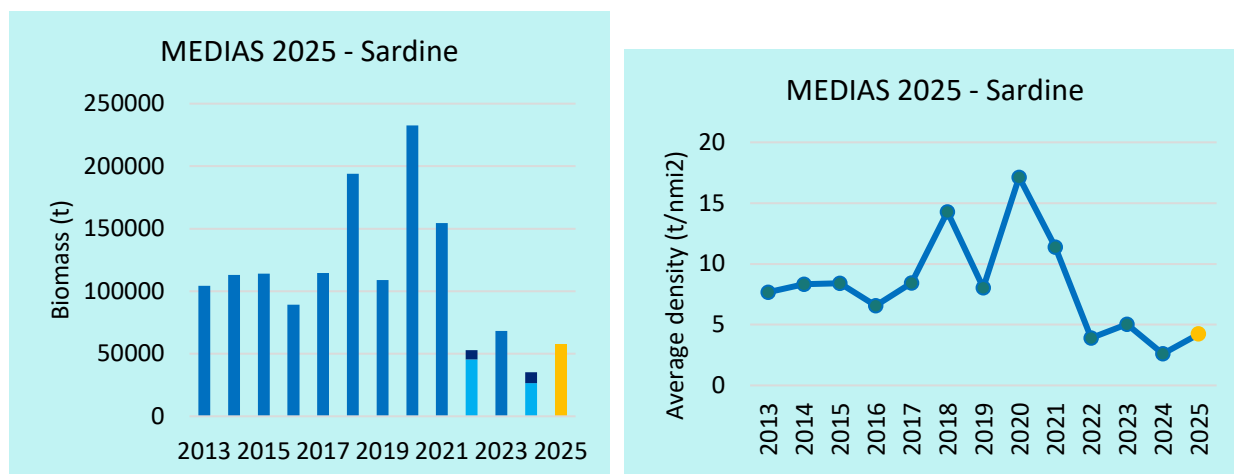


Figure 2.7.4. Sardine biomass estimates per length classes in the eastern part of GSA17 (MEDIAS, 2025).

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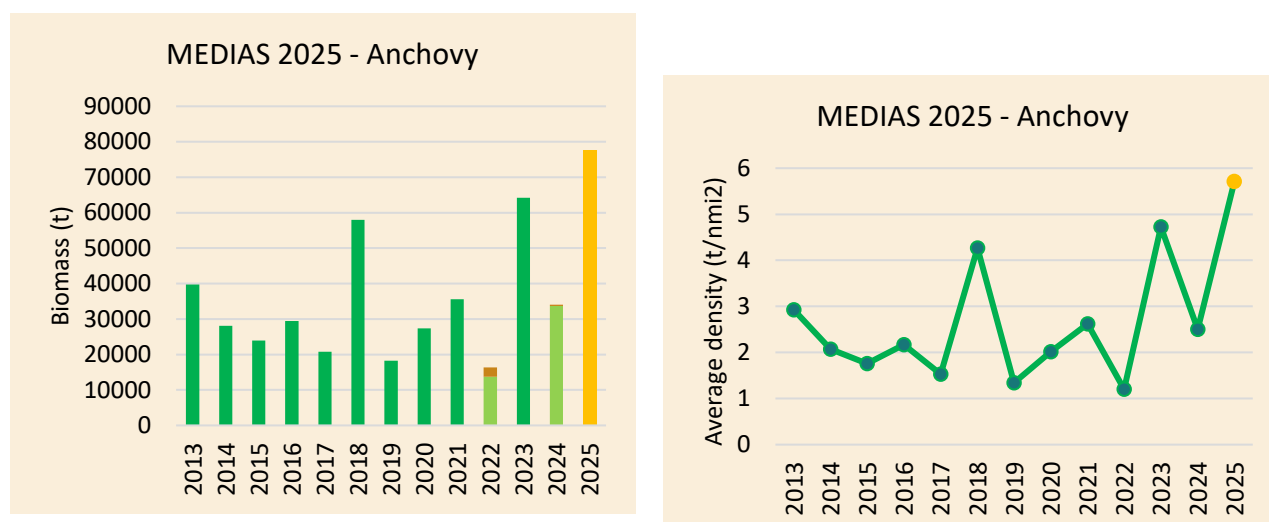


Figure 2.7.5. Anchovy biomass estimates per length classes in the eastern part of GSA17 (MEDIAS, 2025).

Age analyses, made in line with ICES WKARA2 report (2017) recommendations, resulted in survey specific ALKs for anchovy and sardine (Fig. 2.7.6). Results of analyses indicated that anchovy's and sardine's consistent of three age groups (0, 1 and 2). The number of otolith readings for anchovy and sardine was 778 (out of which 622 was age-assigned) and 504 (out

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of which age was assigned on 399) respectfully. During Medias 2025 survey, in terms of biomass, age group 1 was dominant in both anchovy and sardine's population (Fig. 2.7.7).

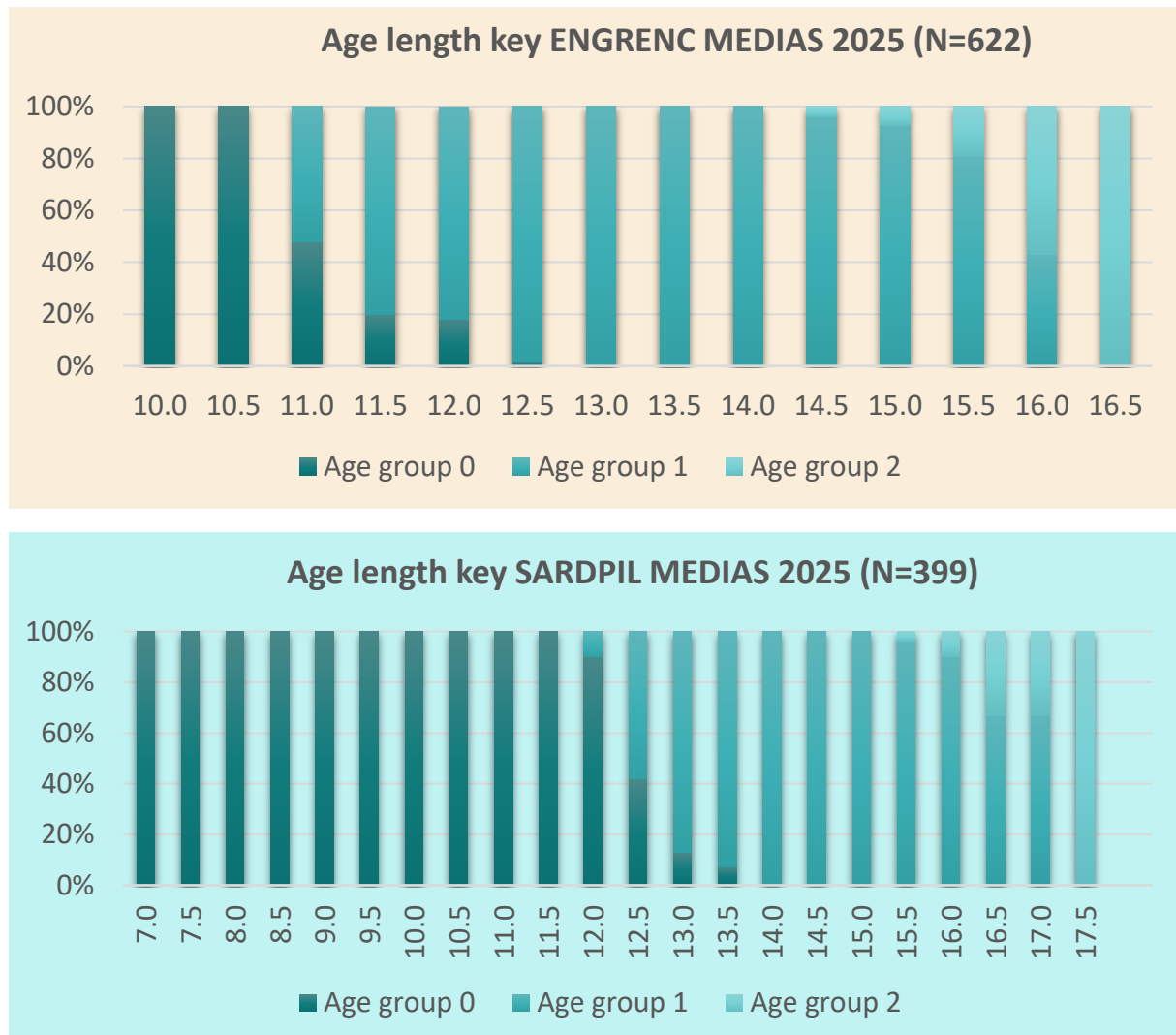
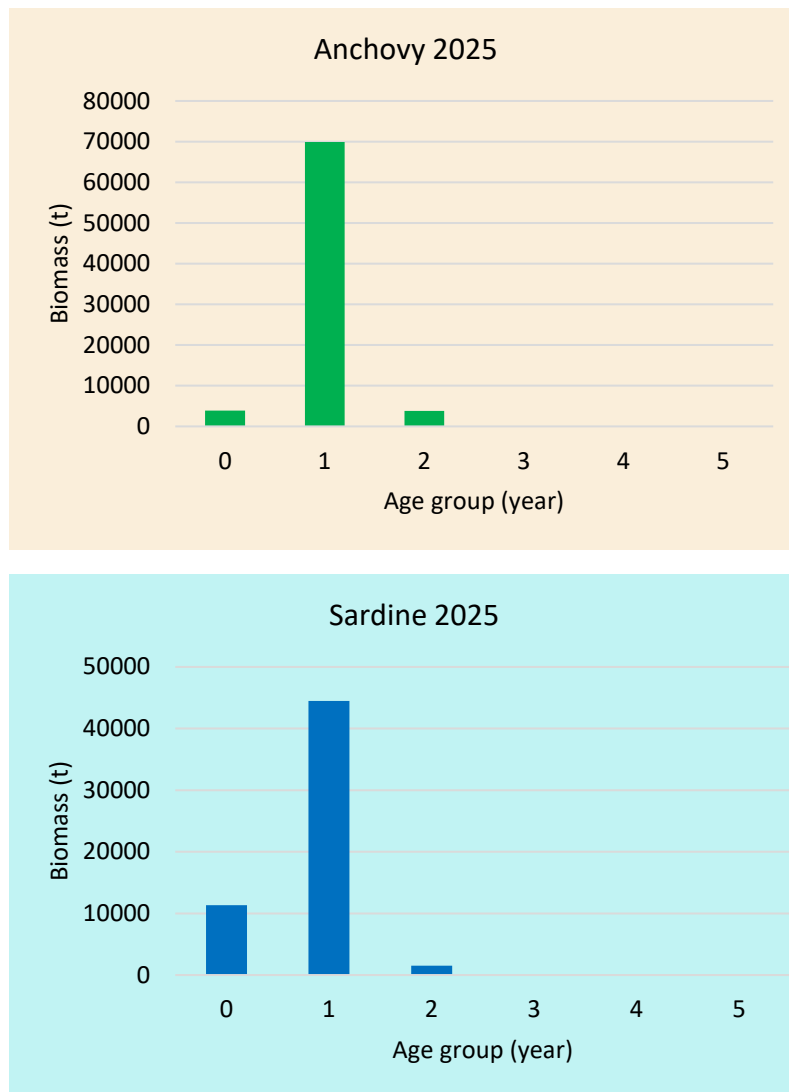


Figure 2.7.5. Age length key (ALK) for anchovy and sardine in GSA 17, MEDIAS 2025.

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Figure 2.7.7. Biomass of anchovy and sardine estimates per age groups (MEDIAS, 2025).

h) Abundance indices of target species

Spatial distributions of sardine and anchovy in the eastern part of GSA17 are presented in terms of NASC per EDSU in Figures 2.7.8. and 2.7.9. Spatial distribution of anchovy shows majority of stock concentrated within northern channels between coast and islands as well as northern part of open sea (Fig. 2.1.8.). Spatial distribution of sardine shows concentration of individuals in the channels between coast and islands, as well as some peaks in the open sea in the north part of Adriatic, while in the central and southern parts number of individuals in the open sea is small (Fig. 2.7.9.).

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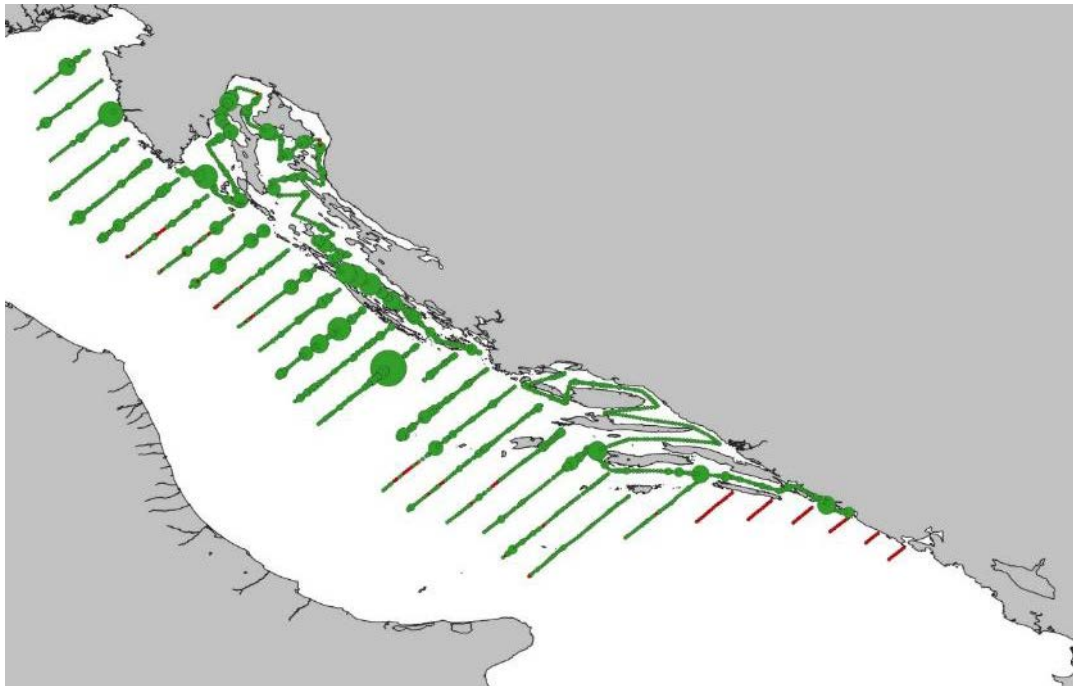


Figure 2.7.6. Anchovy spatial distribution in the eastern part of GSA17 (MEDIAS, 2025).

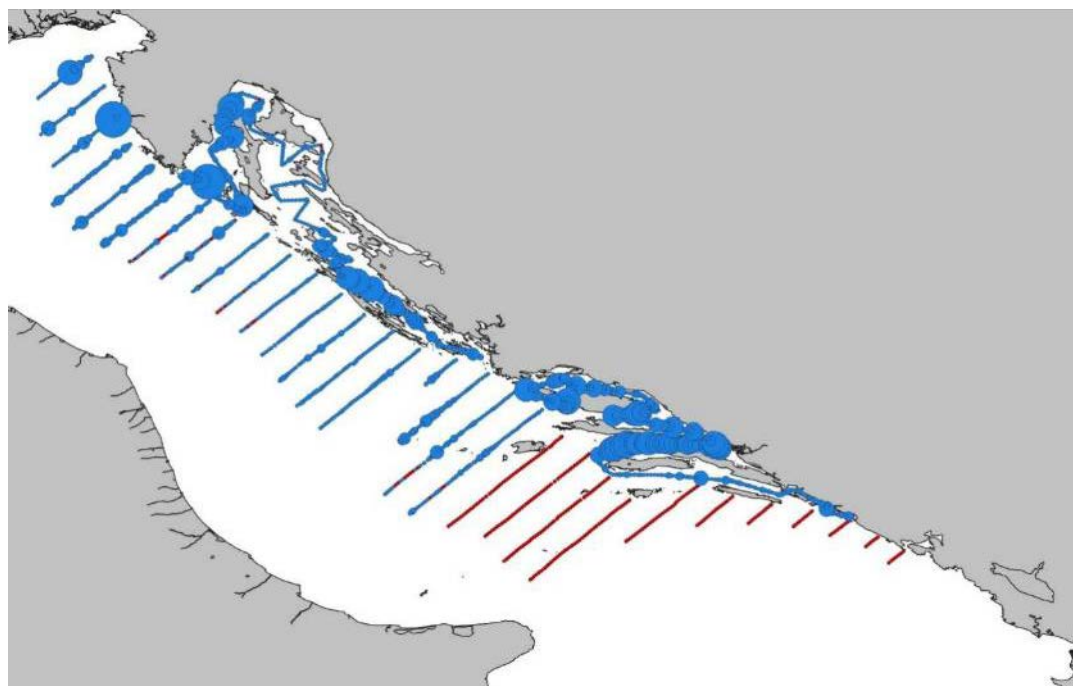
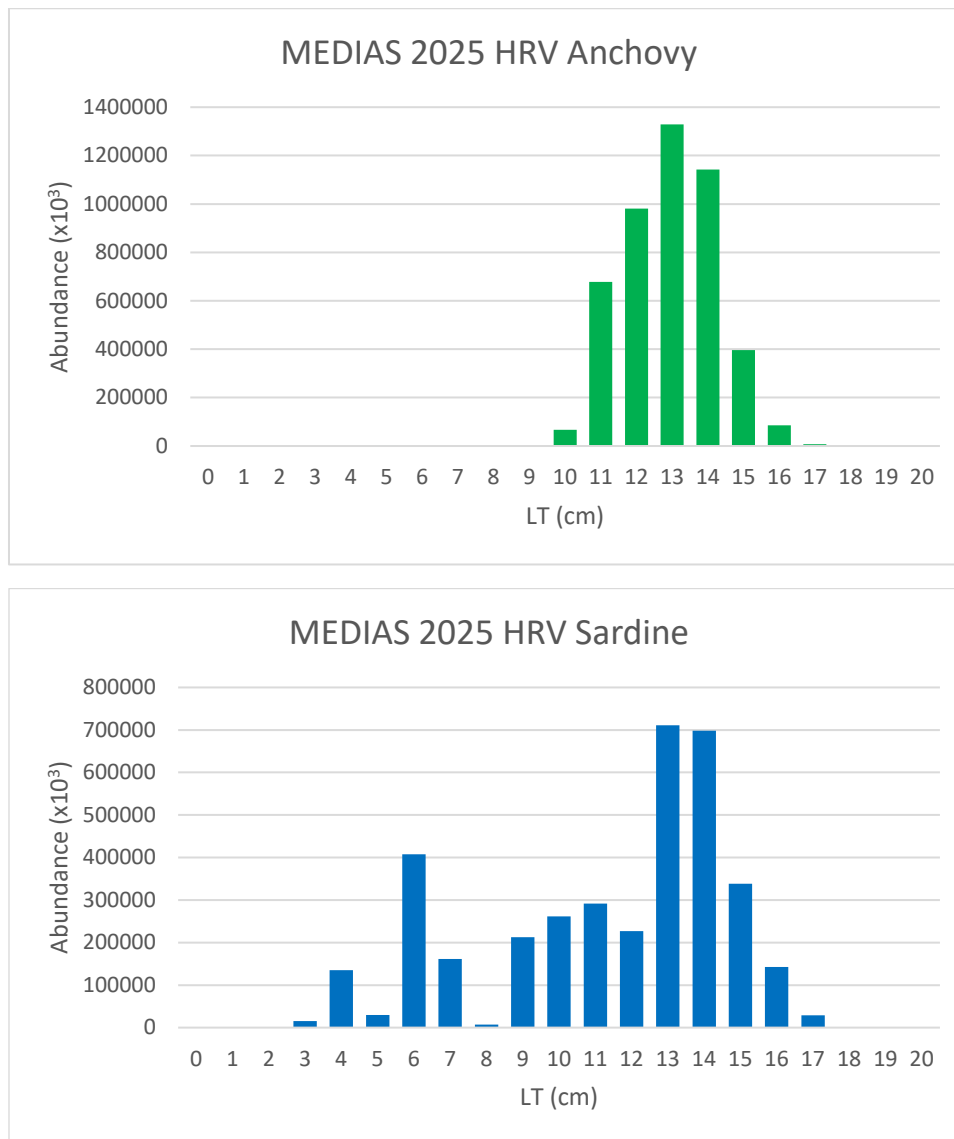


Figure 2.7.9. Sardine spatial distribution in the eastern part of GSA17 (MEDIAS, 2025).

Abundance ($\times 103$) per length for anchovy and sardine are shown in Figure 2.7.10. Although anchovy and sardine abundances had the same median value (in classes 13-14 cm), sardines had larger range of the length frequencies recorded.

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Figure 2.7.10. Abundance (x10³) per length for anchovy and sardine in the eastern part of GSA17 (MEDIAS, 2025).

2.8 Presentation of the 2025 acoustic surveys in the western part of GSA 17 - Northern Adriatic and GSA 18 - Southern Adriatic (CNR-IRBIM)

Iole Leonori, Andrea De Felice, Ilaria Biagiotti, Giovanni Canduci, Antonio Palermينو, Samuele Menicucci, Greta Di Martino. CNR-IRBIM

General information on the survey

MEDIAS 2025 acoustic survey was carried out in the period June 6 – July 23, 2025. It was conducted in the western GSA 17 and GSA 18, following MEDIAS protocol (MEDIAS Handbook, 2025), in the planned area of ~ 13,300 nmi² in western Adriatic Sea. The cruises were conducted on board the research vessel “G. Dallaporta” (built in 2001, 35.30 m, 285 GT, 1100 CV). Since 2024, a European call is set up to select a proper research vessel every two years.

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Type of echosounders and frequencies in use

The equipment was SIMRAD EK80 scientific echosounder operating at 38, 70, 120 and 200 kHz connected with hull-mounted split beam transducers. Acoustic recording was performed during daytime. No TS and Sv thresholds were set for data logging. The threshold for data processing was -70 dB or -60 dB in case of strong scattering from plankton. The pulse duration was 1.024 ms for all frequencies. The surveying acoustic vessel speed was generally 9.5 knots. Echoview software (ver. 12) was used to analyse acoustic data.

Calibration results

The acoustic system was calibrated on the 22nd of June 2025 at 38, 70, 120 and 200 kHz, using the standard sphere method.

Table 2.8.1. Calibration results in MEDIAS 2025

Vessel		Date	Place		Latitude	Longitude	Bottom depth (m)		Temp. At sphere depth (°C)		Salinity at sphere depth (psu)		Speed of sound (m sec ⁻¹)	
R/V Dallaporta		22/06/2025	Ancona		43° 38.0'	13° 42.8'	30.0		16.6		38.0		1515.2	
Freq. (kHz)	Echosou nder type	Transduc er ser. N°	Tungsten (Wc-Co) 38.1 mm TS (dB)	Pulse duration (msec)	Ψ (dB)	Default TS gain	Iter. N°	Time	Range to sphere (m)	Ping rate (s)	Calibrate d TS gain	Time (GMT)	RMS	Sa corr.
38	SIMRAD EK80	502	-42.4	1.024	-20.7	25.50	2027	13:21 – 13:33	16	Max	27.09	11:21 – 11:33	0.105	-0.081
70	SIMRAD EK80	271	-41.6	1.024	-20.7	27	1183	13:40 – 13:57	16	Max	26.95	11:40 – 11:57	0.175	-0.180
120	SIMRAD EK80	924	-39.6	1.024	-20.7	27	2514	14:01 - 14:19	16	Max	26.17	12:01 – 12:19	0.114	-0.131
200	SIMRAD EK80	365	-38.9	1.024	-20.7	26	1598	14:48 – 15:04	16	Max	23.79	12:48 – 13:04	0.132	-0.185

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Survey design

Acoustic data were logged over a grid of systematic parallel transects perpendicular to coastline/bathymetry (inter-transect distance 8-10 nmi, minimum transect length: 5 nmi, maximum transect length: 40 nmi). Number of planned transects is 39 in GSA 17 and 11 in GSA 18 for a total of ~2,000 nautical miles in western Adriatic Sea.

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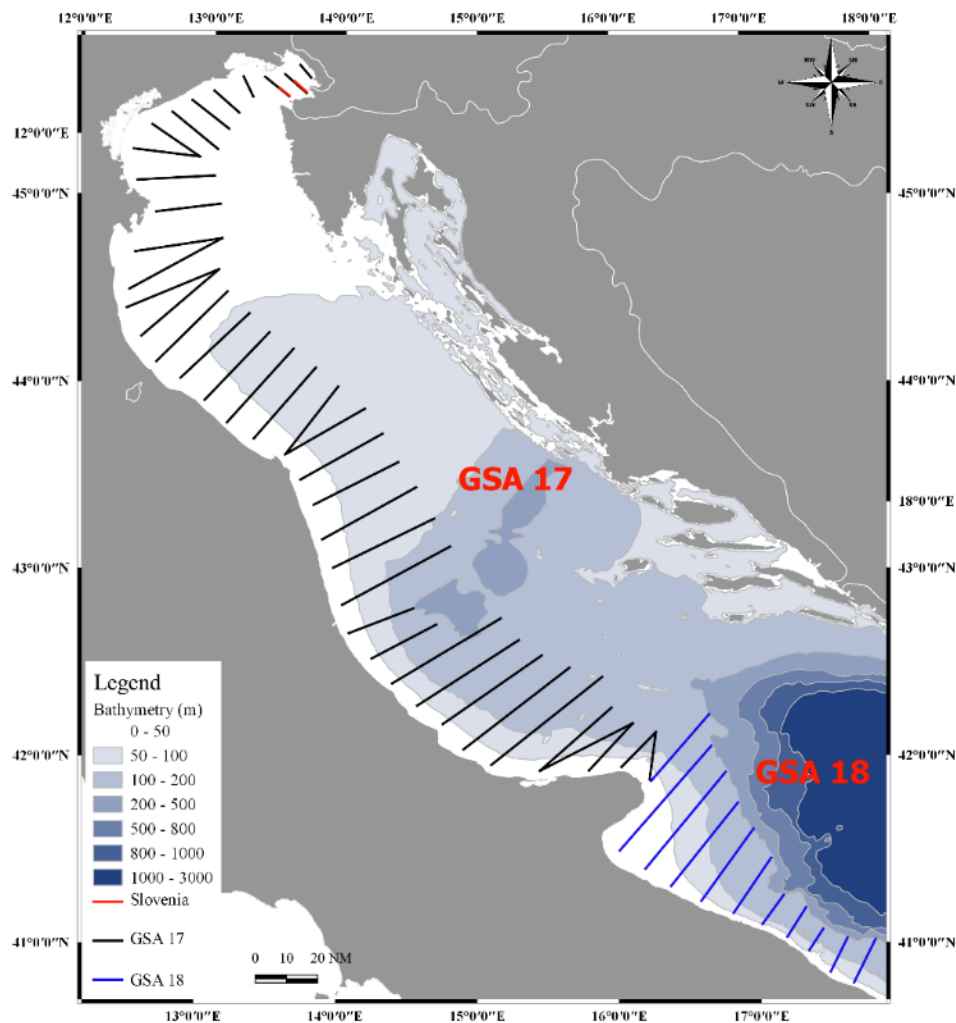


Figure 2.8.1. Acoustic survey design in the western part of GSA 17 and GSA 18. MEDIAS 2025.

Survey period of the MEDIAS 2025 acoustic survey in western GSA 17 was from June 6 – July 4, 2025; area coverage was 100% over a total area of 10,519 nmi² and 39 transects. The number of nautical miles effectively processed for biomass estimation was 1052 nmi (1337 nmi total).

Fish sampling

A midwater sampling trawl “Volante” with the following characteristics was used during the surveys: 18 mm codend mesh size, about 11 m vertical opening and 18 m horizontal opening, headline/ft rope length = 35 m; sidelines length = 27 m. Vessel speed was 3.5 – 4.5 knots during fishing. Haul’s duration was about 30 min. Trawls were monitored by means of SIMRAD FX80 Trawl sonar. Fishing operations were performed at different light conditions and bathymetry. Biological samplings were conducted along the survey routes for biomass allocation into species and to know mean lengths and weights of the pelagic fish (Species, Size Composition, length-weight). The entire catch was considered to determine the proportion in species by weight; in case the catch was huge (more than 50 kg) an adequate subsample was considered for this operation. Length frequency distributions on board were obtained measuring a subsample of 100 individuals per species when available. Subsamples of target species specimens of up to 5 individuals per 0.5 cm length class were collected to determine age, by means of otoliths readings, following DCR standards, and maturity stages and frozen for successive measurements in the laboratory.

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In western Adriatic Sea, in 2025, 29 pelagic hauls were done in GSA 17 (Fig. 2.8.2.). Catch composition, derived from pelagic hauls, showed among the most abundant species *Engraulis encrasicolus* and *Sardina pilchardus*. Other pelagic fish species – OPS - minor for occurrence were: *Sprattus sprattus*, *Trachurus mediterraneus*, *Trachurus trachurus*, *Spicara spp*, *Scomber colias*, *Scomber scombrus*, *Sardinella aurita*, *Boops boops*. In 2025, we had minor presence of sardine in the Northern Adriatic. Many salps and jellyfish were present in the Northern part (south of Po river mouth) of GSA 17.

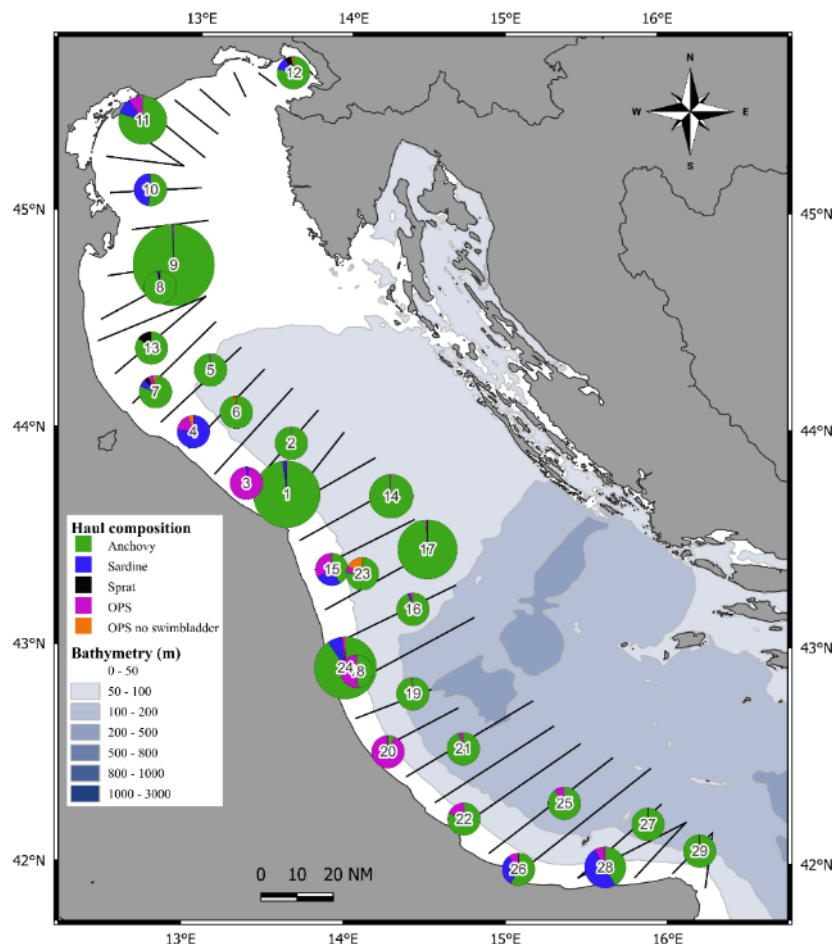


Figure 2.8.2. Pelagic hauls composition (26) carried out during the acoustic survey in western GSA 17. MEDIAS 2025.

Oceanographic parameters

In total, 62 CTD stations were performed in GSA 17 (Fig. 2.8.3.), western Adriatic Sea, using a CTD (Seabird 19 plus) probe to collect temperature, salinity, fluorescence, and dissolved oxygen data from the water column. As extra sampling activity, 46 mesozooplankton stations were done in GSA 17 using a WP2 vertical net.

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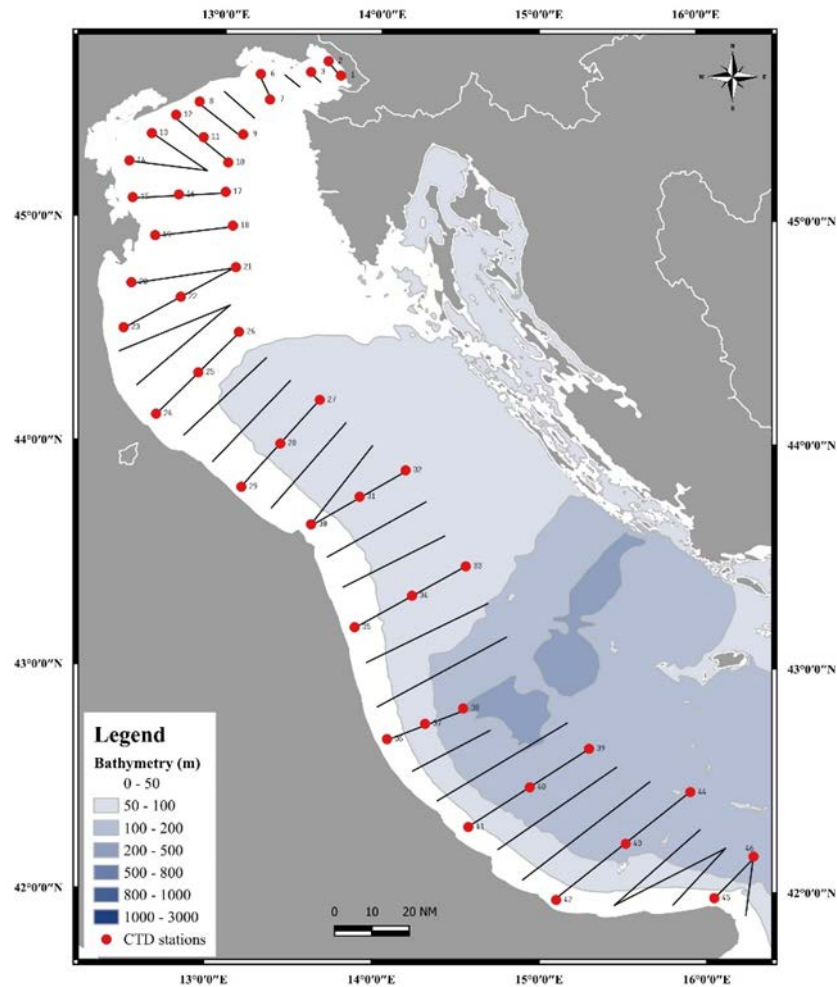


Figure 2.8.3. Planned CTD stations carried out during the acoustic survey in the western part of GSA 17. MEDIAS 2025.

Biomass estimations of target species:

Biomass of sardine (*Sardina pilchardus*) (Fig. 2.8.4) and anchovy (*Engraulis encrasicolus*) (Fig. 2.8.5) and related (geostatistical simulations) CVs, in 2025, in western GSA 17, were estimated in:

Year	Sardine	CV	Anchovy	CV	Sampled Area
2025	31.461 t	9.5%	391.929 t	8.7%	10,519 nmi ²

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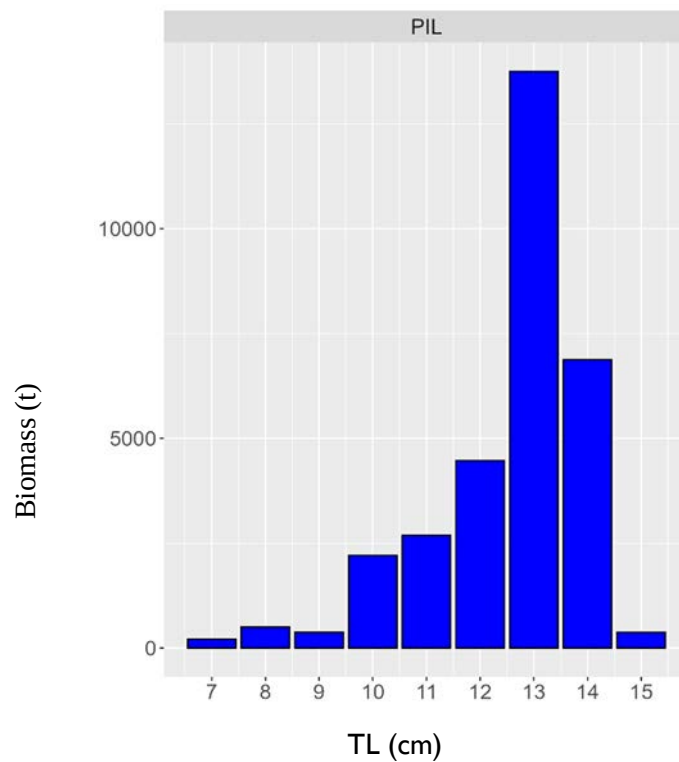


Figure 2.8.4. Sardine (PIL) biomass in tons by length (LFD) in western GSA 17. MEDIAS 2025.

For sardine, biomass per length class is concentrated in the range 7-15 cm (Fig. 2.8.4) with low recruitment.

63

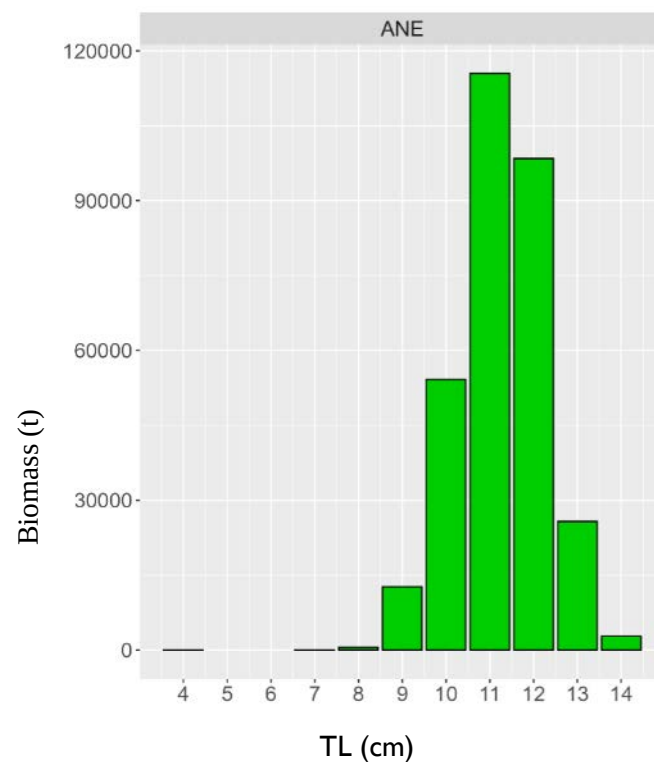


Figure 2.8.5. Anchovy (ANE) biomass in tons by length (LFD) in western GSA 17. MEDIAS 2025.

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Anchovy biomass per length class shows a distribution in the range 7-14 cm (Fig. 2.8.5).

Biomass time series

In 2025, in western GSA 17 MEDIAS (Fig. 2.8.5b.), we have an increase in the level of anchovy biomass in line with the last two years. For sardine, we have a decrease in the trend of biomass, in contrast with the increase of the last year in western GSA 17 MEDIAS.

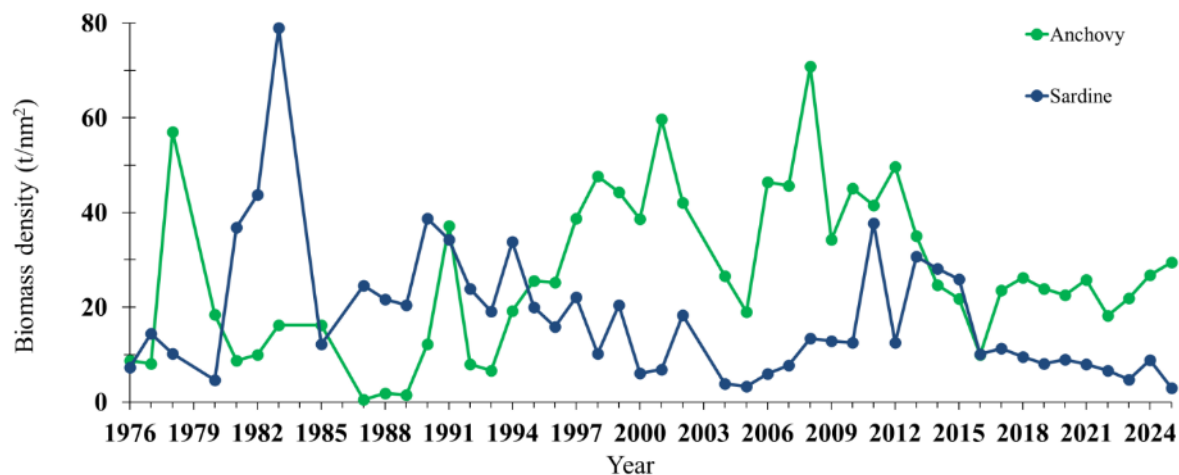


Figure 2.8.5b. Historical trends in Northwest Adriatic Sea 1976-2025.

Age length key (ALK) for sardine in western GSA 17, MEDIAS 2025, was composed by 3 years classes: age 0, age 1 and age 2. The number of otoliths readings was 285 for sardine (no. individuals) (Fig. 2.8.6).

Anchovy ALK in western GSA 17, MEDIAS 2025, was represented by 3 years classes: age 0, age 1 and age 2. The number of otoliths readings was 585 for anchovy (no. individuals) (Fig. 2.8.6).

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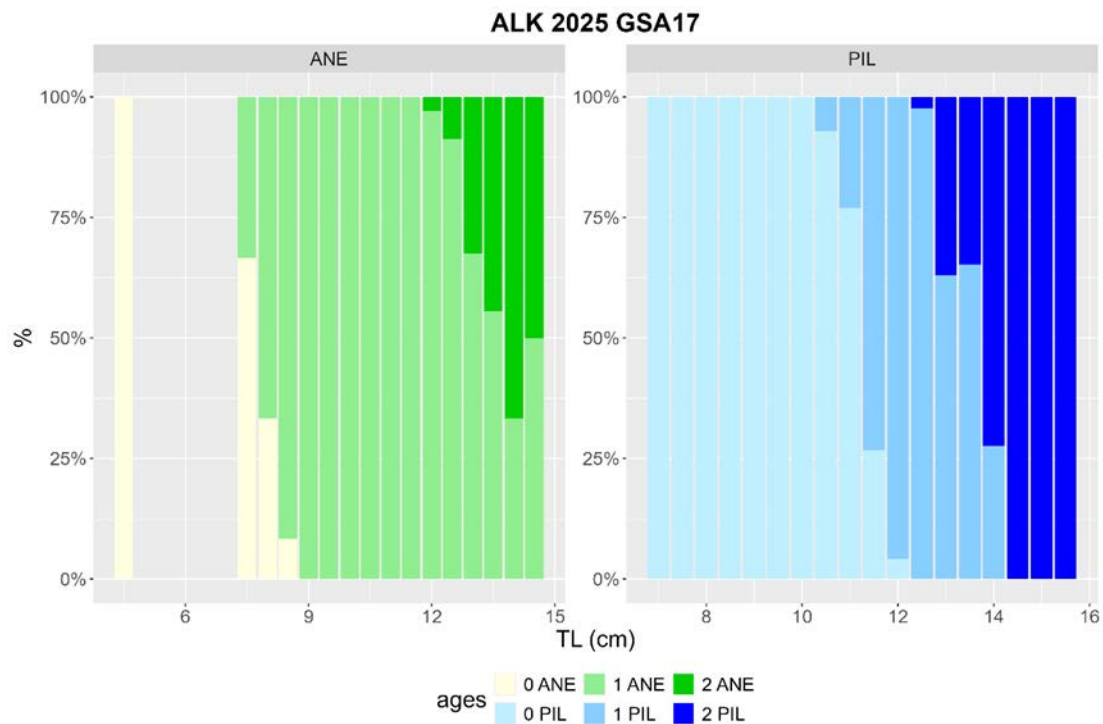


Figure 2.8.6. Anchovy and sardine ALK western GSA17, MEDIAS 2025.

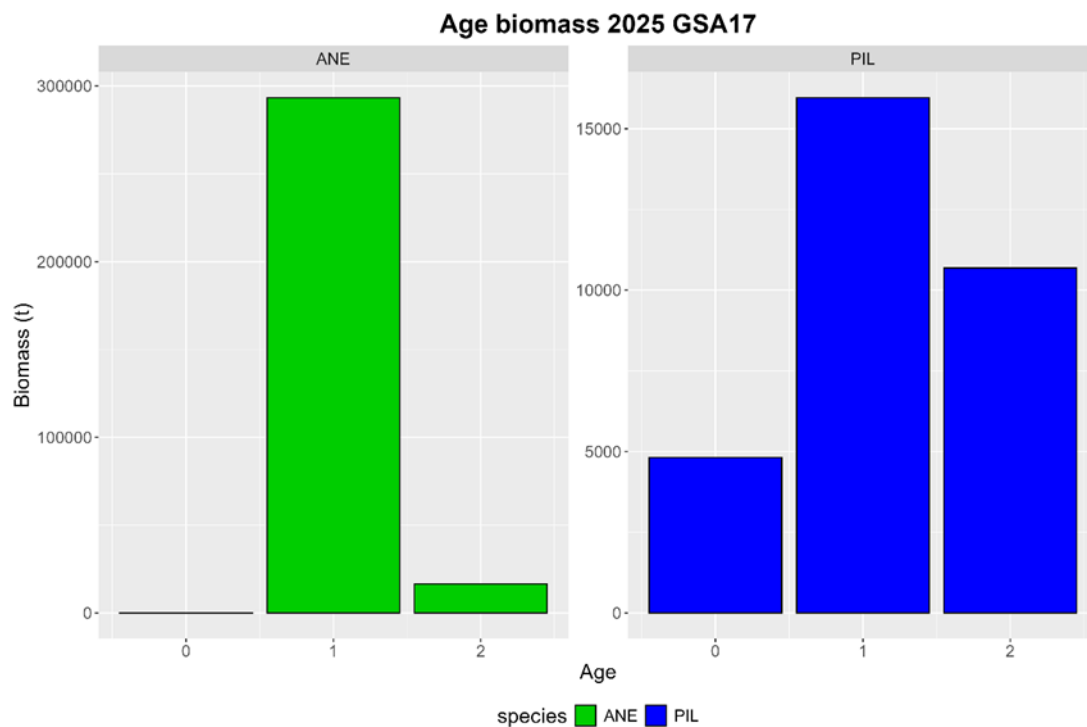


Figure 2.8.7. Anchovy and Sardine biomass at age in the western GSA17, MEDIAS 2025.

Sardine and anchovy biomass per age were estimated (Fig. 2.8.7.) using the above reported ALKs.

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Anchovy biomass at age distribution showed that there were mainly 2 age groups: 1, 2. Age 1 is dominant. There was very low recruitment.

For sardine, biomass at age was mainly composed by age group 0, 1 (dominant) and 2.

Abundance indices of target species:

Spatial distributions of sardine and anchovy abundance indices, in terms of NASC (m^2/mn^2), in western GSA 17, in June-July 2025, are reported in Figures 2.8.8 and 2.8.9.

Anchovy covers all the continental shelf in GSA 17 (also in the Trieste Gulf). Anchovy is also present offshore but less abundant in the southern part of the Middle Adriatic.

Sardine covers mainly the northern part of the basin, particularly between the Po river mouth area and the Gulf of Trieste while it is scarce in the south of Po area. In the central part it is mainly present along the coast.

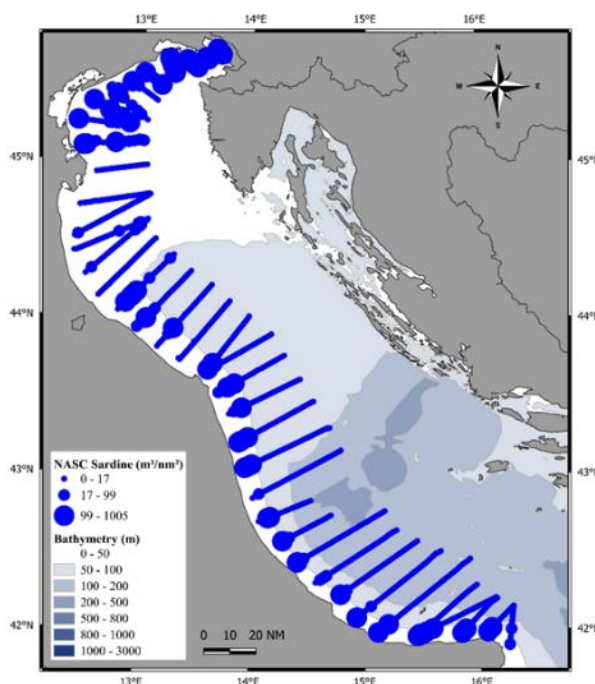


Figure 2.8.9. Sardine spatial distribution in western GSA 17 in June July. MEDIAS 2025.

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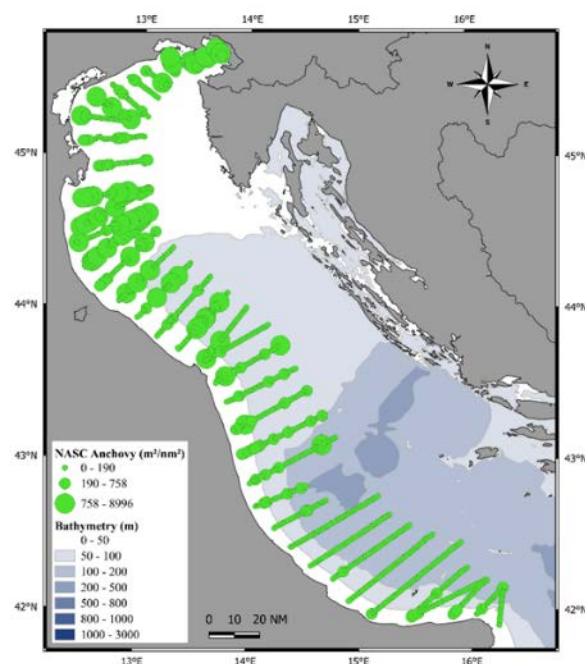


Figure 2.8.9. Anchovy spatial distribution in western GSA 17 in June – July. MEDIAS 2025.

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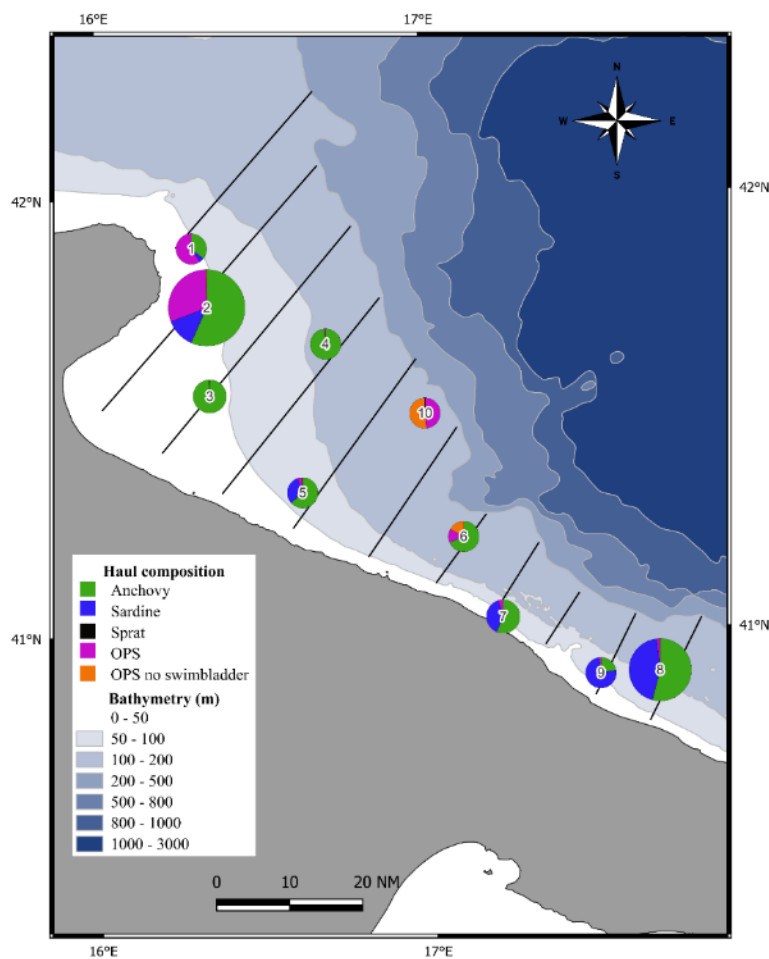
Western GSA 18

Survey period of the MEDIAS 2025 acoustic survey in western GSA 18 was from July 4 - July 23, 2025; area coverage was 100% over a total area of 2,510 nmi² and 11 transects. The number of nautical miles effectively processed for biomass estimation was 267 nmi (360 nmi total).

In western Adriatic Sea, in 2025, 10 pelagic hauls were done in GSA 18 (Fig. 2.8.10.). Catch composition, inferred from pelagic hauls, showed among the most abundant species *Engraulis encrasicolus* and *Sardina pilchardus*.

Other pelagic fish species – OPS - minor for occurrence were: *Sardinella aurita*, *Trachurus mediterraneus*, *Trachurus trachurus*, *Scomber colias*, *Boops boops*, and *Sarda sarda*.

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Figure 2.8.10. Pelagic hauls composition (10) carried out during the acoustic survey in western GSA 18. MEDIAS 2025.

Oceanographic parameters

In total, 18 CTD stations were performed in GSA 18 (Fig. 2.8.11.), western Adriatic Sea, using a CTD (Seabird 19 plus) probe to collect temperature, salinity, fluorescence, and dissolved oxygen data from the water column.

As extra sampling activity, 12 mesozooplankton stations were done in GSA 18 using a WP2 vertical net.

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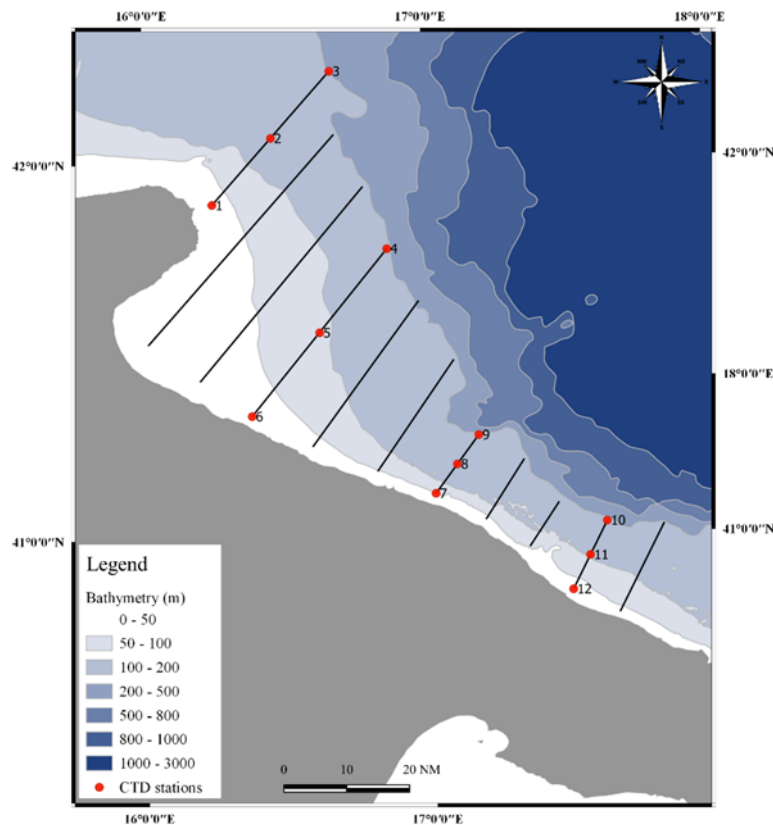


Figure 2.8.11. Planned CTD stations carried out during the acoustic survey in the western part of GSA 18. MEDIAS 2025.

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Biomass estimations of target species:

Biomass of sardine (*Sardina pilchardus*) (Fig. 2.8.12.) and anchovy (*Engraulis encrasicolus*) (Fig. 2.8.13.) and related (geostatistical simulations) CVs, in 2025, in western GSA 18, were estimated in:

Year	Sardine	CV	Anchovy	CV	Sampled Area
2025	6,052 t	17.3%	16,534 t	13.5%	2,510 nmi ²

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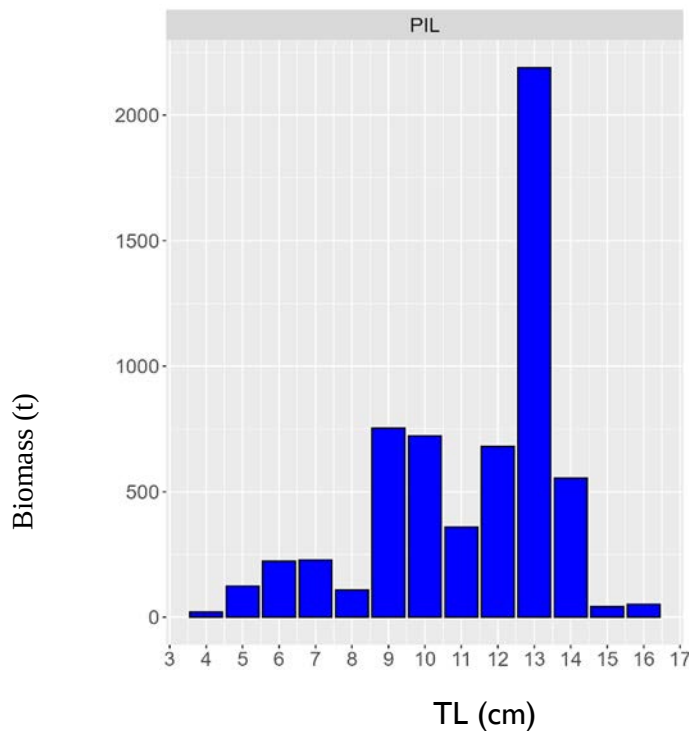


Figure 2.8.12. Sardine (PIL) biomass in tons by length (LFD) in western GSA 18. MEDIAS 2025.

For sardine, biomass per length class is trimodal (4-8 cm; 8-11 cm; 11-16 cm); recruitment is present.

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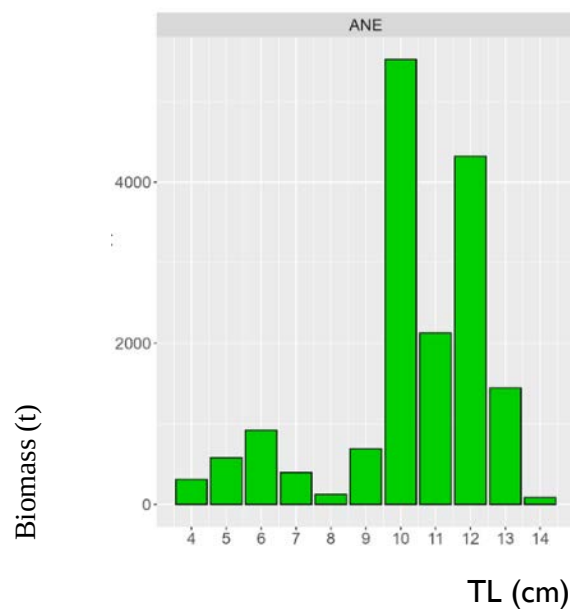


Figure 2.8.13. Anchovy (ANE) biomass in tons by length (LFD) in western GSA 18. MEDIAS 2025.

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For anchovy, biomass per length class is bimodal (4-8 cm; 9-14 cm).

Many juveniles of anchovy and sardine were found in GSA 18.

Biomass time series

In 2025, in western GSA 18 MEDIAS (Fig. 2.8.13b.), anchovy biomass has increased respect to the last calculated value of 2022.

For sardine, there is a light increase in 2025 in opposition to the huge decline in the last years (2021-2022).

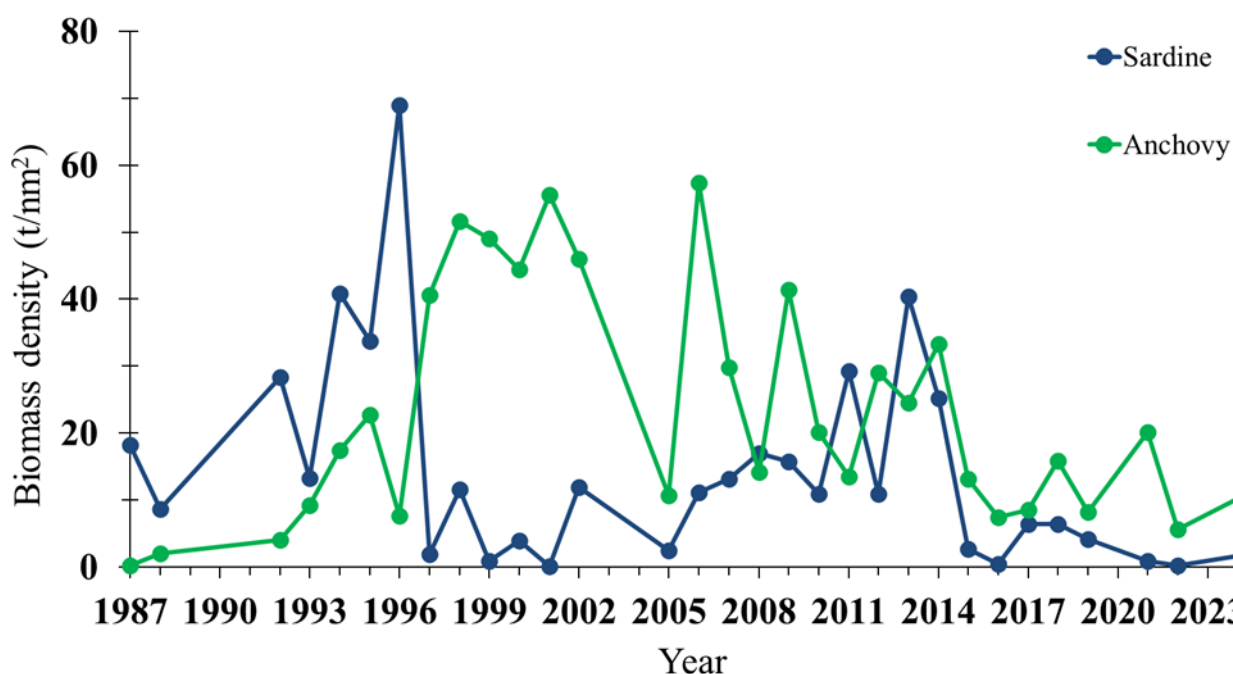


Figure 2.8.13b. Historical trends in South-western Adriatic Sea 1987-2025.

Anchovy ALK in western GSA 18, MEDIAS 2025, was represented by 3 years classes: age 0, age 1 and age 2. The number of otoliths read was 146 for anchovy (no. individuals) (Fig. 2.8.14).

Age length key (ALK) for sardine in western GSA 18, MEDIAS 2025, was composed by 3 years classes: age 0, age 1 and age 2. The number of otoliths read was 130 for sardine (no. individuals) (Fig. 2.8.14).

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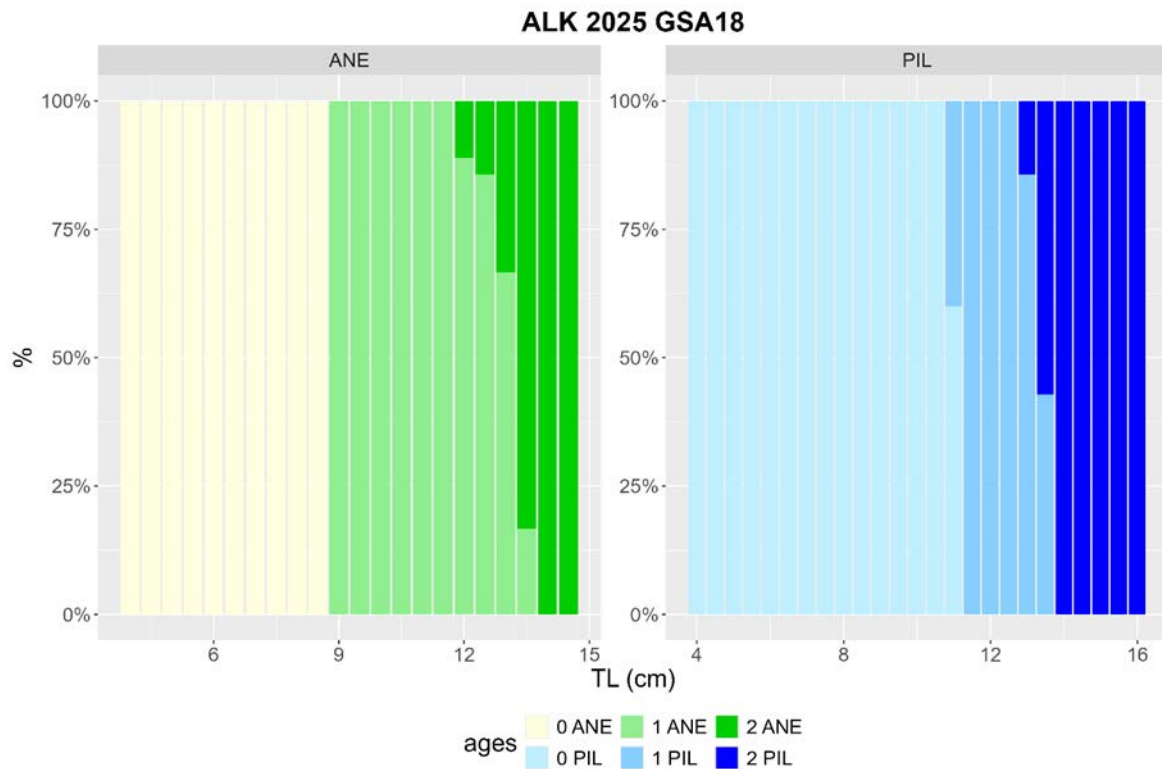


Figure 2.8.14. Anchovy and sardine ALK western GSA18, MEDIAS 2025.

Sardine and anchovy biomass per age were estimated (Fig. 2.8.15.) using the above reported ALKs. For anchovy, biomass at age was mainly composed by age group 1 (dominant), 0 and 2 are also represented. Sardine biomass at age distribution showed that there were 3 age groups: 0, 1, 2. Age 0 is dominant (4-11 cm). Age 1 is similar.

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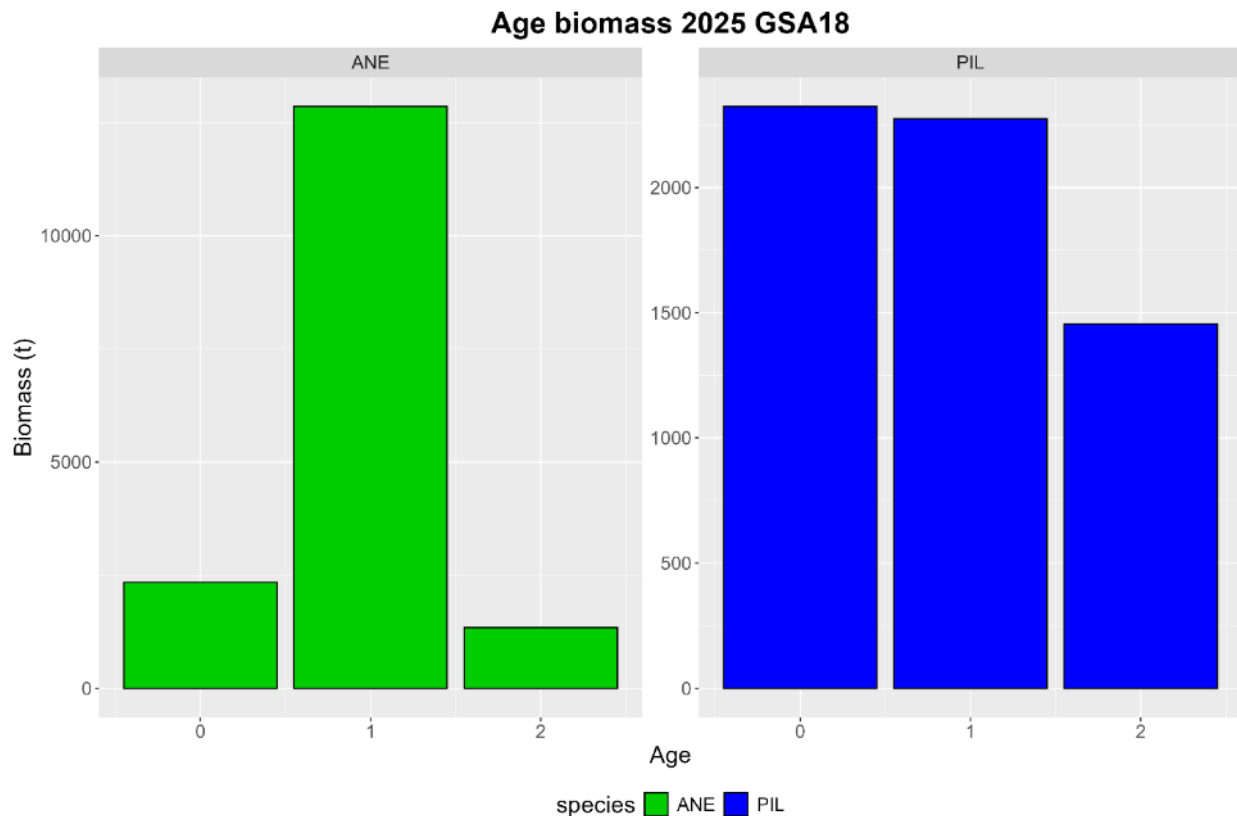


Figure 2.8.15. Sardine and anchovy biomass at age in western GSA 18 in 2025.

Abundance indices of target species (spatial distribution):

Spatial distributions of sardine and anchovy abundance indices, in terms of NASC (m^2/mn^2), in western GSA 18, in July 2025, are reported in Figures 2.8.16 and 2.8.17.

Anchovy covers all the continental shelf also in GSA 18 and is particularly abundant in the Gulf of Manfredonia.

Sardine is mainly present along the coast of GSA 18 and is abundant in the Gulf of Manfredonia.

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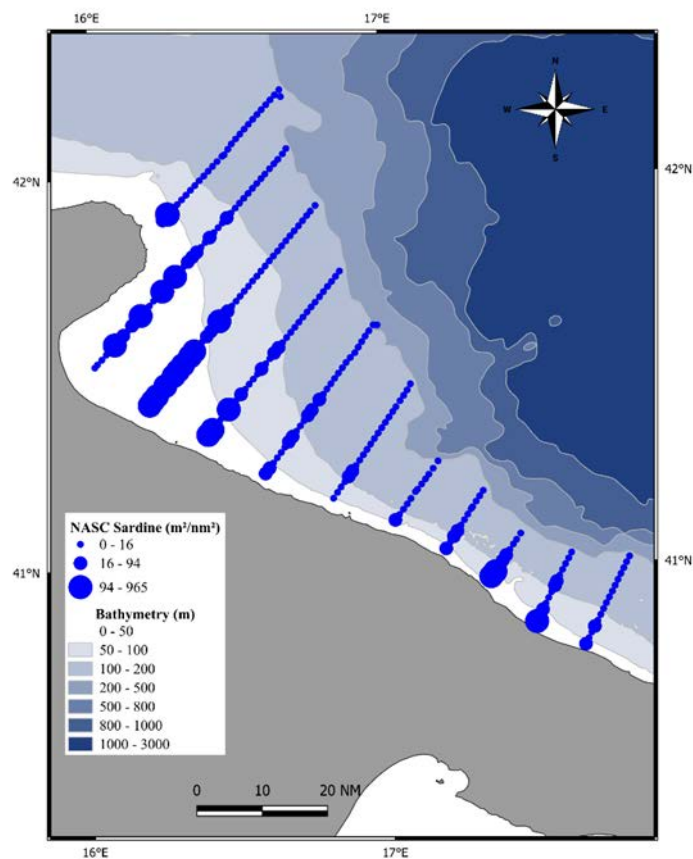


Figure 2.8.16. Sardine spatial distribution in western GSA 18 in July. MEDIAS 2025.

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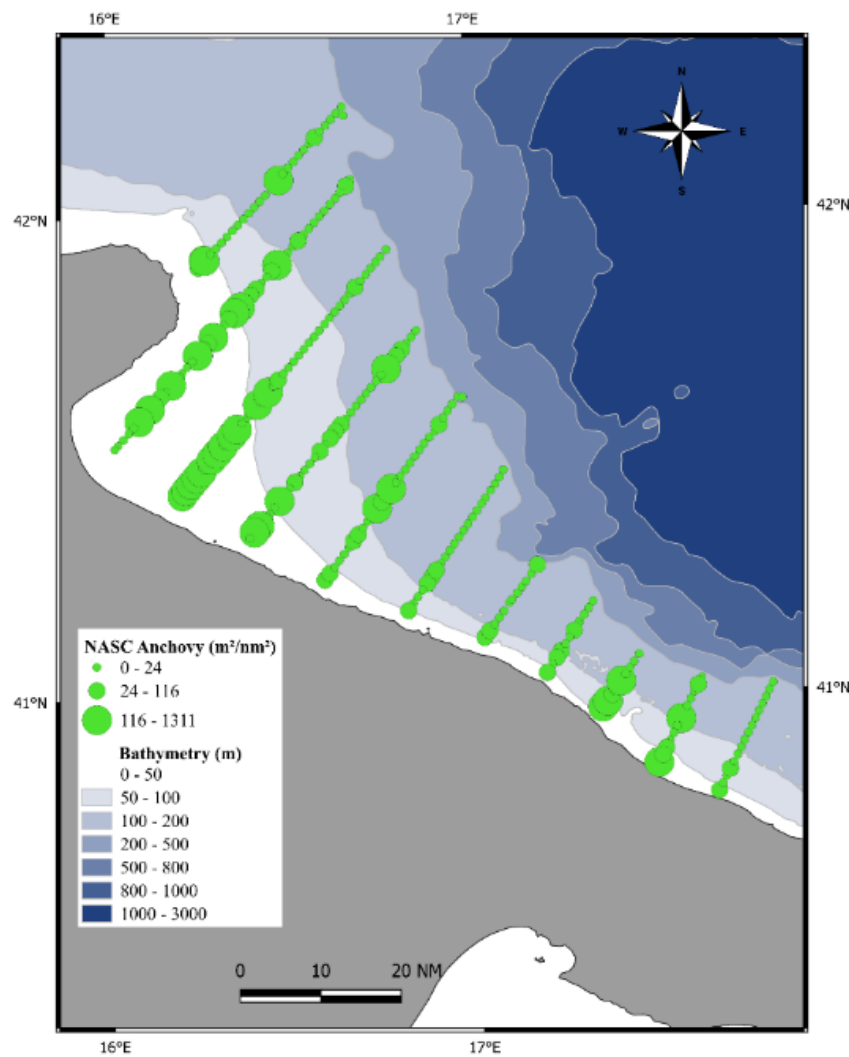


Figure 2.8.17. Anchovy spatial distribution in western GSA 18 in July. MEDIAS 2025.

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2.9 Presentation of the 2025 acoustic surveys in GSA 20 - Eastern Ionian Sea and GSA 22 - Aegean Sea (HCMR)

Maria Myrto Pyrounaki, Zacharias Kapelonis, Konstantinos Tsagarakis, Athanassios Machias, Konstantinos Markakis, Evdoxia Schismenou, Stylianos Somarakis and Marianna Giannoulaki, HCMR

a) General information on the survey

MEDIAS 2025 acoustic surveys covered 9552 nmi² in Aegean Sea during June - July, and 3593 nmi² in eastern Ionian Sea during September - October with the fishery Research Vessel PHILIA (26 m length, 2× 340 HP).

b) Type of echosounders and frequencies in use

The split beam echo sounder used is SIMRAD EK80, with the 38, 120, 200 and 333 kHz frequency. There is no threshold limit applied in the raw data. The threshold for processing for the assessment (38 KHz) is -70 dB. The pulse duration is 1024 ms. The surveying acoustic vessel speed is 8 knots. The Echoview software was used to visualize and analyze acoustic data.

c) Calibration results

The acoustic system was calibrated at the beginning of the MEDIAS 2025 in northern Aegean Sea.

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Table 2.9.1 Calibration results of the MEDIAS 2025.

	38 kHz (ES38-7)	120 kHz (ES120-7c)	200 kHz (ES200-7c)	333 kHz (ES333-7c)
Target	Copper (Cu) 60 mm	Copper (Cu) 23 mm	Copper (Cu) 13.7 mm	Tungsten (Wc-Co) 22 mm
Adjusted Gain [dB]	26.25	27.16	28.35	21.99
Sa correction [dB]	-0.13	-0.05	-0.11	-0.19
Offset alongship [deg]	-0.04	-0.02	-0.19	0.10
Offset athwartship [deg]	-0.03	-0.02	-0.03	-0.07
Beamwidth alongship [deg]	7.81	6.42	6.38	7.78
Beamwidth athwartship [deg]	7.95	6.43	6.30	6.06
Depth (sphere, bottom) [m]	10, 26	10, 26	10, 26	10, 26

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	38 kHz (ES38-7)	120 kHz (ES120-7c)	200 kHz (ES200-7c)	333 kHz (ES333-7c)
RMS TS error [dB]	0.06	0.05	0.11	0.59

d) Survey design

Acoustic data were collected from 75 transects in GSA 22 and 48 transects in GSA 20 (Fig 2.9.1-2.9.2). The total nautical miles effectively used for acoustic analysis amounted to 1293 in GSA 22 and 540 in GSA 20.

In general, the transects were either parallel, perpendicular to the coastline, with 10 nmi intertransect distance, covering the bathymetric range from the 10m isobath up to the 200m isobath (reaching the 1500m isobath in certain areas like the Thracian Sea plateau), or zigzag inside gulfs. In the Thracian Sea and the Strymonic Gulf (GSA22) the intertransect distance was 5 nmi, to improve precision of sardine abundance estimates. Geostatistical analyses from the previous years revealed a spatial autocorrelation range of approximately 5 nmi, indicating highly aggregated sardine distributions. Under a systematic survey design with 10 nmi spacing between transects, the likelihood of detecting high-density patches is low (Petitgas, 2001). Therefore, modifying the design is a practical approach to enhance estimate accuracy. Since transects are sampled continuously and the overall mean is derived from the simple average of cell means, the mean along each transect is considered to be estimated without error.

e) Fish sampling

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Echotraces are identified with pelagic hauls. Forty (40) pelagic hauls were carried out in GSA 22 and twenty-two (22) in GSA 20 to be used for the scrutinizing of the echograms (Fig 2.9.3 - 2.9.4). Acoustic recording was conducted during daytime and trawl hauls during daytime/ night time. The pelagic net used has headline length of 28m, a sideline dimension of 55m and codend mesh size of 8mm.

f) Oceanographic parameters

164 hydrological stations have been conducted in GSA 22 and 88 hydrological stations in GSA 20 in 2025, using a SBE 19plus CTD, which measures conductivity, temperature, pressure, fluorescence, PAR (Photosynthetically active radiation), oxygen and turbidity (Fig 2.9.1 and 2.9.2).

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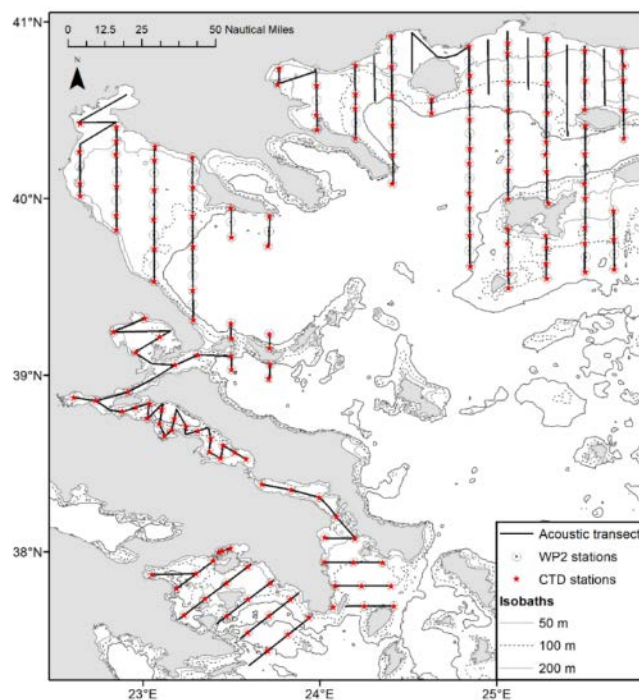


Figure 2.9.1. Acoustic transects sampled in the MEDIAS of the Hellenic part of northern Aegean Sea (GSA 22) in June - July 2025. The position of CTD stations and WP2 stations sampled are also shown.

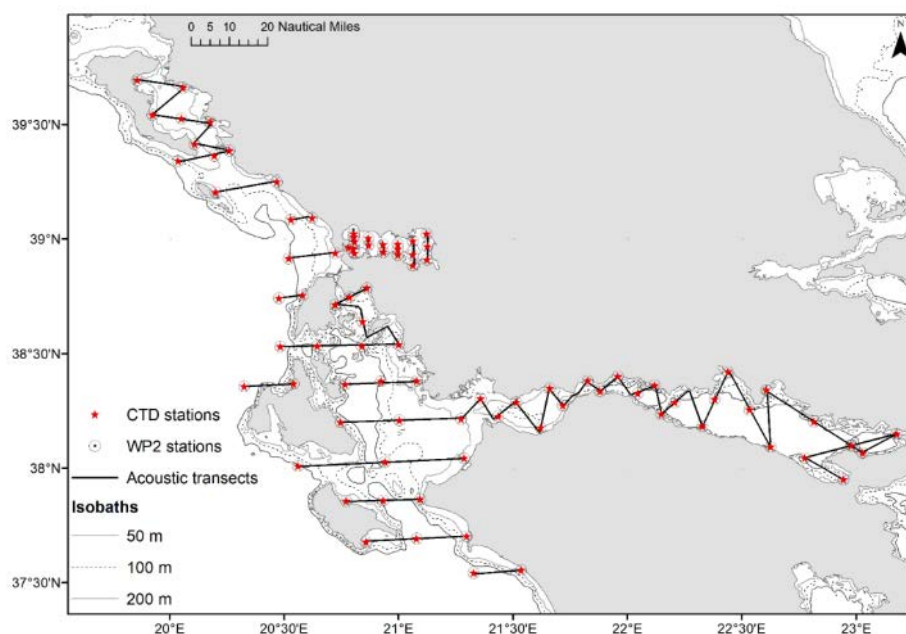


Figure 2.9.2. Acoustic transects sampled in the MEDIAS of the Hellenic part of eastern Ionian Sea (GSA 20) in September - October 2025. The position of CTD stations and WP2 stations sampled are also shown.

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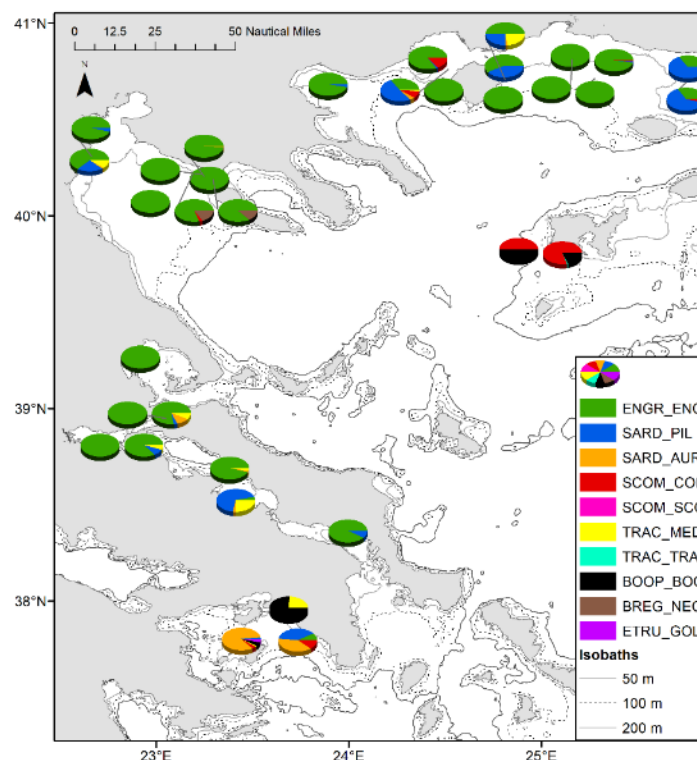


Figure 2.9.3. The catch compositions of the hauls (species kg/haul) weighted per hauling hour in northern Aegean Sea (GSA 22) during June - July 2025.

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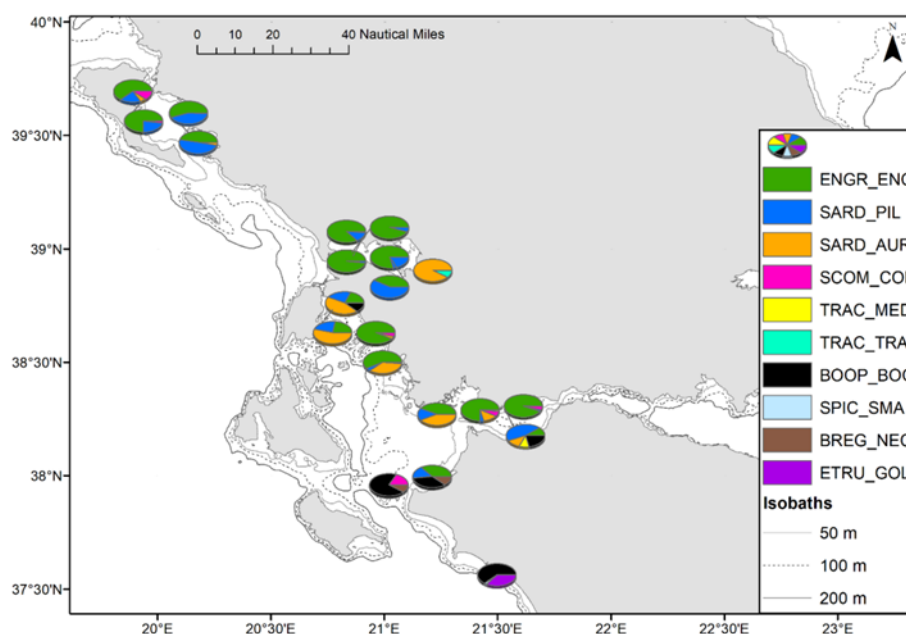


Figure 2.9.4. The catch compositions of the hauls (species kg/haul) weighted per hauling hour in eastern Ionian Sea (GSA 20) during September - October 2025.

g) Biomass estimations of target species

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The biomass estimation of sardine and anchovy in GSAs 22 and 20, as well as the associated CVs of geostatistical simulations, are reported in the table 2.9.2. The historical trend of anchovy and sardine in GSAs 22 and 20 are shown in Fig 2.9.5 and 2.9.6.

Table 2.9.2. Estimates of biomass and CV for sardine and anchovy in GSAs 20 and 22 in 2025.

	GSA 22		GSA 20	
	Biomass (t)	CV	Biomass (t)	CV
Anchovy	68898	11.6 %	43895	14.6 %
Sardine	19562	23.4 %	13616	19.3 %

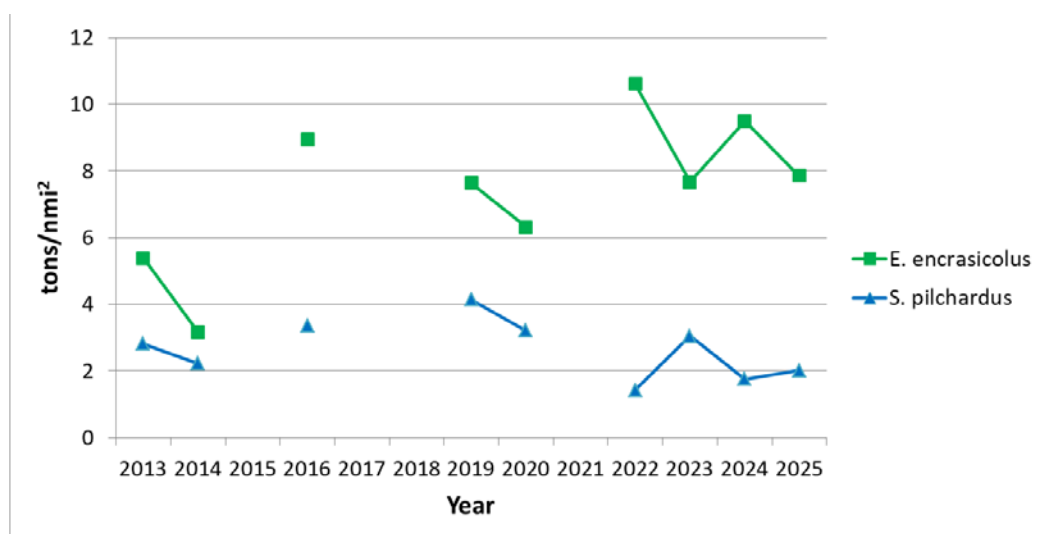


Figure 2.9.5. Historical trends in GSA 22 (northern Aegean Sea).

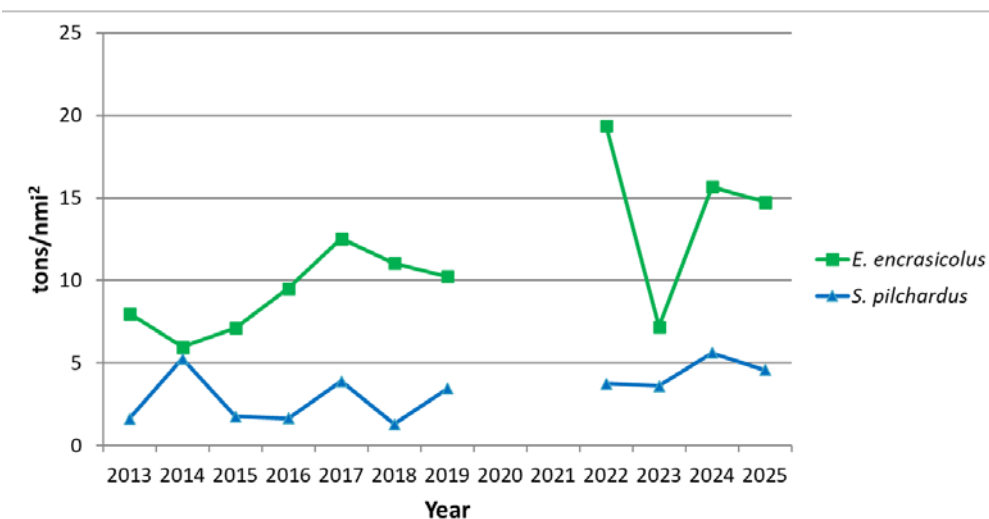


Figure 2.9.6. Historical trends in GSA 20 (eastern Ionian Sea).

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Biomass per length class for the two species are shown in Fig 2.9.7 and 2.9.8 for GSA 22 and GSA 20, respectively. Biomass per age class was estimated for anchovy and sardine using otoliths reading and age-length key was assessed (Fig 2.9.9 and 2.9.10). Subsequently, biomass per age class for the two species are shown in Fig 2.9.11 and 2.9.12 for GSA 22 and GSA 20, respectively.

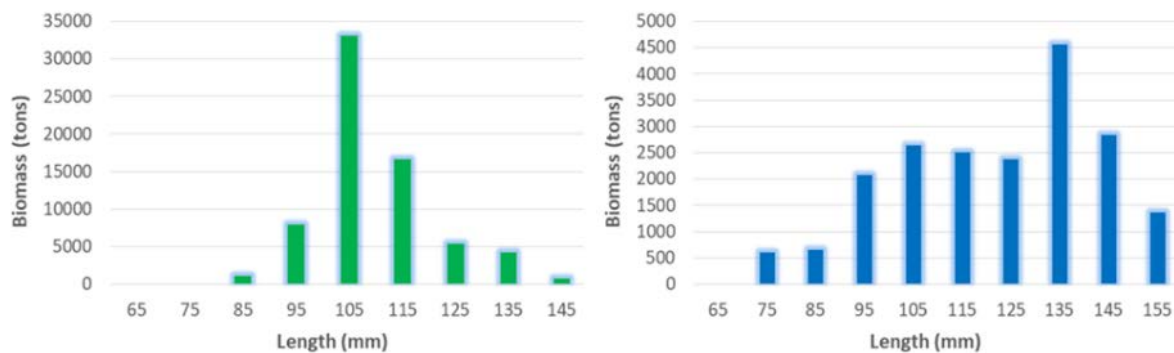


Figure 2.9.7. The anchovy (green) and sardine (blue) biomasses (in tons) per length class in northern Aegean Sea (GSA 22) during June - July 2025.

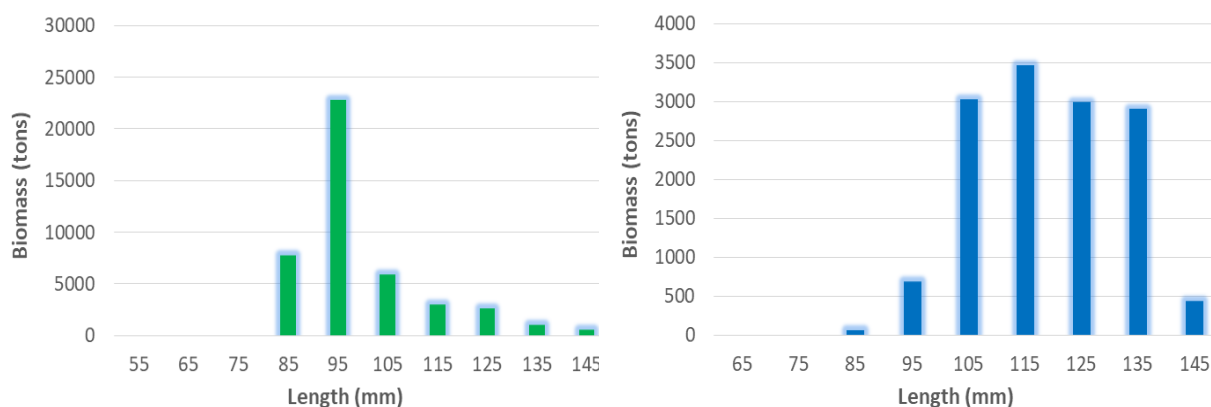


Figure 2.9.8. The anchovy (green) and sardine (blue) biomasses (in tons) per length class in eastern Ionian Sea (GSA 20) during September – October 2025.

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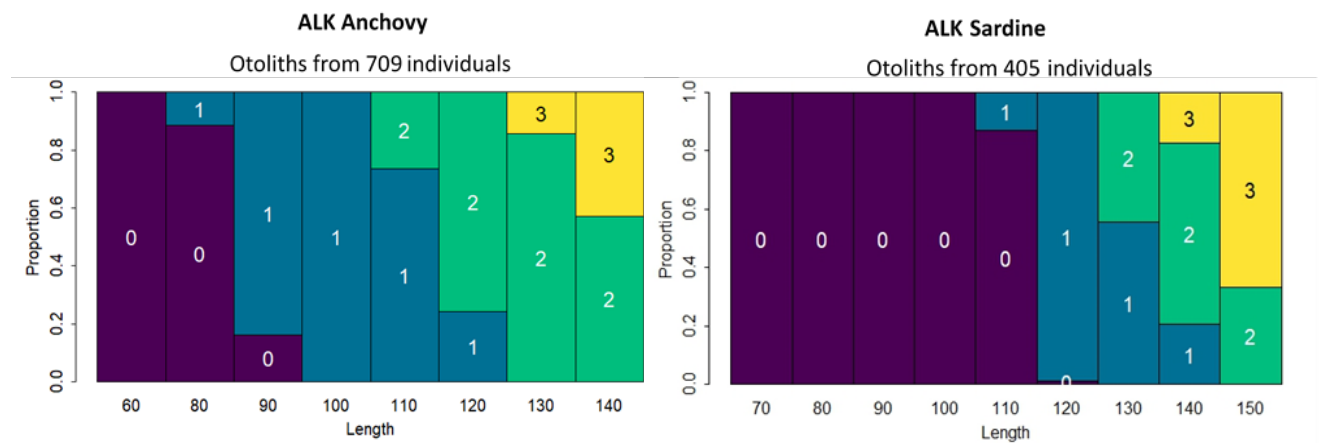


Figure 2.9.9. Age-length key assessed for anchovy and sardine in GSA 22 during June - July 2025.

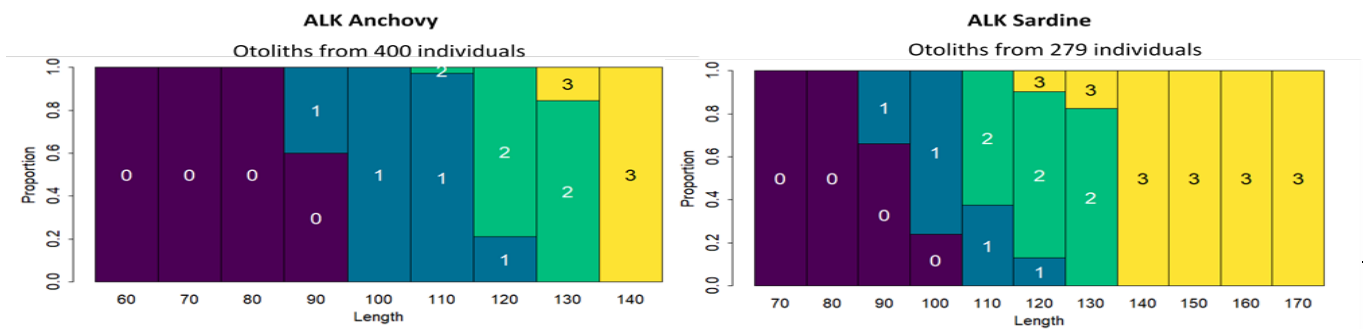


Figure 2.9.10. Age-length key assessed for anchovy and sardine in GSA 20 during September - October 2025.

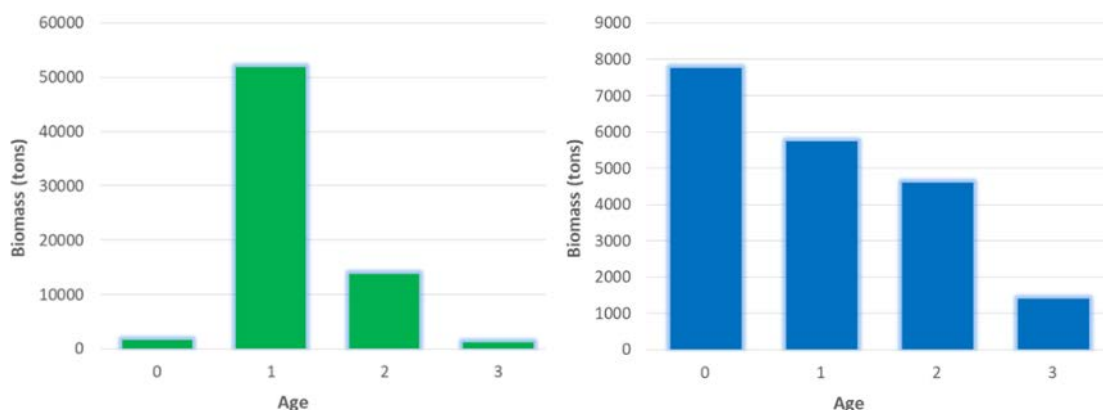


Figure 2.9.11. Anchovy (green) and sardine (blue) biomasses (in tons) per length class in northern Aegean Sea (GSA 22) during June - July 2025.

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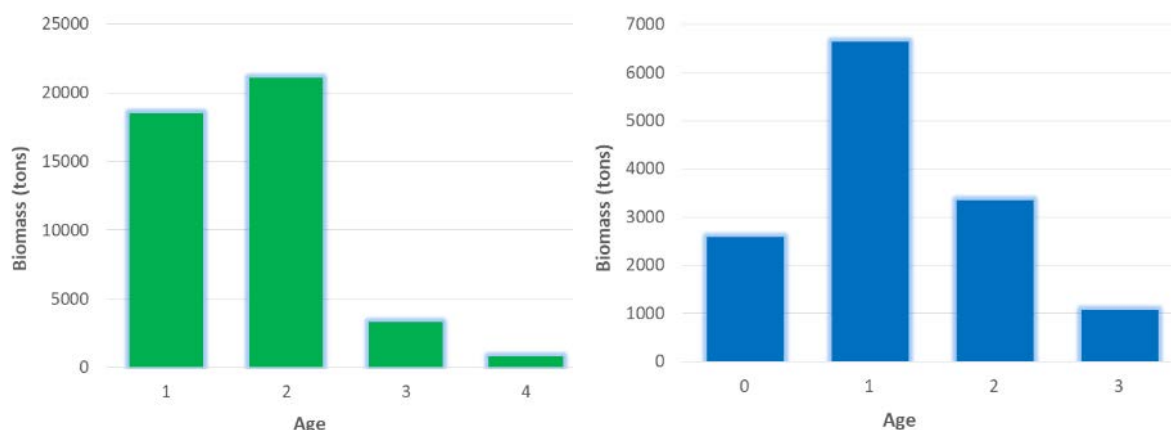


Figure 2.9.12. Anchovy (green) and sardine (blue) biomasses (in tons) per age class in eastern Ionian Sea (GSA 20) during September - October 2025.

h) Abundance indices of target species

Spatial distributions of anchovy and sardine abundance indices, in terms of NASC (m^2/nmi^2) and biomass (tons/EDSU) for GSAs 22 and 20, are given in Fig 2.9.13 - 2.9.20. The spatial distribution of total fish NASC (m^2/nmi^2) is given in figures 2.9.21 and 2.9.22.

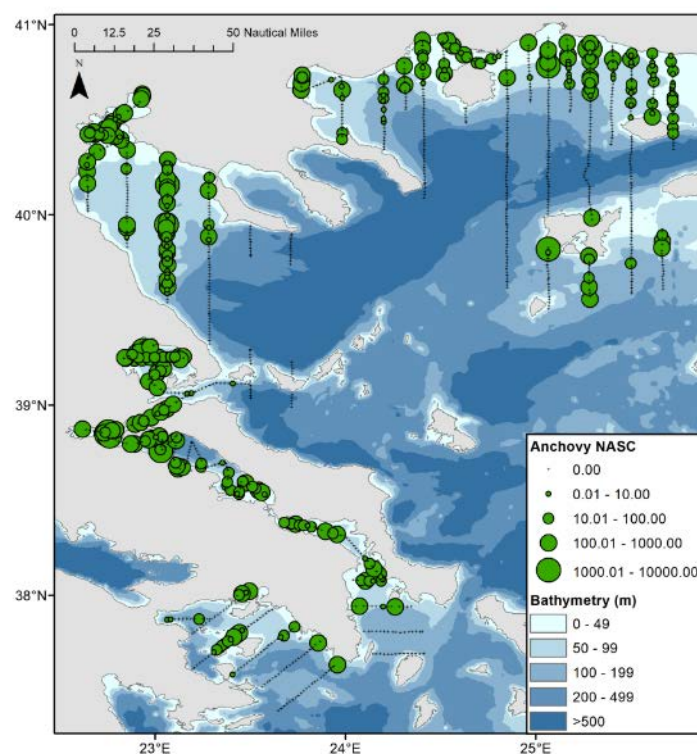


Figure 2.9.13. The distribution of anchovy NASC (m^2/nmi^2) per EDSU in northern Aegean Sea (GSA 22) during June - July 2025.

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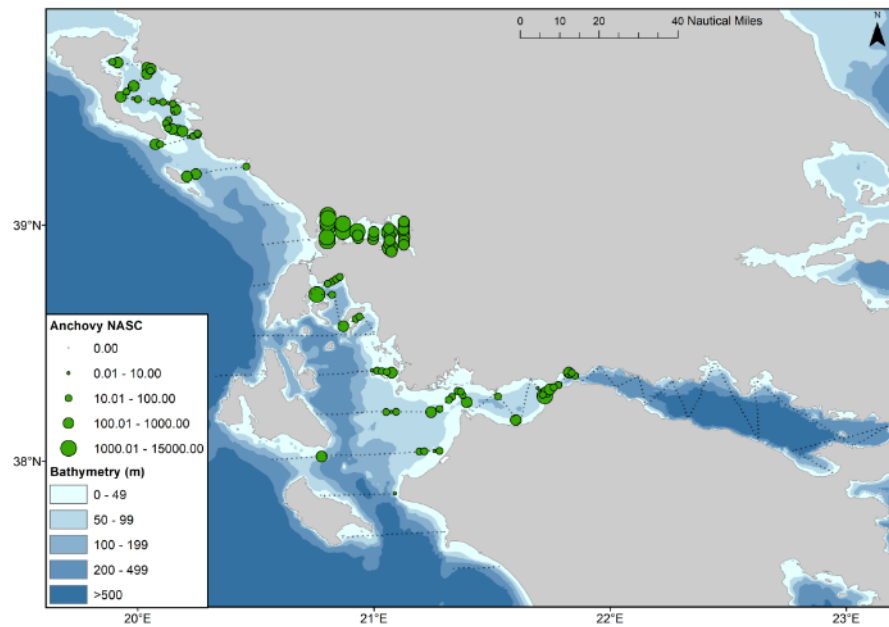


Figure 2.9.14. The distribution of anchovy NASC (m2/nmi2) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2025.

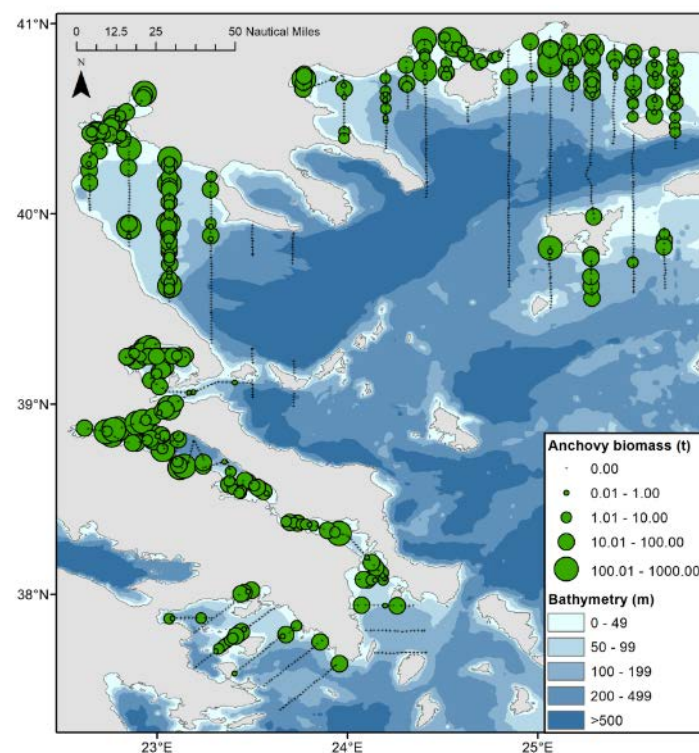


Figure 2.9.15. The distribution of anchovy biomass (t) per EDSU in northern Aegean Sea (GSA 22) during June - July 2025.

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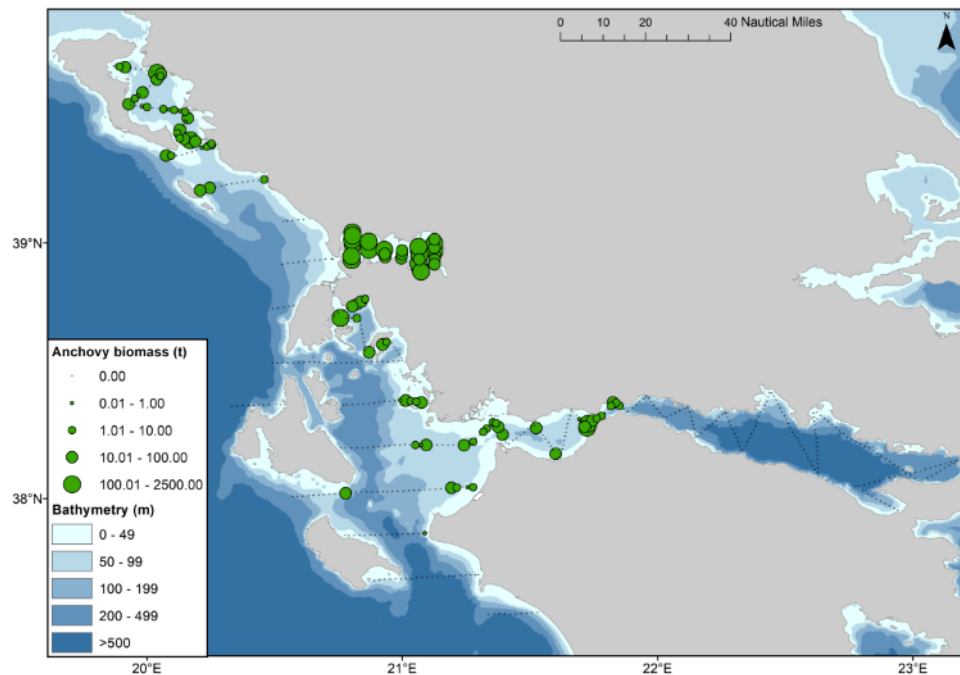


Figure 2.9.16. The distribution of anchovy biomass (t) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2025.

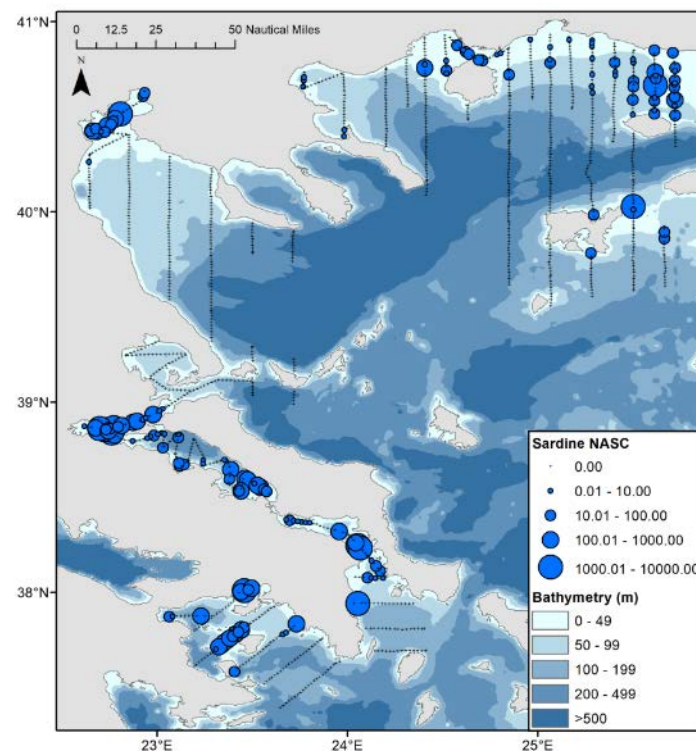


Figure 2.1.17. The distribution of sardine NASC (m2/nmi2) per EDSU in northern Aegean Sea (GSA 22) during June - July 2025.

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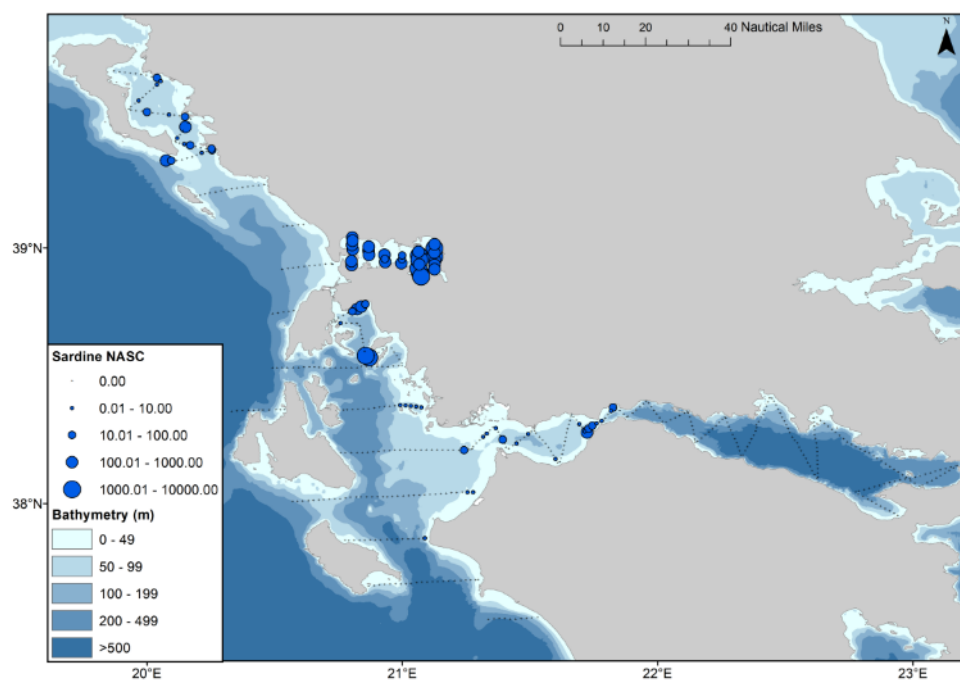


Figure 2.9.18. The distribution of sardine NASC (m^2/nmi^2) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2025.

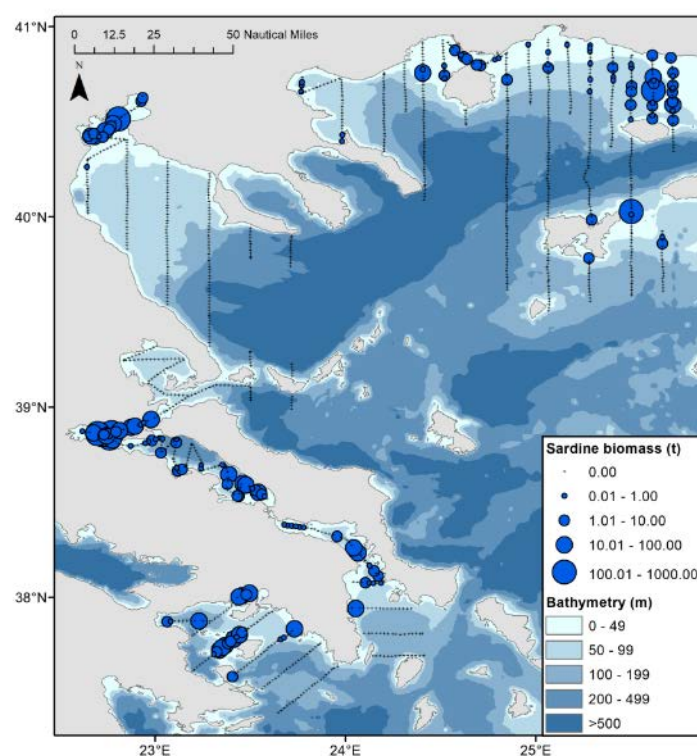


Figure 2.9.19. The distribution of sardine biomass (t) per EDSU in northern Aegean Sea (GSA 22) during June - July 2025.

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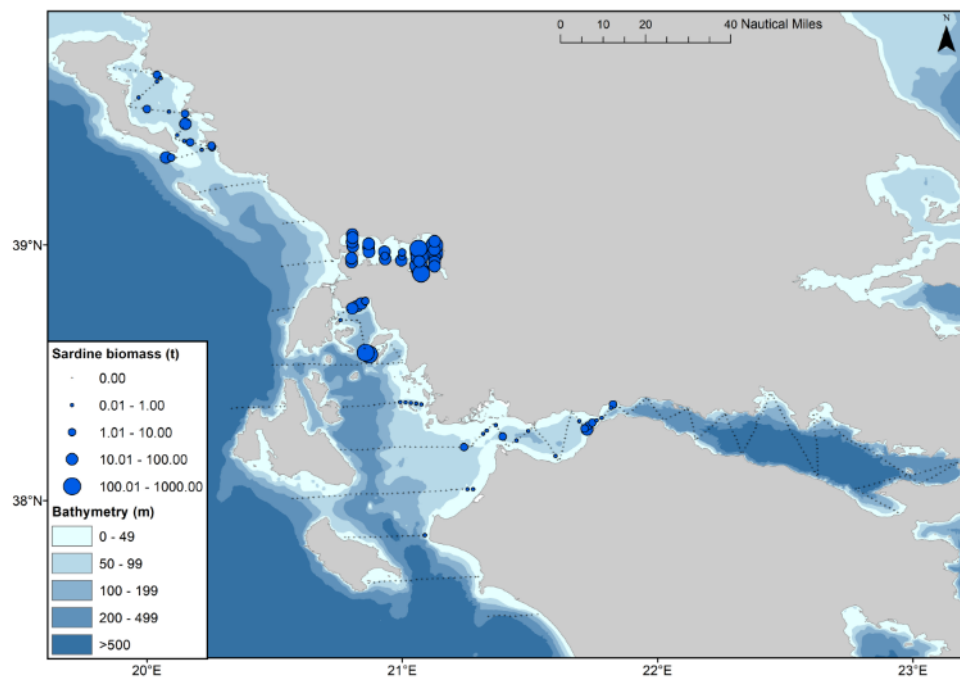


Figure 2.9.20. The distribution of sardine biomass (t) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2025.

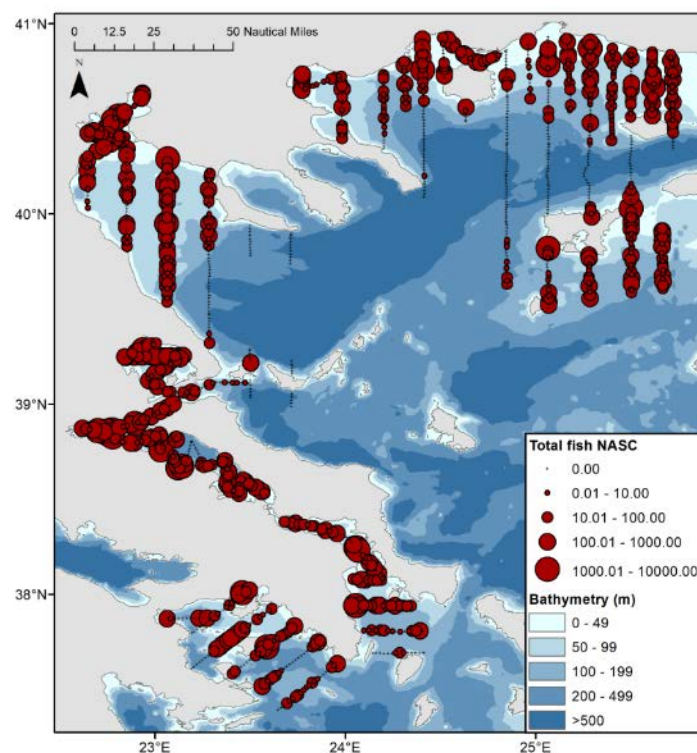


Figure 2.9.21. The distribution of total fish NASC (m^2/nmi^2) per EDSU in northern Aegean Sea (GSA 22) during June - July 2025.

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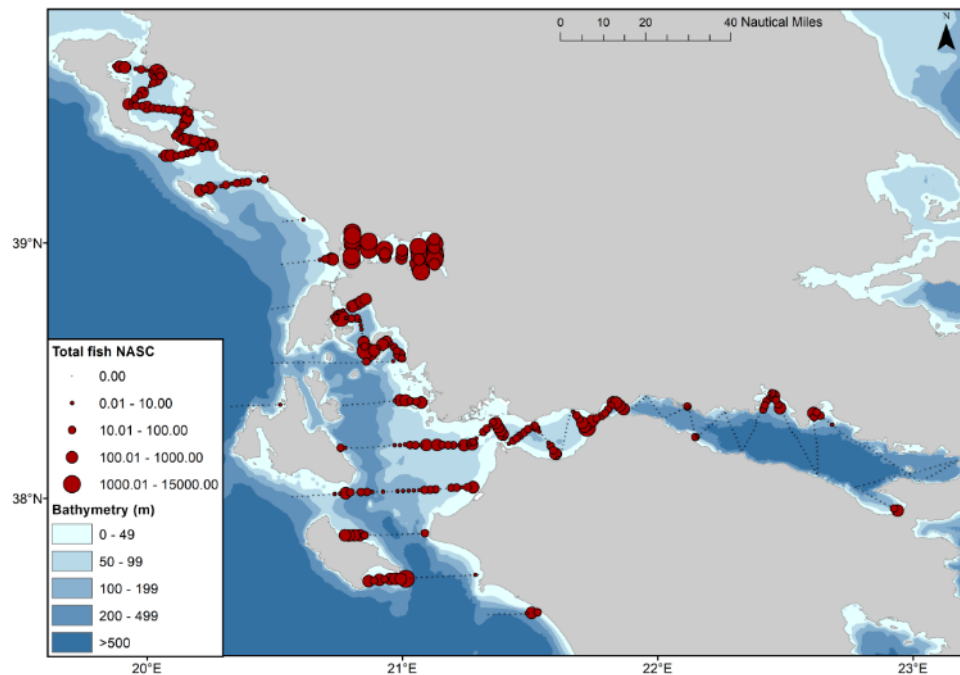


Figure 2.9.22. The distribution of total fish NASC (m²/nmi²) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2025.

2. Other surveys outside the MEDIAS protocol: Pelagic trawl surveys

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2.1 Presentation of the 2025 surveys in the GSA 29 - Black Sea: Bulgarian pelagic survey (IO-BAS)

Dimitar Dimitrov and Violin Raykov

a) General information on the survey

Pelagic trawl survey in the Black Sea (PTSBS) for sprat stock assessment is planned for June -July (spring season) and October - November (autumn season) applying the swept area method in the Bulgarian Black Sea area. The Pelagic Trawl survey (PT) was accomplished on board of R/V HaitHabu. The main characteristics of the ship are given below: IMO = 8862686; MMSI = 207139000; Call sign = LZHC; Flag = Bulgaria [BG]; AIS Vessel Type = Other; Gross Tonnage = 142; Length Overall x Breadth Extreme = 24.53m x 8m; Crew = 6. The aim of the pelagic trawl survey in the Black Sea is the assessment of the biomass of sprat (*Sprattus sprattus*) stock. Furthermore, an analysis of the distribution and abundance of the other species caught as well as by-catch will be presented. Accordingly, this survey aims to:

- Estimating abundance indices (by number and biomass) of the main pelagic species of commercial interest distributed at a depth between 10 m and 100 m;
- Describing the demographic structure of species of interest to the fishery, together with spatial distribution patterns;

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- Undertaking size and biological sampling, including extraction of parts to determine the age of the main species targeted by the fishery;
- Estimate maturity and feeding ecology of sprat and horse mackerel;
- Assessing the impact of fishing activity on the environment.

b) Survey design

To establish the abundance of the target species (*Sprattus sprattus*) and bycatch in front of the Bulgarian coast a standard methodology for stratified sampling was employed (Gulland, 1966). To address the research objectives the region was divided into 3 strata according to depth: Stratum 1 (15 - 30 m), Stratum 2 (35 – 50 m) and Stratum 3 (50 – 100m). The study area in Bulgarian waters was partitioned into 128 equal in size, not overlapping fields, situated at a depth between 16-92 m. At 37 of the fields chosen at random, sampling employing midwater trawling was carried out. Each field is a rectangle with sides 10' Lat × 10' Long and area around 125.16 km² (measured by application of GIS), large enough for a standard lug extent in a meridian direction to fit within the field boundaries (Fig 2.10.1).

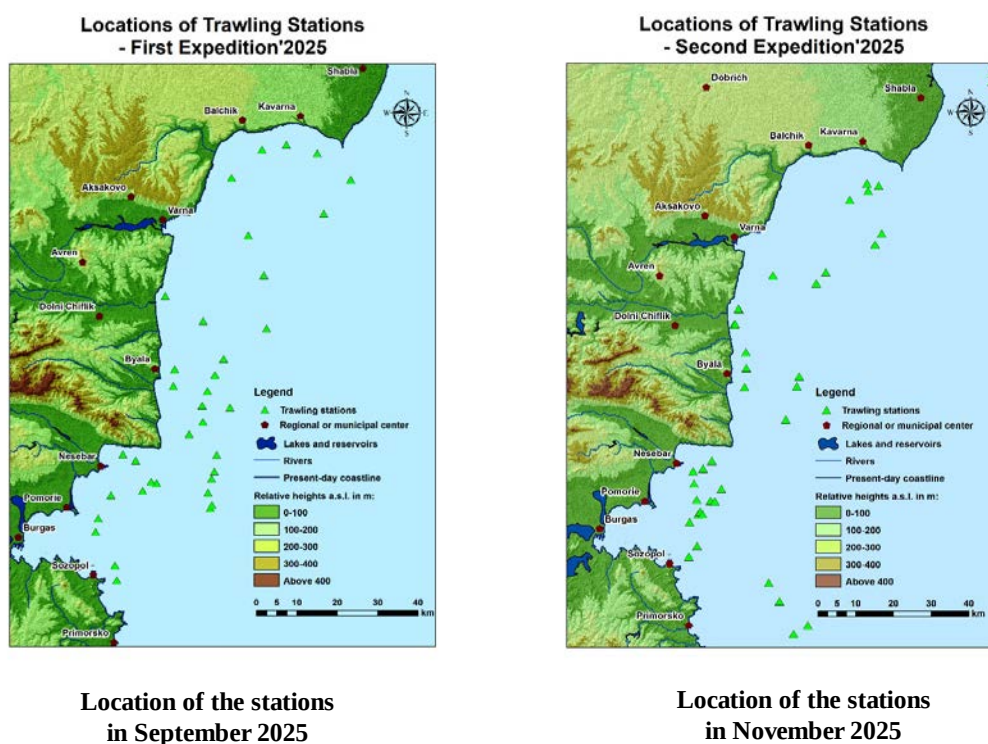


Figure 3.1.1. Pelagic trawl planned distribution points, (Left) Spring season and (Right) autumn season. MEDIAS 2025

b) Fish sampling

The dimensions of the pelagic trawl employed are as follows: type of pelagic trawl = 50/35 – 74 m; Length of the head rope = 40 m; Horizontal spread of trawl = 16 m; Vertical spread of trawl = 7 m; Mesh size of the net = 7 x 7 mm; Effective part of wingspread = 27 m; Pelagic doors = 3.5 m² The hauls were carried out during the day with single haul duration between 30 - 40 min; depending on hydro-meteorological conditions at average trawl speed 2.7 knots. Each survey includes 30 mid-water trawl hauls for 10 days. The main aim of the survey is to obtain the abundance index for sprat, whiting,

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picked dogfish and horse mackerel, red mullet, anchovy exploited stock. During the surveys, the collected information includes length (TL), weight, sex composition and maturity. Otoliths for age determination are collected and discards are investigated. The methodology of pelagic survey is available in the following links:

http://www.io-bas.bg/publications/manuals/Raykov_best_guidline_RAYKOV_Corr_last.pdf;

http://www.io-bas.bg/publications/manuals/Methodology%20for%20pelagic%20research%20in%20the%20Bulgarian%20Black%20Sea%20waters_IO_BAS.pdf.

Collected information from the sprat survey: the data recorded for each haul includes: depth, measured by the vessel's echo sounder; GPS coordinates of start/end haul points; haul duration; abundance of the target species; weight of total catch; absolute and standard length, individual weight of the separate specimens; otoliths collection for age determination; sex identification and the species composition of the by-catch.

d) Biomass estimations of target species in summer survey

A total of 24 species were identified during the survey, including 17 fish species, 2 crustaceans, 2 mollusks, and 3 macrozooplankton species. The most frequently encountered species in the trawl catches (presence/absence) were *T. mediterraneus* (45.76%), *M. barbatus* (24.66%), and *M. merlangus* (10.4%). *Sprattus sprattus* was observed sporadically in the catches. Other species, such as *Alosa immaculata*, *Neogobius melanostomus*, *Gobius niger*, *Mesogobius batrachocephalus*, *Zosterisessor ophiocephalus*, *Raja clavata*, *Dasyatis pastinaca*, *Pegusa lascaris*, *Uranoscopus scaber*, *Trachinus draco*, *Scophthalmus maximus*, *Squalus acanthias*, *Acipenser gueldenstaedtii* and *Acipenser stellatus*, had a negligible presence in the catches.

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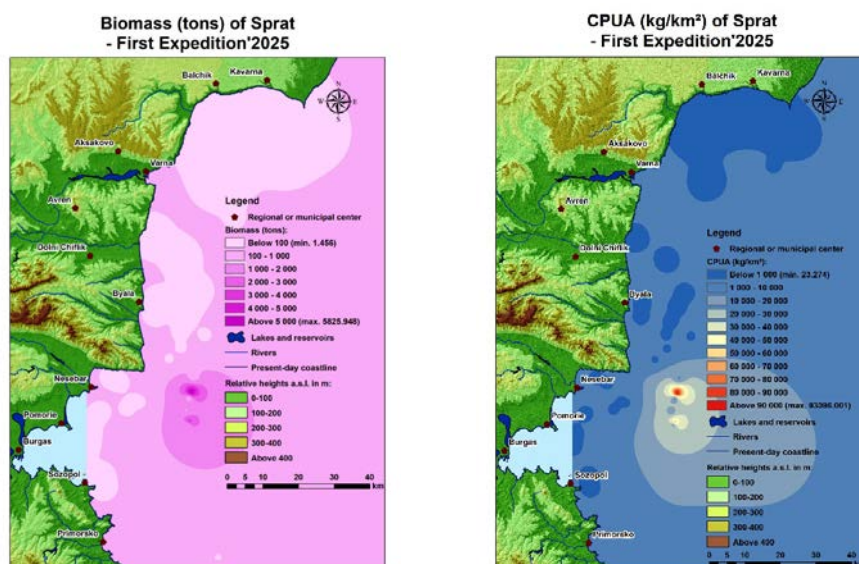


Figure 3.1.2. Sprat biomass at different depth layers in September 2025 (left), Catch per unit area (CPUE kg.km⁻²), (right) November 2025

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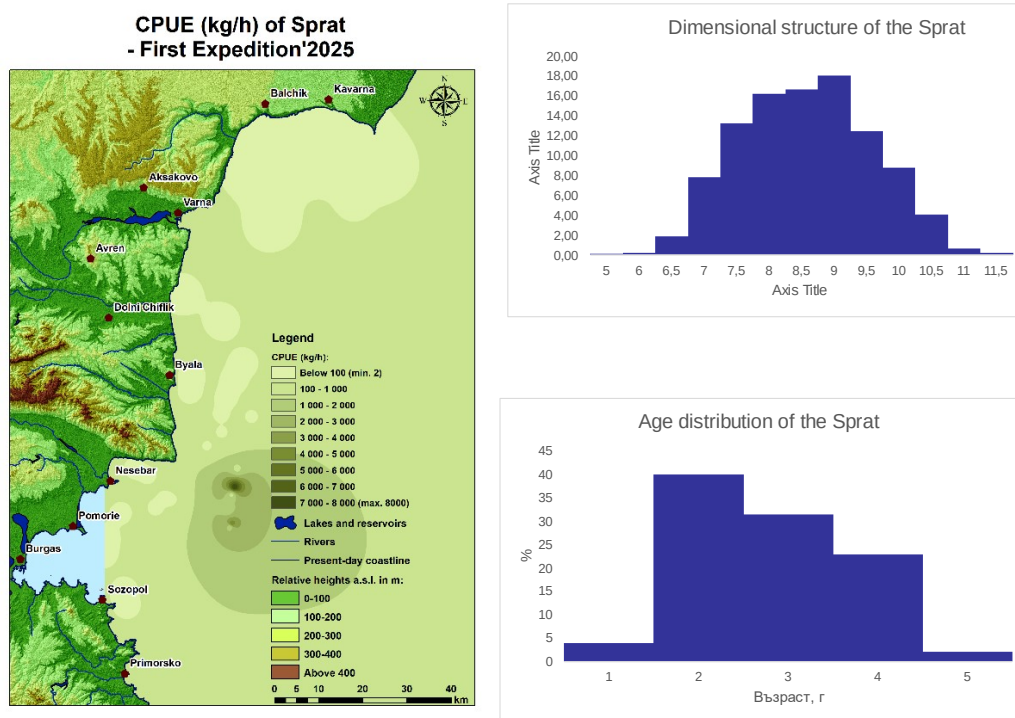


Figure 3.1.3. Sprat biomass at different depth layers in September 2025 (a), Catch per unit area (CPUE kg/h)

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Sprat (*Sprattus sprattus*) – although one of the most widespread pelagic species in the Black Sea – was represented by single specimens during the study period. This is most likely related to the migration of predatory species and the scattered nature of the sprat schools. High sea water temperature is a significant factor contributing to the dispersed distribution of small pelagic fish schools, such as sprat.

Table 3.1.1. Area method for surveying stocks in the month of September 2025 – average values of catch per unit area (CPUA), biomass (kg), Ax – area and number of stations

CPUA average	Strata	Biomass (kg)	Ax Surface	Number of stations
512.03	15-30	1057.41	2065,14	33
1178.246	30-50	624.61	1814.82	29
344.17	30-50	14.13	4130,28	29
		1696.15	8010.24	128

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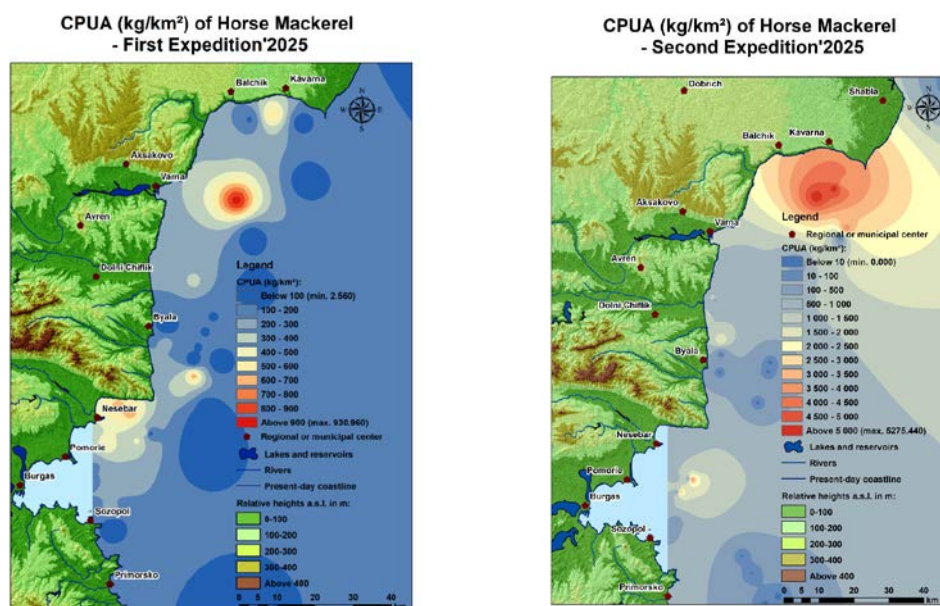


Figure 3.1.4. Horse Mackerel biomass at different depth layers in September 2025 (left) Catch per unit area (CPUA kg.km⁻²) (right) November 2025

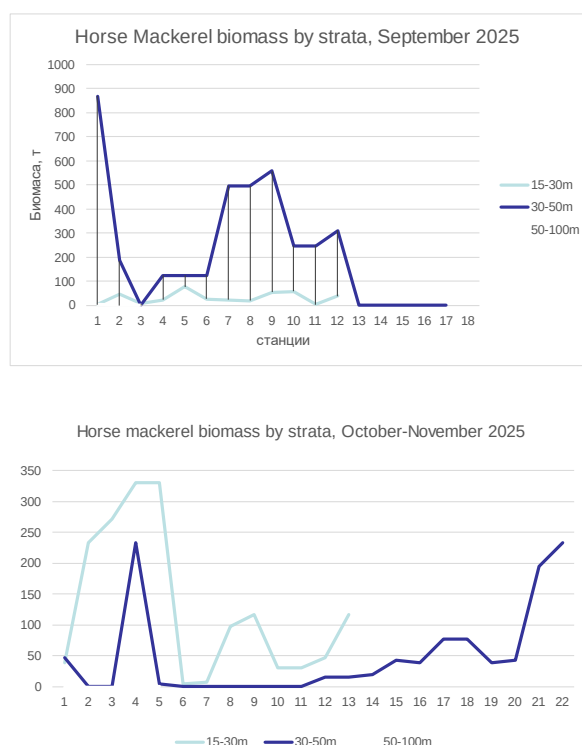


Figure 3.1.5. Horse Mackerel biomass by strata, September 2025 and November 2025

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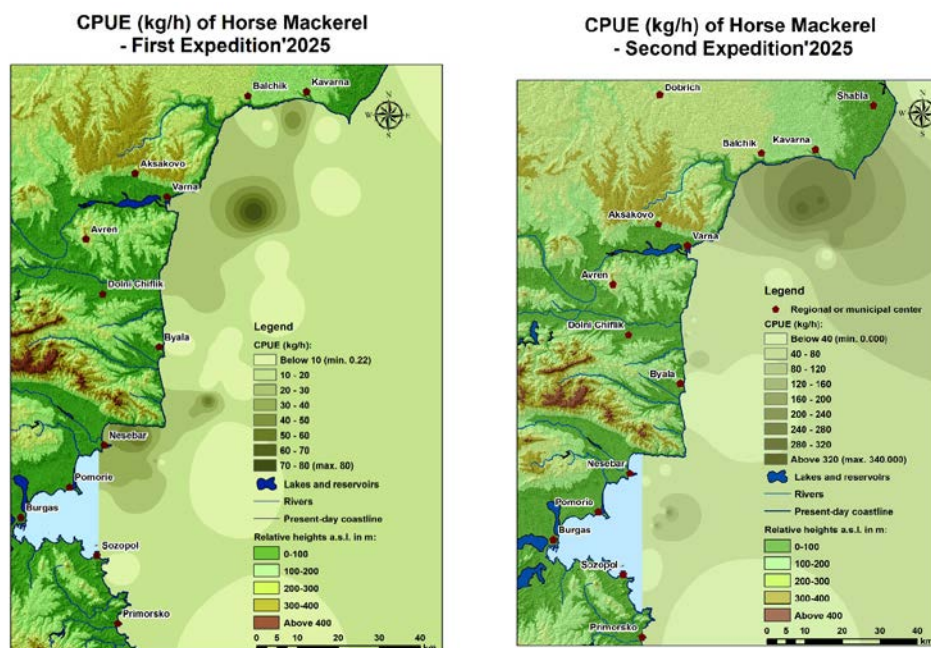


Figure 3.1.6. Horse Mackerel biomass at different depth layers in September 2025 (a), Catch per unit area (CPUE kg/h), November 2025 (b)

- During the survey, **horse mackerel** was observed to be widely distributed, with the highest biomass values recorded in the 30–50 m depth layer: 1589.8 t, followed by 1030.6 t (30–50 m) and 472.8 t (15–30 m).
- The total surveyed area was 8010.24 km², and the estimated total biomass of horse mackerel was 3093.2 tonnes. The densest aggregations were observed off the coast of Byala and in the Bay of Nesebar. The highest biomass was recorded in the 30–50 m depth stratum: 2138 t, followed by 1511.35 t (15–30 m) and 1281.71 t (50–100 m).
- In November 2025, horse mackerel was well represented in the catch composition, with the highest density of distribution recorded in the waters of the Nesebar Bay, Obzor, and Burgas Bay.
- The highest values of CPUA (catch per unit area) were recorded in the 30–50 m depth layer – 1178.3 kg.km⁻², with an average of 731 kg.km⁻². In the 15–30 m depth layer, CPUA was 731 kg.km⁻², and in 50–100 m – 310.3 kg.km⁻², where the species was found in isolated trawls.
- The highest CPUE (catch per unit effort, kg.h⁻¹) values were observed off Obzor and in Nesebar Bay.
- The length distribution of horse mackerel samples followed a normal (Gaussian) pattern, with a bell-shaped curve. The most frequent lengths were in the range of 8.5–10.5 cm, with a peak at the 10.5 cm size group.
- The dominant age group of horse mackerel during the study period was 2–2+ years (37.33%), followed by 1–1+ years (26%). Juvenile recruitment accounted for 7.66%. The age structure ranged from 0 to 5+ years, with significant representation of the 3–3+ year group (21.33%).
- The length–weight relationship was described by the model $W = 0.009 * L^{2.99}$, indicating a positive allometric growth coefficient (> 3). The nonlinear model showed a high degree of determination ($R^2 = 0.9903$).
- Growth parameters calculated using the von Bertalanffy growth model showed an asymptotic length of 22.45 cm and a relatively high growth coefficient, indicating a faster approach to asymptotic size.
- The average weights of horse mackerel ranged from 7.3 to 29.9 g.

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- The 10.5–12.5 cm size classes dominated the catches, while larger size classes were represented in smaller proportions. In November 2025, the 12.5 cm size class had the highest percentage in the catches, followed by the 10.5 cm size class.
- Biomass, like abundance, was dominated by the 125 mm size group.
- The gonadosomatic index (GSI %) of horse mackerel indicated a later stage of spawning activity. The correlation between gonad weight and GSI was strong ($R^2 = 0.3353$), suggesting active spawning and sexual maturity during the study period.
- The sex ratio of horse mackerel was as follows: females – 50%, males – 45%, and immature individuals – 5%.

Regarding, **whiting**, the species was represented in the catches by single specimens, with catches of 1 kg each at two of the stations. It was not possible to make a spatial and quantitative assessment of the species' distribution based on the autumn 2025 survey.

- The size distribution of the specimens showed a normal pattern, with peaks at 11.5 cm and 14.5 cm.
- In the catches from the autumn 2025 survey, individuals aged 4–4+ years (38%) and 5–5+ years (20%) were predominant.
- The length–weight relationship showed a very high degree of reliability ($R^2 = 0.955$).
- The von Bertalanffy Growth Function (VBGF) was applied to determine growth parameters. The asymptotic length (L_∞) reached 27.55 cm, and the growth rate was classified as low ($k = 0.23$).
- The sex ratio was 50% females, 49% males, and 1% larvae.
- The maturation of the gonads indicates the onset of the species' active reproductive period. Due to the warmer weather, the spawning process is likely to intensify in the coming months, even at relatively lower sea temperatures.
- The relationship between gonad weight and the gonadosomatic index showed a high level of reliability ($R^2 = 0.83$).
- The low number of specimens caught did not allow for a more detailed spatial analysis to determine the biomass and abundance of the species during the study period. As a result, it was not possible to conduct analyses or draw conclusions regarding sustainable exploitation measures for the autumn 2025 period.

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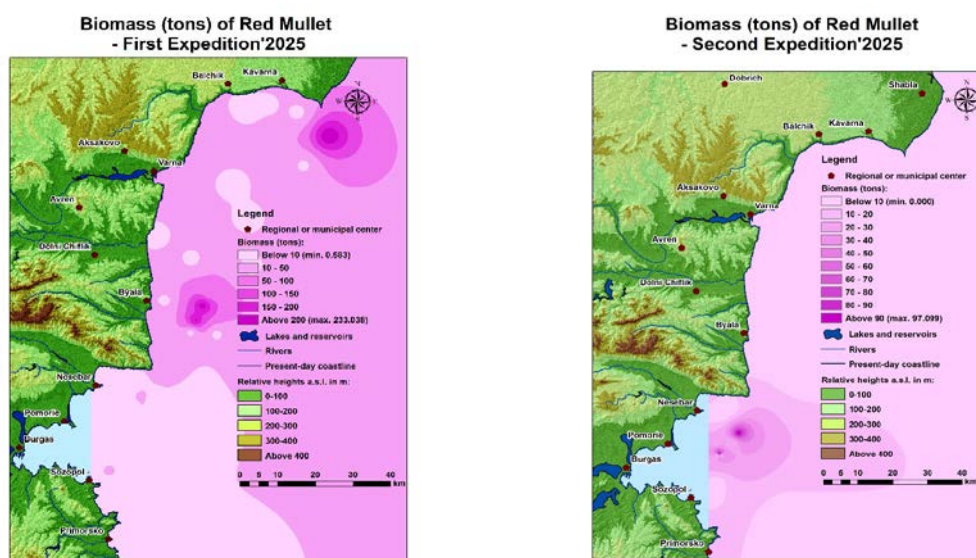


Figure 3.1.7. Red Mullet biomass in (t) in September 2025 (a) and November 2025 (b)

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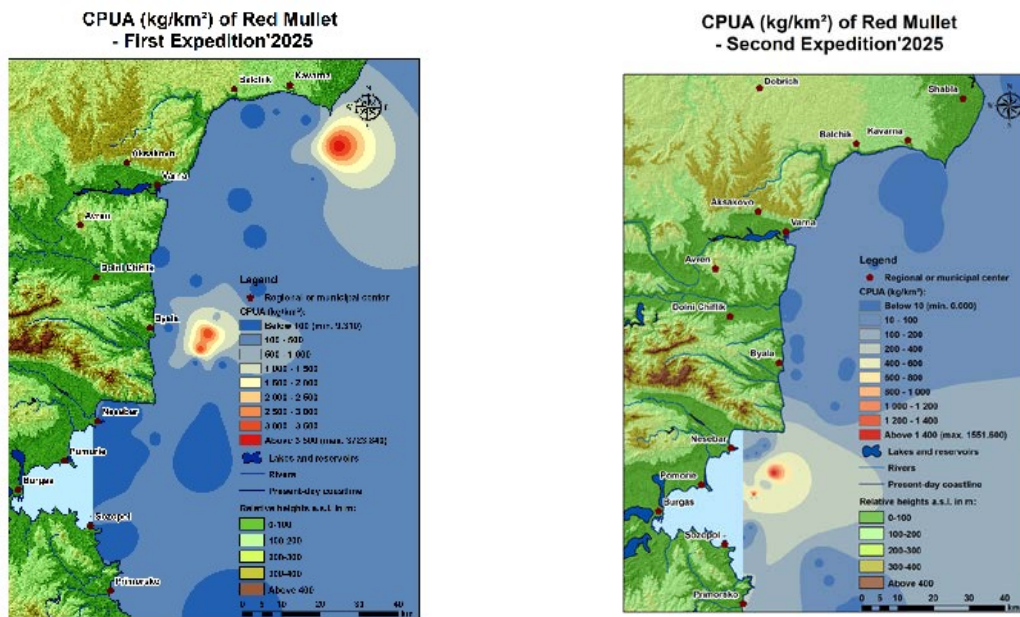


Figure 3.1.8. Red Mullet biomass at different depth layers in September 2025 (a), Catch per unit area (CPUA kg.km⁻²), November 2025 (b)

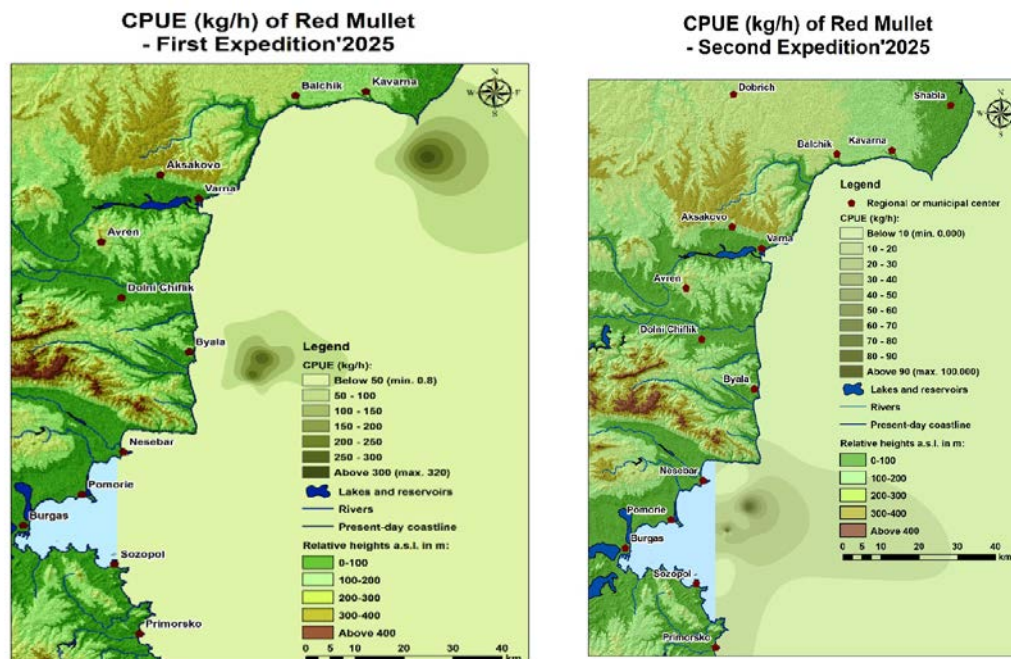


Figure 3.1.9. Red Mullet biomass at different depth layers in September 2025 (a), Catch per unit area (CPUE kg/h), November 2025 (b)

- The total surveyed area was 8010.24 km², and the estimated total biomass of red mullet was 496 t.
- The densest aggregations were observed off Cape Kaliakra, in Nesebar Bay, and Burgas Bay of at depths of 30–50 m, and west of Sozopol at depths of 50–100 m. The species was recorded at 24 out of 36 stations, with the highest density in the 30–50 m stratum.
- The length–weight relationship for red mullet showed a strong positive allometry, with a high coefficient of determination ($n = 3.114$), $R^2 = 0.9944$.

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- Catch per unit area (CPUA) in the 15–30 m stratum was 125 kg.km⁻²; in the 30–50 m stratum – 124 kg/km², and in the 50–100 m stratum – 2.9 kg.km⁻². Average CPUA values ranged between 15 and 310 kg.km⁻².
- Analysis of CPUA and CPUE (catch per unit effort) showed that the highest densities and abundances were found in the 30–50 m depth zone, followed by the 15–30 m zone.
- Length–weight analysis (L–W) for red mullet in November 2025 showed a very strong dependence between size and weight, with well-defined allometric growth ($R^2 = 0.9944$).
- The dominant size classes in the catches during the survey were 11 cm and 13 cm.
- The most abundant age group was 1–1+ years, followed by 2–2+ and 3–3+ years. Other age groups had negligible representation in the catches in November 2025.
- Growth parameters calculated using the von Bertalanffy growth model showed an asymptotic length of 18.41 cm and relatively high growth coefficient values, indicating faster attainment of the asymptotic size.
- The 11.0 cm and 13.0 cm size classes dominated the red mullet catches, while larger size classes were represented in lower proportions. In November 2025, the 11 cm size class had the highest share in the catches, followed by the 13 cm class.
- The numerical abundance of 3–3+ year-old individuals was the highest, followed by the 2–2+ age group. However, in terms of biomass, the 4–4+ age group dominated.
- The sex ratio for red mullet was as follows: females – 48%, males – 44%, and immature individuals – 8%.
- Red mullet was in an active phase of gonadal maturation, likely due to high sea water temperatures.

e) Prey number (PN), species composition of food and relative importance index (IRI) of zooplankton

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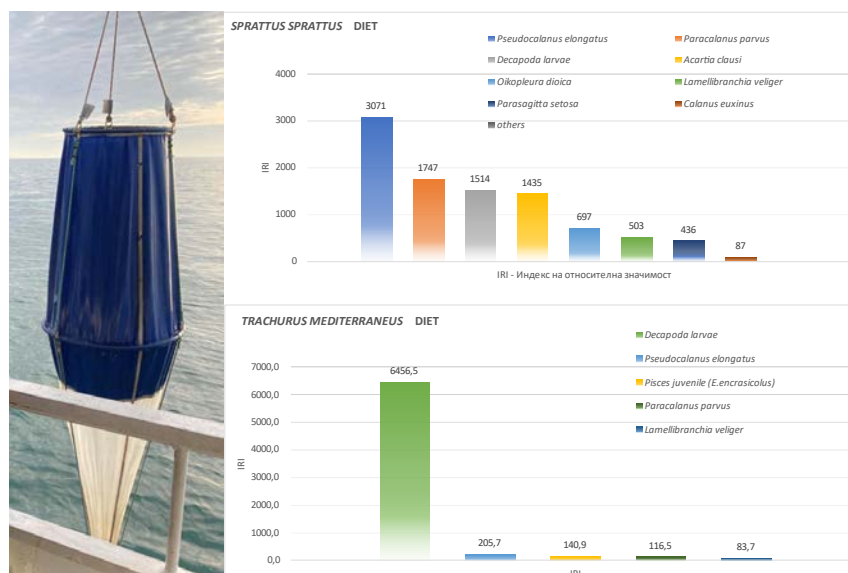


Figure 3.1.10. Average values of the relative importance indices (IRI) of the main species in the diet of the sprat (1) and horse mackerel (2) in 09.2025

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Figure 3.1.11. Distribution of the biomass of mesozooplankton (1, mg.m^{-3}) and gelatinous zooplankton (2, mg.m^{-3}), as well as the abundance of the main zooplankton groups (3, ind.m^{-3}) by stations in 09.2025

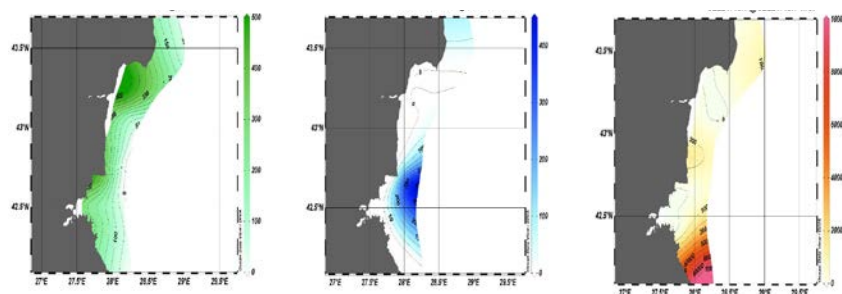


Figure 3.1.12. Spatial distribution of biomass (mg.m^{-3}) of: mesozooplankton (1), Protozoa (2), gelatinous zooplankton (3) in 09.2025

- In autumn 2025, the diet of horse mackerel included 20 species/groups, while the diet of sprat contained two species/groups. Sprat primarily fed on Copepoda, specifically *Calanus euxinus*. The diet of horse mackerel was more diverse, including various species of Mysida, Copepoda, Diplostraca, meroplankton, Appendicularia, Chaetognatha, and fish larvae.
- The Copepoda species *C. euxinus* dominated the diet of sprat ($\text{IRI} = 15631.7$). In horse mackerel, meroplanktonic larvae, particularly Cirripedia larvae ($\text{IRI} = 6285.89$), as well as the copepod *Acartia clausi* ($\text{IRI} = 2,562.64$), were predominant.
- The mean ISF varied among species: sprat – $0.22\% \text{ BW} \pm 0.12 \text{ (SD)}$ and horse mackerel – $0.52\% \text{ BW} \pm 0.64 \text{ (SD)}$. The current study recorded a higher stomach fullness index for horse mackerel, but a lower ISF value for sprat compared to data from 2023.
- Horse mackerel stomachs contained the highest average number of prey items ($88.58 \text{ ind/stomach} \pm 11.88 \text{ SE}$), with a maximum of 624 ind/stomach, mainly due to the consumption of Cirripedia larvae. In contrast, sprat had an average of $6.70 \text{ ind/stomach} \pm 1.90 \text{ SE}$.

The average biomass of zooplankton in the marine environment was $3800 \text{ mg.m}^{-3} \pm 2051.76 \text{ (SE)}$, composed mainly of gelatinous species – $2830.13 \text{ mg.m}^{-3} \pm 1981.43 \text{ (SE)}$. The biomass of edible

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zooplankton was comparable to the seasonal average – $42.86 \text{ mg}\cdot\text{m}^{-3}$, with maximum values of $\sim 77.2 \text{ mg}\cdot\text{m}^{-3}$ recorded along the northern coasts.

In October and November 2025, 27 species/groups were identified in zooplankton samples from the marine environment, of which 14 species/groups were present **in the diet** of both sprat and horse mackerel.

The main food items for sprat were *Calanus euxinus* (IRI = 5486.61), followed by *Paracalanus parvus* (IRI = 3455.38) and *Pseudocalanus elongatus* (IRI = 1847.81). This characterizes sprat as a planktivorous filter feeder that primarily consumes copepod zooplankton. Horse mackerel also fed predominantly on zooplankton, with the most important prey items being *Pseudocalanus elongatus* (IRI = 1252.30), veliger larvae of bivalve mollusks (IRI = 1228.13), and *Paracalanus parvus* (IRI = 1054.14), indicating a planktivorous feeding strategy during October-November 2025. Although this species often shifts to active predation at larger sizes, such behavior was not observed during the study period. Differences in the abundance and composition of dietary items suggest that, despite partial overlap, the two species occupy distinct trophic niches: sprat prefer larger zooplankton, whereas horse mackerel consume smaller and larval forms.

Data on the **index of stomach fullness (ISF)** in sprat and horse mackerel confirmed significant differences in feeding behavior between the two species. In sprat, the mean ISF was 1.113% of body weight (SD = 0.515), with a median of 1.076%, indicating relatively stable and widespread feeding within the population. The distribution of ISF showed moderate variability and was close to symmetrical, with 75% of individuals having an ISF < 1.38%. However, in horse mackerel, the mean ISF is lower ($0.194\% \pm 0.203 \text{ SD}$), with a median of 0.142% and a coefficient of variation exceeding 100%, indicating a highly skewed distribution. Most of the analyzed specimens had nearly empty stomachs ($Q1 = 0.052\% \text{ BW}$; minimum = $0.002\% \text{ BW}$), whereas improved feeding was observed in only a few individuals. Thus, the observed pattern reflects high heterogeneity in horse mackerel feeding, likely associated with reduced activity and/or a seasonal phase of low feeding in October - November 2025. These results, combined with spatial distribution data, confirm distinct trophic niches and feeding strategies between the two species, despite partial overlap in their dietary range and spatial occurrence.

➤ Analysis of the **number of prey items (PN)** in the stomach contents confirmed the differences in feeding activity between sprat and horse mackerel. In sprat, the mean number of prey was considerably higher ($285 \text{ ind/stomach} \pm 298.1 \text{ SD}$), with 75% of individuals having fewer than 450 ind/stomach. Despite a strongly skewed distribution and wide range (up to 1493 ind/stomach), these data indicate widespread and relatively consistent feeding across the population. In horse mackerel, the mean PN was much lower ($41.3 \pm 97.7 \text{ ind/stomach}$, with a median of 10 ind/stomach), reflecting highly uneven feeding: most individuals had very few prey items in stomachs ($Q1 = 1.0 \text{ ind/stomach}$), while a few well-fed individuals (maximum: 559 ind/stomach) caused a spike in the mean value. These results again point to different feeding strategies: sprat exhibits stable and widespread filter-feeding activity, whereas horse mackerel shows episodic and selective feeding, likely associated with localized zooplankton aggregations.

➤ The **mean zooplankton biomass** was $16.03 \text{ g}\cdot\text{m}^{-3} \pm 7.95 \text{ (SE)}$, with gelatinous zooplankton being the dominant component (mean $15.96 \text{ g}\cdot\text{m}^{-3} \pm 7.95 \text{ SE}$) and reaching local maxima of $\sim 95 \text{ g}\cdot\text{m}^{-3}$ off the central and southern coasts, indicating “bloom” events. The biomass of the fodder mesozooplankton was $50.98 \text{ mg}\cdot\text{m}^{-3}$, with the highest values ($\sim 142.96 \text{ mg}\cdot\text{m}^{-3}$) observed off the northern coast. Protozoa contributed a low mean biomass ($23.76 \text{ mg}\cdot\text{m}^{-3}$) but formed localized concentrations of up to $\sim 212.16 \text{ mg}\cdot\text{m}^{-3}$ off the northern and central coasts.

f) Biomass estimations of target species in autumn survey

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The total number of species identified during the survey was 28, including 19 fish species, 3 crustaceans, 2 mollusks, and 3 macrozooplankton species. The most frequently occurring species in the trawl catches (presence/absence) were: *Sprattus sprattus* (9.5%), *Merlangius merlangus* (19.22%), *Mullus barbatus* (20.05%), and *Trachurus mediterraneus* (44.21%), which was observed sporadically in the catches. Other species such as *Alosa immaculata*, *Neogobius melanostomus*, *Gobius niger*, *Mesogobius batrachocephalus*, *Zosterisessor ophiocephalus*, *Raja clavata*, *Dasyatis pastinaca*, *Pegusa lascaris*, *Aphia minuta*, *Uranoscopus scaber*, *Trachinus draco*, *Scophthalmus maximus*, *Squalus acanthias*, *Chelidonichthys lucerna*, *Acipenser gueldenstaedtii*, and *Acipenser stellatus* had negligible presence in the catches.

HORSE MACKEREL

The total surveyed area was 8010.24 km², and the estimated total biomass of horse mackerel was 5629 t.

The densest aggregations were observed off Balchik and Kavarna. Biomass in the 15–30 m stratum was the highest (4200 t), followed by 784 t (30–50 m) and 1.24 t (50–100 m).

The highest CPUA values were recorded in the 15–30 m depth layer (1241 kg·km⁻²), with a mean of 512 kg·km⁻². In the 30–50 m layer, values ranged from 124 to 869 kg·km⁻², while in the 50–100 m layer they were very low (3.41 kg·km⁻²).

The length–weight relationship for horse mackerel is described by the model $W = 0.009 \cdot L^{2.77}$. The allometric growth coefficient is >3 , and the fitted nonlinear model shows a high coefficient of determination ($R^2 = 0.97$).

The length distribution of horse mackerel samples is bimodal (Gaussian), with two peaks, as the most frequent lengths range between 10 and 13.5 cm. A peak was observed at the 10 cm size class (1500 individuals).

The dominant age group during the study period was 2–2+ years (31.5%), followed by 1–1+ years (9.8%). Recruitment accounted for 4.6%. The age structure ranged from 0 to 5+ years, with a notable contribution of the 3–3+ year group (19.66%).

Growth parameters (based on 1500 individuals), estimated using the von Bertalanffy model, indicate an asymptotic length of 25.42 cm and relatively high values of the growth coefficient.

During October–November 2025, the 10.0 cm length class had the highest percentage contribution to the catches.

Analysis of the age structure in the catches showed that age groups 3–3+ and 4–4+ years had high abundance indices and dominated the catches. Recorded age groups ranged from 0 to 4+ years.

➤ Biomass, similarly to abundance, showed a predominance of the 10 mm size group, followed by the 13.5 mm size group. During October–November 2025, age groups 1–1+ years had a significantly higher contribution to the catches compared to the other age groups.

➤ Female and male individuals (n = 250) were represented as follows: 49% males and 51% females.

➤ The gonadosomatic index (GSI, %) based on 250 individuals indicates a later stage of spawning ($R^2 = 0.77$). A strong relationship between gonad weight and GSI suggests active reproductive processes and advanced gonadal maturity during the study period.

➤ Absolute fecundity (measured in 250 individuals) was highest at a length of 16 cm, reaching 51040 eggs. In terms of relative fecundity, the highest value was recorded in individuals of 10 cm length (1,074 eggs). The mean values of absolute and relative fecundity were 31255 and 978, respectively.

WHITING

Merlangius merlangus inhabits near-bottom depth layers, and its primary prey is sprat. It is a predatory species and an important component of the food web, serving as prey for larger predators such as *Scophthalmus maximus* and dolphins. During the survey, whiting was not strongly represented in the catch composition, likely due to higher-than-usual seawater temperatures.

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The highest biomass of whiting was recorded in the 50–100 m stratum (5,810 t), followed by 2042 t in the 30–50 m layer and 256 t in the 15–30 m layer.

The total surveyed area was 8010.24 km², and the estimated total biomass of whiting in Bulgarian Black Sea waters during October–November 2025 was 8109.2 t.

Whiting showed the highest distribution density in the catches in the area off Byala and Cape Maslen Nos. In the 15–30 m depth layer, the species was recorded at all 12 stations; in the 30–50 m layer at 13 stations; and in the 50–100 m layer at 7 stations.

In the 30–50 m depth layer, the highest CPUA value recorded was 3413 kg·km⁻², with a mean of 1125.4 kg·km⁻². In the 15–30 m layer, CPUA was 124 kg·km⁻², and in the 50–100 m layer, 1406.88 kg·km⁻².

The highest CPUE (kg·h⁻¹) values were recorded off Byala and southward toward Cape Maslen Nos.

Length distribution (1200 individuals) was normal, with peaks at 10.5 and 12.5 cm.

Individual weights ranged from 3.18 to 26.91 g.

In the autumn 2025 survey, dominant age groups were 3–3+ years (28%) and 2–2+ years (20%), based on 1200 individuals.

The length–weight relationship showed a high degree of fit ($R^2 = 0.96$).

Growth parameters estimated using the von Bertalanffy growth function (VBGF) indicated an asymptotic length (L_∞) of 27.5 cm and a relatively low growth coefficient ($k = 0.23$).

Females comprised 50%, males 49%, and larvae 1% of the sampled individuals.

➤ Gonadal development indicates the onset of active reproduction. Due to warmer conditions, spawning activity is likely to intensify in the coming months as seawater temperatures decrease. Analysis of sexual maturity (250 individuals) showed gonads in stages 2a to 3b, with no clear dominance of a specific size group. No deviations from normal maturation patterns were observed.

➤ Male and female individuals aged 3–3+ years had the highest presence in the catches, predominantly at maturity stage 3a.

➤ The relationship between gonad weight and the gonadosomatic index (GSI) showed a high level of reliability ($R^2 = 0.86$).

➤ Absolute fecundity (measured in 250 individuals) was highest at a length of 17.5 cm, reaching 60322 eggs. The highest relative fecundity was observed in individuals of 14 cm length (3247.66 eggs). Mean values of absolute and relative fecundity were 36252 and 1596.02, respectively.

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SPRAT

During October–November 2025, sprat showed a scattered distribution in the nearshore zone, mainly due to high water temperatures. The highest biomass values were recorded at greater depths (30–50 m), reaching 4272.4 t. Sprat was recorded at 7 of the 36 surveyed stations.

During October–November 2025, sprat biomass in the 15–30 m stratum was estimated at 0 t, followed by 6870.7 t in the 30–50 m stratum and 25.7 t in the 50–100 m stratum.

The biomass in the 30–50 m stratum had the highest value (Sozopol–Primorsko area). As seawater temperature decreased compared to September 2025, a clear migration of aggregations toward coastal areas was observed. The total surveyed area was 8010.24 km², and the estimated total biomass of the sprat stock was 6896.4 t. Compared to September 2025, the instantaneous biomass of sprat along the Bulgarian Black Sea coast decreased by 93% during October–November. This indicates the high dynamics of sprat schools and the influence of external factors, such as hydrometeorological conditions and predation, on the distribution of small pelagic fish.

The catch per unit area (CPUA, kg·km⁻²) was relatively high in the 50–100 m stratum, with the formation of aggregations atypical for sprat. The densest schools were recorded off Primorsko and southeast of Sozopol (30–50 m), while in other surveyed areas the species was spatially dispersed.

Catch per unit effort (CPUE) for the identified species is presented spatially using GIS.

Length structure. During the survey (October–November 2025), the smallest identified length class was 6 cm and the largest 12 cm. The dominant length classes in the catch were 7, 9, and 10 cm, while other classes were less represented.

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➤ Absolute fecundity showed a mean value of 35544 eggs, while relative fecundity was 7352 eggs.

ANCHOVY

During the October–November 2025 survey, only 7 individuals of *Engraulis encrasicolus* were caught at a single station out of 36. Biological and spatial–quantitative analyses could not be performed for the study period due to insufficient sample size.

2.2 Presentation of the 2025 surveys in the GSA 29 - Black Sea: Romanian pelagic survey (NIMRD)

George Tiganov

a) General information on the survey

The aim of the pelagic trawl survey in the Black Sea is the assessment of the stock biomass of sprat (*Sprattus sprattus*). Furthermore, an analysis of the distribution and abundance of the other species caught as by-catch will be presented.

- * Estimating abundance indices (by number and biomass) of the main pelagic species of commercial interest distributed at a depth between 10 m and 100 m;
- * Describing the demographic structure of species of interest to the fishery, together with spatial distribution patterns;
- * Undertaking size and biological sampling, including extraction of parts to determine the age of the main species targeted by the fishery;
- * Assessing the impact of fishing activity on the environment.

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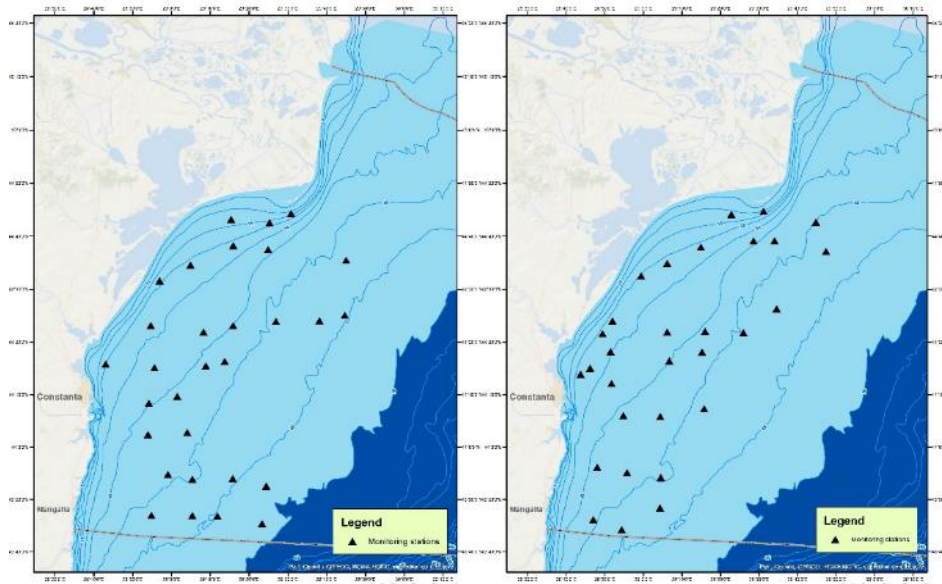


Figure 3.2.1. Pelagic trawl planned distribution points (a – spring season and b-autumn season), 2025

b) Survey design

The trawl surveys for sprat stock assessment are planned for June (spring season) and October - November (autumn season) applying the swept area method in the Romanian Black Sea area. To establish the abundance of the reference species in front of the Romanian coast a standard

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methodology for stratified sampling was used (Gulland, 1966). To address the research objectives the region was divided into four strata according to depth – Stratum 1 (15 - 35 m) Stratum 2 (35 - 50 m), Stratum 3 (50 - 75 m). Each field is a rectangle with sides 10' Lat × 10' Long and area around 125.16 km² (measured by application of GIS), large enough for a standard lug extent in a meridian direction to fit within the field boundaries. Each survey includes 30 mid-water trawl hauls for 8 days.

The main aim of the survey is to obtain the abundance index for sprat, whiting and picked dogfish exploited stock. During the surveys the collected information will include length (TL), weight, sex composition and maturity. Otoliths for age determination will be collected and discards will be investigated. The methodology pelagic survey is available in the following link: https://www.rmri.ro/Home/Downloads/Publications.Other/NAFA_Material%20and%20methods%20for%20survey%20in%20the%20Romanian%20Black%20Sea%20area.pdf

Collected information from the sprat survey: the data recorded for each haul includes: depth, measured by the vessel's echo sounder; GPS coordinates of start/end haul points; haul duration; abundance of the target species; weight of total catch; absolute and standard length, individual weight of the separate specimens; otoliths collection for age determination; sex identification and the species composition of the by-catch.

The results obtained will be presented as maps and tables comprising data on: for the turbot and sprat surveys, additional information for the calculation of the catch per unit effort (CPUE/kg/hour) and the catch per unit area (CPUA/kg/km²) in the swept fields will be provided. Collected data will be stored in the NIMRD database, as well as in a module especially developed as a part of the Romanian NAFA.

c) Fish sampling

The dimensions of the pelagic trawl employed are as follows: type of pelagic trawl = 50/35 – 74 m; Length of the head rope = 40 m; Horizontal spread of trawl = 16 m; Vertical spread of trawl = 7 m; Mesh size of the net = 7 × 7 mm; Effective part of wingspread = 27 m; Pelagic doors = 3.5 m². The hauls were carried out during the day with single haul duration between 30 - 40 min; depending on hydro-meteorological conditions at average trawl speed 2.7 knots. Each survey includes 30 mid-water trawl hauls for 10 days. The main aim of the survey is to obtain the abundance index for sprat, whiting, picked dogfish and horse mackerel, red mullet, anchovy exploited stock. During the surveys, the collected information includes length (TL), weight, sex composition and maturity. Otoliths for age determination are collected and discards are investigated. The methodology of pelagic survey is available in the following links: Pelagic trawl spring surveys: in 2025, the calculated biomasses for the main pelagic fish species at the Romanian coast were: sprat (50,562.01 t) and whiting (7877.84 t).

d) Biomass estimations of target species

In the spring season, agglomeration biomass of sprat was higher by about 50 % compared with the previous year. Due to the very small catches and the small number of specimens of picked dogfish caught, both in the spring season, the evaluation of the species in pelagic trawls was not performed.

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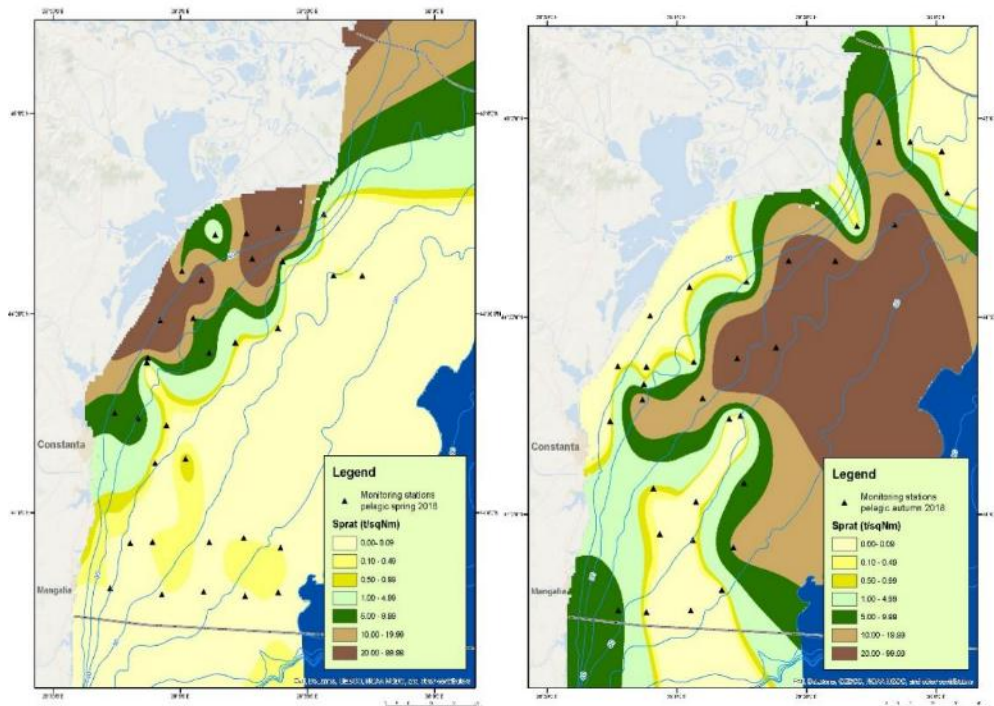


Figure 3.2.2. Distribution of sprat agglomerations in the spring (a) and autumn season (b), pelagic trawl survey, in 2025

Pelagic trawl autumn surveys: in 2025, the calculated biomasses for the main pelagic fish species at the Romanian coast were: sprat (7104.68 t) and whiting (577.80 t). In the autumn season of 2025, the biomass of sprat agglomerations was very low in comparison with the previous year. Due to the catches and the small number of dogfish specimens caught, in the autumn season, the assessment of the species in pelagic trawls was not performed.

Pelagic spring survey

Evaluation of sprat agglomerations in the pelagic trawl expedition, in the spring season of 2025

Table 3.2.1. Biomass (tons) and abundance (individuals) of sprat

Depth range (m)	0–30 m	30–50 m	50–70 m	Total
Investigated area (Km ²)	2050	3175	5500	10725
Variation of the catches (t/Km ²)	0.040 –	0.040 – 14.240	0.040 – 1.199	0.040 – 49.964
Average catch (t/ Km ²)	8.546	1.627	0.513	3.561
Biomass of the fishing agglomerations (t)	20962.13	8025.48	3801.07	32788.68
Biomass extrapolated the Romanian shelf (t)				50562.01

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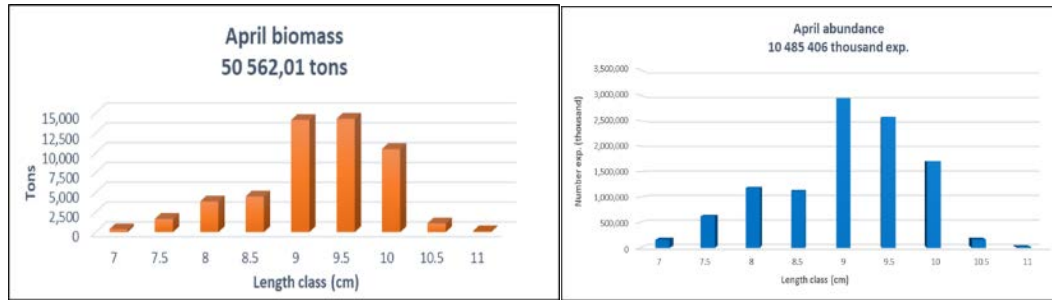


Figure 3.2.3. Structure by lengths of biomass (a) and abundance (b) of sprat during spring pelagic survey

Structure of biomass and abundance by age distribution



Figure 3.2.4 Structure by ages of biomass (a) and abundance (b) of sprat during spring survey

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Pelagic autumn survey

Evaluation of sprat agglomerations in the pelagic trawl expedition, in the autumn season of 2025

Table 3.2.2 Biomass (tons) and abundance (individuals) of sprat

Depth range (m)	0–30 m	30–50 m	50–70 m	Total
Investigated area (Km ²)	2005	3350	5100	10455
Variation of the catches (t/Km ²)	0.200 – 3.997	0.090 – 0.999	0.240 –	0.090 –
Average catch (t/ Km ²)	0.835	0.179	0.274	0.429
Biomass of the fishing agglomerations (t)	2048.54	885.19	2028.14	4961.86
Biomass extrapolated the Romanian shelf (t)				7104.68

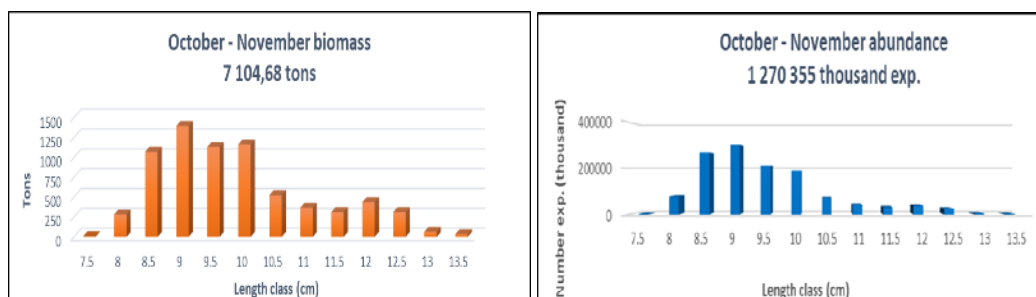


Figure 3.2.5 Structure by lengths of biomass (a) and abundance (b) of sprat during autumn pelagic survey

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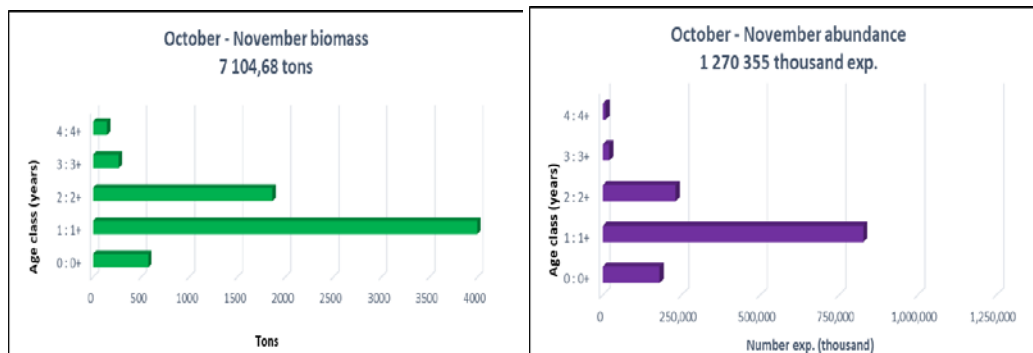


Figure 3.2.6 Structure by ages of biomass (a) and abundance (b) of sprat during autumn survey

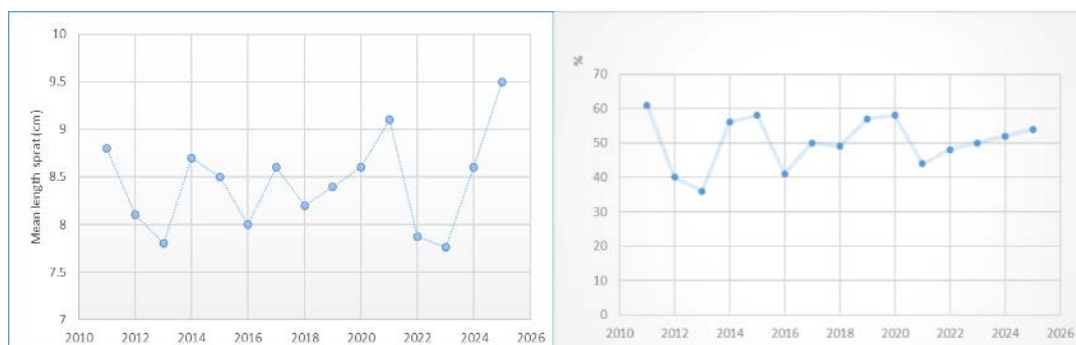


Figure 3.2.7 The average length (a) and percentage (b) of sprat specimens larger than the average size at first sexual maturation in the period 2011 – 2025

3. Minutes from the 19th MEDIAS Coordination Meeting on 28-30 April 2026

4.1. General Discussion (on surveys presented)

The WG emphasized that challenges related to the timing of surveys and technical issues with research vessels often remain. The MEDIAS survey is highly technical, and equipment failures are common. Moreover, the schedules of research vessels are often fully booked, making it difficult to secure optimal timing. Both bureaucratic and technical obstacles contribute to these difficulties and explain why certain surveys started later this year than the official period defined in the protocol by GSA. DG MARE representative stressed the need that DCF surveys should be prioritised. The Steering Committee reiterated the importance of engaging with the European Commission in such cases. It was reaffirmed that any survey planned outside the authorized window—i.e., more than one buffer month beyond the official period—must receive prior approval from both the MEDIAS Steering Committee and the EC before implementation.

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4.2. DG-MARE - Commission's views and suggestions

Venetia Kostopoulou, DG-MARE

Venetia Kostopoulou (VK, DG MARE, Unit C3) presented MEDIAS specific issues, relevant outcomes of the Regional Coordination Group (RCG) Med & BS, the results of closing data issues in the Data Transmission Monitoring Tool (DTMT), ongoing work on the quality annexes of DCF Work Plans, an update on the hosting of the regional database Med & BS and RDBFIS project and informed of the latest release of survey data.

Regarding **MEDIAS specific issues**, she gave an overview of the discussions at the 2025 MEDIAS meeting, namely: (i) the urgent need for research vessels noted by participants, (ii) the proposal to follow the example of France that gives the highest priority to DCF surveys, (iii) the ongoing discussion on necessary equipment for an acoustic survey in the Black Sea, (iv) the dedicated RDBFIS data call for disaggregated MEDIAS data, (v) the ongoing work on a document addressed to end users, (vi) methodological work¹, (vii) raising of MEDIAS data and (viii) the possible impact that offshore floating wind turbines may have on MEDIAS survey.

VK informed that a coordination meeting between the chairs of MEDITS and MEDIAS Groups is established, with the aim of sharing best practices. One of the issues discussed was the intention of MEDITS Group to have a dedicated session in the next **GFCM Fish Forum**. The MEDIAS group is also interested in participating.

VK asked the MEDIAS Group to propose changes for the next **Regional Work Plan (RWP)** Med & BS (2028-2030). The Group reviewed and updated the RWP, making minor adjustments to survey details and updating links and references. The MEDIAS chair will communicate the changes to Charis Charilaou, who coordinates this exercise, on behalf of the RCG Med & BS.

At the 2025 RCG Med & BS meeting, it was decided to review the list of stocks included in the Med & BS data call (Med & BS _2025_D01). The final RCG Med & BS proposal was sent to DG MARE, and a reply was subsequently provided to the RCG Med & BS. Apart from 6 species that were proposed for deletion by the RCG Med & BS, for which MARE DI still considered the need to be included, a common agreement was reached for the rest.

VK presented the exercise of closing the open **data issues** in the Data Transmission Monitoring Tool (**DTMT**) for the period 2014-2024, according to which DG MARE issued a final decision, with the help of a series of ad hoc contracts. For the data issues stemming from the Med & BS data call, a number of categories remain open, as input is still needed before taking a final decision. She referred specifically to the category '**Follow up needed (RCG)**', for which the RCG Med & BS is expected to take a decision at the regional level.

VK presented the ongoing exercise of developing **guidelines** for the **evaluation** of the **quality annexes** in the Work Plans. A number of ad hoc contracts will propose draft guidelines, to be consulted with RCGs and presented at the relevant EWGs. In this respect, the RCG Med & BS and relevant ISSGs, including the MEDIAS Group, are consulted, in order to identify the relevant reference methodologies for the region and end-users, any agreed minimum coverage levels for sensitive species, regionally coordinated optimisation of sampling effort etc. The aim is to consolidate all input at the 2026 RCG Med & BS meeting. Following this meeting, the ad hoc contracts will incorporate the RCG Med & BS input to the guidelines.

¹ on night trawling in GSA 1, time series reconstruction in GSA 1, standardization of age reading and maturity estimates, harmonization of the protocol for age reading in the Adriatic and daily egg production method.

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VK informed participants of the ongoing MARE internal work for the **relocation of RDBFIS² to DIGIT cloud**, which is a solution that offers DIGIT supervision, security and stability. The timeline for the transition is approximately one year. The expected changes for the users will be: minor adaptations in visuals to align to COM environment; a new URL; use of EU login for authentication; and a final testing and validation phase. Regarding the **management** of the regional database (RDB) Med & BS, a similar solution to the current set up is envisioned, namely having a consortium under a FWC to oversee the regional database and ensure its functioning.

Finally, the updated Med & BS survey data set has been released, under a new license³, following discussions at the RCG Med & BS. The data set is accompanied by an end user document prepared by the MEDIAS group, explaining any changes in the protocol and/or implementation through time. This document aims to help in the interpretation of MEDIAS data.

4.3. Presentation of the methodology of time series reconstruction in GSA 01

Ana Ventero, Gloria Blaya, Pilar Córdoba, Magdalena Iglesias, IEO/CSIC

The partial coverage of GSA01 in certain years of the 2009-2024 MEDIAS survey time series caused inconsistencies in the application of analytical models. For this reason, the Working Group on Stock Assessment of Small Pelagic Species (WGSASP) and the MEDIAS SC recommended reconstructing the biomass time series in GSA01. To address this issue, three complementary actions were implemented: (i) the use of day–night fishing strategy to improve species identification, particularly in areas with limited daytime accessibility (rocky bottoms); (ii) reconstruction of missing data (for the years when the area was partially covered) to complete the time series and (iii) the re-scrutinizing of echograms using a direct allocation method instead of the nearest-haul approach (Figure 4.3.1).



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Figure 4.3.1: Chronology of the improvements implemented in the GSA01.

² RDBFIS – Regional Database Fisheries Information System, is a study under the FWC Med & BS. The Hellenic Centre for Marine Research (HCMR) is the coordinator of the consortium.

³ CC BY-NC-SA

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At the WGSASP data preparation meeting, it was concluded that reconstructing data for areas not covered in a given year using the average of other covered years from the MEDIAS series was not appropriate, since acoustic surveys are direct methods for estimating biomass. However, they approved the re-reading of echograms for specific years in the area through expert assessment (**Figure 4.3.2**). In parallel, night fishing was introduced in 2023 in areas with complex seabed topography, and expanded in 2024 through paired day–night sampling. Preliminary results show that rocky-bottom areas are not preferred habitats for anchovy and sardine, consistent with historical data and bibliography. Day–night comparisons demonstrate good agreement in Malaga Bay, while higher variability was observed in Almeria Bay, particularly for anchovy due to low abundance. Night sampling improved species detection, likely due to changes in fish behavior. This work reflects the improvements implemented in the acoustic survey carried out on the GSA01 to enhance the reliability of biomass estimates. Work continues on comparing day/night pelagic hauls.

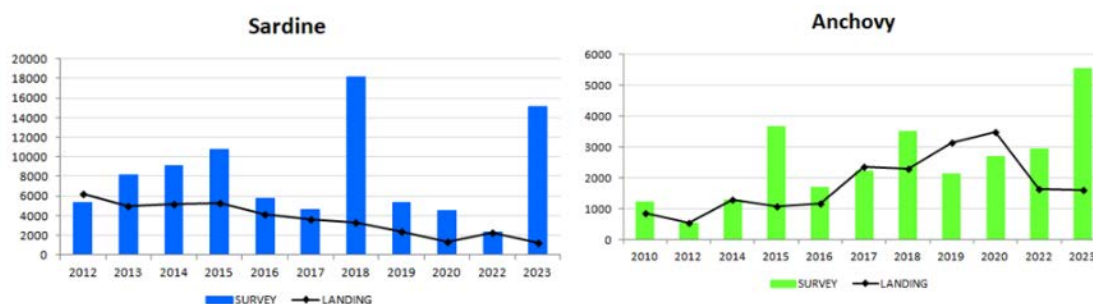


Figure 4.3.2. Reconstructed time series for sardine and anchovy biomass in GSA01 as accepted in the GFCM WGSASP in December 2025.

4.4. Summary of the data already uploaded to RDBFIS and missing datasets

Stefanos Kavadas, RDBFIS-III project

The presentation focused on the status of data uploads to the RDBFIS database and related issues. Stefanos Kavadas presented an overview of uploaded data across member states, highlighting missing or inconsistent information, particularly regarding CTD measurements and total catches by species. The SC discussed two approaches for distributing total catches and percentage weights, deciding to use the first approach for consistency. Issues with data validation, missing information, and the need for a more robust validation package were identified. The SC also discussed adding a species column to the echotye table to facilitate biomass estimation.

4.5. Update on the progress of Phase III of RDBFIS project

Stefanos Kavadas, RDBFIS-III project

RDBFIS II:

During the implementation period of RDBFIS II (April 2023 – March 2025), revisions and improvements have been made in the database structure and the validation scheme for acoustics, pelagic trawls and CTDs components. On the RDBFIS Git repository the following information is available:

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- - Data base structure acoustics ([html](#), [pdf](#))
- - Pelagic trawl ([html](#), [pdf](#))
- - CTDs ([html](#), [pdf](#))
- - Working file ([xlsx](#))

The integration of the MEDIAS component within RDBFIS is well established and constitutes a robust subsystem of the platform. It supports data visualization and extraction, performs validation checks for acoustic, pelagic trawl, and CTD data, and enables the seamless upload of historical datasets in accordance with the "Data Call for Acoustics, Pelagic Trawl, and CTD Data Collected from Surveys in the Med&BS.

Stefanos Kavvadas highlighted improvements made during the third phase and the implementation of new features for data validation and visualization. The SC discussed the option to perform separate consistency checks for different data categories (acoustics, pelagic trawl, and CTD) versus implementing cross-category checks, noting potential advantages and disadvantages of each approach.

The consistency check process is currently under development and will be finalized during the implementation phase of RDBFIS III as an R library. It follows a structured sequence of steps designed to ensure that datasets are complete, valid, and internally consistent.

Additionally, the proposed by the consortium Eggs&Larvae database structure, has been officially endorsed by MEDIAS and ichthyoplankton experts, laying the groundwork for the future expansion of biological data collection (available on RDBFIS Git repository: [html](#), [pdf](#)). A user friendly data entry form has been constructed to accept raw data.

RDBFIS III:

The RDBFIS consortium presented the current status and future developments of the RDBFIS platform. The presentations focused on the progress achieved during the third phase of the project, the implementation of the MEDIAS subsystem, and the future operation of MEDIAS data calls.

The consortium highlighted the close collaboration established with MEDIAS experts throughout the development process. This collaboration included a series of technical meetings and workshops that enabled the adaptation of the MEDIAS database structure, harmonisation of national datasets, revision of validation procedures, and refinement of syntax and consistency checks. Several country-specific issues related to validation constraints, decimal precision, and cross-table dependencies were identified and resolved through joint discussions. The upload status of the 2024 MEDIAS datacall was also presented, together with specific technical issues concerning the `t_catch` and `percentage_weight` fields in the pelagic trawl species table.

The consortium presented the MEDIAS database, the implementation of spatial validation procedures, reporting functionalities through maps and graphical outputs, and consistency checks based on referential integrity among tables belonging to the same data category (acoustics, pelagic trawl, and CTD).

A discussion was held regarding the integration of cross-category consistency checks within the RDBFIS. Two alternative workflows were presented: (i) the current sequential approach, where each data category is validated and uploaded independently before cross-category checks are executed, and (ii) a unified validation workflow in which all MEDIAS datasets are validated simultaneously through a single import interface. The advantages and disadvantages of both approaches were discussed, particularly with respect to user flexibility and system usability. The MEDIAS experts agreed that the implementation approach should be left to the developers, as the chosen integration method has no impact on the end users' workflow.

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The consortium also informed participants that the transition of the RDBFIS platform to the EU DIGIT infrastructure will not affect the continuity of the service. The platform will remain fully operational throughout the transition period, and continuous technical support will be provided to all participating countries.

Finally, an important decision was reached concerning the future MEDIAS data calls. It was agreed that, starting from the next submission cycle, MEDIAS datasets will be uploaded annually to the RDBFIS platform by the end of May, covering data collected during the previous calendar year ($n-1$). This common timetable will provide a harmonised schedule for all participating countries, facilitate the preparation and validation of national datasets, and ensure the timely availability of harmonised regional data for subsequent quality control and reporting activities.

Moreover, the contribution of the MEDIAS members to the implementation of MEDIAS-RDBFIS was acknowledged, and the participation of one member from each acoustic team in RDBFIS III was agreed upon.

4.6. Presentation of the validation scheme package

Zacharias Kapelonis, HCMR

The group discussed data validation processes for RDBFIS, with Zacharias Kapelonis presenting a new R package for local data validation that includes syntax and consistency checks. An R package developed for the validation of RDBFIS MEDIAS tables was presented. The package implements the cross-table consistency checks agreed upon during RDBFIS-MEDIAS meetings and is designed for both local use and seamless integration with the RDBFIS web application. It is organized into three core components: (a) an input/output subsystem responsible for table reading, writing, and reporting; (b) a validation module containing table-specific consistency checks; and (c) an automatic field completion system. Upon completion of the validation process, the package generates a report stored in memory as an R dataframe and, optionally, exports it in CSV format alongside the validated tables with automatically completed fields. The package will be made available to the group for local use, while its integration with RDBFIS is currently underway. In parallel, the package will be expanded to include a syntax-checking component, which will enable full replication of the data quality tools available in the online system. The presentation concluded with a brief live demonstration of the tool. The group agreed to use this validation package for current data submissions (2024-2025) while waiting for full RDBFIS III integration, and to recheck and resubmit past data after the validation system is fully implemented. Given the complexity of these issues and the limited time available during the meeting, the group agreed on a workplan to continue working on a series of dedicated workshops by the end of the year.

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4.7. Presentation of the results of adaptation of the core EchoR package functions to the RDBFIS format

Antonio Palermino, CNR- IRBIM

Antonio Palermino presented a comprehensive study on multi-clustering methods for fish stock assessment, comparing different approaches to biomass estimation in the Adriatic and Croatian waters across multiple years. The research tested various methods including nearest neighbor assignment, cluster-based approaches, and multiclustering approach. Decisions on clustering were based on haul distance, bathymetry, species composition as well as a linear combination of dissimilarity matrix. Significant differences in biomass estimates between methods were found. The group discussed implementing these methods across different countries and regions, addressing the need to cover all

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approaches used by different groups including sub-region methods. The group agreed to continue developing the script further and test it with different datasets before the next MEDIAS coordination meeting, with plans to extend the current version to include echotypes.

4.8. Presentation of new standardized NASC maps at the Mediterranean scale

Marco Barra, CNR-ISMAR

Prior to the meeting, all MEDIAS participants shared anchovy and sardine NASC data collected during the 2024 surveys, which allowed us to update the NASC-map time series for both species (Fig 3.8.1 and 3.8.2).

All the datasets were merged, and since the aim of the common NASC maps was to illustrate the spatial distribution of NASC across the Mediterranean, the NASC values were interpolated onto a 1 nautical mile (nmi) reference grid using the inverse distance weighted (IDW) interpolation method, with the search radius limited to the ten nearest EDSUs.

The 2024 Mediterranean anchovy and sardine NASC maps were uploaded to the MEDIAS website (<https://www.medias-project.eu/index.php/maps>) and IFREMER's SEXTANT Geoportal (<https://sextant.ifremer.fr/eng/Data/Catalogue>).

The current version of the anchovy and sardine NASC maps time series on the MEDIAS website and the IFREMER Geoportal now cover the period from 2019 to 2024.

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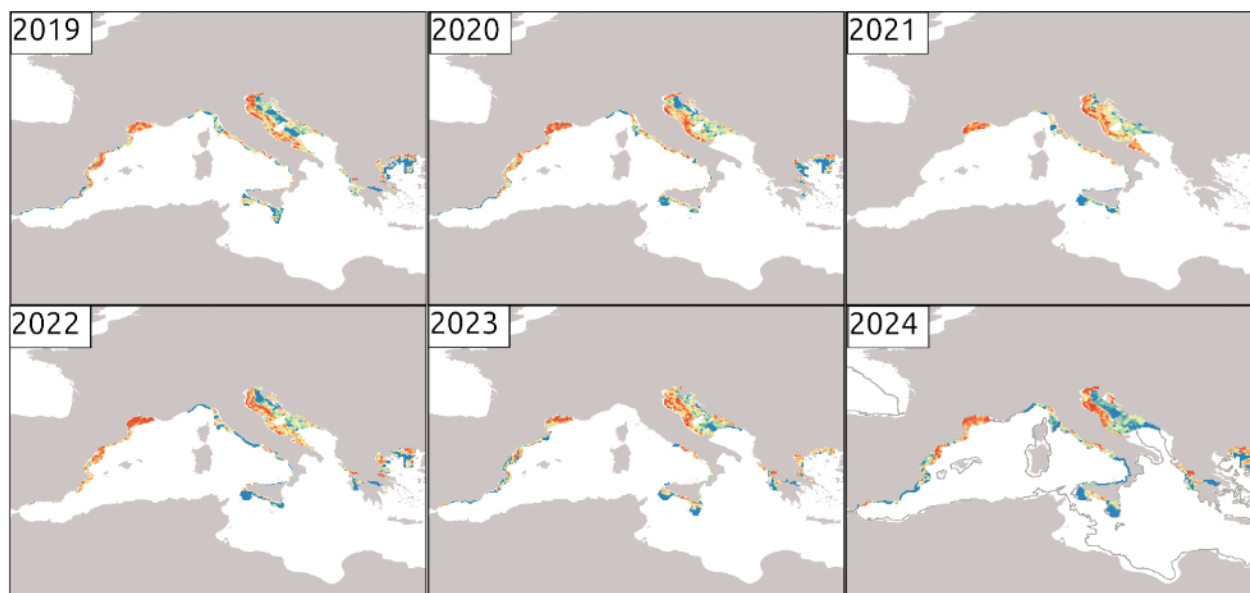


Figure 3.8.1. Anchovy maps 2019 - 2024

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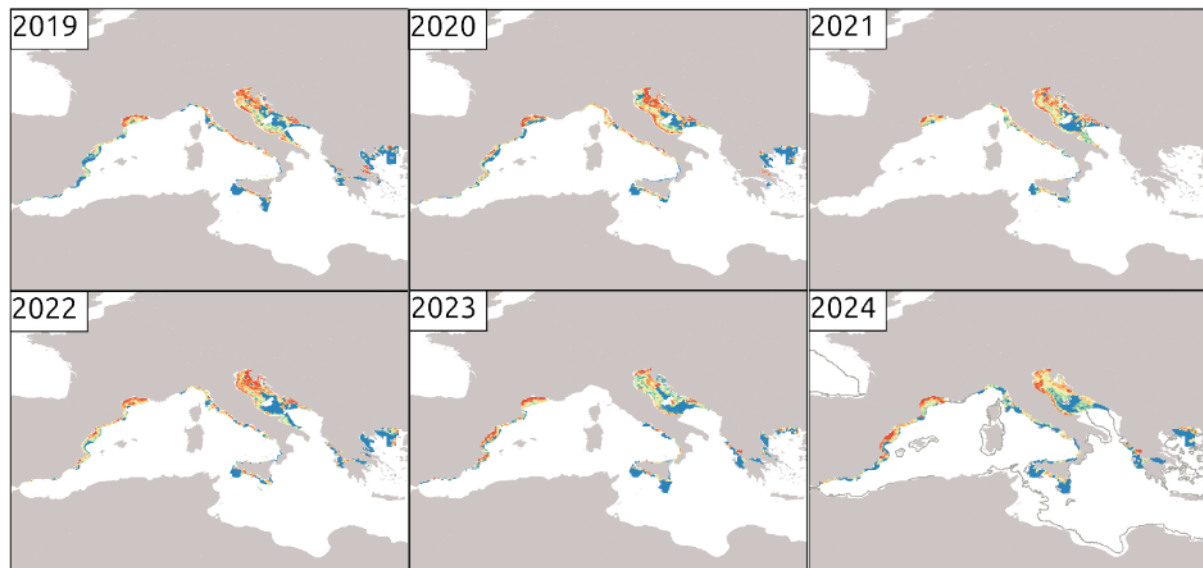


Figure 3.8.2. Sardine maps 2019 - 2024

4.9. Dealing with extreme values in biological sampling: A systematic methodology to combining catch data

Zacharias Kapelonis, HCMR

The presentation discussed the issue of handling extreme values when working with biological sampling data. In cases where haul combinations are used to attribute biological information to acoustic integration values, different weighting strategies can be used, e.g. equal weighting, weighting by catch/individuals per hour, or weighting by back-scatter. When weighting by catch per hour, hauls with very high catch can potentially dominate the combination, diminishing the effect of multiple other hauls participating in the combination. The presentation explored the idea of applying methods from extreme value analysis theory for the detection of a truncation point in the catch distribution which could then be applied to individual samples (hauls). The presentation concluded that although methodologically sound, this approach has a number of limitations to be used in practice, including subjectivity in threshold selection, spatial/temporal effect on threshold, and also the necessity for expert intervention in the haul combination process. The group provided context on previous discussions in the Adriatic regarding different sampling approaches. It was agreed that caution is needed and a decision tree, incorporated in the R script used for biomass estimates, is needed to address hauls with extreme catch values.

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4.10. Presentation of the outcome of the standardization of echo-trace representation

Zacharias Kapelonis, HCMR

A presentation on the standardization of ecotrace representation was given, explaining the need for unified documentation of main echotypes across GSAs to enable comparison and identify similarities and differences between regions. In this presentation, characteristic echo-traces submitted by CNR-IRBIM, IFREMER and HCMR were presented, to facilitate the discussion for further data collection

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efforts. In particular, echo-traces of schools for anchovy and sardine were shown from the three datasets, portraying schools that seem to exhibit similar typology among the different regions, while some examples to discuss possible differences were also provided. The presentation concluded with some guidelines to proceed with data collection from more GSAs, and if necessary, the enrichment of already submitted datasets. It was agreed to work further on this during the next period and results to be presented next year aiming to incorporate echograms for specific echotypes in the report.

4.11. Presentation of the current status of the GFCM surveys, including methodologies and ongoing developments

Paolo Carpentieri, GFCM

The MEDIAS group was informed of the efforts of the General Fisheries Commission for the Mediterranean (GFCM) to implement and harmonize scientific surveys across the Mediterranean and Black Sea, with a particular focus on pelagic-acoustic surveys. In response to gaps in knowledge on the biological status of demersal and pelagic stocks in several geographical subareas, GFCM established, since 2019, a framework for standardized surveys-at-sea. Building on existing EU protocols such as MEDITS, SoleMon and MEDIAS, GFCM developed the *Technical guidelines for scientific surveys in the Mediterranean and the Black Sea*, enabling collaboration with national institutes and supporting the consistent implementation of surveys in the whole region. Since then, 34 demersal surveys (in 11 countries), 9 pelagic surveys (in 4 countries), and, since 2022, 12 beam trawl surveys (in the Black Sea) have been conducted. GFCM has also supported these activities through the procurement of standardized fishing gear and equipment and the provision of training on procedures and sampling methodologies. Regarding acoustic surveys in the Black Sea, methodologies have been adapted to regional specificities, and 15 years of historical acoustic data have been reprocessed under a common protocol and integrated using spatio-temporal modeling to produce standardized time series for key small pelagic stocks.

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All these efforts, together with the further development of a comprehensive, harmonized database identified as a key next step, would contribute to strengthening the scientific basis for fisheries management.

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A specific session of the meeting was devoted to relevant scientific work based on MEDIAS collected data. Specifically, the group acknowledged the work carried out by PhD students of HCMR, IFREMER and CNR-IAS was presented.

4.12. Acoustic surveys as a multidisciplinary tool to study the pelagic ecosystem, with a focus on mesozooplankton

By Samuele Menicucci, CNR-IRBIM

The pelagic ecosystem plays a crucial role in the global carbon budget, contributing about half of total net primary production, while coastal areas regulate nutrient cycles, carbon sequestration, and sustain over 90% of global fish catches. However, continental shelves are heavily impacted by human activities, making ecosystem monitoring essential. Zooplankton are central to pelagic food webs, linking primary producers to higher trophic levels, recycling nutrients, and contributing to carbon export through sinking fecal pellets and carcasses. Because ecosystem services depend on community functional traits, understanding zooplankton dynamics is key to preserving trophic coupling under climate change.

This research used the MEDIAS acoustic survey conducted annually by the IRBIM-CNR as a multipurpose platform to investigate the pelagic environment of the Adriatic Sea, integrating acoustic, environmental, and biological data.

The first study analyzed stable isotopes ($\delta^{15}\text{N}$, $\delta^{13}\text{C}$) in three small pelagic fish (anchovy, sardine and sprat) to assess trophic niches and resource partitioning. High productivity, particularly in the northern basin, supported niche differentiation. Anchovy showed the greatest trophic plasticity, suggesting higher adaptability to future climate-driven changes, though warming and reduced productivity may intensify competition and stock fluctuations.

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The second study compared mesozooplankton communities in the North Adriatic between 2019 and 2022, years with contrasting climatic conditions. Warmer temperatures and altered salinity in 2022 coincided with a shift from a Noctiluca-dominated to a crustacean-dominated community, demonstrating sensitivity to river inputs and climate anomalies.

The third study linked acoustic backscatter in the South Adriatic to zooplankton biomass and environmental variables, highlighting aggregation near the pycnocline and strong correlations with chlorophyll, oxygen, salinity, and temperature.

Finally, combining acoustics and zooplankton imaging in the North Adriatic revealed gas-bearing zooplankton as major sound scatterers. However, correlations between acoustic signals and plankton metrics depended strongly on community composition, highlighting the complexity of interpreting pelagic acoustic data.

4.13. Comparison of mesozooplankton identification between ZooCam, ZooScan and microscopy in the North-West Mediterranean Sea

By Melanie Morvan, IFREMER

Mesozooplankton plays a central role in marine ecosystems, both as a key component of pelagic food webs and an indicator of environmental variability. However, its monitoring remains methodologically challenging due to its small size, morphological diversity and high abundance of organisms. This study compares three mesozooplankton identification methods, microscopy, ZooScan and ZooCam, based

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on samples collected during the 2022 MEDIAS monitoring survey in the Gulf of Lion (GSA 7, north-western Mediterranean Sea).

Method comparisons were conducted across multiple levels of biological organisation, including total mesozooplankton abundance, taxon-specific relative abundances, community composition, as well as individual-level size metrics. Total mesozooplankton abundances were consistent across methods, with small, non-significant differences detected among stations. In contrast, taxon-specific comparisons revealed differences in taxonomic resolution and recognition accuracy, due in part to morphological similarity. Microscopy provided superior taxonomic precision, whereas imaging-based methods allowed faster processing and improved reproducibility. The identification method explained only a small fraction of the total variance in community structure, which remained largely driven by spatial variability.

Overall, these results highlight the importance of method calibration and appropriate taxonomic aggregation to ensure data interoperability and continuity of long-term time series when moving from microscopy to imaging. Despite some limitations, imaging-based approaches, particularly ZooCam, offer substantial operational advantages for monitoring programmes, enabling at-sea processing of fresh samples and increased sampling efficiency. When carefully calibrated, imagery provides a robust opportunity for optimising mesozooplankton monitoring in the Mediterranean Sea, especially with the development of the ZooCam double-view. This new version has two cameras, allowing two images of the same organism to be taken. This allows better identifications and better size estimations for the mesozooplankton.

4.14. Climate-driven redistribution of European anchovy in the Mediterranean and adjacent Atlantic waters: insights from ensemble species distribution modelling

By Gabriella Lo Cicero, CNR-IAS

Gabriella presented a study that assesses the effects of climate change on the future distribution of the European anchovy (*Engraulis encrasicolus*) using ensemble species distribution models (SDMs). Models were calibrated across the species' full range to capture its ecological niche, combining expanded occurrence data with updated environmental predictors. A rigorous framework was applied, including variable selection, control of multicollinearity, standardized sampling, pseudo-absence generation, multi-metric evaluation, uncertainty quantification, and extrapolation risk assessment.

Projections show a strong poleward shift in suitable habitat, with significant losses in southern regions. While declines at the southern range are partly offset by gains in northern Atlantic areas, losses within the Mediterranean are not compensated. Under high-emission scenarios, habitat suitability may decline by up to 60% in the eastern Mediterranean and 40% in the central basin, exceeding 70% in some sub-regions. Although extinction risk is low, these shifts may have major regional impacts, highlighting the need for climate-informed, adaptive fisheries management.

4.15. Characterizing spatiotemporal variability in anchovy spawning grounds: A case study from the North-East Aegean Sea

By Eleni Servou, HCMR

Understanding the spatiotemporal variability of fish spawning grounds is crucial for marine population ecology, as spawning habitat selection influences recruitment success and reflects ecosystem and

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population dynamics. However, disentangling the roles of environmental forcing and intrinsic population processes in shaping spawning distributions remains challenging. This study analyzed available egg abundance data from the North-East Aegean Sea, collected between 2003 and 2022, to investigate interannual variations in European anchovy (*Engraulis encrasicolus*) spawning grounds and to assess the influence of environmental and density-dependent processes on their spatiotemporal dynamics. Using a spatiotemporal generalized additive mixed-effects modeling (GAMM) framework, we partitioned variability into stable spatial patterns, temporal variability, space–time interactions, and covariate effects. Environmental covariates were selected to represent the pronounced topographic, hydrological, and biological heterogeneity of the area. Spawning grounds exhibited strong site fidelity, characterized by a stable spatial pattern with higher egg abundance over the continental shelf and lower abundance offshore. Bathymetry and sea surface salinity emerged as key drivers of the spatial and spatiotemporal variability, while population biomass primarily accounted for temporal variability in egg abundance. The spatially varying effect of biomass revealed density-dependent spatial dynamics, consistent with the basin model theory. Our findings indicate that anchovy spawning ground dynamics in the North-East Aegean Sea are driven by specific topographic and oceanographic features and biomass-dependent processes, while also highlighting the role of additional mechanisms, potentially behavioral, like spawning aggregation and site fidelity.

4.16. Update of MEDIAS Handbook

The Working Group has agreed to incorporate echograms illustrating typical echo-traces observed across the various Geographical Sub-Areas (GSAs) into the MEDIAS handbook, in order to enhance the clarity and comparability of acoustic survey outputs. To ensure consistency in terms of graphical representation and overall layout, it was decided that the relevant acoustic data, along with the corresponding polygons delineating the echo-traces, would be transmitted in Echoview format to Zacharias Kapelonis (HCMR). He will be in charge of generating standardized echogram visualizations that conform to a common visual framework agreed upon by the group.

An exception to this procedure was acknowledged for France, which utilizes different software tools for acoustic data processing. As such, France will provide their layouts in an alternative format that still clearly indicates the position and nature of the observed echo-traces.

In addition, the WG has decided to update the “database section” of the MEDIAS handbook to include the use of RDBFIS and the associated algorithms for data storage, evaluation and analysis.

4.17. Election/nomination of a new MEDIAS Chair

Marianna Giannoulaki (HCMR, Greece) has been officially nominated and has accepted the position of the next Chairperson of the MEDIAS Coordination Group. This appointment upholds the established tradition of rotating the chairmanship among the member states, thereby ensuring balanced representation and shared leadership within the group. Marianna will assume her responsibilities starting in September, following the Regional Coordination Meeting and present the outcomes of the MEDIAS WG.

4.18. Terms of reference for the next meeting (2027); dates and venue of next meeting

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MEDIAS SC discussed and accepted the Terms of References (ToR) for the next, 20th MEDIAS coordination meeting in 2027. The approved ToR will include the following key objectives:

General

- To present and harmonize the ongoing acoustic surveys in the Mediterranean Sea and Black Sea
- To provide information for management decisions if requested
- To provide input for stock assessment purposes concerning the stocks which are managed internationally
- To provide information for Good Environmental Status in the MSFD, if requested.

Specific

- Update MEDIAS handbook and website if needed.
- Continuing the work on MEDIAS RDBFIS related issues
- Continuing the work on the validation scheme package
- Presentation of the results of adaptation of the core EchoR package functions to the RDBFIS format
- Work on a decision tree process within an R script to assign haul information into echo that reflects all GSAs and surveys peculiarities
- Continuing the work on the standardization of echo-trace representation
- Presentation of the maturity exchange results
- Presentation of the progress of work regarding the TS of anchovy
- Present updates related to regional NASC mapping
- Update the MEDIAS handbook regarding ichthyoplankton surveys

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The next meeting will take place from April 13 to 15, 2027. Tarek Hattab from IFREMER have kindly agreed to organize the 20th MEDIAS SC in Sete/Montpellier, France.

4.19. Closure of the meeting

The Chair thanked all experts for their participation in the 19th meeting of the MEDIAS Steering Committee and particularly to Marianna Giannoulaki (HCMR) for hosting the meeting the efficient organization and technical support of this hybrid meeting. The 19th MEDIAS Steering Committee was closed on 30 April 2026 at 16:00.

4. Conclusions and decisions of the 19th MEDIAS Steering Committee

1. During the past year, a new R package tailored to the MEDIAS framework was developed, building on the core functionalities of EchoR and fully adapted to the RDBFIS format. As development is ongoing, work will continue throughout 2026–2027 to support data quality control and biomass estimation while accounting for survey-specific differences. Key priorities include refining quality control and consistency procedures, as well as biomass and abundance estimates. The SC suggested a specific subgroup to work towards this approach with online meetings by the end of the year.

2. The Steering Committee emphasized the need for the new R package to include a decision tree guiding haul allocation to acoustic backscatter, accounting for survey-specific conditions. These

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include differences in sampling design (e.g. daytime vs nighttime hauls, synchronous vs asynchronous acoustic and biological sampling), species composition (monospecific vs mixed catches), spatial structure of hauls and echotypes. Depending on haul distribution and density, either nearest-neighbour or clustering approaches may be more appropriate. The package should therefore incorporate criteria for cluster selection, weighting schemes for averaging hauls within subareas, and rules for defining the allocated haul based on either distance or expert judgment. Results from the Adriatic case studies demonstrated that these methodological choices can substantially affect biomass estimates, highlighting the importance of transparency and reproducibility through standardized R-based workflows that enable comparison of outputs. The Steering Committee noted that significant progress has already been achieved, particularly through the Italian and Croatian acoustic surveys in the Adriatic Sea. This work will be further advanced by the sub-group developing the MEDIAS RDBFIS scripts and tables.

3. The Steering Committee updated the standardized template used to report changes in the MEDIAS survey protocol over time. The table records the type, duration, and reasons for any deviations, as well as their potential impact on biomass estimates. Completed tables will be submitted with survey summaries, compiled into the final meeting report, and shared with end-users. They will also be included as metadata in the publicly available MEDIAS dataset. Additionally, following updates from the Commission, the SC was informed of DG MARE's intention to support the transition of the database to DigitCloud. The Commission also informed on the development of a document for evaluating quality annexes and asked for information to be provided by the group.

4. In light of the difficulties some teams have faced in adhering to the official survey period defined in the handbook, the Steering Committee reiterated the importance of engaging with the European Commission in such cases. It was reaffirmed that any survey planned outside the authorized window—i.e., more than one buffer month beyond the official period—must receive prior approval from both the MEDIAS Steering Committee and the EC before implementation.

5. Regarding ongoing efforts to develop a TS (target strength) model for anchovy, the group agreed to continue enhancing the spatial coverage of the *in-situ* dataset, particularly in the Northwestern Mediterranean where data remain sparse. Additionally, the Spanish and Sicilian teams will review historical datasets to identify potential night trawls with monospecific anchovy catches that could be shared with Zacharias Kapelonis (HCMR) to support the analyses.

6. The MEDIAS SC acknowledges the efforts done by the MEDIAS groups in collecting anchovy samples in accordance with the protocol presented at the 18th MEDIAS SC. Ongoing TS modelling analyses based on these samples will complement the *in situ* TS analyses. The group will continue working intersessionally to finalize both modelling and *in situ* TS analyses, with results to be presented at the next MEDIAS SC.

7. The SC has decided to continue working on echograms showing typical echo-traces observed in the different GSAs to be added in the MEDIAS handbook. To ensure the consistency of the echograms in terms of graphical representation, it was agreed to send the acoustic data and the accompanying polygons (defining the echo-traces) in Echoview format to Zacharias Kapelonis (HCMR), who will be responsible for producing the standardized echogram visualizations.

8. The SC encouraged the participation of MEDIAS experts in ICES age readings workshops involving anchovy and sardine.

9. The SC welcomed the presentation by Paolo Carpentieri on behalf of GFCM regarding pelagic trawl surveys in the Mediterranean and Black Sea and encouraged the collaboration between surveys. The respective protocol is available at <https://www.fao.org/3/ca8870en/CA8870EN.pdf>

11. The SC acknowledged the reconstruction of the acoustic surveys time series in the Alboran Sea.

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12. The SC acknowledged the intention of the Romanian survey to purchase a Simrad EK80 WBT echosounder to be in accordance with the MEDIAS protocol. The SC suggested the use of 38 KHz transducer.

13. The SC acknowledged the use of the new template produced by the RCG Secretariat in 2025 for the preparation of survey presentations and reports. Moreover, it encourages all groups to use this template in order to establish a common visual identity. The RCG Secretariat will be equally available to assist in the organisation of next year's meeting.

14. The Steering Committee welcomed and acknowledged the work presented by four PhD students using MEDIAS survey data, including acoustic observations and datasets on zooplankton, fish, and fish egg abundance.

15. Following the agreement of Member States, survey data - including MEDIAS - was made publicly available through JRC: Joint Research Centre Data Catalogue - EU Mediterranean and Black Sea Fisheries Independent... - European Commission. The citation is the following: 'European Commission, Joint Research Centre (JRC) (2025): EU Mediterranean and Black Sea Fisheries Independent Survey Data up to 2024. European Commission, Joint Research Centre (JRC) [Dataset] doi: 10.2905/JRC.N8Y59G8; 10.2905/ef36af5d-eb4e-4a9f-9513-82a877fe71fe PID: <http://data.europa.eu/89h/ef36af5d-eb4e-4a9f-9513-82a877fe71fe> MEDIAS is included in the keywords. The data set will be updated every year, adding one more year.

16. Stefanos Kavadas provided two options for the web user interface to allow the integration of the cross-category check validation scheme, and requested the SC opinion. Since vsyntax checks and validation will be possible to be performed locally using the R-package that is in final development stages, the SC agrees that either options are fine, and leaves the final decision to the RDBFIS consortium.

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17. The SC following the work presented during the meeting regarding the RDBFIS, acknowledged the effort and work carried by MEDIAS experts of the different groups in order to develop an operational database for the first time for the purposes of MEDIAS. The SC stressed the need to officially involve MEDIAS experts from different groups in the next phase of RDBFIS in order to finalize algorithms, pending tasks and ensure the optimum outcome.

17. Marianna Giannoulaki from HCMR was elected as the new MEDIAS Chair for the next three years. Rotation rules for the chairing were agreed based on equal representation of member states and teams following the order: Greece, Spain, Italy (Sicily), Italy (Adriatic), Croatia, France, Malta, Slovenia.

5. Workplan

- A specific doodle to arrange subgroups meetings will be circulated taking into account the necessary steps to follow to complete the RDBFIS algorithms.

- The SC suggested that work towards a new R package to include a decision tree guiding haul allocation to acoustic backscatter should continue by the sub-group developing the MEDIAS RDBFIS tables and results to be presented during the 2027 meeting. Antonio Palermino (CNR IRBIM) will be in charge.

- The SC suggested a specific subgroup to work towards new R package tailored to the MEDIAS framework, building on the core functionalities of EchoR and fully adapted to the RDBFIS format

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with online meetings with one representative from each team, by the end of the year. Tarek Hattab (IFREMER) will be in charge.

-The SC noted certain issues that need to be addressed in the RDBFIS in order to be operational. For this purpose, the SC suggested to work on the syntax checking within the validation R package of the RDBFIS algorithms by MEDIAS experts. Moreover, corrections regarding the current database structure should include survey area polygons, the addition of species' column in the echotype table and the correction of total catch. Following the necessary corrections, re-uploading data already submitted by experts should be timely planned.

- The SC suggested the group to continue working intersessionally to finalize both modelling and in situ TS analyses for anchovy, with results to be presented at the next MEDIAS SC. Zacharias Kapelonis (HCMR) will be in charge.

-The SC suggested the subgroup on maturity stages to conclude the work by the end of 2026 and an update to be presented during the 2027 SC meeting. Rosalia Ferreri (CNR-IAS) will be in charge.

- The SC has decided to continue working on echograms showing typical echo-traces observed in the different GSAs to be added in the MEDIAS handbook. Zacharias Kapelonis (HCMR) will be in charge.

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Annex I. Participants list 28th – 30th April 2026

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RCG secretariat	EU RCG			Online

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Annex II. Agenda April 2026

MEDIAS Coordination Meeting in April 2026

28th April

09:00

09:00 – 09:30 Connection testing; Opening of the meeting & participants introduction; Adoption of the agenda.

09:30 – 10:00 Election/nomination of a new MEDIAS Chair

10:00 – 10:30 Presentation of the 2025 acoustic surveys in GSA 1 - Northern Alboran Sea and GSA 6 - Northern Spain (IEO) - Magdalena Iglesias, Ana Ventero and Pilar Córdoba

10:30 – 11:00 Presentation of the 2025 acoustic surveys in the GSA 7 - Gulf of Lion (IFREMER) - Tarek Hattab and Jean-Hervé Bourdeix

11:00 – 11:30 Coffee break

11:30 – 12:00 Presentation of the 2025 acoustic survey in GSA 10 – Tyrrhenian Sea (CNR-IAS and CNR-ISMAR) - Angelo Bonanno, Marco Barra, Simona Genovese, Gualtiero Basilone and Rosalia Ferreri

12:00 – 12:30 Presentation of the 2025 acoustic surveys in GSA 15 - Malta (MAFA-ARM) - Giancarmelo Ales

12:30 – 13:00 Presentation of the 2025 acoustic surveys in GSA 16 - South Sicily (CNR-IAS and CNR-ISMAR) - Angelo Bonanno, Marco Barra, Simona Genovese, Gualtiero Basilone and Rosalia Ferreri

29th April

09:00 DG-MARE - Commission's views and suggestions (Venetia Kostopoulou, DG-MARE).

09:30 Review of issues discussed in other meetings held in relation to MEDIAS (RCG Med&BS Recommendation) (Tarek Hattab)

09:45 Presentation of the methodology of time series reconstruction in GSA 01 (Magdalena Iglesias, Ana Ventero)

10:15 Progress update on standardization of age reading and maturity estimates (Rosalia Ferreri)

11:00 *Coffee break*

11:30 Work on MEDIAS regional database (Stefanos Kavadas, RDBFIS-II project)

13:00 *Lunch break*

14:30 Explore the use of EchoR for data processing

15:00 Drafts a document addressed to end users describing any changes in the sampling design through the years

15:30 Presentation of new standardized NASC maps at the Mediterranean scale (Marco Barra)

15:45 Presentation of the new MEDIAS website (Marco Barra)

16:00 *Coffee break*

16:30 Update on the progress of the TS anchovy estimation work (Andrea De Felice and Zacharias Kapelonis)

17:00 Data collection for anchovy backscatter modeling (Antonio Palermino et al.)

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17:30 Application of the Daily Egg Production Method in Greek waters during the last decade -
Evdoxia Schismenou and Stelios Somarakis

18:00 *Closing of the session*

30th April

09:00 General discussion and revision of the common MEDIAS protocol

10:00 Update of MEDIAS Handbook

10:30 Election/nomination of a new MEDIAS Chair

11:00 *Coffee break*

11:30 Drafting and adoption of meeting conclusions

12:15 Terms of reference for the next meeting (2026); dates and venue of next meeting

12:30 Other issues

13:00 *Lunch break*

14:30 Drafting report

16:00 *Closing of the session*

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Annex III. MEDIAS HANDBOOK (Version: April 2026)

Common protocol for the MEDiterranean International Acoustic Survey (MEDIAS)

The geographical areas that are covered by the MEDIAS surveys and the respective days at sea per survey are presented in the following Table I and Figure I. References can be found on MEDIAS website: <http://www.medias-project.eu/medias/website/>. More detailed information on MEDIAS, from current and historical perspective, are given in editorial written by Giannoulaki et al., 2021 and review paper written by Leonori et al., 2021 (see: <https://doi.org/10.12681/mms.29068> and <https://doi.org/10.12681/mms.26001>).

Table I. The size of the geographical area that is covered by each Institute in the Mediterranean Sea (acoustic surveys) and in the Black Sea (pelagic trawl surveys). NM = nautical miles.

Country	Institute	Geographical area	Size of area	Standard number of days
Greece	HCMR	Aegean Sea	9000 NM ²	40
Greece	HCMR	Eastern Ionian Sea	2800 NM ²	30
France	IFREMER	Gulf of Lion	3300 NM ²	33
Slovenia	CNR-IRBIM/FRIS/IOR	Adriatic Sea (Slovenia)	117 NM ²	1
Italy	CNR-IRBIM	Adriatic Sea (Italy)	13200 NM ²	48
Italy	CNR-IAS	Sicily Channel	4300 NM ²	16
Italy	CNR-IAS	Sardinia (east)*	3207 NM ²	7
Italy	CNR-IAS	Tyrrhenian and Ligurian Sea	6644 NM ²	30
Spain	IEO/CSIC	Iberian coast	8829 NM ²	38
Malta	MAFA	Malta (east)	1868 NM ²	4
Croatia	IOR	Adriatic Sea (Croatia)	13578 NM ²	35
Bulgaria	IO-BAS	Black Sea	3400 NM ²	20
Romania	NIMRD	Black Sea	4300 NM ²	20

* Official inclusion of this survey in DFC is pending

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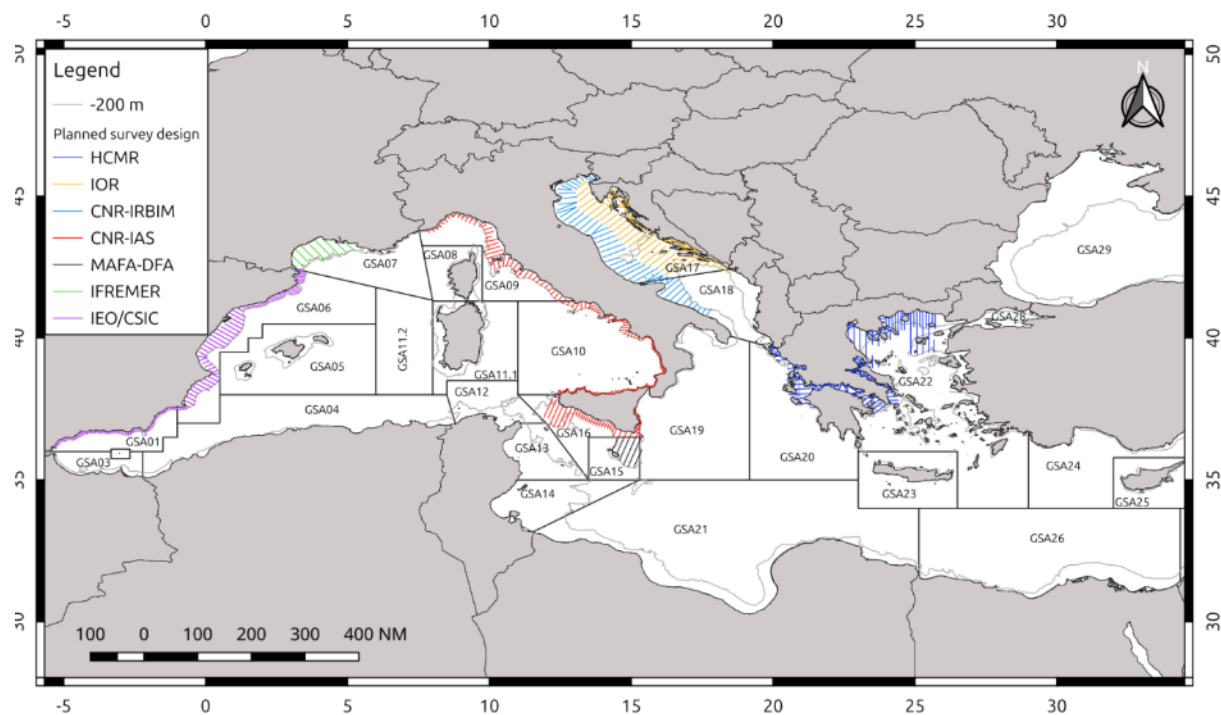


Figure 1. Surveys design in the EU-MEDIAS.

Survey Identity

In the report of the DCF each Institute should report, the geographical area, the size of the area covered, the days at sea, as well as the period and dates in which the survey took place. In addition, the following vessel characteristics should be reported: Name of vessel, vessel length and vessel HP.

Echo sounder parameters

A variety of equipments with specific characteristics could be considered as adequate for the assessment of small pelagics. A split beam echo-sounder should be used for the echo-sampling. The angle beam, Athwart Beam Angle (in degrees), Along Beam Angle, and Ping rate of the echo-sounder should be reported. The frequency for assessment should be the 38 kHz, while the 18, 70, 120, 200 and 333 kHz can operate as complementary frequencies, depending on the research vessel used.

The pulse duration should be 1 ms; a pulse duration of 0.5 ms will be used only in case of Target Strength specific experiments. The threshold for assessment should be -70 to -60 dB depending on the survey and the ecosystem and should be reported. As the main objective is the optimum discrimination between fish and plankton, the background noise should be removed and in a next step, based on the available frequencies used in each survey, a frequency response-based mask should be developed to split the acoustic backscattering between fish and plankton. Whenever this cannot apply, the threshold for assessment should be set at -70 to -60 dB, depending a) on noise level (-60 dB in case of high noise); b) the peculiarities of each area regarding school morphology and plankton density (-60 when plankton is dense, but -70 dB when small schools dominate the area); c) echo-sounder features; d) time of day that echo acquisition is carried out.

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The ping rate should be set as fast as possible depending on depth, in order to assure good echo discrimination. At least one calibration of echo-sounder should be held per survey based on the procedure described in the manual of each echo-sounder and according to the principles described by Demer *et al.* (2015). The calibration parameters and the results of the acoustic equipment should be reported by survey according to the following Table 2. In principle, one calibration per survey is suggested.

Table 2. Calibration report

Calibration report
Frequency (kHz)
Echo-sounder type
Transducer serial no.
Vessel
Date
Place
Latitude
Longitude
Bottom depth (m)
Temperature (°C) at sphere depth
Salinity (psu) at sphere depth
Speed of sound (ms ⁻¹)
TS of sphere (dB)
Pulse duration (s)
Equivalent 2-way beam angle (dB)
Default TS transducer gain
Iteration no.
Time
Range to sphere (m)
Ping rate
Calibrated TS transducer gain
Time (GMT)
RMS
sA correction

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Survey timing

June-July is the best period for MEDIAS survey for biological reasons, however, in the impossibility of defining a common period for all MEDIAS surveys, due to research vessel availability problems, a specific official period has been established for each GSA, taking into account pragmatic, historical and operational considerations (table 3). This will ensure the continuity of time series within the GSA level and keep the sampling period consistent among years. A buffer period of plus or minus one month is authorized in case of particular difficulties that may be encountered in certain years, while considering the month of October as an upper limit not to be exceeded. However, if the survey has to be brought forward or delayed by more than this buffer month outside the official period, a request must first be made to MEDIAS SC and the EC before launching the survey.

Table 3. Official period for MEDIAS surveys per GSA

GSA	Official period
GSA1	6 7
GSA6	6 7
GSA7	6 7
GSA9	8 9
GSA10	7 8
GSA15	7 8
GSA16	7 8
GSA17 E	6 7
GSA 17 W	6 7
GSA 18	6 7
GSA 20	9 10
GSA 22	6 7
GSA 29 (summer)	6 7
GSA 29 (autumn)	10 11

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Survey Design

The survey design for the acoustic sampling should consider the characteristics of the spatial structures of small pelagic fish in each area as well as the peculiarities in the topography of each area. Transects should be run along the greatest gradients in fish density, which is often related to gradients in bottom topography, meaning that transects will normally run perpendicular to the coastline/bathymetry. Inter-transect distance should be adjusted to achieve the minimization of the coefficient of variation of the

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acoustic estimates for the target species in each area but also take into account survey duration. In cases that topography is complex like in the case of semi-closed gulfs transect design could be decided otherwise. The survey design in each area should be reported. Based on some preliminary studies of the spatial structure characteristics of small pelagics in the Mediterranean Sea (WKACUGEO 2010; MEDIAS 2011) the inter-transect distance should not exceed 12 NM.

Specifically, within certain common workshops that were held in the framework of the AcousMed project (Anonymous, 2012) and past MEDIAS meetings, the existing survey design at different areas has been reviewed along with area peculiarities (e.g. size of the area, topography, survey duration). In the framework of these workshops, geostatistical analysis was applied on historical acoustic data under a common protocol and different survey designs were evaluated towards optimization, considering the spatial characteristics of small pelagic fish aggregations. The optimum inter-transect distance in each area has been identified and proposed. The results have been adopted at the 5th MEDIAS coordination meeting. However, in order to evaluate the survey performances in each area, a dedicated session with this specific Terms of Reference should be held when needed within the framework of the MEDIAS annual meetings.

Vessel speed during acoustic sampling should be adjusted depending on vessel noise as set by the ICES-WGFAST (WGFAST 2006). The working group agreed that vessel speed of 8-10 knots is adequate for a split beam echo sounder of 38 kHz. At higher speeds, problems might be encountered with engine noise or propeller cavitation.

It was strongly recommended that if species identification depends on the recognition of schools based on the echograms, the survey will have to take place only during day- time, being interrupted during periods in the 24-hour cycle when the schools disperse.

Otherwise, if available survey time does not permit this, echo sampling might be extended. In this case, echo allocation into species will not be based on school shape identification and justification should be given in the report that this does not affect the accuracy of the estimations. In the framework of the AcousMed project appropriate acoustic data from daytime and nighttime have been analyzed in order to determine the degree of error. Results from recent study (Bonanno et al, 2021) indicated that night estimates can be higher or lower compared to daytime estimates largely depending on the area peculiarities and especially the local plankton and fish densities. However, results showed that correction is possible, and it is advisable when night sampling is inevitable.

Transects should be extended as close to the coast as possible in order to cover adequately the spatial distribution of sardine. The minimum distance from the shore largely depends on the size of the research vessel used. In any case, the Distance of acoustic sampling from the coast in respect to the Bottom depth should whenever this is possible reach the 10 m isobath. In each case the minimum bottom depth of each survey should be reported. The maximum echo-sounding depth should be 200 m, and the minimum echo-sounding depth should be reported as it depends on the draught of the research vessel.

The Elementary Distance Sampling Unit (EDSU) for echo integration should be 1 nautical mile (NM), excluding “bad data”. In the case of parallel transect designs, the acoustic energy in the inter-transect tracks will not be considered for assessment purposes. The working group concluded that the target species of the survey will be anchovy (*Engraulis encrasicolus*) and sardine (*Sardina pilchardus*).

The echo partitioning into species should be based on echogram visual scrutinization. This will be done either by direct allocation based on the identification of individual schools and/or allocation on account of representative fishing stations.

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Target Strength (TS) equations: in the Mediterranean Sea, different species TS equations are currently applied depending on the area. The application of common TS equations should ideally derive from *in situ* estimations of TS, preferably based on acoustic data from the Mediterranean Sea. For this purpose, specific workshops were held in the framework of AcousMed project as well as DCF and MEDIAS coordination meetings but largely based on the analysis of available historical data. Based on these results, the 5th MEDIAS coordination meeting agreed to apply for sardine the following TS-TL equation this point forward:

$$TS=20\log (TL)-72.6 \text{ dB}$$

where TS=Target Strength, TL=Total Length. The Steering Committee at its 14th annual meeting also agreed that in addition to use previous TS equation for sardine (with $b_{20} = -72.6$ dB), IFREMER also will continue to use a $b_{20} = -71.2$ dB in the Gulf of Lions, for compatibility reasons to the long time-series available, but in line with harmonization IFREMER will also provide estimates based on common TS that will be used for regional mapping purposes. Analysis results concerning anchovy indicated large differences between areas. For this purpose, MEDIAS partners concluded that further analysis using more data from all areas is needed and agreed not to propose a single TS equation and b_{20} value for anchovy. It was suggested that the work regarding anchovy TS should continue within the framework of specific MEDIAS workshops, using available data from additional areas, such as Croatia. Thus, it was agreed that for the time being, the historical Target Strength equations for anchovy will be maintained in each area and the applied TS equation should be reported.

Acoustic data processing for the assessment of the target species, Echoview or alternative Movies 3D software should be used for acoustic data analysis and the estimation of abundance. For compatibility reasons, raw data should be available into a common *.hac file format. Due to the large file size raw data will be stored within the responsibility of each Institute. The common *.hac format will be also available for the requirements of the Data Collection Framework (DCF) upon request.

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A script in R to calculate geostatistical CV associated with biomass estimates from acoustic survey, based on Walline et al. (2007), has been created by Marco Barra (CNR) and tested by all MEDIAS groups. This procedure is considered mandatory to calculate geostatistical CV to be provided along with acoustic estimates.

Workflow for acoustic data processing

During the 6th MEDIAS meeting the Steering Committee agreed on a common workflow for acoustic data processing, which is structured in the following four steps:

- a) Load and view data
- b) The acoustic data acquired by echo-sounder during the survey are loaded in a software environment for visual exploration in terms of echograms and maps.
- c) Calibrate
- d) The results of calibration procedure, carried out on board the vessel, are installed in order to convert the raw acoustic data into absolute backscattering measurements. Such step includes also the installation of correct settings of transducers position referred to GPS antenna.
- e) Remove background noise
- f) Before analyzing the acoustic data any ambient noise present in the underwater environment has to be removed.
- g) Detect and filter

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The step includes the use of grids, lines, regions and mathematical operators for excluding from the collected acoustic data any backscattering signal not linked to the presence of fish and/or plankton.

Specific aspects are:

1. Intermittent noise removal;
2. Evaluate possible interferences that may produce artefacts in the echograms, and adopt a procedure for removing them;
3. Surface and seafloor exclusions;
4. Use lines for correctly separating the backscattering signals from surface and bottom;
5. Single targets estimation;
6. In case of organisms scattered in the water column, typical of night-time data acquisition, adopt the necessary procedure for separating fishes from planktonic organisms;
7. Schools' estimation;
8. Use regions and/or mathematical operators for estimating backscattering signal due to fish aggregations.

Abundance indices

The following abundance indices should be estimated and reported in the DCF within the framework of MEDIAS:

The Total fish NASC per EDSU, as well as Point maps of total fish NASC should be available.

The target species of MEDIAS for assessment purposes will be anchovy (*Engraulis encrasicolus*) and sardine (*Sardina pilchardus*). The abundance indices estimated by all MEDIAS parties provided in the DCF report should include both NASC and Biomass estimations, for the whole area. Specifically, for the two target species abundance estimates provided in the report are: NASC/EDSU; Biomass/EDSU; Number of fish/EDSU; Number/age and per length class; Biomass/age and per length class. Point maps of anchovy and sardine in NASC/mile; Biomass/mile should also be available. In addition, abundance indices could be given for all pelagic species in the community which are important in each area.

The catch compositions of the hauls: pie-charts indicating percentage by weight per species and/or group of species should be available also.

Fish sampling and haul allocation

According to the standard methodology followed in acoustics, species allocation of the acoustic records is impossible if trawl information is not available. Fish sampling is required to collect representative samples of the fish population in order to identify echoes. The main objectives of trawling in an acoustic survey are a) to obtain a sample from the school or the layer that appears as an echo trace on the sounder for echo trace identification and allocation into species and b) to get biological information and evaluation of the size distribution of each species. Therefore, the trawling gear used is of no importance as long as it is suitable to catch a representative sample of the target-school or layer. In the framework of the AcousMed project available past data from different areas in the Mediterranean were analyzed based on a common protocol. Results showed no significant differences between day and night sampling (Machias et al., 2013). The coordination meeting based on

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these results concluded that samples collected during both day and night in the same survey could be merged and used for the necessary estimations.

In addition, the sampling intensity of the hauls cannot be pre-determined because of the objectives of the acoustic survey *per se*. The sampling intensity in an acoustic survey depends on the size of the area covered, the frequency of occurrence of different echo traces on the sounder screen and the spatial characteristics of fish aggregations. In addition, the geographical coordinates or the sampling depth of the hauls cannot be pre-determined because pelagic species execute extended horizontal and vertical movements. Schools' morphometry and energetic characteristics might change depending on the area, the time interval or even the fishing pressure. Therefore, the sampling strategy has to be adaptive depending on the school characteristics per area, time period and year.

Considering that, within a common protocol, the different research vessels used and the peculiarities of each area the following points have been agreed:

- A pelagic trawl will be used in all areas for biological sampling.
- Maximum codend mesh size should be equal to 24 mm (side of mesh equal to 12 mm). The codend and the trawl characteristics used in each area will be reported. If codend cover is used it should be reported and not to be used for LFD of target species.
- The vertical opening of the pelagic hauls along with the netsounder used should be reported.
- The duration of hauls should be no less than 30 min for unknown echoes and when multi-species scattered echoes are being fished.
- Vessel speed during fishing should be 3.5–4.5 knots.
- It is widely accepted that in the framework of an acoustic survey a standard total number of hauls cannot be set because this depends on the fish distribution and abundance found in each survey. However, in any case the hauls number must be adequate in order to a) ensure identification of echo traces; b) obtain a representative length structure of the population for each target species; c) obtain species composition and biological samples.
- Pelagic hauls are used to assign species into echo traces, however this depends on the density, the location and the species composition of the haul and the approach can vary in order to minimize bias in the estimates. For example, nearest haul assignment or clustering of hauls can be an equally accepted approach. Thus, a common decision tree guiding haul allocation to acoustic backscatter, accounting for survey-specific conditions is decided, accounting differences in sampling design (e.g. daytime vs nighttime hauls, synchronous vs asynchronous acoustic and biological sampling), species composition (monospecific vs mixed catches), and spatial structure of hauls and the use of echotypes or not. A dedicated R package, will be added in the RDBFIS algorithms, is under developement by MEDIAS experts for this purpose incorporating criteria for cluster selection, weighting schemes for averaging hauls within subareas, and rules for defining the allocated haul based on either distance or expert judgment.
- Target species of the MEDIAS surveys are anchovy and sardine, but biological data for all species in the pelagic community (e.g. bogue, horse mackerels, sprat, etc.) regarding length frequency distribution and Length-Weight relationships should also be acquired.

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Biological and oceanographic parameters

The following biological parameters should be estimated in each survey:

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- The Length frequency distribution (0.5 cm) should be estimated from a representative sample for each fish species per haul. Total length will be measured for all species. The Length–Weight relationship for all pelagic species will be estimated and reported. The size of each sample should be set at minimum the one described in the respective protocol of the Data Collection Framework (DCF).
- For the target species, anchovy and sardine, the mean Total Length at age should be estimated, as well as the Age-Length-Key used for the conversion of abundance indices to abundance-at-age. Data should be provided according to the DCF instructions.
- Otolith reading criteria for anchovy and sardine should be in accordance with ICES WKARA2 report (2017) and follow the recommendation of that meeting. In particular the 1st of January should be considered the birthdate for anchovy from an assessment point of view in relation to time-steps in the assessment. Mean TL at age should be reported.
- It is strongly recommended the use of ICES WKSPMAT report (2008) scale during the lab processing for classifying the reproductive phase for anchovy and sardine, particularly for identifying mature/immature which are very relevant to stock assessment purposes, in order to obtain the L50 estimation. This scale allows reaching a higher accuracy since it has been developed specifically for small pelagics (indeterminate spawners).
- Since the environmental parameters are very important for small pelagic fish, a minimum of 3 CTD stations should be held per transect or a grid of stations with density adequate to describe the oceanography of the surveyed area. Temperature and salinity are the hydrographic parameters that should be measured in the entire water column at each station.
- Furthermore, the need for a common database has been concluded. The need for collaboration with the respective surveys in the Atlantic region (e.g. Bay of Biscay) has also been discussed and agreed. In the framework of this collaboration, information and experience will be exchanged.

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Database

In the framework of the RDBFIS I, II & III projects as well as within MEDIAS workshops, a common database design has been decided for all MEDIAS surveys. The SC of the MEDIAS coordination meeting agreed to use this database and the associated algorithms to store, inspect, evaluate acoustic, biological and hydrological data collected within the acoustic surveys in the Mediterranean Sea as well as implement any necessary biomass estimates using the agreed RDBFIS format. The MEDIAS database is comprised of 3 modules: Acoustics (6 tables), Pelagic Trawl (4 tables) and CTD (3 tables); the corresponding tables in the relevant schemas were all inspected and adapted (wherever needed) by the group, field by field. Pelagic trawl surveys carried out under DCF in Bulgarian and Romanian Black Sea waters were also included. The database can be accessed via the following link: <https://medbs-rdbfis.hcmr.gr/>. The detailed table structure and validation rules are available in Annex VI.

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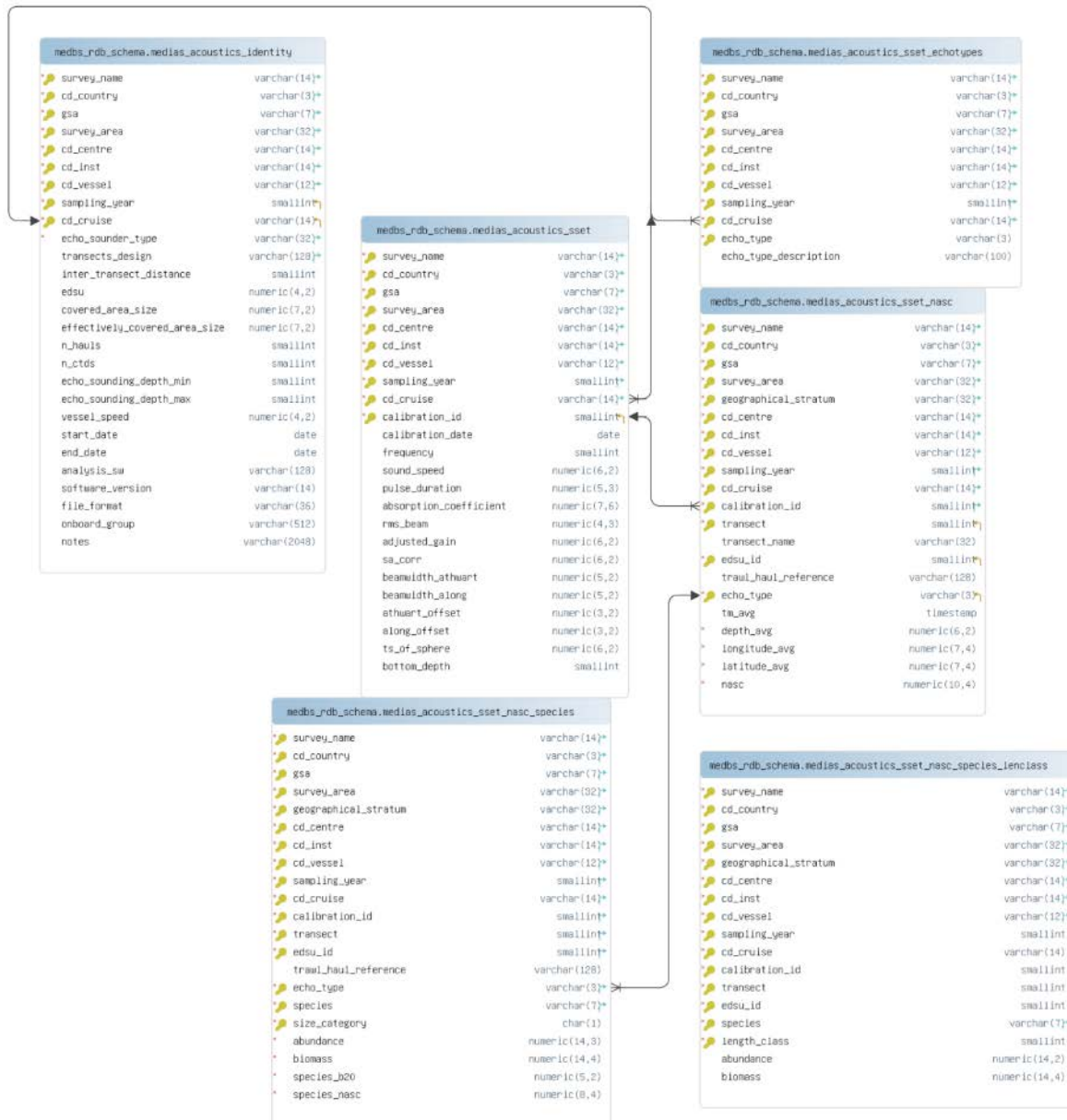
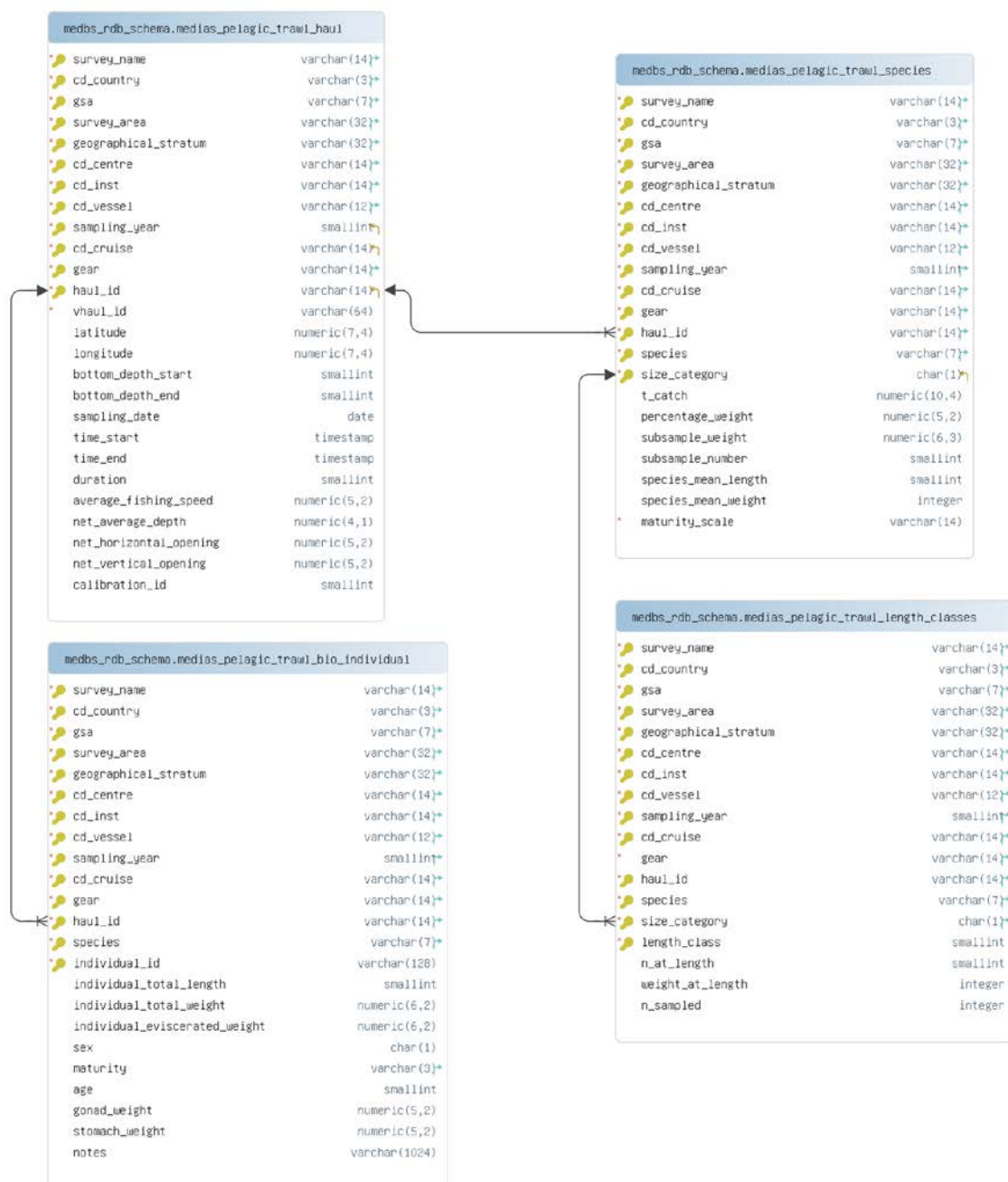


Figure 2. Database schema diagram for MEDIAS acoustic tables.

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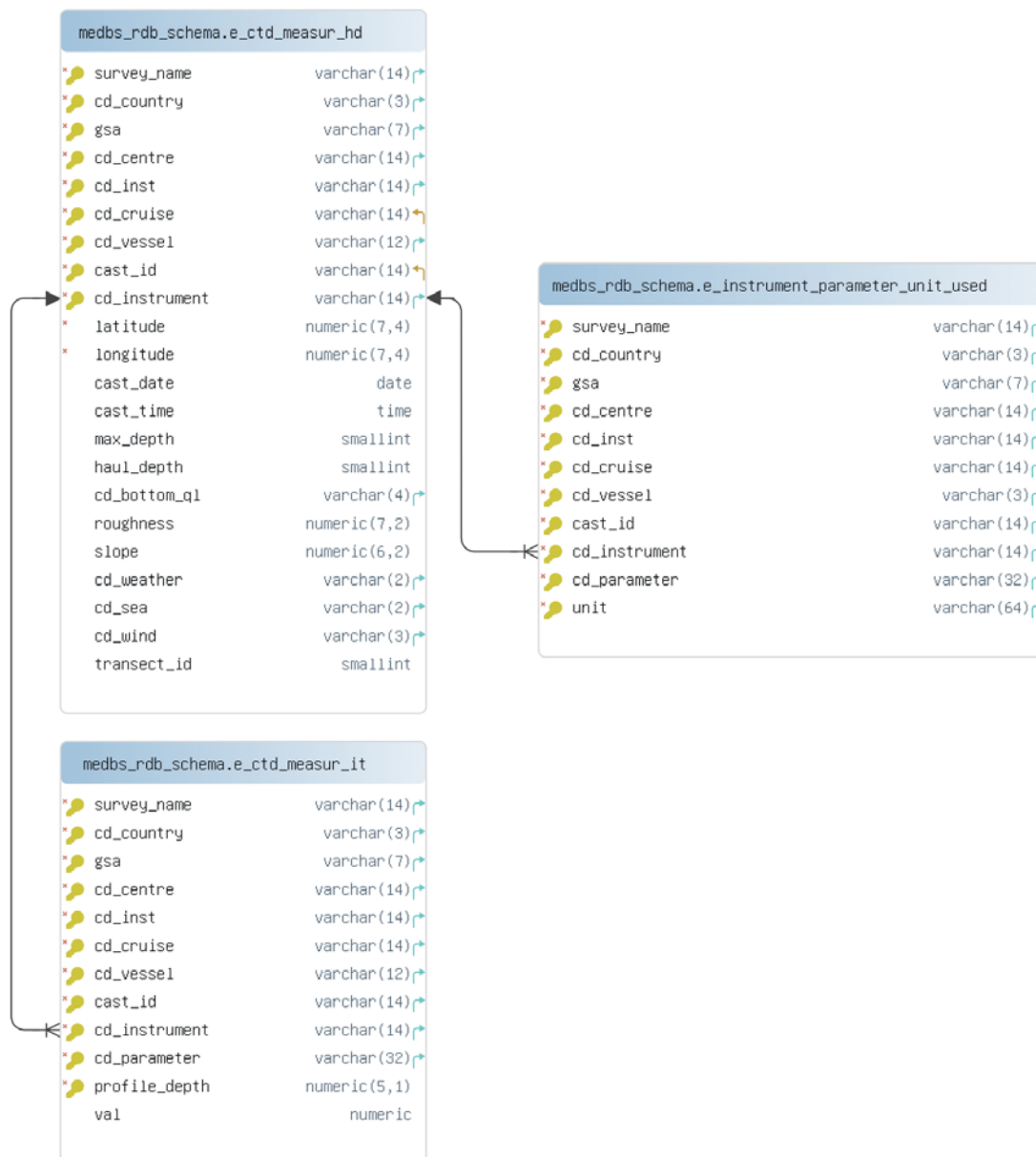


Figure 4. Database schema diagram for MEDIAS CTD sampling tables.

Ecosystem indices related to acoustic surveys

The abilities of currently applied MEDIAS surveys to contribute towards an ecosystem-based management approach in relation to the current and the future DCF requirements was extensively discussed by the MEDIAS partners. In the following Table 4 the ecosystem indices that can derive from acoustic surveys (based on data regularly collected and analyzed) are reported.

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Table 4. Ecosystem indices that could be derived from acoustic surveys.

Good Environmental Status indices	Spatial/temporal strata	Spatial strata	GSA			
			Acoustic survey			
		Time periods	Season (Summer/Autumn depending on the area)			
	Taxonomic levels	Community	Pelagic fish (Species composition, occurrence in pelagic hauls)			
		Target Species	Adult	Anchovy		
				Sardine (for Mediterranean)		
				Sprat (for Black Sea)		
	Indices	Biodiversity	Species	Population size	Acoustic estimates	Total biomass & abundance estimates for target species
						Estimation error (CV) (i.e. as agreed based on a common estimation procedure, see ToRs)
				Population condition	Biomass &	Anchovy, Sardine, Sprat (Black Sea)
					Recruitment index	Sardine (i.e. Number at Age 0 of the population based on summer surveys)
				Habitats		

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						Temperature (i.e. SST: average at 10m, estimated as the interpolated mean value for the whole area)
				Habitat condition	Hydrological condition	Salinity (i.e. SSS: average at 10m, estimated as the interpolated mean value for the whole area))
		Community	Fish Community condition	Community	Total pelagic fish NASC	
				Species composition (i.e. percentage in terms of weight of pelagic trawls per hour)*		
		Age and size distribution	95% percentile of the population length distribution for the target species			
			Proportion of fish larger than L50 (length at first maturity estimated based on collected data or defined based on literature)			

Tables for DCF Data Call

The common templates (e.g. <https://datacollection.jrc.ec.europa.eu/dc/medbs/templates>), currently used for submission of MEDIAS results to Data Calls by MS, provided by JRC, are the following:

Abundance (in numbers per species per sex and length class)	 <u>xxx_Abundance</u>
Biomass (biomass per species per sex and length class)	 <u>xxx_Biomass</u>
Abundance biomass (abundance and biomass per species per sex and age	

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class)	xxx_Abund_Biom
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Common format for presentations at MEDIAS Coordination Meetings

- GSA number and general information on the GSA; map and general information on the acoustic survey
- Type of echosounder and frequencies in use
- Calibration results
- Survey design
- Number of nautical miles effectively processed for biomass estimation
- Biomass estimation results in tons by GSA and graphs in terms of biomass density (time series of average t/nm^2)
- Headline, footrope length of the pelagic net, sidelines dimensions, mesh size
- CTD stations map
- Biomass per length classes (0.5 cm) and per age classes in tons
- Graphs of Age Length Keys (in %, with total No. otoliths, by length classes)
- Maps of anchovy and sardine spatial distribution (proportional maps of NASC values - bubble plots)
- Map with pie charts reporting % in weight of anchovy, sardine and other species.

Other results of interest from acoustic surveys could be also reported but they are not mandatory.

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Data accessibility

As the MEDIAS Steering Committee acknowledges the need for MEDIAS data and output accessibility it was agreed to:

- 1) MEDIAS data need to be available after March 31 of the next year (e.g. N+1 March 31, where N is year of the survey), and MS and end-users are recommended to respect this date (Recommendation No. 12 from RCM Med&BS meeting in 2016);
- 2) MEDIAS data need to be available after May 31 of the next year for RDBIFIS (e.g. N+1 May 31, where N is year of the survey) following the SC annual meeting, and MS and end-users are recommended to respect this date
- 3) MEDIAS results per survey are presented in the Annual MEDIAS report which is freely available in the MEDIAS website;
- 4) Overall biomass and abundance estimates are available through the DCF Data Call;
- 5) Include annual distribution maps of NASC per species along with the respective metadata information in a GEOportal (<https://sextant.ifremer.fr/eng/Data/Catalogue#/metadata/7c4c6bfe-15a8-496b-8778-d8ccb829b1f>).

Detailed data per EDSU could be available to third parties through the GEOportal. The third party should send a request and present to the Steering Committee the type of data requested, the

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purpose for which data are needed and exchange ideas for collaboration.

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Summary table of the common protocol for the MEDiterranean International Acoustic Survey (MEDIAS).

Survey Identity	
Geographic area	Should be reported
GSA area	Should be reported
Size of Area to be covered (NM ² / km ²)	Should be reported
Days at sea	Should be reported
Vessel	Should be reported
Vessel length	Should be reported
Vessel HP	Should be reported
Period of survey	Should be reported
Echo sounder parameters	
Echo sounder	Split beam
Frequency for assessment (kHz)	38
Complementary frequencies (kHz)	18, 70, 120, 200, 333 kHz depending on availability.
Pulse duration (ms)	0.5 or 1 ms, should be reported
Beam Angles (degrees) Athw. Beam Angle, Alog. Beam Angle	Should be reported
Ping rate	Maximum depending on depth
Calibration (No per survey)	A calibration report should be given
Threshold for acquisition (dB)	-80
Threshold for assessment (dB)	-70 to -60 (reported)
Survey design	
Transects design	Perpendicular to the coastline/bathymetry, otherwise depending on topography The survey design according to the MEDIAS conclusion for each area and should be reported.

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Inter-transect distance (NM)	Max ≤ 12 NM. The inter-transect distance should be according to the MEDIAS conclusion for each area and should be reported
Time of day for acoustic sampling	Day time. Otherwise, in cases of time limitation and if echo allocation into species does not depend on school shape identification (in this case justification of the accuracy of results will be presented)
EDSU (nm)	1 NM
Distance from the coast according to the Bottom depth (min, m)	Bottom depth should whenever this is possible reach the 10 m isobath
Echo sounding depth (min, m)	Depending on the draught of RV. Should be reported
Echo sounding depth (max, m) recording.	200 m
Vessel speed	8-10 knots
Software for analysis	Movies and/or Echoview
File format	*.hac
Inter – transect	Acoustic energy in the inter-transect track will not be taken into account
Applied TS (dB)	Sardine: -72.6 dB, See also handbook Other species: Keep historical TS equations.
Echo partitioning into species	Echo trace classification based on echogram visual scrutinisation Direct allocation and allocation on account of representative fishing station
Abundance estimates	
Abundance indices estimated	Total fish NASC per EDSU Anchovy, Sardine NASC per EDSU

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	Anchovy, Sardine Biomass per EDSU Anchovy, Sardine Numbers per EDSU Anchovy, Sardine Number/age and per length class Anchovy, Sardine Biomass/age and per length class
Maps and charts	Point maps of total fish NASC Point maps of target species in NASC/mile; biomass / mile. Catch compositions of the hauls, pies charts indicating biomass per species
Fish sampling and haul allocation	
Target species	Anchovy, Sardine
Other species	Biological data for all species in the pelagic community: Length-Weight relationships; Length distribution.
Fishing gear, codend mesh size	Pelagic trawl, Codend and trawl characteristics should be reported. Max Codend mesh size = 24 mm (side of mesh = 12 mm).
Vertical opening of the pelagic trawl	Should be reported
Netsounder used	Should be reported
Duration of haul	Minimum 30 min for unknown echoes
Time of sampling	Both daytime and night time biological samples from the same survey will be used.
Vessel speed during fishing	3.5 – 4.5 knots
Sampling intensity, no of hauls	The total number of hauls has to be adequate to: ensure identification of echo traces; obtain length structure of the population;

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	obtain species composition; get biological samples.
Method for haul allocation	Should be reported along with the map of hauls allocation
Biological and oceanographic parameters	
Length	All species: Total length (TL), Length frequency distribution (0.5 cm)
Age readings, ALK	Sardine, Anchovy: Mean TL at age Sample sizes according to the new DCF.
Length - Weight	All pelagic species
Oceanographic. Parameter (CTD)	Minimum 3 CTD per transect or grid of stations with density adequate to describe the oceanography of the surveyed area. Minimum variables: T, S

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Annex IV - MEDIAS group proposals:

1) Mesozooplankton sampling synoptic with acoustic survey

The MEDIAS Steering Committee discussed in many occasions about the importance to add a sampling on zooplankton to the already foreseen MEDIAS routine activities at sea, and finally agreed to propose that this research topic could be incorporated into the DCF for what concerns acoustic surveys. The reasons for this proposal are numerous. First of all, by knowing plankton abundance it is possible to have an index of productivity, and thus prey availability, that is important in the study of small pelagic fish abundance over the years and of their spatial distribution; this ecosystem indicator could also be important in the Marine Strategy Framework Directive.

Another important element is given by the fact that the sampling activity on plankton would produce a ground truth of some targets in the acoustic data, so that, during the acoustic processing, these targets could be discarded with a higher degree of certainty, while separating the small pelagic fish echoes from unwanted plankton echoes. The accuracy of this process could be further enhanced through the knowledge of the kind of planktonic organisms that are prevalent in a certain area, derived from sample collection by means of the plankton net, due to the fact that different planktonic organisms for anatomic and physiologic characteristics give different responses in multifrequency during the acoustic survey.

The analysis on plankton can also give information on the ichthyoplankton fraction; in this way a deeper knowledge on spawning (from collected eggs) and nursery areas (from collected larvae), at least for anchovy (*Engraulis encrasicolus*), given the survey period, could be gained. This fact would potentially allow the possibility to explore new management scenarios in the Mediterranean Sea, eventually based on local closures in correspondence of spawning and nursery areas.

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The analysis on plankton can also give additional information on the pelagic ecosystem structure and function. The knowledge on zooplankton component in pelagic ecosystem is particularly important because it represents a link between the lowest trophic level (i.e. primary production - phytoplankton) and higher trophic levels (i.e. fish) in the marine food web. Such improved knowledge on marine ecosystem can be considered as necessary precondition in applying ecosystem-based management (EBM) in the future, in line with the new CFP.

This proposal concerns the MEDIAS surveys that are held along the Iberian coast (GSA 1 and 6) carried out by IEO (Spain), Gulf of Lion (GSA 7) by IFREMER (France), Sicily Channel (GSA 16) by CNR-IAS (Italy), western Adriatic Sea (GSA 17 and 18) by CNR-IRBIM (Italy), eastern Adriatic Sea (GSA 17) by IOR (Croatia) and eastern Ionian Sea and Aegean Sea (GSA 20 and 22) by HCMR (Greece). The proposal also concerns the acoustic survey carried out by CNR-IAS (Italy) in the Tyrrhenian and Ligurian seas (GSAs 9 and 10), that are part of the MEDIAS since 2017. All these surveys are conducted in the period June-September.

A proper number of stations (depending on transect length) could be performed along dedicated transects in order to collect information on mesozooplankton with an appropriate resolution.

A proper financial support is needed in order to plan and perform this kind of activity, both in the field and in the laboratory. Moreover, there is the need to buy specific staff such as plankton nets, bottles, laboratory staff for the preservation and the analysis of the samples, etc.

2) Intercalibration exercise

An intercalibration exercise involving all the MEDIAS groups is proposed. One of the MEDIAS study areas could be selected to host the intercalibration and all the involved research vessels, together with personnel

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and equipment in use during acoustic surveys should converge there. The procedure to conduct the intercalibration could be the one described in Simmonds and Mac Lennan (2005). Due to the fact that there are more than two vessels operating in MEDIAS surveys, the calibration should proceed in pair (two vessels at a time) conducting more trials.

3) Reference

Simmonds J., MacLennan D. 2005. Fisheries Acoustics: Theory and Practice. (2nd Edition) Blackwell Publishing Ltd., 437 p.

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AnnexV Updated Table with changes in MEDIAS surveys

The Steering Committee decided to provide this document in the form of a table listing all the changes that have taken place in the surveys over time. The information compiled by the various teams is presented in the table 3.7.1 below.

Table 1. Summary table of changes in MEDIAS surveys over time

Year	GSA	Change	Duration of change	Reason	Possible impact in term of biomass estimates
2016	GSA06	Interradial distance has been increased to 8nmi in narrow continental shelf area (removing 14 tracks)	Permanent	Standardization of inter-track distance between narrow continental shelf and wide platform areas	Sensitivity analysis shows no effect on the estimates
2009	GSA06	Survey started in May instead of mid-June	One year	Vessel availability calendar	Very low
2020	GSA07	Change of period of the survey	One year	Delay due to the COVID19 pandemic	Increased contribution of juveniles of anchovy to total biomass
2024	GSA09	Change of period of the survey	One year	Delay accumulated due to bureaucratic procedures for renting the research vessel	Increased contribution of juveniles to small pelagics biomass
2024	GSA10	Change of period of the survey	One year	Delay accumulated due to bureaucratic procedures for renting the research vessel	Increased contribution of juveniles to small pelagics biomass
2024	GSA15	Change of period of the survey	One year	Delay accumulated due to bureaucratic procedures for renting the research vessel	Increased contribution of juveniles to small pelagics biomass
2025	GSA15	Use of a bottom trawl	One year	Research vessel availability	Patchy distribution of fish assemblages, low abundance along with the lower catchability of the vessel may result in increased uncertainty

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Year	GSA	Change	Duration of change	Reason	Possible impact in term of biomass estimates
2024	GSA16	Change of period of the survey	One year	Delay accumulated due to bureaucratic procedures for renting the research vessel	Increased contribution of juveniles to small pelagics biomass
2009	GSA17 West	Extension of two transects in central Adriatic Sea near the Pomo Pit (> 200 m)	Permanent	Better coverage of the area	Very low
2010	GSA17 West	Slight shift of two transects in the northern area of GSA 17	Permanent	Avoidance of military shooting range	Very low
2015	GSA17 West	Change in survey period from September to June-July	Permanent	Harmonization within the MEDIAS group	Unknown
2025	GSA17 East	Survey time change from September to June-July	Permanent	To standardize with the western part of the Adriatic	Possible lower estimates of anchovy juveniles/ increased abundance of sardine juveniles associated to lower sardine biomass.
2025	GSA17 East	Survey done partially (south part) with 2 ships, one collecting acoustic data, one collecting biological data	One year	Malfunction of fishing gear	Assume no impact
2024	GSA17 East	Survey done with 2 ships, one collecting acoustic data, one collecting biological data ; southern inner sea route simplified ; number of trawls reduced	One year	Malfunction of fishing gear	possible lower precision of estimated biomass

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Year	GSA	Change	Duration of change	Reason	Possible impact in term of biomass estimates
2023	GSA17 East	Echoview data processing team changed	Permanent	Change in project personnel	Possible effect on the assignment of echo traces into fish species, could affect time series. Nevertheless, harmonization with the MEDIAS group and especially with GSA17 west is enhanced to anticipate this effect.
2022	GSA17 East	Survey conducted in two parts, the second one later than usual	One year	Survey was prolonged due to malfunction on ship drive and weather, and combined with ship unavailability	low impact, decrease in number of juveniles
2008	GSA17&18	Parallel grid of transects adopted (previous design was zig-zag)	Permanent	Harmonization within the MEDIAS group; improvement of uncertainty estimate	Improvement of uncertainty estimate
2024	GSA17&18	Change in survey period from June-July to August-September	One year	Delay due to bureaucratic procedures for renting the research vessel	Increased contribution of juveniles to small pelagics biomass
2013	GSA22	Change of period of the survey (September)	One year	Due to research vessel unavailability	No significant impact on biomass estimates, higher abundance of small anchovy individuals
2018	GSA20	Change of period of the survey (November)	One year	Due to research vessel unavailability	No significant impact on biomass estimates
2023	GSA22	Change of period of the survey (August)	One year	Due to research vessel unavailability	No significant impact on biomass estimates, higher abundance of small anchovy individuals

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Year	GSA	Change	Duration of change	Reason	Possible impact in term of biomass estimates
2023	GSA22	Intertransect distance at 5 nm in the Thracian Sea	Depending on the density of sardine aggregations	Highly aggregated sardine distributions with subsequent low detection rate. Adapt the systematic sampling with shorter intertransect distance to improve the precision of sardine abundance estimates	Higher precision, no effect on the mean estimates
2024	GSA22	Intertransect distance at 5 nm in the Thracian Sea	Depending on the density of sardine aggregations	Highly aggregated sardine distributions with subsequent low detection rate. Adapt the systematic sampling with shorter intertransect distance to improve the precision of sardine abundance estimates	Higher precision, no effect on the mean estimates
2024	GSA22	The survey covered only Thracian Sea and Limnos plateau	One year	Due to research vessel unavailability	Underestimate of total biomass for anchovy and sardine
2025	GSA22	Intertransect distance at 5 nm in the Thracian Sea	Permanent	Highly aggregated sardine distributions with subsequent low detection rate. Adapt the systematic sampling with shorter intertransect distance to improve the precision of sardine abundance estimates	Higher precision, no effect on the mean estimates
2025	GSA29 (Romania)	Survey time change from June-July to September	One year	Due to vessel unavailability	

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Annex VI. Structure of MEDIAS database tables

Table I. Acoustic table structure and validation rules

#	Primary key	Field name	Data type	Description	Validation Scheme
Medias_acoustics_identity TABLE I					
1	Ö	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	Ö	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	Ö	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	Ö	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan-ITA-IAS, TyrLigSea-ITA-IAS)
5	Ö	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
6	Ö	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value

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7	Ö	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
8	Ö	sampling_year	int2	Sampling year	integer in range [2003, 2024]
9	Ö	cd_cruise	varchar(14)	Cruise code	any text up to 14 characters, not empty
10		echo_sounder_type	varchar(32)	Echo sounder type	any(BioSonics DT-X, ES38B, Simrad EK500, Simrad EK60, Simrad EK80, Simrad EK60, EK80)
11		transects_design	varchar(128)	Transects design	any(mixed, parallel, zig zag)
12		inter_transect_distance	int2	(optional) Inter-transect distance (NM), will be filled where transect is parallel/zig zag [-1 if not known]	integer in range [5, 12] or -1
13		edsu	numeric(4, 2)	EDSU: the Elementary Distance Sampling Unit used for acoustic integration (nmi). E.g. 1 = by 1 nmi, 0.54 by 0.54 nmi, etc.	number in range [0.1, 5]; allow up 2 digits after the decimal point
14		covered_area_size	numeric(7, 2)	Size of area to be covered (NM2/km2)	NM2 in range [100, 99999] with at maximum 2 digits after the decimal point
15		effectively_covered_area_size	numeric(7, 2)	Size of area effectively covered (NM2/km2)	NM2 in range [100, 99999] with at maximum 2 digits after the decimal point
16		n_hauls	int2	Number of hauls (auto filled)	integer in range [1, 999] or -1
17		n_ctds	int2	Number of CTDs (auto filled)	integer in range [1, 999] or -1
18		echo_sounding_depth_min	int2	Echo sounding depth (min, m), auto calculated from NASC	integer in range [10, 1500] or -1
19		echo_sounding_depth_max	int2	Echo sounding depth (max, m) recording, auto calculated from NASC	integer in range [10, 1500] or -1
20		vessel_speed	numeric(4, 2)	Speed of research vessel (kt) during acoustic sampling	number in range [5, 10] with at maximum 2 digits after the decimal point
21		start_date	date	Starting date of survey (dd/mm/yyyy) [is related to operational date ?] [auto filled]	date in the format dd/mm/yyyy; the year must be the same as the sampling year

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22	end_date	date	Ending date of survey (dd/mm/yyyy) [auto filled]	date in the format dd/mm/yyyy; the year must be the same as the sampling year
23	analysis_sw	varchar(128)	Software for analysis	any(Echoview, MOVIES3D, MOVIES)
24	software_version	varchar(14)	(optional) Software version [empty if not known]	any text up to 14 characters
25	file_format	varchar(36)	Acoustic data storage format. This can be 'raw' or 'hac' for current systems, and any of: 'raw', 'hac', 'ek5', 'BI500', 'ek6', 'dt4' for earlier systems.	any(raw, hac, ek5, ek6, dt4, BI500) or any combination separated by -
26	onboard_group	varchar(512)	(optional) Onboard group [empty if not known]	any text up to 512 characters
27	notes	varchar(2048)	(optional) Notes [or empty]	any text up to 2048 characters

Medias_acoustics_sset TABLE 2

1	✓	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	✓	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	✓	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	✓	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan-ITA-IAS, TyrLigSea-ITA-IAS)

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5	√	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
6	√	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
7	√	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
8	√	sampling_year	int2	Sampling year	integer in range [2003, 2024]
9	√	cd_cruise	varchar(14)	Cruise code	any text up to 14 characters, not empty
10	√	calibration_id	int2	The echosounder calibration identification code (e.g. 1, 2). Used to associate acoustic integration data in other tables with the specific instrument calibration applied during data collection & analysis.	integer in range [1, 10]
11		calibration_date	date	Calibration date (dd/mm/yyyy)	date in the format dd/mm/yyyy; the year must be the same as the sampling year
12		frequency	int2	Acoustic pulse frequency used for calibration and data acquisition (kHz). Typically 38 kHz for biomass surveys. Additional frequencies might be calibrated for auxiliary purposes during echogram scrutinization (e.g. echotrace identification and/or plankton filtering)	any(38, 70, 120, 200)
13		sound_speed	numeric(6, 2)	Value of the speed of sound (m/s) calculated during calibration	number in range [1400, 1600] with at maximum 2 digits after the decimal point
14		pulse_duration	numeric(5, 3)	Acoustic pulse duration used for calibration and data acquisition (ms), e.g. 1.024, 0.512	number in range [0, 2] with at maximum 3 digits after the decimal point
15		absorption_coefficient	numeric(7, 6)	Value of the acoustic absorption coefficient alpha (dB/m) calculated during calibration	number in range [0, 1] with at maximum 6 digits after the decimal point

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16	rms_beam	numeric(4, 3)	The root-mean-square (RMS) error (dB) between measurements taken during calibration, and the adjusted acoustic beam model, e.g. 0.02, 0.1	number in range [0, 1] with at maximum 3 digits after the decimal point
17	adjusted_gain	numeric(6, 2)	The adjusted transducer gain (dB) as a result of the calibration procedure	number in range [1, 9999] with at maximum 2 digits after the decimal point
18	sa_corr	numeric(6, 2)	Sa correction (dB). This value is estimated during calibration and represents the correction required to the Sv constant to harmonize the TS and NASC measurements	number in range [-2, 2] with at maximum 2 digits after the decimal point
19	beamwidth_athwart	numeric(5, 2)	The 3 dB beamwidth angle (deg) in the athwartship direction, as calculated during calibration, e.g. 6.8	number in range [5, 12] with at maximum 2 digits after the decimal point
20	beamwidth_along	numeric(5, 2)	The 3 dB beamwidth angle (deg) in the alongship direction, as calculated during calibration, e.g. 6.8	number in range [5, 12] with at maximum 2 digits after the decimal point
21	athwart_offset	numeric(3, 2)	The beam offset angle (deg) in the athwartship direction, as calculated during calibration, e.g. 0.1, 0.2	number in range [-1, 1] with at maximum 2 digits after the decimal point
22	along_offset	numeric(3, 2)	The beam offset angle (deg) in the alongship direction, as calculated during calibration, e.g. 0.1, 0.2	number in range [-1, 1] with at maximum 2 digits after the decimal point
23	ts_of_sphere	numeric(6, 2)	Target Strength (TS) of calibration sphere (dB re 1 m ²) at distance of 1 m, e.g. -33.5	number in range [-70, -20] with at maximum 2 digits after the decimal point
24	bottom_depth	int2	Sea bottom depth at the calibration location (m), e.g. 25	integer in range [5, 200]

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Medias_acoustics_sset_nasc TABLE 3

1	√	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	√	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)

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3	√	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	√	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan-ITA-IAS, TyrLigSea-ITA-IAS)
5	√	geographical_stratum	varchar(32)	Geographical stratum (area inside a GSA and survey area)	any(Gulf of Lion, Central Adriatic Sea, North Adriatic Sea, South Adriatic Sea, IOR, NA, SRGRC-AMVRAKIKOSG, SRGRC-CHALKIDIKIG, SRGRC-CORINTHIAKOSG, SRGRC-ETHASSOS, SRGRC-KERKIRAIKOSG, SRGRC-NEVOIKOS, SRGRC-NIONIAN, SRGRC-PATRAIKOSG, SRGRC-SARONIKOSG, SRGRC-SEVOIKOS, SRGRC-SIONIAN, SRGRC-THERMAIKOSG, SRGRC-WTHASSOS)
6	√	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
7	√	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
8	√	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
9	√	sampling_year	int2	Sampling year (yyyy)	integer in range [2003, 2024]
10	√	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters

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11	√	calibration_id	int2	The echosounder calibration identification code (e.g. 1, 2). Used to associate acoustic integration data in other tables with the specific instrument calibration applied during data collection & analysis.	integer in range [1, 10]
12	√	transect	int2	Transect ID	integer in range [1, 999]
13		transect_name	varchar(32)	(optional) Transect name [empty if not known]	string that is either empty or up to 32 characters
14	√	edsu_id	int2	Elementary Distance Sampling Unit: The EDSU interval index (unitless) within the transect as a result of deviding the total transect length by the EDSU, e.g. 1, 2, 3	integer in range [1, 2000]
15		trawl_haul_reference	varchar(128)	(optional) Trawl haul_id reference: [survey_name][cd_country][gsa][survey_area][geographical_stratum][cd_centre][cd_inst][cd_vessel][cd_cruise][calibration_id][vhaul_id] // see vhauls.pptx	string that is either empty or up to 128 characters
16	√	echo_type	varchar(3)	Echo type: detail description is needed; default value=E1)	any(E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E18, E19, E20)
17		tm_avg	timestamp	The date and time of the middle ping in the domain corresponding to the EDSU interval (dd/mm/yyyy hh:mi) - UNIVERSAL TIME	timestamp in the format dd/mm/yyyy hh:mi:ss
18		depth_avg	numeric(6, 2)	The average bottom depth in the domain corresponding to the EDSU interval as calculated by all interval pings (in m)	number in range [10, 1500] with at maximum 2 digits after the decimal point
19		longitude_avg	numeric(7, 4)	The longitude (in decimal degrees with 4 digits) of the middle ping in the domain corresponding to the EDSU interval	longitude in decimal degrees with at maximum 4 digits after the decimal point; accepted values [-5.5 - 35]
20		latitude_avg	numeric(7, 4)	The latitude (in decimal degrees with 4 digits) of the middle ping in the domain corresponding to the EDSU interval	latitude in decimal degrees with at maximum 4 digits after the decimal point; accepted values [34 - 45.70]

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21	nasc	numeric(10, 4)	The NASC corresponding to the acoustic backscatter characterized by echo type (m^2/nmi^2) within the EDSU interval	number ≥ 0 with a maximum 6 digits before the decimal point and at maximum 4 digits after the decimal point
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Medias_acoustics_sset_nasc_species TABLE 4

1	√	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	√	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	√	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	√	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan-ITA-IAS, TyrLigSea-ITA-IAS)
5	√	geographical_stratum	varchar(32)	Geographical stratum (area inside a GSA and survey area)	any(Gulf of Lion, Central Adriatic Sea, North Adriatic Sea, South Adriatic Sea, IOR, NA, SRGRC-AMVRAKIKOSG, SRGRC-CHALKIDIKIG, SRGRC-CORINTHIKOSG, SRGRC-ETHASSOS, SRGRC-KERKIRAIKOSG, SRGRC-NEVOIKOS, SRGRC-NIONIAN, SRGRC-PATRAIKOSG, SRGRC-SARONIKOSG, SRGRC-SEVOIKOS, SRGRC-SIONIAN, SRGRC-THERMAIKOSG, SRGRC-WTHASSOS)
6	√	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS,

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HCMR, IFREMER, IO-BAS,
IOR, JRC, NIMRD, FAO, ICES)

7	√	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
8	√	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
9	√	sampling_year	int2	Sampling year (yyyy)	integer in range [2003, 2024]
10	√	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	√	calibration_id	int2	The echosounder calibration identification code (e.g. 1, 2). Used to associate acoustic integration data in other tables with the specific instrument calibration applied during data collection & analysis.	integer in range [1, 10]
12	√	transect	int2	Transect ID	integer in range [1, 999]
13	√	edsu_id	int2	Elementary Distance Sampling Unit: The EDSU interval index (unitless) within the transect as a result of deviding the total transect length by the EDSU, e.g. 1, 2, 3	integer in range [1, 2000]
14		trawl_haul_reference	varchar(128)	(optional) Trawl haul_id reference: [survey_name][cd_country][gsa][survey_area][geographical_stratum][cd_centre][cd_inst][cd_vessel][cd_cruise][subset_id][vhaul_id] // see vhaults.pptx	string that is either empty or up to 128 characters
15	√	echo_type	varchar(3)	Echo type: detail description is needed; default value=E1)	any(E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E18, E19, E20)
16	√	species	varchar(7)	Species code: species list based on ASFIS FAO and WoRMS (for MEDIAS purposes)	any(BVQ, ATB, WHB, ANE, PIL, JAX, HMM, JAA, HOM, BOG, SAA, SAE, VMA, MAC, MAZ, SPC, PIC, SPR)
17	√	size_category	char(1)	Size category: S=small, L=large ,C=combine // default value='C'	any(S, L, C)

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18	abundance	numeric(14,3)	The number of fish for the species corresponding to the EDSU interval	match real numbers >0, ensuring up to 11 digits before the decimal point and up to 3 digits after the decimal point-numeric(14,3)
19	biomass	numeric(14,4)	The total weight of fish for the species corresponding to the EDSU interval (in Kg)	real numbers >0, ensuring up to 10 digits before the decimal point and up to 4 digits after the decimal point-numeric(14,4)
20	species_b20	numeric(5, 2)	The species TS (dB) for the EDSU interval. This is a result of the average species fish length attributed to the EDSU interval (from biological sampling) and the L-TS function used (the description need to be revised)	real numbers between -90 and -60, inclusive, with at maximum 2 digits after the decimal point
21	species_nasc	numeric(8,4)	The NASC corresponding to backscatter attributed species within the EDSU interval (m^2/nmi^2)	real numbers ≥ 0 with at maximum 4 digits before the decimal point and at maximum 4 digits are allowed after the decimal point-numeric(8,4)

medias_acoustics_sset_nasc_species_lenclass TABLE 5

1	√	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	√	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	√	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	√	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS,

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SicChan-ITA-IAS, TyrLigSea-
ITA-IAS)

5	√	geographical_stratum	varchar(32)	Geographical stratum (area inside a GSA and survey area)	any(Gulf of Lion, Central Adriatic Sea, North Adriatic Sea, South Adriatic Sea, IOR, NA, SRGRC-AMVRAKIKOSG, SRGRC-CHALKIDIKIG, SRGRC-CORINTHIAKOSG, SRGRC-ETHASSOS, SRGRC-KERKIRAIKOSG, SRGRC-NEVOIKOS, SRGRC-NIONIAN, SRGRC-PATRAIKOSG, SRGRC-SARONIKOSG, SRGRC-SEVOIKOS, SRGRC-SIONIAN, SRGRC-THERMAIKOSG, SRGRC-WTHASSOS)
6	√	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
7	√	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
8	√	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
9	√	sampling_year	int2	Sampling year	integer in range [2003, 2024]
10	√	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	√	calibration_id	int2	The echosounder calibration identification code (e.g. 1, 2). Used to associate acoustic integration data in other tables with the specific instrument calibration applied during data collection & analysis.	integer in range [1, 10]
12	√	transect	int2	Transect ID	integer in range [1, 999]
13	√	edsu_id	int2	Elementary Distance Sampling Unit: The EDSU interval index (unitless) within the transect as a result of deviding the total	integer in range [1, 2000]

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transect length by the EDSU,
e.g. 1, 2, 3

14	√	species	varchar(7)	Species code: species list based on ASFIS FAO and WoRMS (for MEDIAS purposes)	any(BVQ, ATB, WHB, ANE, PIL, JAX, HMM, JAA, HOM, BOG, SAA, SAE, VMA, MAC, MAZ, SPC, PIC, SPR)
15	√	length_class	int2	Length class (mm)	BVQ in [2,60], ATB in [2,15], WHB in [2,450], ANE in [2, 240], PIL in [2, 240], JAX in [2, 550], HMM in [2,550], JAA in [2,440], HOM in [2,500], BOG in [2,400], SAA in [2,300], SAE in [2,300], VMA in [2,450], MAC in [2,450], MAZ in [2,450], SPC in [2,220], PIC in [2,220], SPR in [2,220]
16		abundance	numeric(14,2)	The number of fish for species at length class, corresponding to the EDSU interval	number >=0, up to 12 digits before the decimal point and up to 2 digits after the decimal point
17		biomass	numeric(14,4)	The total weight of fish for cd_species at length_class corresponding to the EDSU interval (in Kg)	number >=0 with a maximum total length of 14, where at maximum 4 digits are allowed after the decimal point

Medias_acoustics_sset_echotypes TABLE 6

1	√	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	√	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	√	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)

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4	√	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan-ITA-IAS, TyrLigSea-ITA-IAS)
6	√	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
7	√	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
8	√	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
9	√	sampling_year	int2	Sampling year (yyyy)	integer in range [2003, 2024]
10	√	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
12	√	echo_type	varchar(3)	Echo type	any(E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E18, E19, E20)
13		echo_type_description	varchar(100)	Echo type description	string of up to 100 characters

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Table 2. Trawl table structure and validation rules

#	Primary key	Field name	Data type	Description	Validation Scheme
medias_pelagic_trawl_haul TABLE I					
1	Ö	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	Ö	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)

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3	Ö	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
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4	Ö	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea- SVN-FRIS, AegSea-GRC- IMBRIW, BSea-BGR-IO- BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan- ITA-IAS, TyrLigSea-ITA-IAS)
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5	Ö	geographical_ stratum	varchar(32)	Geographical stratum (area inside a GSA and survey area)	any(Gulf of Lion, Central Adriatic Sea, North Adriatic Sea, South Adriatic Sea, IOR, NA, SRGRC- AMVRAKIKOSG, SRGRC- CHALKIDIKIG, SRGRC- CORINTHIKOSG, SRGRC-ETHASSOS, SRGRC-KERKIRAIKOSG, SRGRC-NEVOIKOS, SRGRC-NIONIAN, SRGRC- PATRAIKOSG, SRGRC- SARONIKOSG, SRGRC- SEVOIKOS, SRGRC- SIONIAN, SRGRC- THERMAIKOSG, SRGRC- WTHASSOS)
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6	Ö	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
7	Ö	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
8	Ö	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
9	Ö	sampling_year	int2	Sampling year	integer in range [2003, 2024]
10	Ö	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	Ö	gear	varchar(14)	Gear code	any(PIMO4, 4FFI76, 4PMI59, ATGM47-43, OTM)
12	Ö	haul_id	varchar(14)	Haul ID	non-empty string of up to 14 characters
13		vhaul_id	varchar(64)	Virtual haul ID - ARIS will provide detail description (refer to line 100 for an example of how vhaul_id could be generated)	equal to V+haul_id or combination of more than one haul_id separated by the symbol (-); e.g. V15, V10-V20
14		latitude	numeric(7, 4)	Latitude (decimal degrees with 4 digits)	latitude in decimal degrees with at maximum 4 digits after the decimal point; accepted values [34 - 45.70]
15		longitude	numeric(7, 4)	Longitude (decimal degrees with 4 digits)	longitude in decimal degrees with at maximum 4 digits after the decimal point; accepted values [-5.5 - 35]
16		bottom_depth_start	int2	Bottom depth start (m)	integer in range [10, 1500]
17		bottom_depth_end	int2	Bottom depth end (m)	integer in range [10, 1500]
18		sampling_date	date	Sampling date (dd/mm/yyyy)	date in the format dd/mm/yyyy

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19	time_start	timestamp	Time start (when the net is operational) (dd/mm/yyyy hh:mi) - UNIVERSAL TIME	time stamp in the format dd/mm/yyyy hh:mi:ss
20	time_end	timestamp	Time end (when the net is hauling) (dd/mm/yyyy hh:mi) - UNIVERSAL TIME	time stamp in the format dd/mm/yyyy hh:mi:ss
21	duration	int2	Duration (hauling duration in minutes)	integer in range [10, 180]
22	average_fishing_speed	numeric(5, 2)	Average fishing speed (knots)	number in the range [1.5, 7] with at maximum 2 digits after the decimal point
23	net_average_depth	numeric(4, 1)	(optional) Net average depth (m) [-1 if not known]	number in the range [5, 800] with at maximum 1 digit after the decimal point or -1
24	net_horizontal_opening	numeric(5, 2)	(optional) Average values of Net horizontal opening (m) [-1 if not known]	number in the range [5, 35] with at maximum 2 digit after the decimal point or -1
25	net_vertical_opening	numeric(5, 2)	(optional) Average values of Net vertical opening (m) [-1 if not known]	number in the range [1, 25] with at maximum 2 digit after the decimal point or -1
26	calibration_id	int2	(optional) The echosounder calibration identification code (e.g. 1, 2). Used to associate acoustic integration data in other tables with the specific instrument calibration applied during data collection & analysis. [-1 if not known]	integer in range [1, 999] or -1

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medias_pelagic_trawl_species TABLE 2: all species					
1	Ö	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	Ö	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	Ö	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14,

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					GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	Ö	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan-ITA-IAS, TyrLigSea-ITA-IAS)
5	Ö	geographical_stratum	varchar(32)	Geographical stratum (area inside a GSA and survey area)	any(Gulf of Lion, Central Adriatic Sea, North Adriatic Sea, South Adriatic Sea, IOR, NA, SRGRC-AMVRAKIKOSG, SRGRC-CHALKIDIKIG, SRGRC-CORINTHIAKOSG, SRGRC-ETHASSOS, SRGRC-KERKIRAIKOSG, SRGRC-NEVOIKOS, SRGRC-NIONIAN, SRGRC-PATRAIKOSG, SRGRC-SARONIKOSG, SRGRC-SEVOIKOS, SRGRC-SIONIAN, SRGRC-THERMAIKOSG, SRGRC-WTHASSOS)
6	Ö	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
7	Ö	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
8	Ö	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
9	Ö	sampling_year	int2	Sampling year	integer in range [2003, 2024]

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10	Ö	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	Ö	gear	varchar(14)	Gear code	any(PIMO4, 4FFI76, 4PMI59, ATGM47-43, OTM)
12	Ö	haul_id	varchar(14)	Haul ID	non-empty string of up to 14 characters
13	Ö	species	varchar(7)	Species code: species list based on ASFIS FAO and WoRMS (for MEDIAS purposes)	any species included in the MEDIAS species list
14	Ö	size_category	char(1)	Size category: S=small, L=large ,C=combine // default value='C'	any(S, L, C)
15		t_catch	numeric(10, 4)	Species Catch (Kg)	number > 0 with a maximum total length of 10, where at maximum 4 digits are allowed after the decimal point
16		percentage_weight	numeric(10, 7)	Percentage weight (total weight % of species in the haul)	Real numbers >0 and <=100 where at maximum 7 digits are allowed after the decimal point
17		subsample_weight	numeric(6, 3)	(Optional) Subsample weight (Kg) [-1 if not available]	Real numbers > 0 have at most 3 digits before and 3 digits after the decimal point or exactly -1
18		subsample_number	int2	(Optional) Subsample number [-1 if not available]	integer 1 to 1000 including -1
19		species_mean_length	int2	Species mean length (mm)	matches integers between 1 and 3000; specify length interval per species or -1 (e.g. in case for jellyfish)
20		species_mean_weight	int2	Species mean weight (g)	integer greater than zero or -1 (e.g. in case for jellyfish)
21		maturity_scale	varchar(14)	Maturity scale (ICES WKSPMAT, MEDITS)	any(ICES WKSPMAT, MEDITS)

medias_pelagic_trawl_length_classes TABLE 3: only small pelagic species

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1	Ö	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	Ö	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	Ö	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	Ö	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan-ITA-IAS, TyrLigSea-ITA-IAS)
5	Ö	geographical_stratum	varchar(32)	Geographical stratum (area inside a GSA and survey area)	any(Gulf of Lion, Central Adriatic Sea, North Adriatic Sea, South Adriatic Sea, IOR, NA, SRGRC-AMVRAKIKOSG, SRGRC-CHALKIDIKIG, SRGRC-CORINTHIKOSG, SRGRC-ETHASSOS, SRGRC-KERKIRAIKOSG, SRGRC-NEVOIKOS, SRGRC-NIONIAN, SRGRC-PATRAIKOSG, SRGRC-SARONIKOSG, SRGRC-SEVOIKOS, SRGRC-SIONIAN, SRGRC-THERMAIKOSG, SRGRC-WTHASSOS)
6	Ö	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)

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7	Ö	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
8	Ö	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
9	Ö	sampling_year	int2	Sampling year	integer in range [2003, 2024]
10	Ö	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	Ö	gear	varchar(14)	Gear code	any(PIMO4, 4FFI76, 4PMI59, ATGM47-43, OTM)
12	Ö	haul_id	varchar(14)	Haul ID	non-empty string of up to 14 characters
13	Ö	species	varchar(7)	Species code: species list based on ASFIS FAO and WoRMS (for MEDIAS purposes)	any species included in the MEDIAS species list
14	Ö	size_category	char(1)	Size category: S=small, L=large ,C=combine // default value='C'	any(S, L, C)
15	Ö	length_class	int2	Length class (mm) // include in the consistency check the length interval of S, L (take into consideration the field 19 of table 2)	integer in range [10, 3000]
16		n_at_length	int2	Number at length (estimated n of individuals at length class)	integer >0
17		weight_at_length	int2	Weight at length (estimated by haul) (g)	integer in range [1,500000] or -1 (e.g. in case for jellyfish)
18		n_sampled	int2	Number sampled (N of individuals measured)	integer >0 or -1

medias_pelagic_trawl_bio_individual TABLE 4: only small pelagic species

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1	Ö	survey_name	varchar(14)	Survey name (e.g. MEDIAS)	any(MEDIAS)
2	Ö	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	Ö	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	Ö	survey_area	varchar(32)	Survey area (may extend more than one GSA, e.g. Iberian coast)	any(AdrSea-HRV-IOR, AdrSea-ITA-IRBIM, AdrSea-SVN-FRIS, AegSea-GRC-IMBRIW, BSea-BGR-IO-BAS, BSea-ROU-NIMRD, ElonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS, SicChan-ITA-IAS, TyrLigSea-ITA-IAS)
5	Ö	geographical_stratum	varchar(32)	Geographical stratum (area inside a GSA and survey area)	any(Gulf of Lion, Central Adriatic Sea, North Adriatic Sea, South Adriatic Sea, IOR, NA, SRGRC-AMVRAKIKOSG, SRGRC-CHALKIDIKIG, SRGRC-CORINTHIKOSG, SRGRC-ETHASSOS, SRGRC-KERKIRAIKOSG, SRGRC-NEVOIKOS, SRGRC-NIONIAN, SRGRC-PATRAIKOSG, SRGRC-SARONIKOSG, SRGRC-SEVOIKOS, SRGRC-SIONIAN, SRGRC-THERMAIKOSG, SRGRC-WTHASSOS)
6	Ö	cd_centre	varchar(14)	Research center code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)

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7	Ö	cd_inst	varchar(14)	Research institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
8	Ö	cd_vessel	varchar(12)	Vessel code	any(BIO, EUR, PHI, AEG, DAL, MIO)
9	Ö	sampling_year	int2	Sampling year	integer in range [2003, 2024]
10	Ö	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	Ö	gear	varchar(14)	Gear code	any(PIMO4, 4FFI76, 4PMI59, ATGM47-43, OTM)
12	Ö	haul_id	varchar(14)	Haul ID	non-empty string of up to 14 characters
13	Ö	species	varchar(3)	Species code according to ASFIS FAO	any species included in the MEDIAS species list
14	Ö	individual_id	varchar(128)	Unique ID in database - [Survey name] [Country][GSA] [Survey area] [Geo Stratum] [Centre] [Institute] [Vessel] [Cruise] [Haul][Species][Stage][Sex][Length] [individual number] provide better description	non-empty string of up to 128 characters
15		individual_total_length	int2	Individual total length (mm)	integer in range [5, 1000]
16		individual_total_weight	numeric(6,2)	Individual total weight (g)	match real numbers greater than 0 with at most 4 digits before the decimal point and at most 2 digits after the decimal point or -1
17		individual_eviscerated_weight	numeric(6,2)	(optional) Individual eviscerated weight (g) [-1 if not available]	match real numbers greater than 0 with at most 4 digits before the decimal point and at most 2 digits after the decimal point, or -1

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18	sex	bpchar(1)	(optional) Sex [empty if not available] - , columnDefinition = "bpchar(1)"	any(M, F, U) or empty
19	maturity	varchar(3)	(optional) Maturity stage [empty if not available]	any(I, II, III, IV, V, VI, 1, 2, 3, 4, 5, 6) or empty
20	age	int2	(optional) Age [-1 if not available]	integer in range [0, 15] or -1
21	gonad_weight	numeric(5,2)	(optional) Gonad weight (g) [-1 if not available]	match real numbers greater than 0 with at most 3 digits before the decimal point and at most 2 digits after the decimal point, or -1
22	stomach_weight	numeric(5,2)	(optional) Stomach weight (g) [-1 if not available]	match real numbers greater than 0 with at most 3 digits before the decimal point and at most 2 digits after the decimal point, or -1
23	notes	varchar(1024)	(optional) Notes [or empty]	free text up to 1014 characters

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Table 3. CTD table structure and validation rules

#	Primary key	Field name	Data type	Description	Validation Scheme
e_ctd_measur_hd (data by cast) TABLE 1					
1	√	survey_name	varchar(14)	Survey name (e.g. MEDIAS, MEDITS)	any(MEDIAS)
2	√	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	√	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)

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4	√	cd_centre	varchar(14)	Centre code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
5	√	cd_inst	varchar(14)	Institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
6	√	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
7	√	cd_vessel	varchar(12)	Vessel code	any(CDS, BIO, EUR, PHI, AEG, DAL, MIO)
8	√	cast_id	varchar(14)	Cast ID	non-empty string of up to 14 characters
9	√	cd_instrument	varchar(14)	Instrument code	any(CTDSBE19, CTDSBE19p, CTDSBE25, CTDSBE9)
10		latitude	numeric(7, 4)	Latitude (decimal degrees with 4 digits)	latitude in decimal degrees with at maximum 4 digits after the decimal point; accepted values [34 - 45.70]
11		longitude	numeric(7, 4)	Longitude (decimal degrees with 4 digits)	longitude in decimal degrees with at maximum 4 digits after the decimal point; accepted values [- 5.5 - 35]
12		cast_date	date	Date (dd/mm/yyyy)	date in the format dd/mm/yyyy
13		cast_time	time	Shooting time (hh:mi)	time in the format hh:mi
14		max_depth	int2	Maximum depth of the cast (to be auto filled by the profile table) (m)	Integers in range(10,1500) or -1
15		haul_depth	int2	Haul depth (m)	integer in the range [10,1500]
16		cd_bottom_ql	varchar(4)	(optional) Bottom type	any(Br, Cb, Co, Cy, G, Kts, M, NK, P, ReBn, Rk, S, SaMu, Sh, Si, St, SU, SWT, TMW, Tr, TS, Wd, Wd2, WdT, WS) or empty
17		roughness	numeric(7, 2)	(optional) Roughness	numeric value with no more than two decimal places that is greater than zero or -1
18		slope	numeric(6, 2)	(optional) Slope	values in range[0,90] or -1
19		cd_weather	varchar(2)	(optional) Weather	any(1, 2, 3, 4, 5, 6, 7, 8, 9, NK)
20		cd_sea	varchar(2)	(optional) Sea condition	any(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, NK)

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21		cd_wind	varchar(3)	(optional) Wind direction	any(E, N, NE, NEE, NK, NNE, NNW, NW, NWW, S, SE, SEE, SSE, SSW, SW, SWW, W)
22		transect_id	int2	(optional) Transect ID	integer in the range [1,999] or -1
e_ctd_measur_it (measurements) TABLE 2					
1	√	survey_name	varchar(14)	Survey name (e.g. MEDIAS, MEDITS)	any(MEDIAS)
2	√	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	√	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	√	cd_centre	varchar(14)	Centre code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
5	√	cd_inst	varchar(14)	Institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
6	√	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
7	√	cd_vessel	varchar(12)	Vessel code	any(CDS, BIO, EUR, PHI, AEG, DAL, MIO)
8	√	cast_id	varchar(14)	Cast ID	non-empty string of up to 14 characters
9	√	cd_instrument	varchar(14)	Instrument code	any(CTDSBE19, CTDSBE19p, CTDSBE25, CTDSBE9)
10	√	cd_parameter	varchar(14)	Parameter	any(alt, cond, chla, dens, dep, flc, nitro, ph, press, sal, do, temp, Temperature, Pressure, Temperature, Salinity, Conductivity, Density, Oxygen concentration, Oxygen saturation, Descent Rate, Fluorescence, Pressure, Turbidity, PAR/Irradiance)

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11	√	profile_depth	numeric(5,1)	Measurement depth (m)	number in range [0.1,1500], with up to one decimal place (step of 0.1)
12		val	numeric	Parameter value	any value>=0
e_instrument_parameter_unit_used TABLE 3					
1	√	survey_name	varchar(14)	Survey name (e.g. MEDIAS, MEDITS)	any(MEDIAS)
2	√	cd_country	varchar(3)	Country ISO 3166 international standard	any(BGR, GRC, ESP, FRA, HRV, ITA, CYP, MLT, ROU, SVN)
3	√	gsa	varchar(7)	GFCM Geographical subarea	any(GSA1, GSA2, GSA3, GSA4, GSA5, GSA6, GSA7, GSA8, GSA9, GSA10, GSA11.1, GSA11.2, GSA11, GSA12, GSA13, GSA14, GSA15, GSA16, GSA17, GSA18, GSA19, GSA20, GSA21, GSA22, GSA23, GSA24, GSA25, GSA26, GSA27, GSA28, GSA29, GSA30)
4	√	cd_centre	varchar(6)	Centre code	any(CNR-FRIS, ARM, IEO/CSIC, CNR, CSIC, FRIS, HCMR, IFREMER, IO-BAS, IOR, JRC, NIMRD, FAO, ICES)
5	√	cd_inst	varchar(8)	Institute code	any(IRBIM-FRIS, ARM, COB, IAS, IRBIM, CNIEO, ICM, FRIS, IMBRIW, IFREMER, IO-BAS, IOR, NIMRD); depends on the cd_centre value
6	√	cd_cruise	varchar(14)	Cruise code	non-empty string of up to 14 characters
7	√	cd_vessel	varchar(3)	Vessel code	any(CDS, BIO, EUR, PHI, AEG, DAL, MIO)
8	√	cast_id	varchar(14)	Cast ID	non-empty string of up to 14 characters
9	√	cd_instrument	varchar(14)	Equipment code (e.g. CTDSBE19p)	any(CTDSBE19, CTDSBE19p, CTDSBE25, CTDSBE9)
10	√	cd_parameter	varchar(32)	Parameter (e.g. TM)	any(alt, cond, chla, dens, dep, flc, nitro, ph, press, sal, do, temp, Temperature, Pressure, Temperature, Salinity, Conductivity, Density, Oxygen concentration, Oxygen saturation, Descent Rate, Fluorescence, Pressure, Turbidity, PAR/Irradiance)
11	√	unit	varchar(64)	Unit (e.g. C)	any([ITS-90, deg C], [deg C], Practical [PSU], [S/m], [density, kg/m^3], [ml/l], [%], [m/s], [mg/m^3], Strain Gauge [db],

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[NTU], [micromole
photon/(m2.second)], pH) or
empty; depends on the
cd_parameter value
