18th MEDIAS Coordination Meeting report (RCG Med&BS)

2025

Final report

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Content

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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

1. Executive summary

The MEDIAS (MEDiterranean International Acoustic Surveys) Steering Committee met in Valletta, Malta, on 08-10 April 2025, hosted by MAFA-ARM and chaired by Tarek Hattab from IFREMER. 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). One representative of EC from DG-MARE, and three representatives from RDBFIS II & RDBFIS-III projects were invited to participate. In total, 39 participants attended the meeting including 15 in-person attendees and 24 virtual participants (see list of participants in Annex I).

All participants adopted the agenda (see Annex II) of the 18th hybrid MEDIAS Coordination Meeting.

In accordance to the Agenda adopted, the main aims of the 18th MEDIAS Coordination Meeting were:

- To present the outcomes related to the MEDIAS activities carried out in 2024;
- To review and discuss information provided by EC representative;
- To review issues from other meetings related to MEDIAS;
- To work on standardization of biological analyses (e.g. age and maturity estimates);
- Explore the use of EchoR for data processing;
- Draft a document addressed to end users describing any changes in the sampling design through the years;
- To work on MEDIAS regional database structure;
- To update regional scale NASC maps;
- To establish the ToRs and plan the 19th MEDIAS meeting in 2026.

Following the agenda, during the first day activities and outcomes related to the 2024 MEDIAS acoustic surveys, carried out by the MEDIAS teams (Fig. 1.1), were presented, as well as results from the pelagic trawl surveys carried out by Bulgaria in the Black Sea.

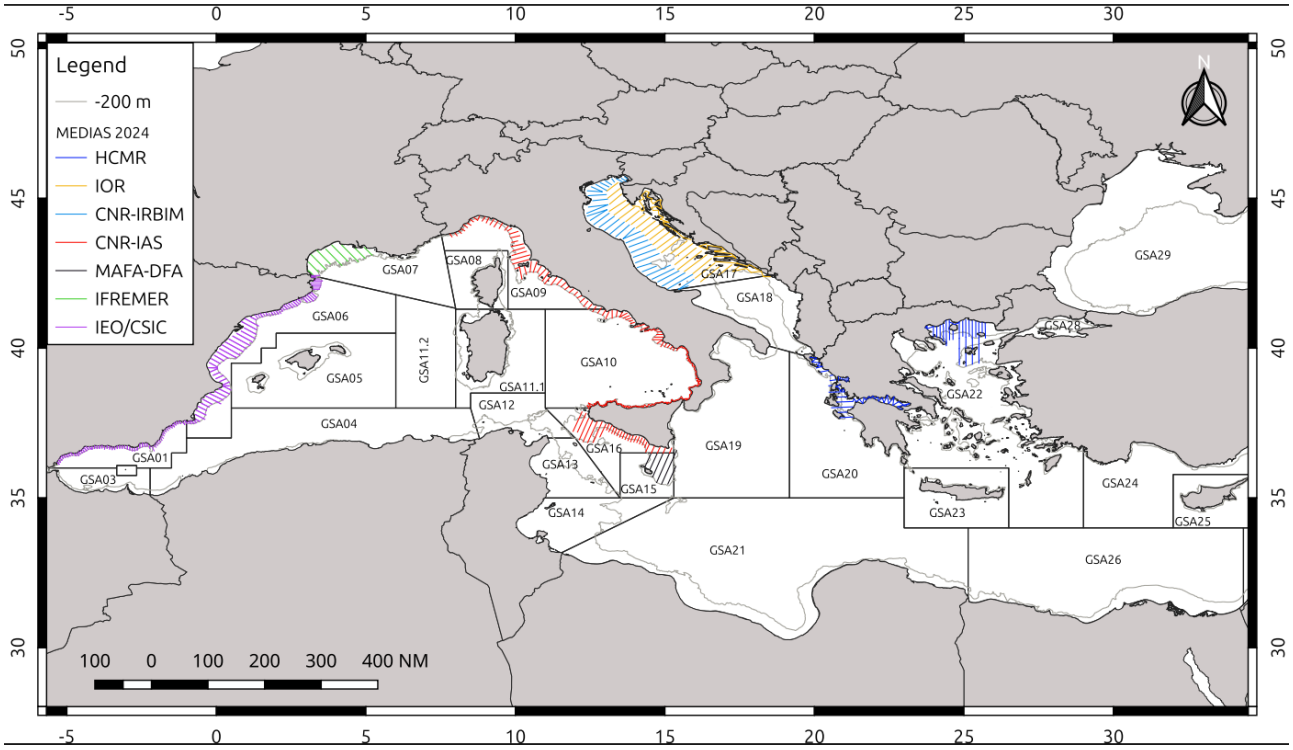


Figure 1.1. Acoustic surveys performed in the MEDIAS framework during 2024

2. Results of the surveys carried out in 2024 in the framework of the Mediterranean International Acoustic Surveys (MEDIAS)

2.1. Presentation of the 2024 acoustic surveys in GSA 1 - Northern Alboran Sea and GSA 6 – Northern Spain (IEO)

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

a) General information on the survey

MEDIAS 2024 acoustic survey was carried out in the Mediterranean Spanish waters (GSA06, Northern Spain and GSA01, Northern Alboran Sea) from 2nd July to 6th August 2024 (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. 15.0 was used to visualize and analyze acoustic data.

c) Calibration results

The acoustic system was calibrated at the beginning of the survey (4th July) using the standard sphere method (Demer et al., 2015) (Table 2.1.1).

Table 2.1.1. Calibration results in MEDIAS 2024

		18 kHz	38 kHz	70 kHz	120 kHz	200 kHz
Environment	**Sound Velocity (m/s)**	1522.2	1522.2	1522.2	1522.2	1522.2
Beam Model results	**Transducer Gain (dB)**	23.04	26.52	27.50	27.13	28.94
	SaCorrection (dB)	0.02	0.02	0.03	-0.0046	-0.04
	Along. Beam Angle (deg)	10.25	6.77	6.63	6.27	5.25
	Along. Offset Angle (deg)	-0.01	-0.03	-0.30	-0.28	-0.69
	Athw. Beam Angle (deg)	10.36	6.80	6.53	6.03	4.80
	Athw. Offset Angle (deg)	-0.06	0.02	-0.17	0.06	-0.04
	RMS	0.09	0.06	0.09	0.09	0.35
Environmental parameter	**Temperature (ºC)**	19.1822	19.1822	19.1822	19.1822	19.1822
	Salinity (ppm	36.9726	36.9726	36.9726	36.9726	36.9726

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 (860 nmi) in GSA06 and 59 transects (271 nmi) in GSA01 (Fig. 2.1.1 & 2.1.2), covering all the area.

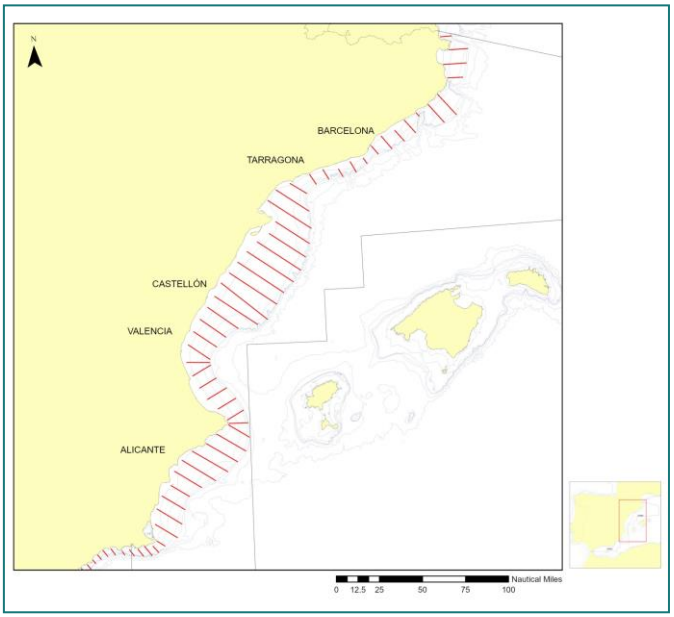


Figure 2.1.1. Acoustic survey design in GSA06: 52 transects prospected.

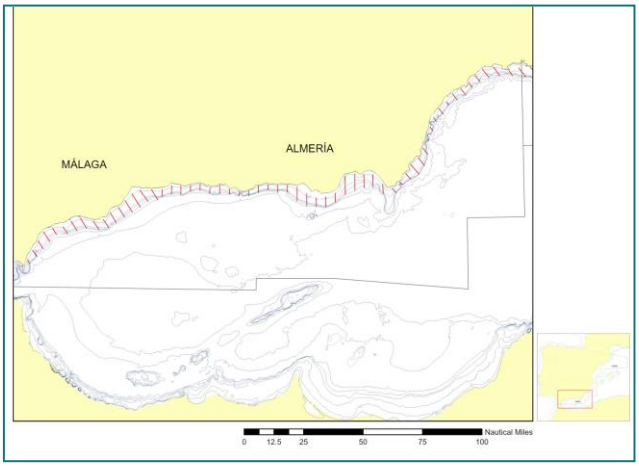


Figure 2.1.2. Acoustic survey design in GSA01: 59 transects prospected.

e) Fish sampling

Echotraces are identified with pelagic hauls. Fifty-two (52) pelagic hauls were carried out during daytime in Northern Spain (GSA06) (Fig. 2.1.3) and twenty (20) pelagic hauls during daytime/ nighttime 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.

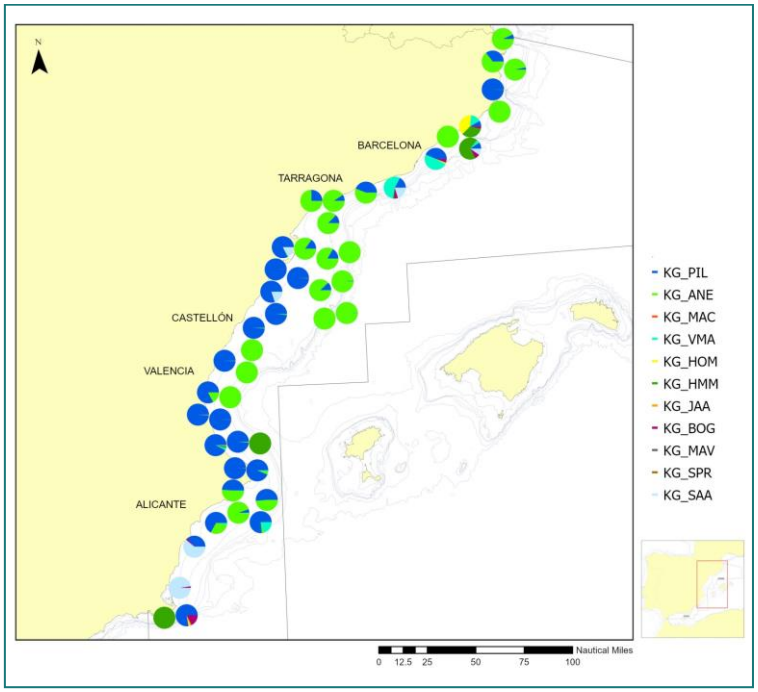


Figure 2.1.3. Pelagic hauls (52) composition (percentages in weight) carried out in GSA06 during the Spanish acoustic survey MEDIAS 2024.

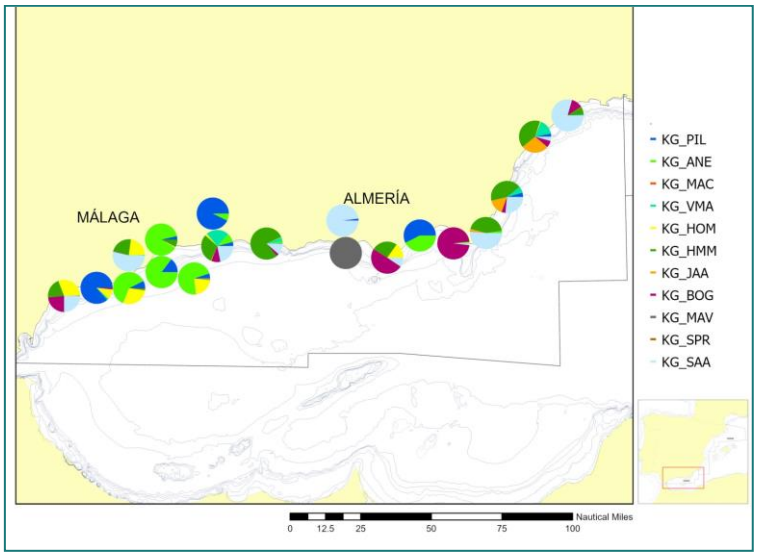


Figure 2.1.4. Pelagic hauls (20) composition (percentages in weight) carried out in GSA01 during the Spanish acoustic survey MEDIAS 2024.

f) Oceanographic parameters

In total, 126 hydrological stations were performed in GSA06 (Fig. 2.1.5) and 35 stations in GSA01 (Fig. 2.1.6), using a Seabird (SBE) 19 plus CTD, which measures conductivity, temperature, pressure, fluorescence and dissolved oxygen.

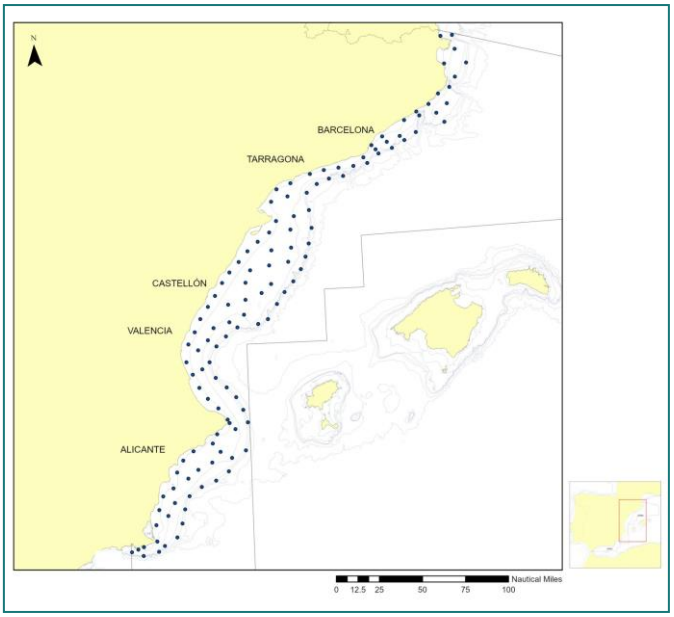


Figure 2.1.5. CTD stations (126) in GSA06 carried out during the Spanish acoustic survey MEDIAS 2024.

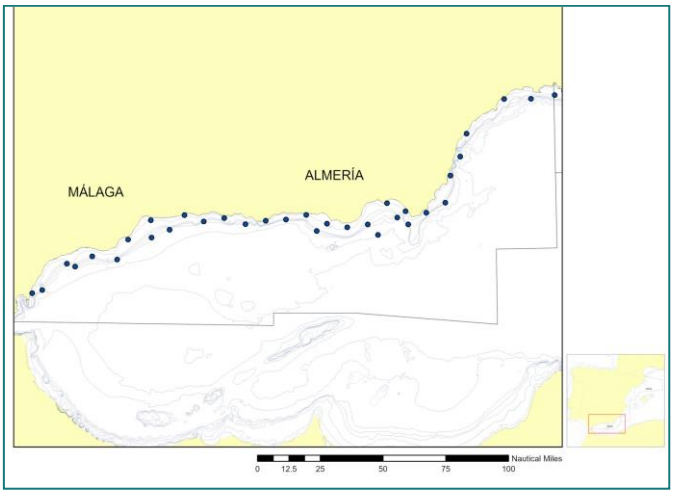


Figure 2.1.6. CTD stations (35) in GSA01 carried out during the Spanish acoustic survey MEDIAS 2024.

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.

Table 2.1.2. Estimates of biomass and CV for sardine and anchovy in GSA's 06 and 01 in MEDIAS 2024.

	GSA06		GSA01	
	Biomass (t)	CV	Biomass (t)	CV
Sardine	69004	9.6%	3346	32.2%
Anchovy	49042	10.4%	5643	23%

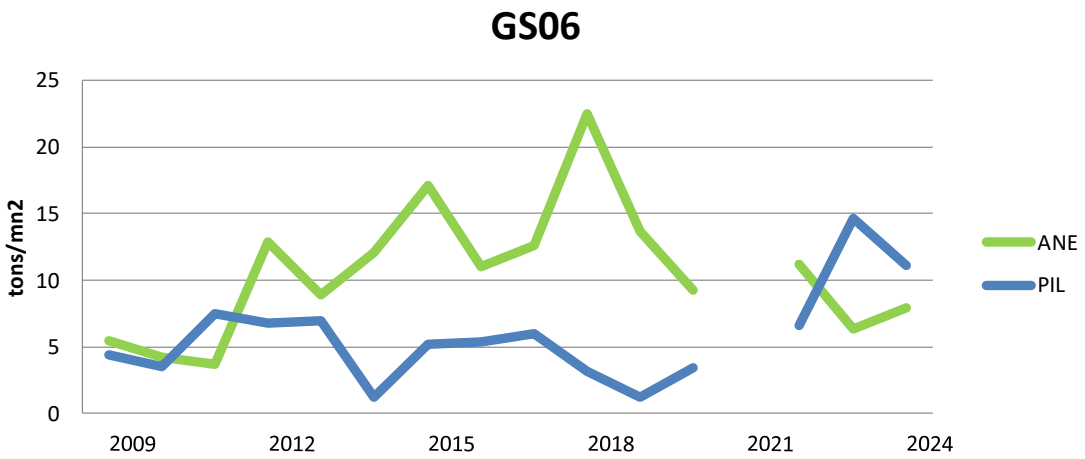


Figure 2.1.7. Historical trends in GSA06 (Northern Spain). PIL: Sardina pilchardus; ANE: Engraulis encrasicolus. Density (tons/mn2).

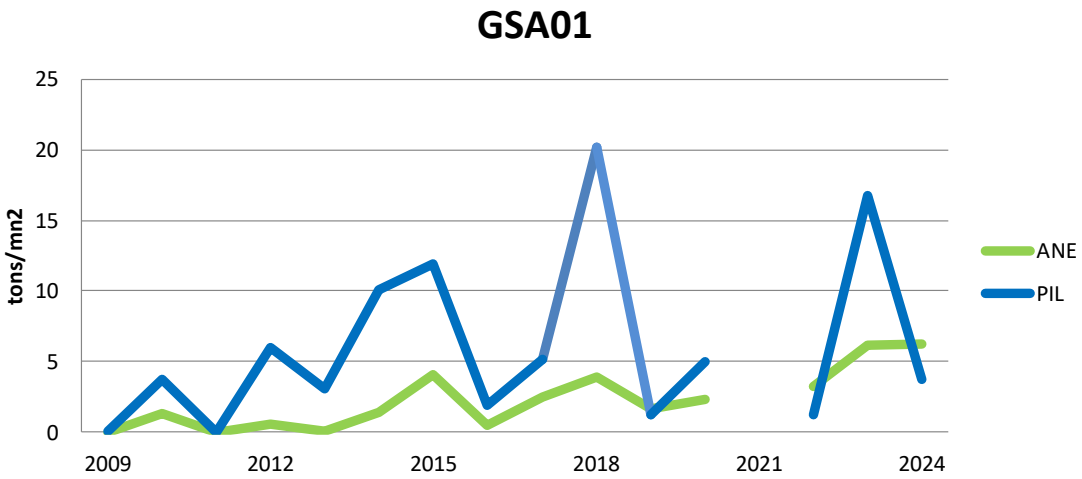


Figure 2.1.8. Historical trends in GSA01 (Northern Alboran Sea). PIL: Sardina pilchardus; ANE: Engraulis encrasicolus. Density (tons/mn2).

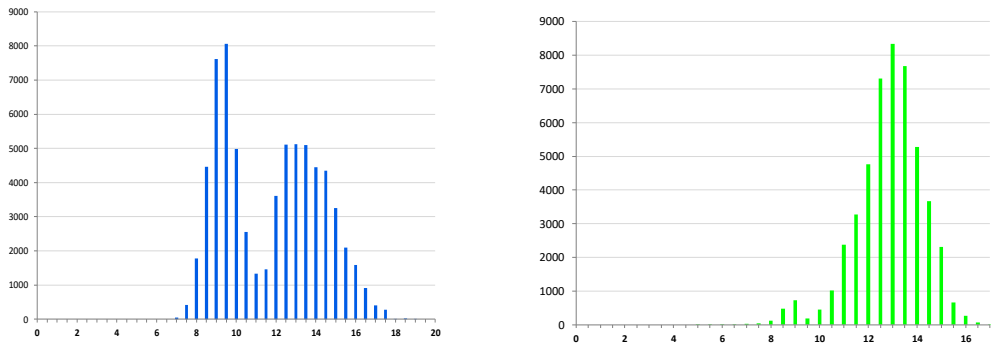


Figure 2.1.9. Sardine (left) and anchovy (right) biomass (in tons) per length class in Northern Spain (GSA06). MEDIAS 2024.

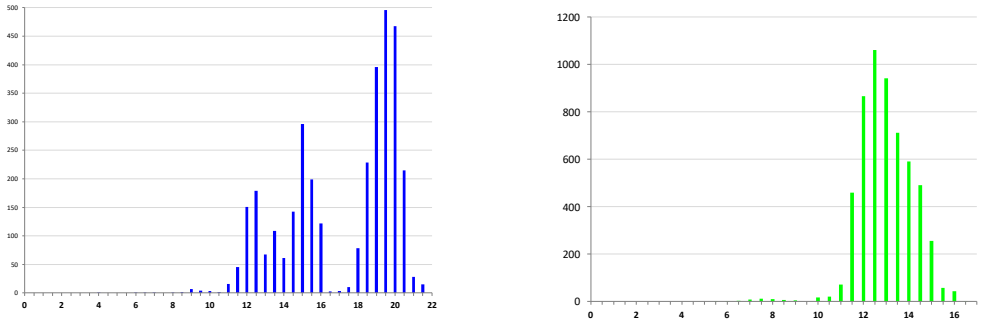


Figure 2.1.10. Sardine (left) and anchovy (right) biomass (in tons) per length class in Northern Alboran Sea (GSA01). MEDIAS 2024.

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 2024, was composed by 5 years classes (0-4). The number of otoliths readings was 1668 (individuals) (Fig. 2.1.11). In GSA01, the number of sardine otoliths readings was 405, the number of age classes were also 5 (0-4) (Fig.2.1.11).

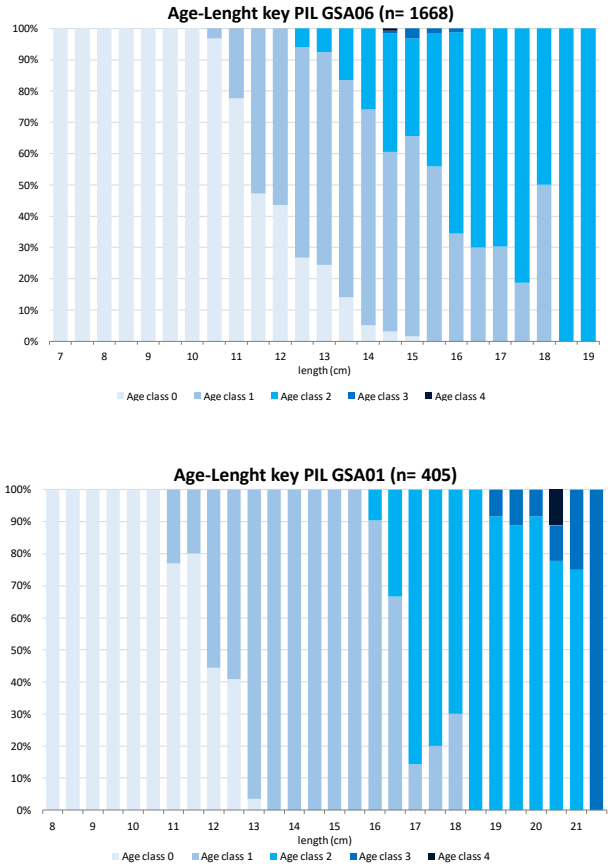


Figure 2.1.11. Sardine ALK in Northern Spain (GSA06, left) and Northern Alboran Sea (GSA0, right). MEDIAS 2024.

Age length key (ALK) for anchovy in GSA06, MEDIAS 2024, was composed by 3 years classes (0-2). The number of otoliths readings was 1096 (individuals) (Fig. 2.1.12). In GSA01, the number of anchovy otoliths readings was 393 and the number of age classes observed were only 2 (0-1) (Fig.2.1.12).

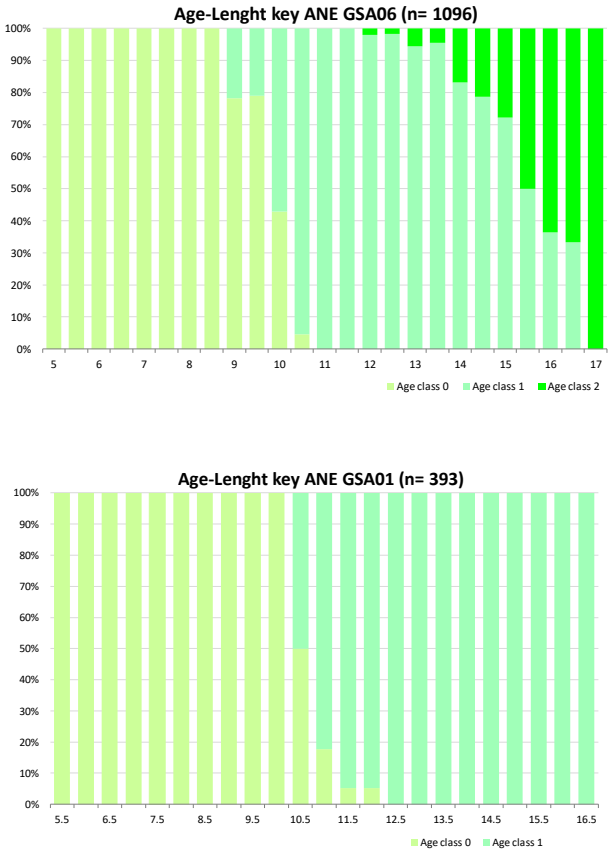


Figure 2.1.12. Anchovy ALK in in Northern Spain in GSA06 (left) and Northern Alboran Sea GSA01 (right). MEDIAS 2024.

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.

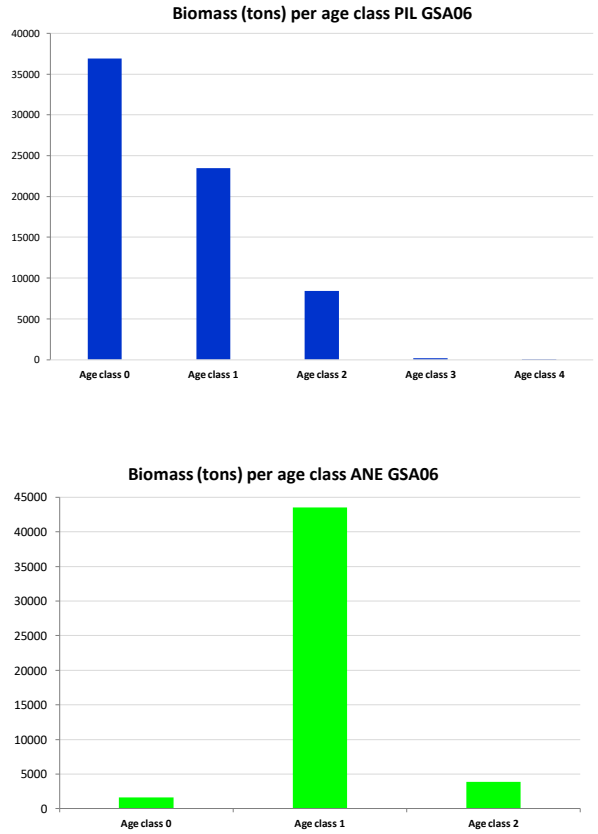


Figure 2.1.13. Sardine and anchovy biomasses (in tons) per length class in Northern Spain (GSA06). MEDIAS 2024.

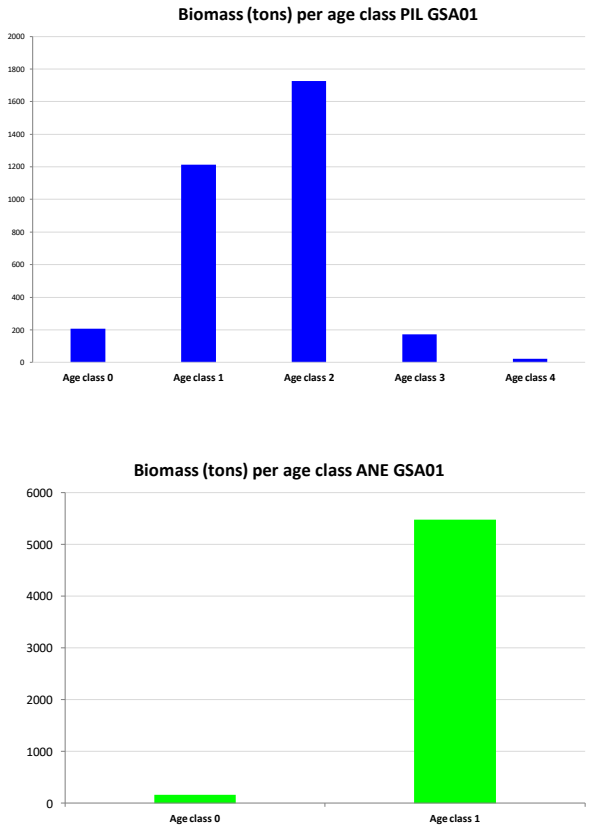


Figure 2.1.14. Sardine and anchovy biomasses (in tons) per length class in Northern Alboran Sea (GSA01). MEDIAS 2024.

h) Abundance indices of target species (spatial distribution)

Spatial distribution of sardine abundance indices in terms of NASC (m2/mn2) in GSA 06 in 2024 is presented in Fig. 2.1.15. Sardine was found throughout the continental shelf of GSA06, being most abundant between the southern Ebro Delta and Valencia, as well as in the Bay of Alicante, always close to the coast, not exceeding 110 m depth.

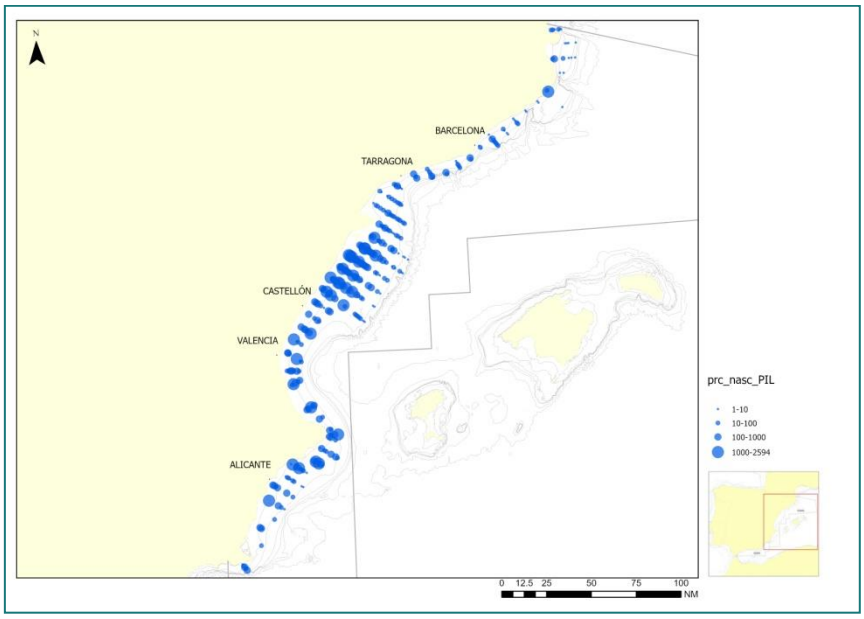


Figure 2.1.15. Sardine (PIL) spatial distribution in Northern Spain (GSA06) in MEDIAS 2024.

Spatial distribution of anchovy abundance indices in terms of NASC (m2/mn2) in GSA 06 in 2024 is presented in Fig. 2.1.16. Anchovy was found all over the continental shelf, being more abundant between Tarragona (north of the Ebro Delta) and Castellón, in deeper waters than sardine.

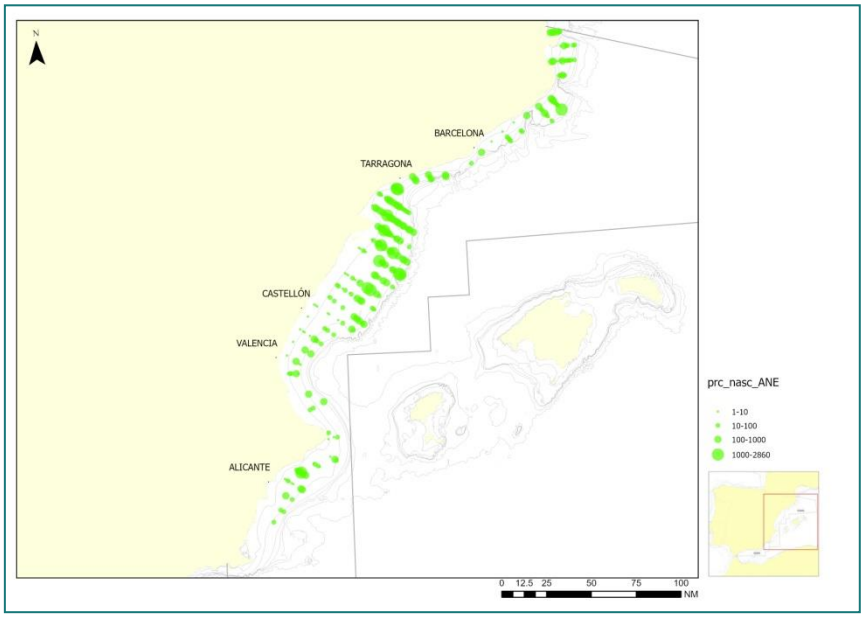


Figure 2.1.16. Anchovy (ANE) spatial distribution in Northern Spain (GSA06) in MEDIAS 2024.

Spatial distributions of sardine and anchovy abundance indices, in terms of NASC (m2/mn2) in GSA 01 in 2024 (Fig. 2.1.17 & 2.1.18, respectively) was mainly in the Bay of Málaga and surroundings for sardine, and between Malaga and the Strait of Gibraltar for anchovy.

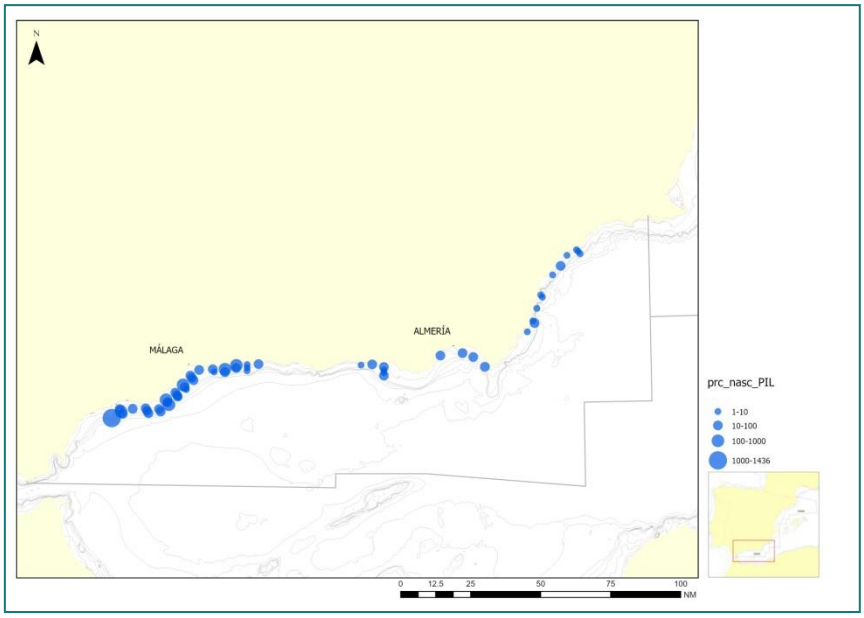


Figure 2.1.17. Sardine (PIL) spatial distribution in Northern Alboran Sea (GSA01) in MEDIAS 2024.

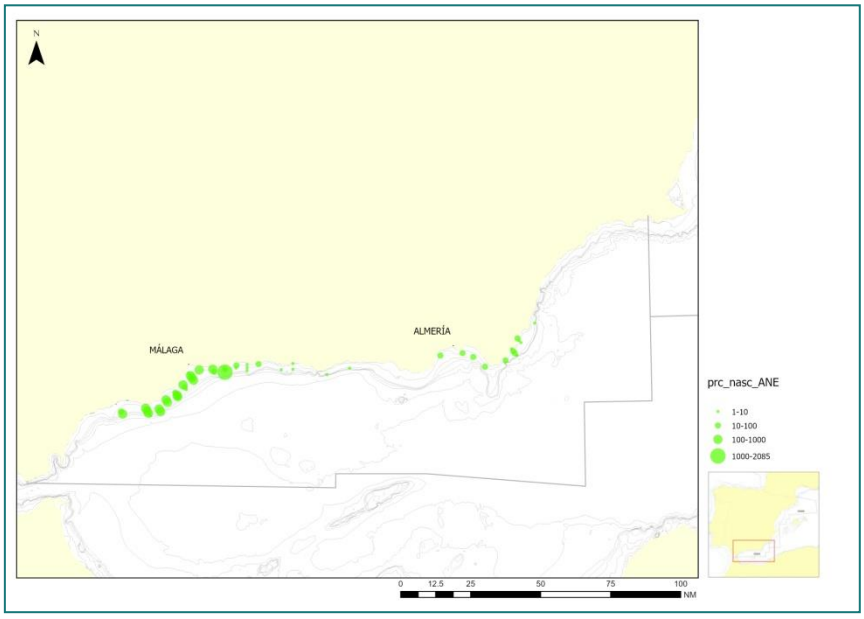


Figure 2.1.18. Anchovy (ANE) spatial distribution in Northern Alboran Sea (GSA01) in MEDIAS 2024.

2.2. Presentation of the 2024 acoustic surveys in the GSA 7 - Gulf of Lion (IFREMER)

Tarek Hattab and Jean-Hervé Bourdeix, IFREMER

General information on the survey

The surveys took place from June 29 to July 31 2024. (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 12 2024. Calibration results are shown in Table 2.2.1.

Table 2.2.1. Calibration results in MEDIAS 2024.

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	12/05/24	12/05/24	12/05/24	12/05/24	12/05/24
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)	15.19	15.19	15.19	15.19	15.66
Temperature (°C) at sphere depth	16.4	16.4	16.4	16.4	16.4
Salinity (psu) at sphere depth	38	38	38	38	38
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	0.12	0.31	0.24	0.19	0.19
resulting gain (dB)	26.48	27.67	24.64	26.32	25.95
Sa corr (dB)	-0.03	-0.27	-0.21	-0.18	-0.11
Beam width atwarth°	6.34	6.67	7.73	7.48	6.44
Beam width along°	6.45	6.69	7.21	7.34	6.32
Atwarth offset°	0.02	-0.02	-0.00	0.21	0.04
Along offset°	-0.03	0.06	0.16	-0.07	-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 2024 total nautical miles effectively used for acoustic analysis (minus pelagic trawls tracks and linking transects) were 272.

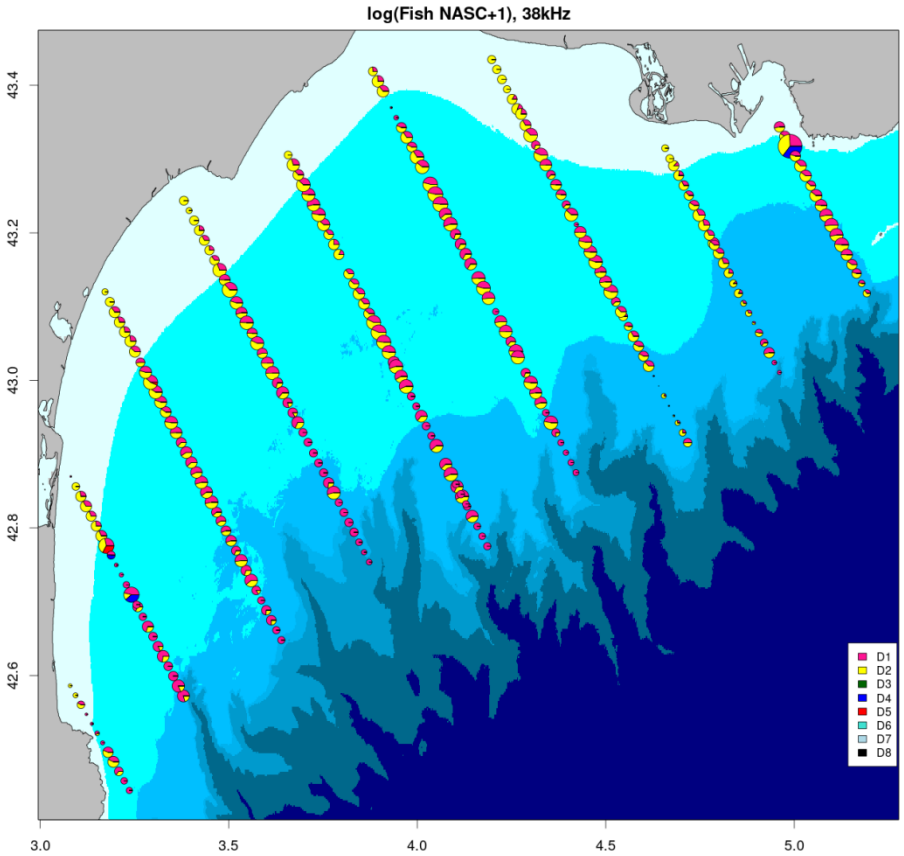


Figure 2.2.1. The survey design in GSA 7 (MEDIAS, 2024). The size of the pie charts is propotional to the log(Fish NASC+1) while the color shows the echotyping result.

Fish sampling

Echotraces are identified with a pelagic haul. Forty-two (42) 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-1 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.

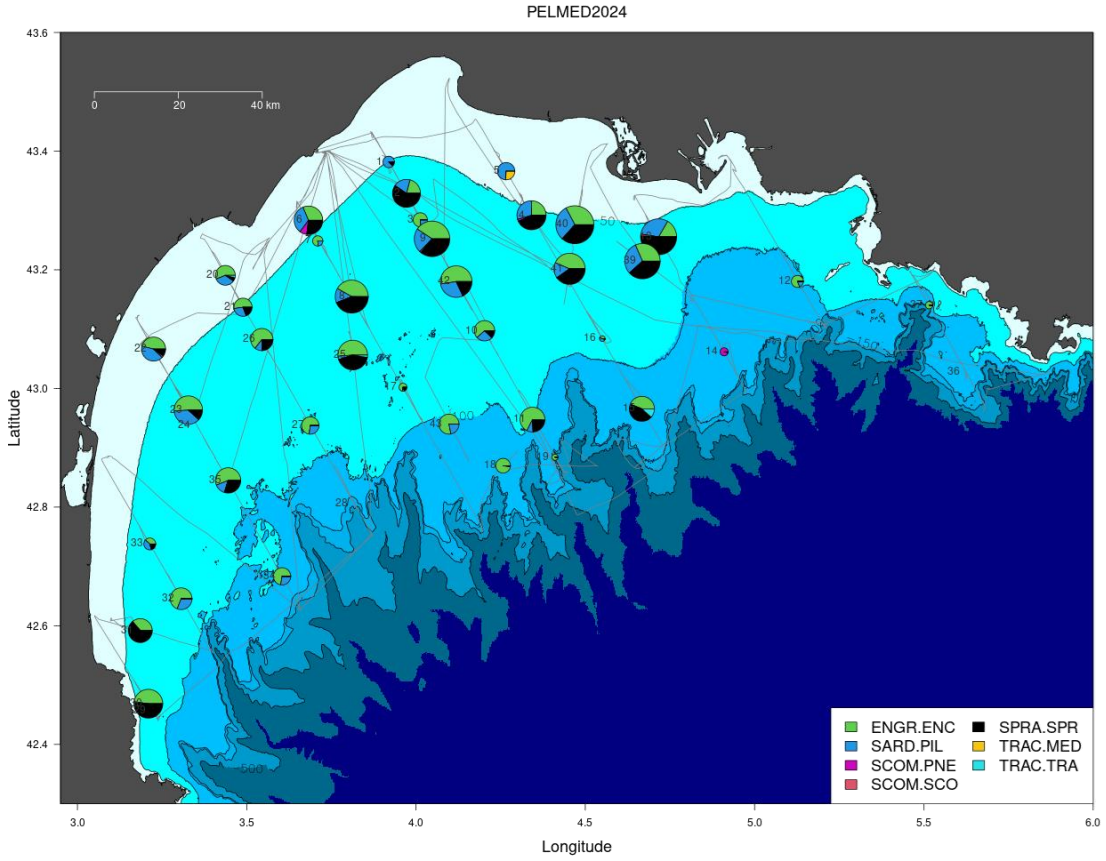


Figure 2.2.2. Catch compositions of pelagic hauls (42) carried out in GSA07 during the French acoustic survey MEDIAS 2024.

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).

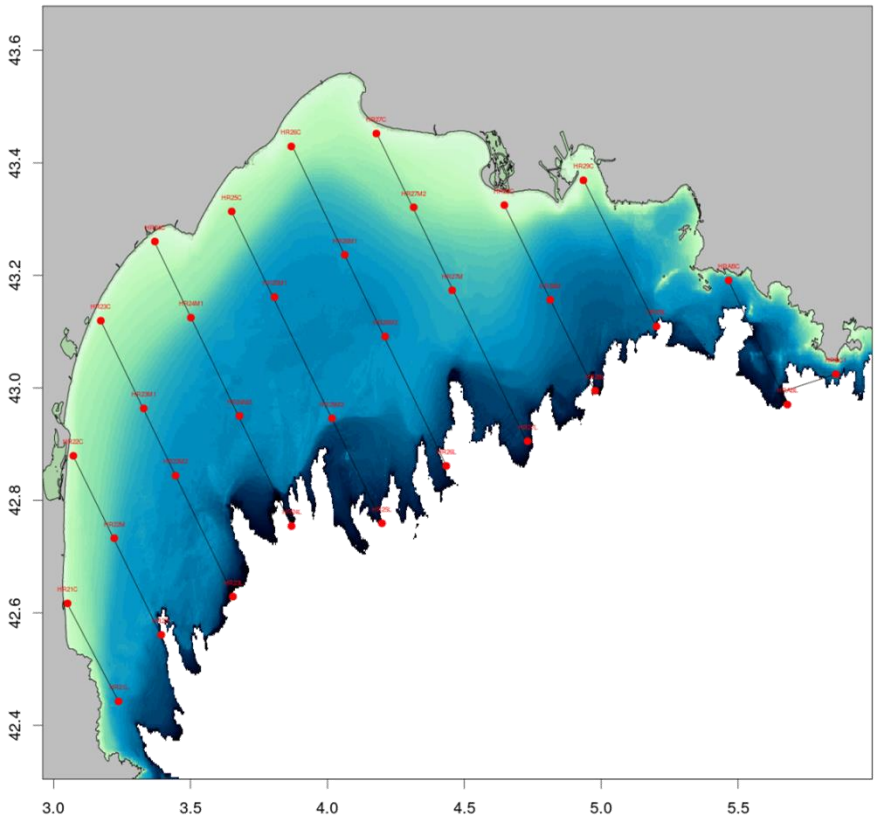


Figure 2.2.3. CTD stations (33) carried out during the French acoustic survey MEDIAS 2024.

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 31420 and 41913 tons in 2024. The CVs of geostatistical simulations were 15 and 9 % while the CV associated to Hauls / ESDUs associations were 11 % and 0.4 % for respectively for sardine and anchovy.

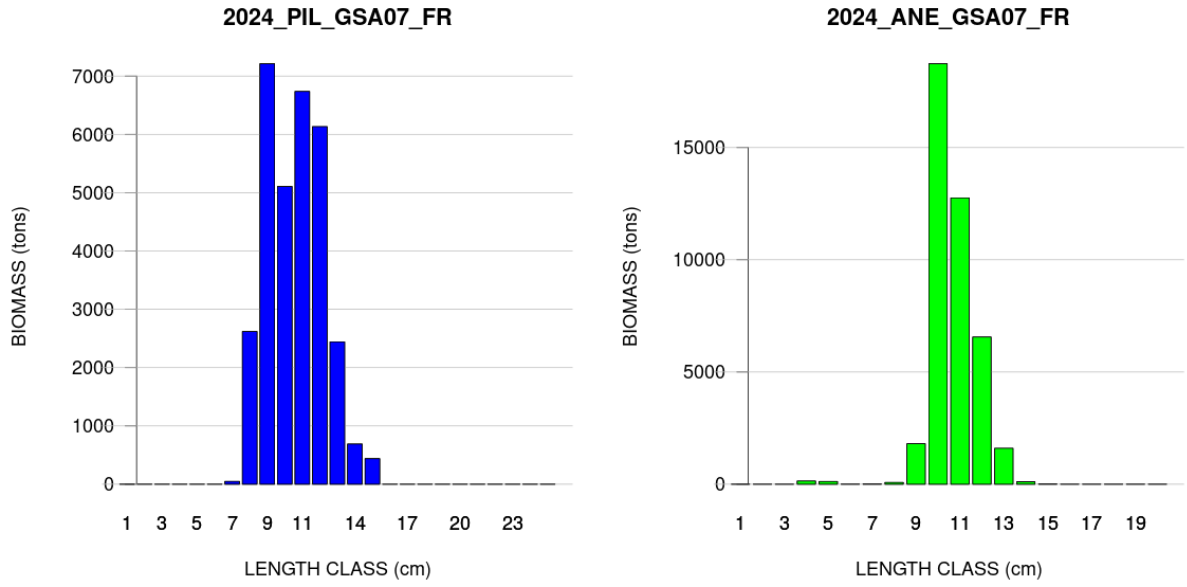


Figure 2.2.4. Biomass estimates per length classes for sardine and anchovy (MEDIAS 2024).

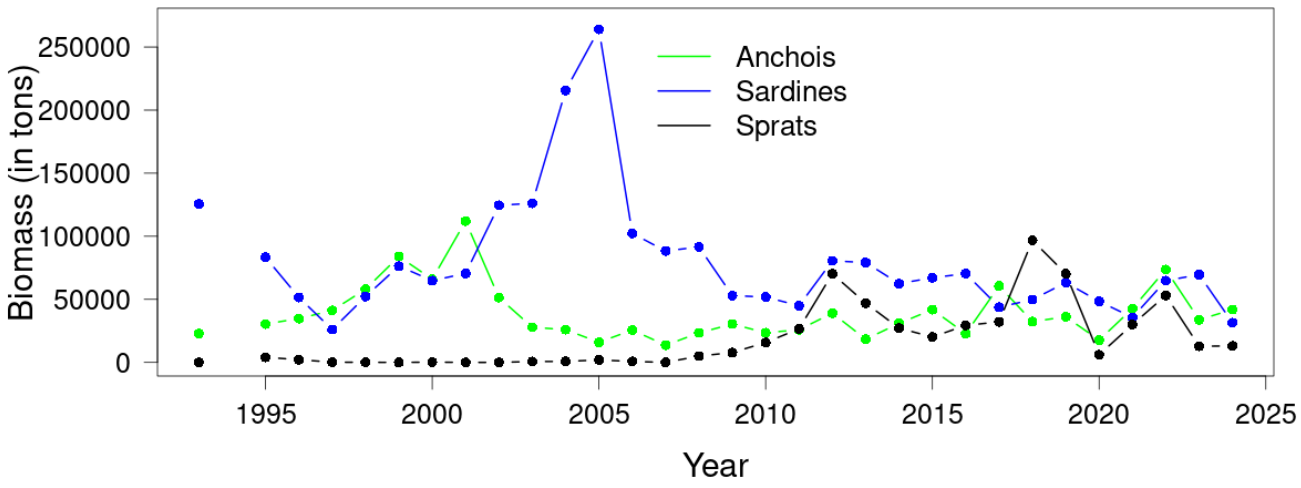


Figure 2.2.5. Long-term biomass estimates in GSA 7 for anchovy, sardine and sprat (DCF-MEDIAS estimates have started in 2009).

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

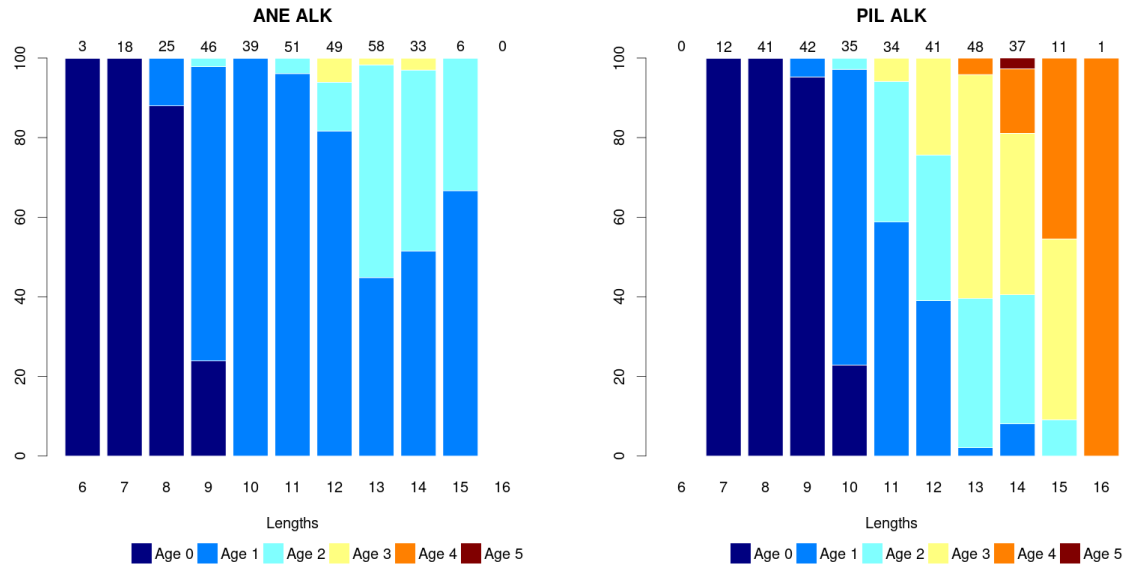


Figure 2.2.6. Age-length keys for sardine and anchovy in GSA 7 (MEDAIS 2024). The number of observations per size class are shown at the top of each bar in the barplot.

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

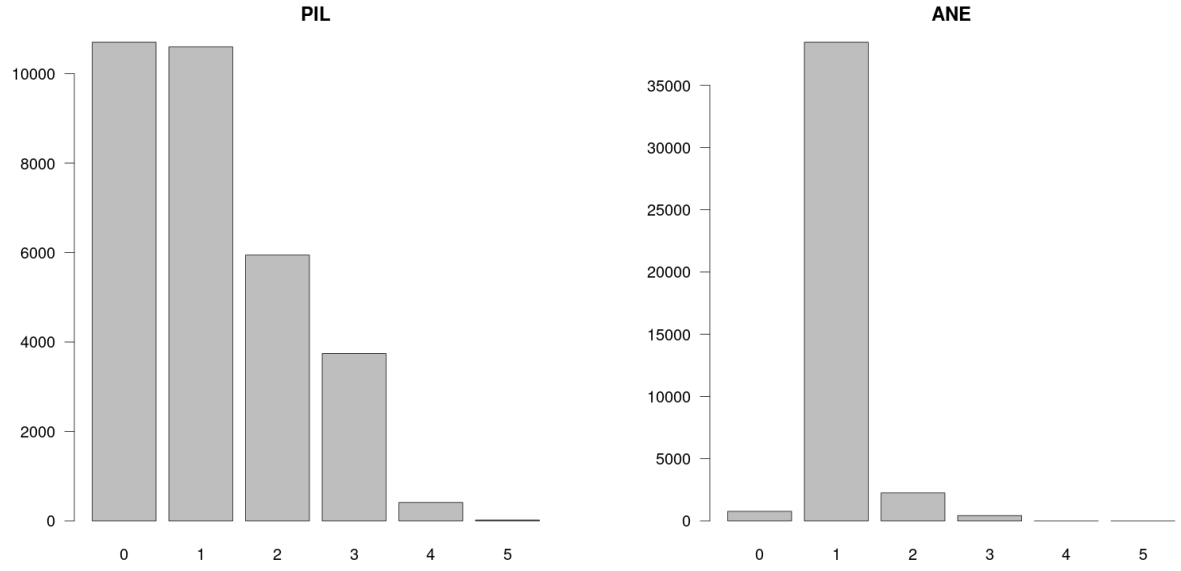


Figure 2.2.7. Biomass at age (in tons) estimates in MEDIAS 2024.

Abundance indices of target species

Spatial distributions of abundance indices of sardine and anchovy in GSA 7 during MEDIAS 2024 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.

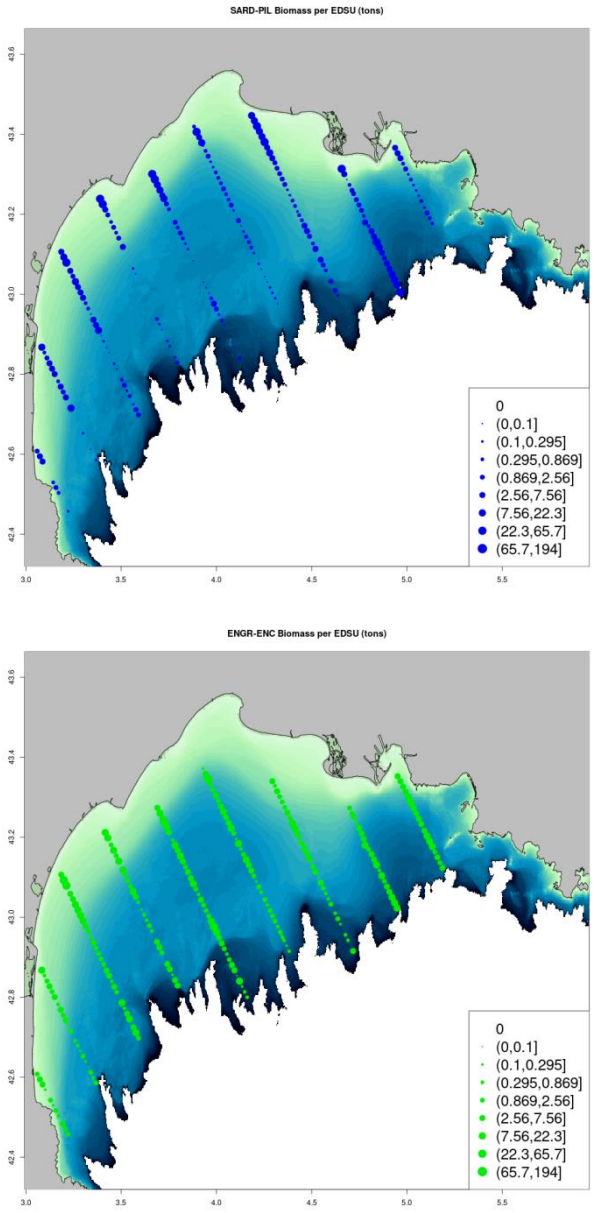


Figure 2.2.8. Spatial distributions of abundance indices of sardine (left) and anchovy (right) in GSA 7 during MEDIAS 2024.

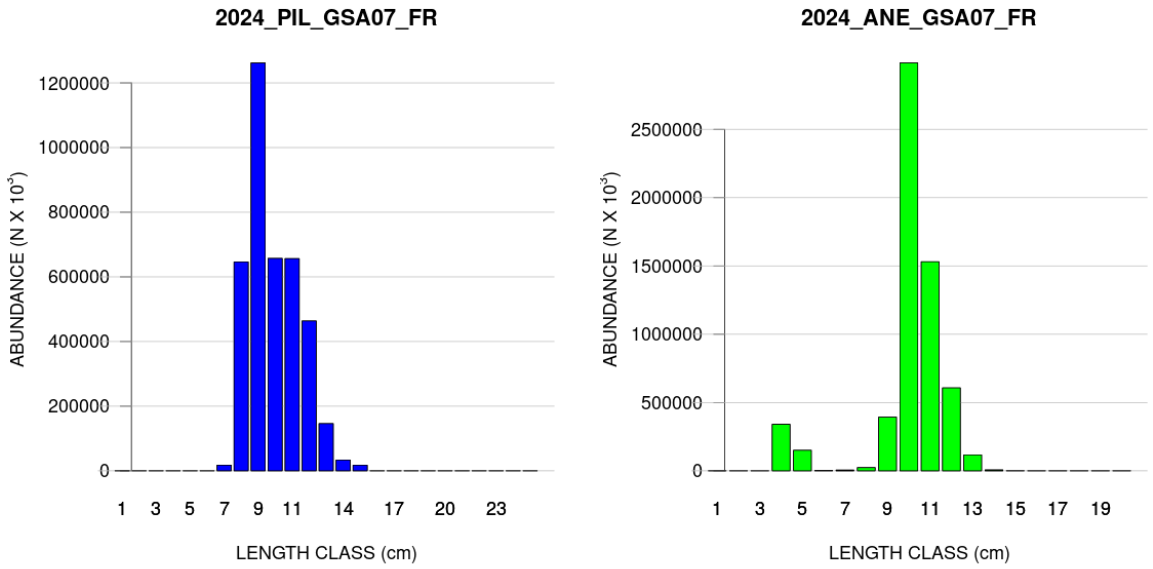


Figure 2.1.9. Abundance estimates per length classes for sardine and anchovy (MEDIAS 2024).

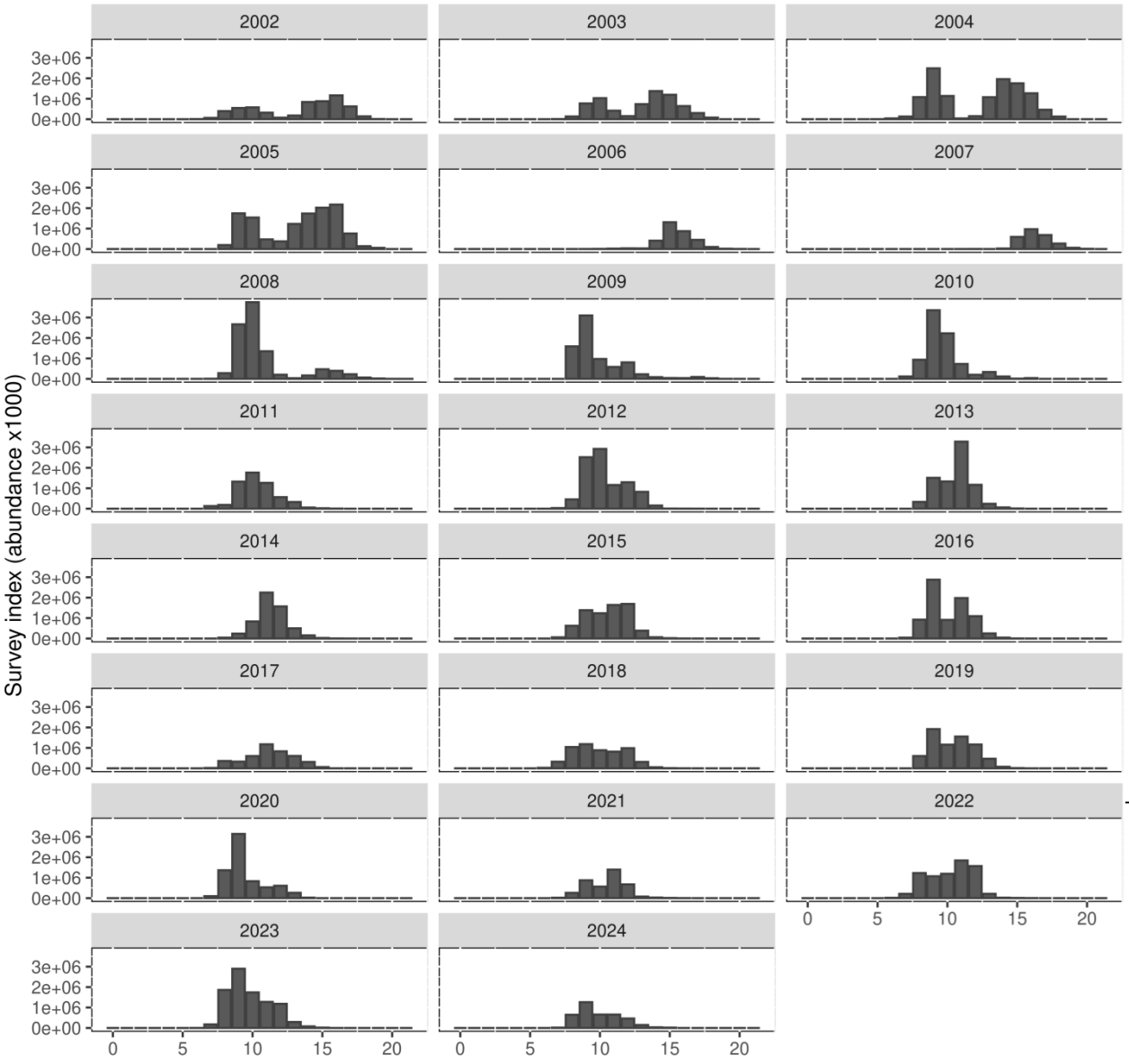


Figure 2.1.10. Length structured abundance estimates for sardine in GSA 07.

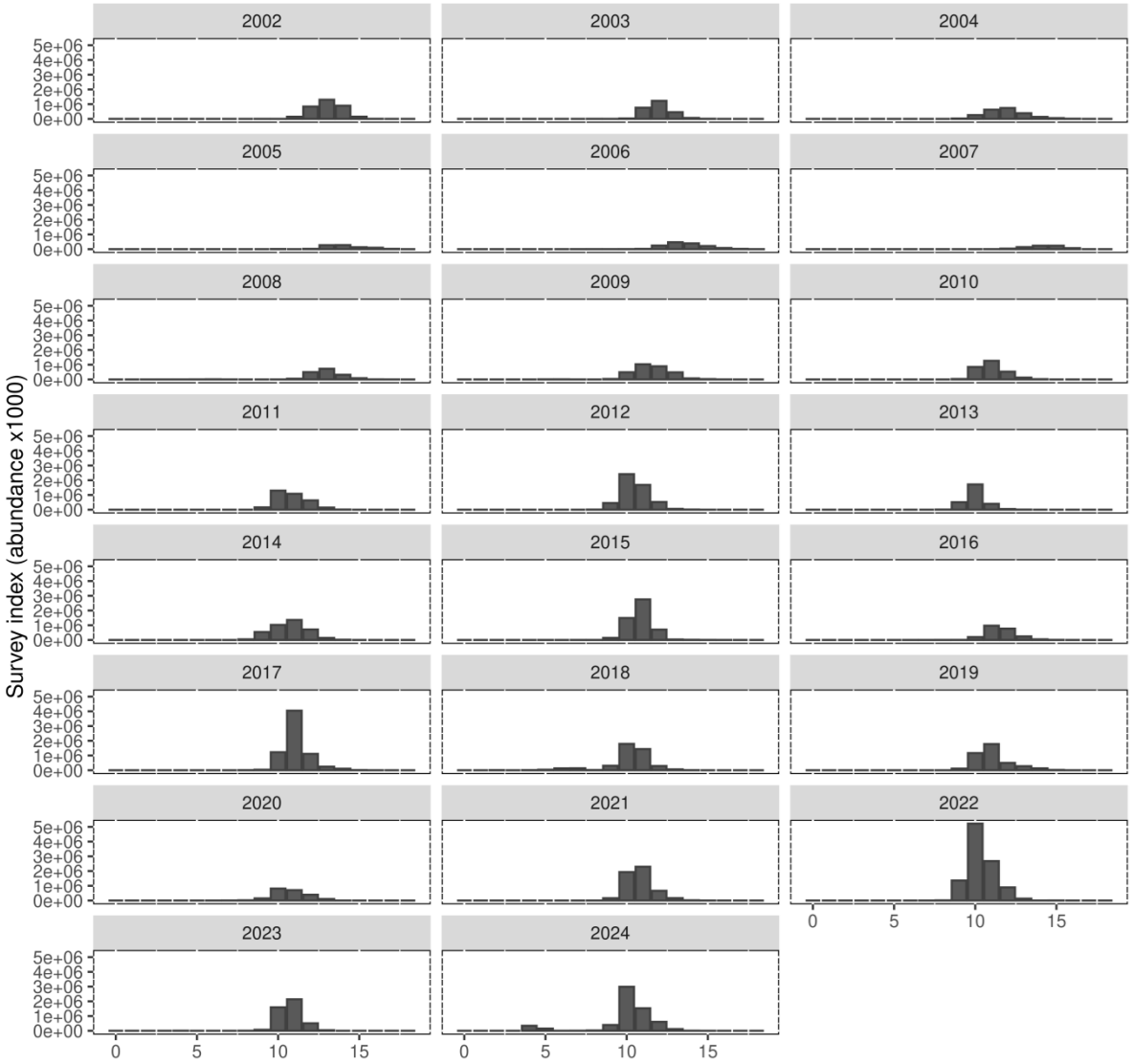


Figure 2.1.11. Length structured abundance estimates for anchovy in GSA 07.

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

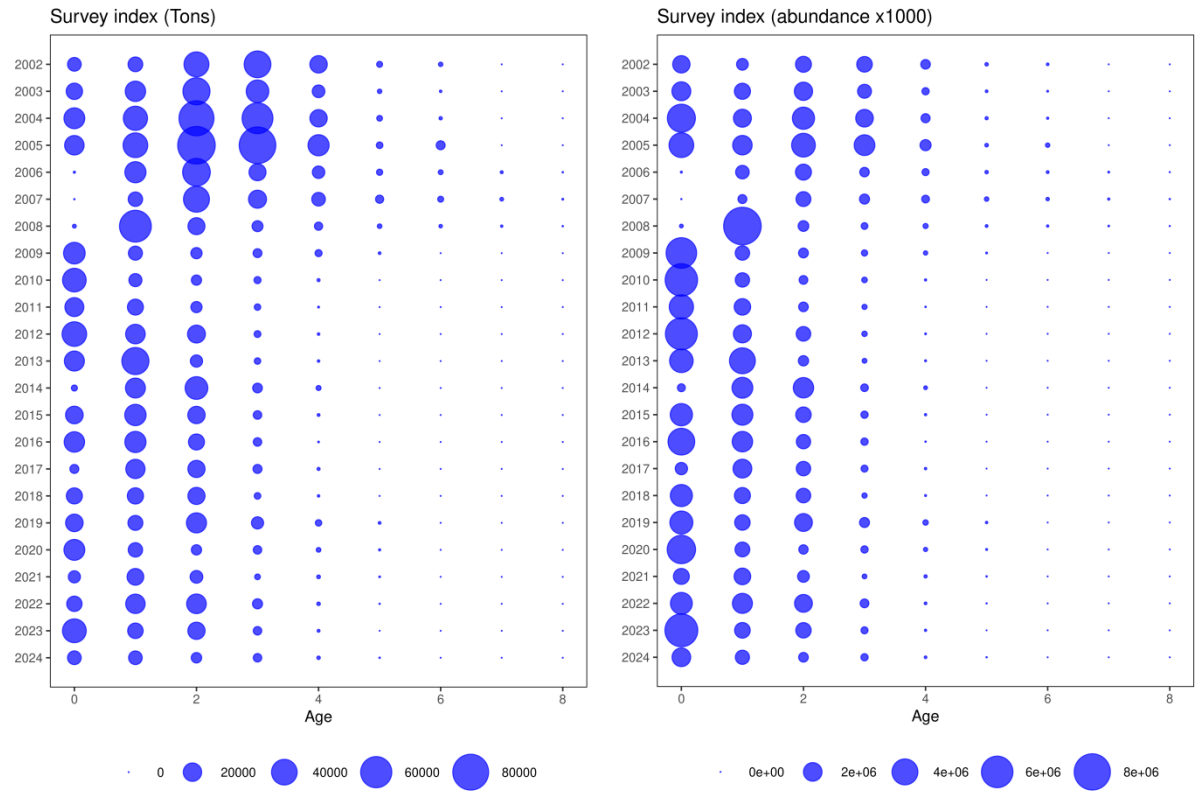


Figure 2.1.12. Age-structured estimates from acoustic surveys for sardine's population in GSA 7.

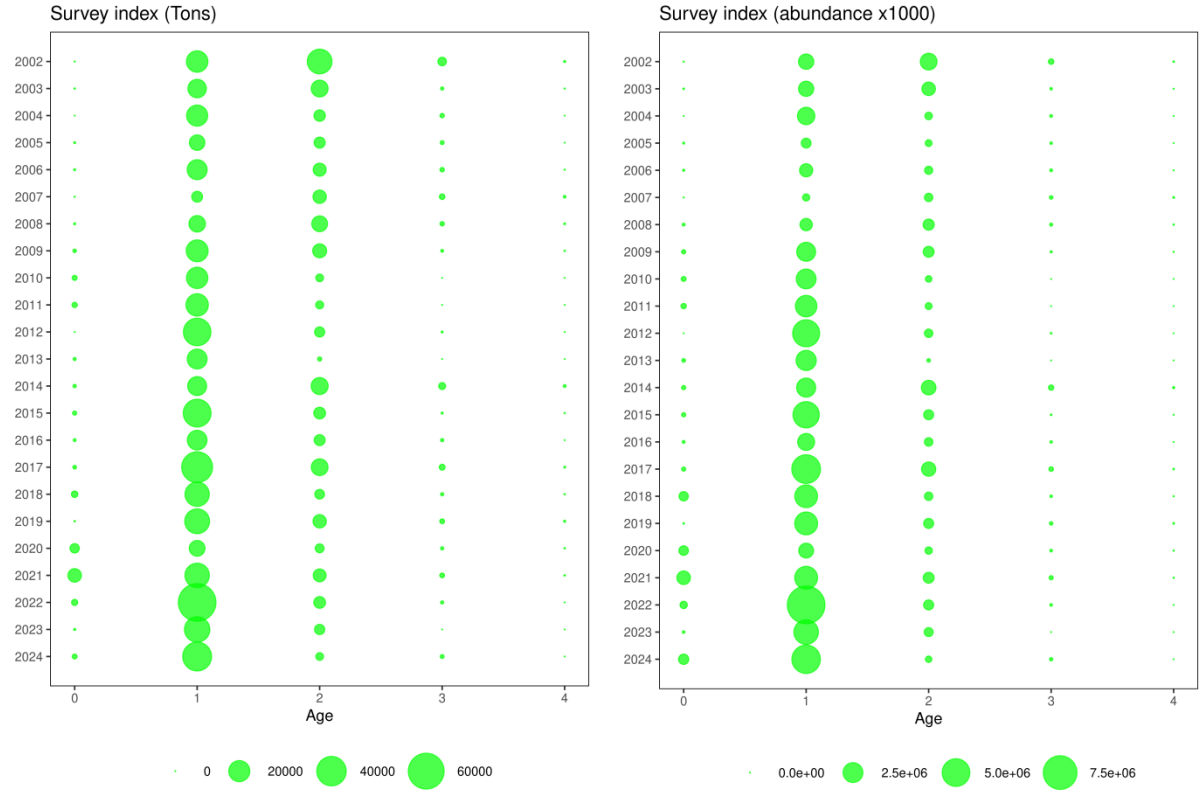


Figure 2.1.13. Age-structured estimates from acoustic surveys for anchovy's population in GSA 7.

2.3. Presentation of the 2024 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 2024 in GSA 9 took place from October 23 to November 2 (lasts 11 days at sea) and covered the continental shelf in the Ligurian and North Tyrrhenian Sea (4672 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°02.810 N 15°16.948 E) on October 9, 2024.

Table 2.3.1. Calibration results in MEDIAS 2024.

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	23.4°C	23.4°C	23.4°C
Salinity (PSU) at sphere depth	39.0	39.0	39.0
TS of Tungsten (WC-Co) sphere 38.1mm (dB)	-42.34	-40.01	-38.84
Pulse duration (ms)	1.024	1.024	1.024
Ping interval (s)	1	1	1
RMS	0.10	0.32	0.34
Transducer gain (dB)	27.36	26.06	23.62
Sa corr. (dB)	-0.51	-0.11	-0.22
Athw. Beam angle (deg)	6.71	6.66	7.71
Along Beam angle (deg)	6.63	6.54	7.00
Athw. Offset Beam angle (deg)	0.14	0.58	-0.70
Along Offset Beam angles (deg)	-0.05	-0.43	-0.13

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 933 nm, while the number of EDSUs effectively processed for acoustic biomass estimation (minus pelagic trawls tracks and linking transects) was 548 nm.

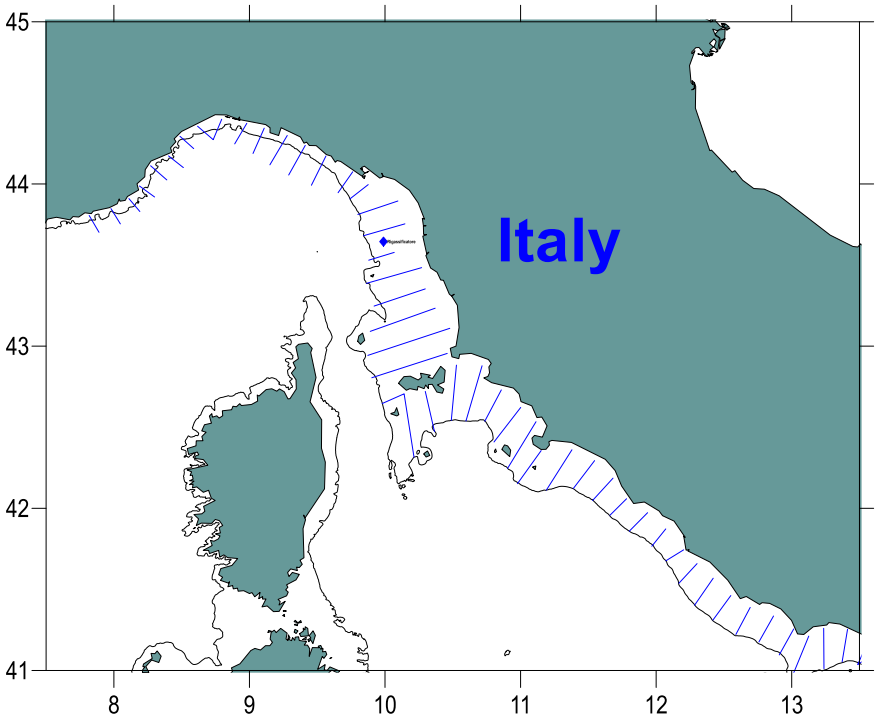


Figure 2.3.1. Acoustic survey design in GSA 9. MEDIAS 2024.

e) Fish sampling

Pelagic fishes are identified by means of pelagic hauls. During the survey in 2024, seventeen (17) pelagic hauls were carried out in GSA 9 to be used for echograms scrutinizing (Fig. 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.

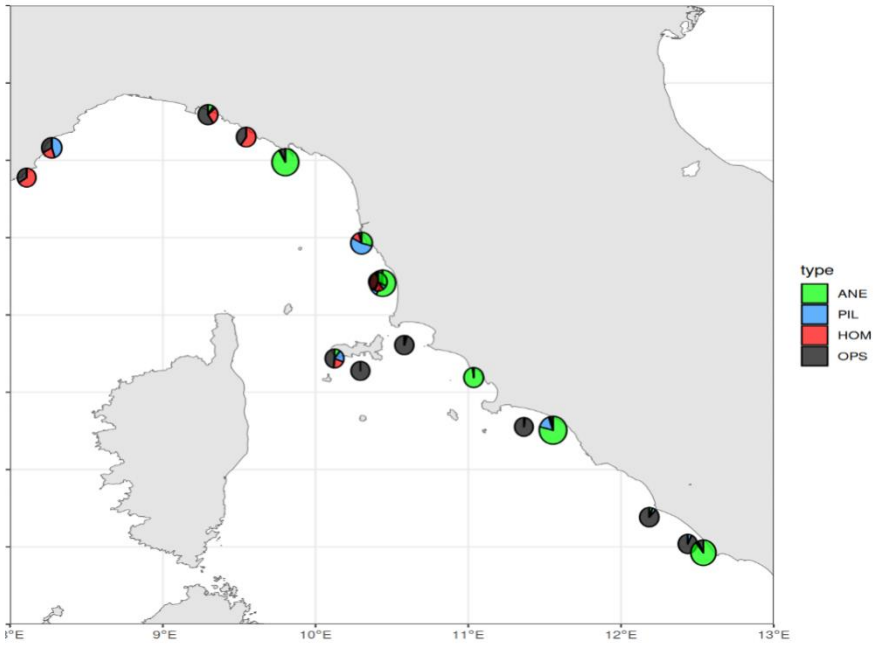


Figure 2.3.2. Map with pie charts reporting percentages in weight of anchovy, sardine, horse mackerel and other pelagic species (OPS) for the survey in GSA 9. MEDIAS 2024.

f) Oceanographic parameters

During the survey in 2024, 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).

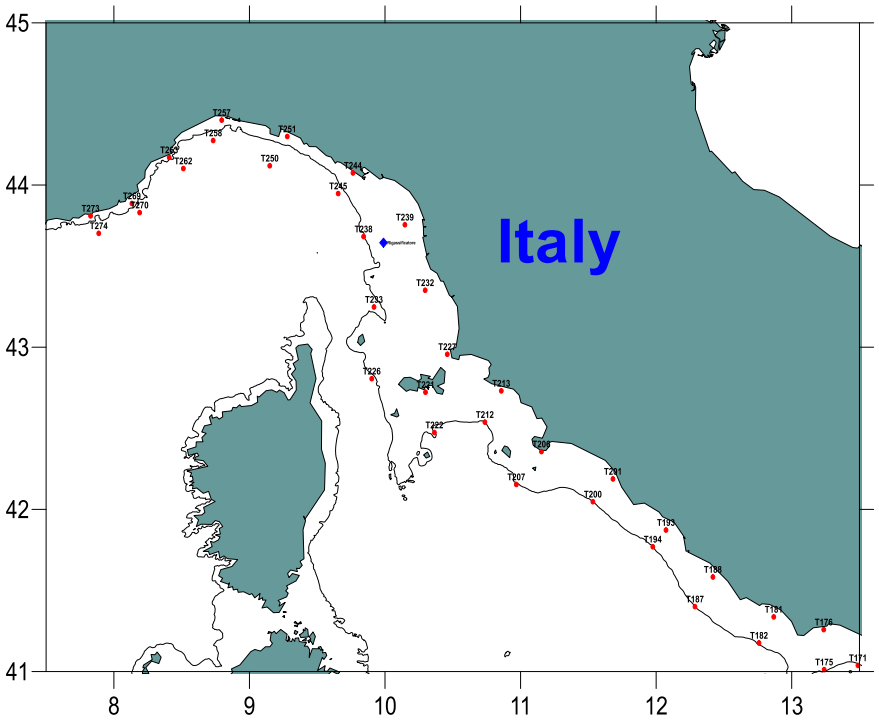


Figure 2.3.3. CTD stations performed during the echosurvey in GSA 9. MEDIAS 2024.

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	9279.1	13.6
Sardine	3170.6	14.9

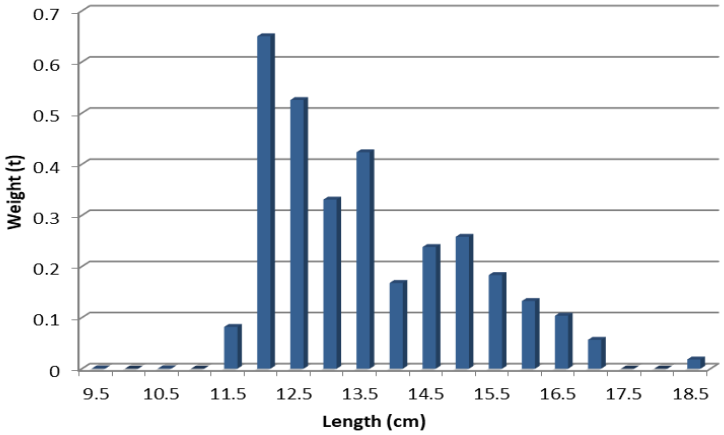


Figure 2.3.4. Sardine (PIL) biomass in tons by length (LFD) in GSA 9. MEDIAS 2024.

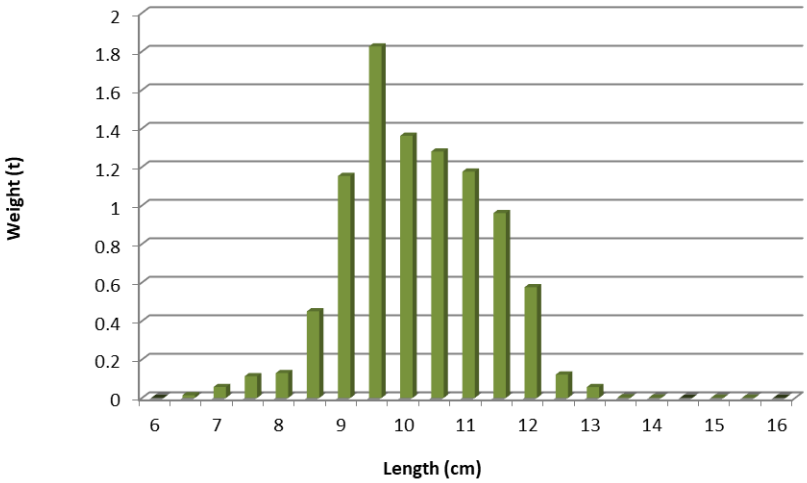


Figure 2.3.5. Anchovy (ANE) biomass in tons by length (LFD) in GSA 9. MEDIAS 2024.

Age length key (ALK) for sardine in GSA 9, MEDIAS 2024, was composed of four year classes. The number of otoliths readings was 200 (no. of individuals) (Fig. 2.3.6).

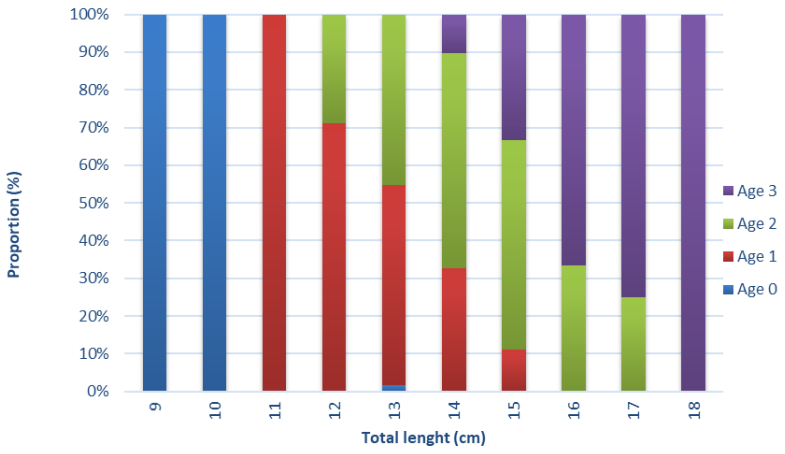


Figure 2.3.6. Sardine ALK in GSA 9, MEDIAS 2024.

Anchovy ALK in GSA 9 was composed by four year classes; the number of otoliths readings was 337 (no. of individuals).

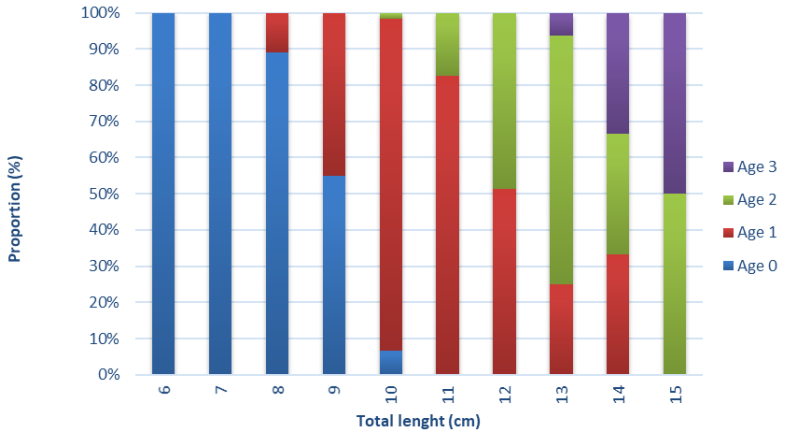


Figure 2.3.7. Anchovy ALK in GSA 9, MEDIAS 2024.

h) Abundance indices of target species

Spatial distribution of sardine and anchovy in GSA 9 in summer 2024 is shown in Fig 2.3.8 and 2.3.9.

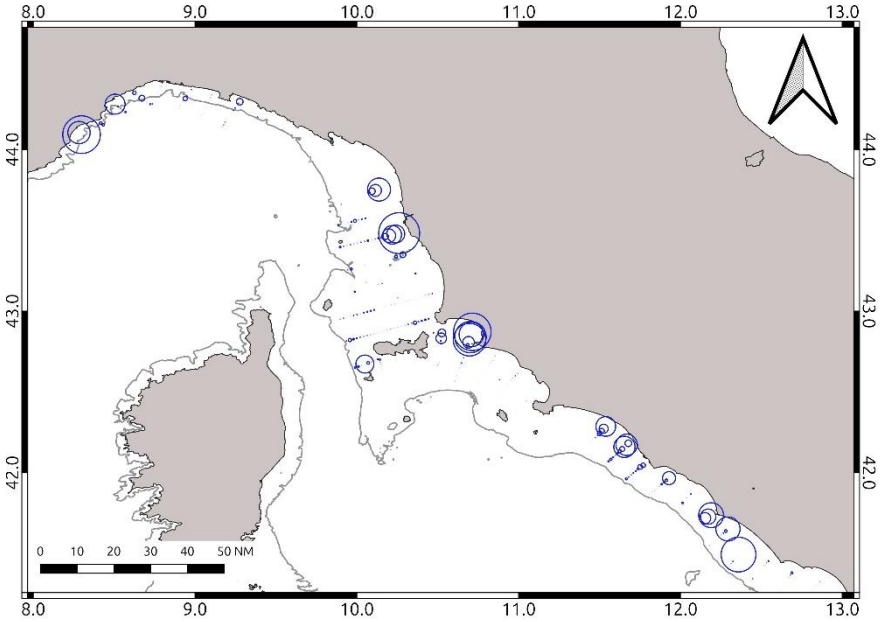


Figure 2.3.8. Sardine (PIL) spatial distribution in GSA 9. MEDIAS 2024.

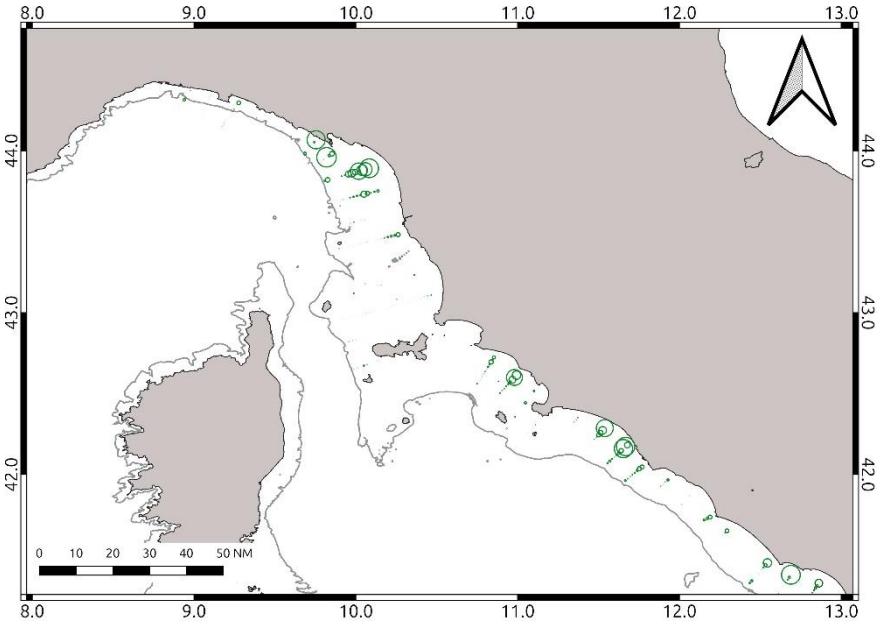


Figure 2.3.9. Anchovy (ANE) spatial distribution in GSA 9. MEDIAS 2024.

Abundance of sardine (Sardina pilchardus) in GSA 9 is reported in Fig. 2.3.10. During this survey, the presence of smaller specimens was less evident than in previous surveys in GSA 9.

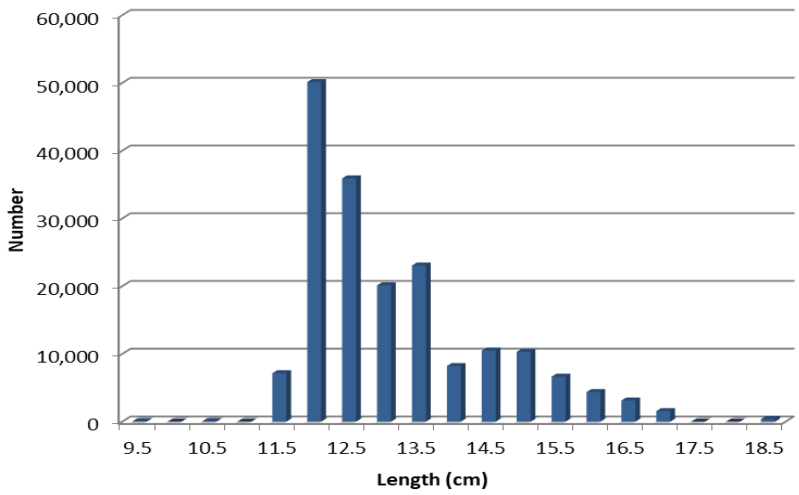


Figure 2.3.10. Sardine (PIL) abundance in numbers by length (LFD) in GSA 9. MEDIAS 2024.

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).

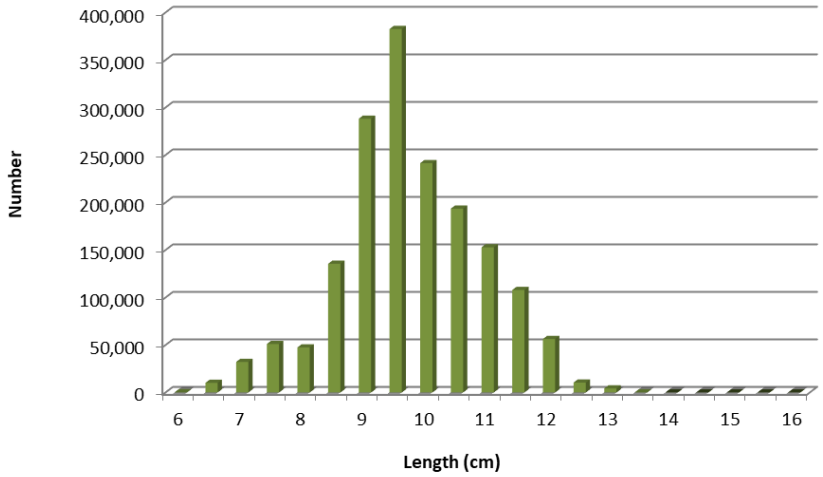


Figure 2.3.11. Anchovy (ANE) abundance in numbers by length (LFD) in GSA 9. MEDIAS 2024.

2.4. Presentation of the 2024 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

a) General information on the survey

MEDIAS 2024 in GSA 10 took place in the period 13 – 23 October (lasts 11 days at sea) and covered the continental shelf in the central and south Tyrrhenian sea (3007 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°02.810 N 15°16.948 E) on October 9, 2024. The calibration results are reported in the section belonging to the MEDIAS 2024 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 903 nm, while the number of EDSUs effectively used for acoustic analysis (minus pelagic trawls tracks and linking transects) was 787.

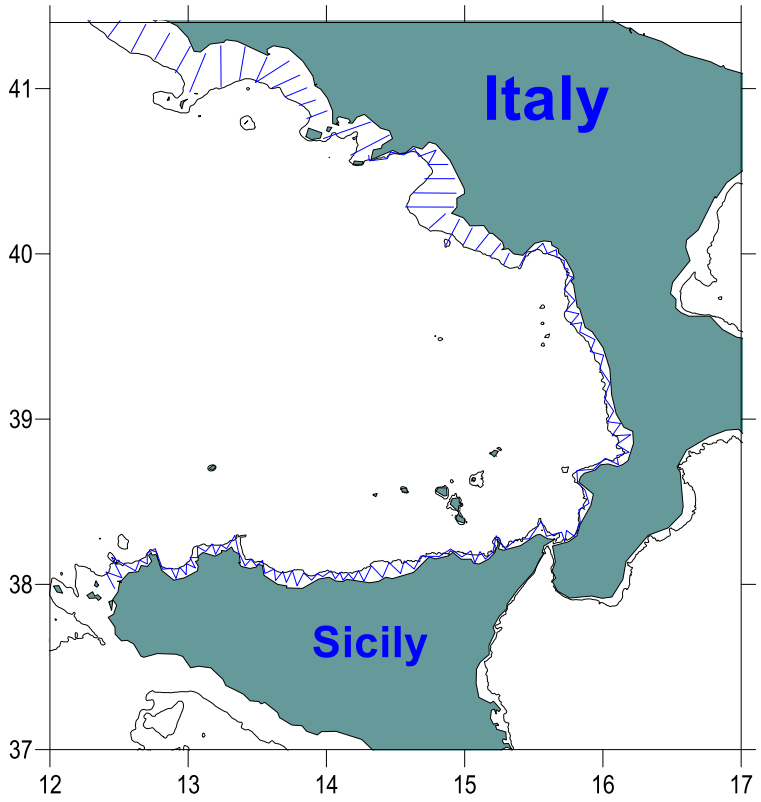


Figure 2.4.1. Acoustic survey design. MEDIAS 2024 in GSA 10.

e) Fish sampling

Pelagic fishes are identified with a pelagic haul. During the survey in 2024, twenty (20) pelagic hauls were carried out in GSA 10 to be used for echograms scrutinizing (Fig. 2.4.2).

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.

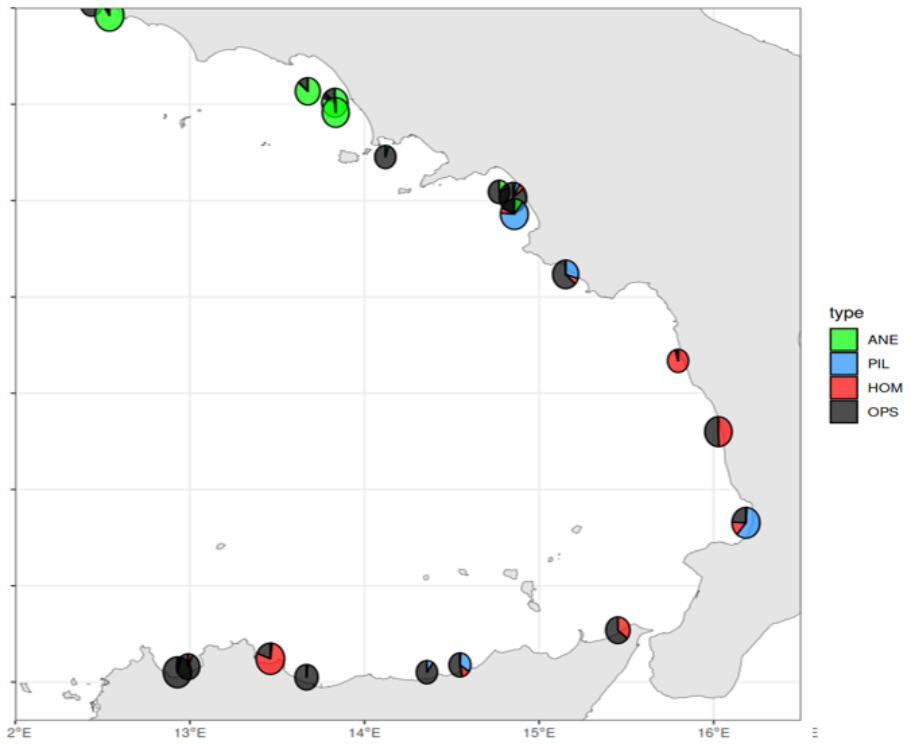


Figure 2.4.2. Map with pie charts reporting percentages in weight of anchovy, sardine, horse mackerel and other pelagic species (OPS) for the survey in GSA 10. MEDIAS 2024.

f) Oceanographic parameters

During the survey in summer 2024, 43 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). Due to the bad weather conditions during the survey period, CTD data in some of the foreseen hydrological stations were not collected.

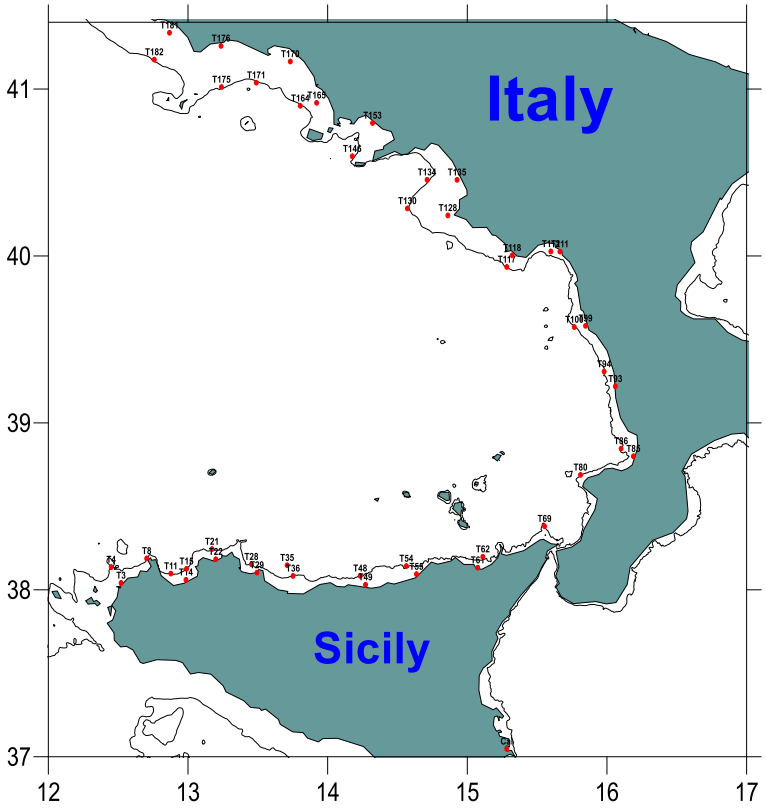


Figure 2.4.3. CTD stations performed during the echosurvey in GSA 10. MEDIAS 2024.

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	10035.7	14.2
Sardine	3681.2	25.4

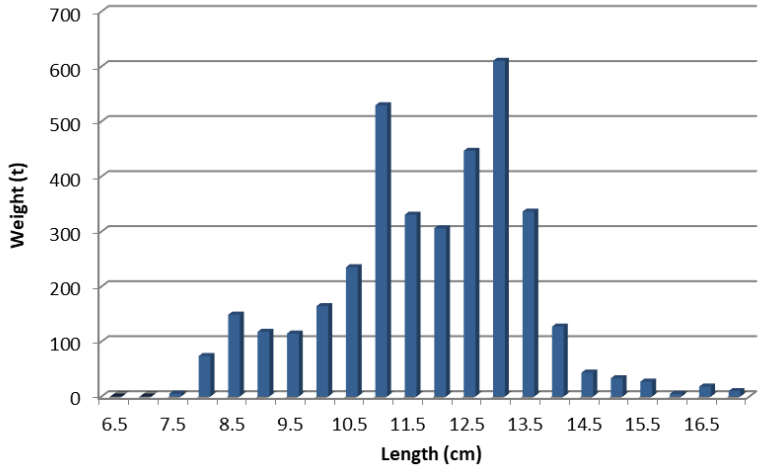


Figure 2.4.4. Sardine (PIL) biomass in tons by length (LFD) in GSAs 10. MEDIAS 2024.

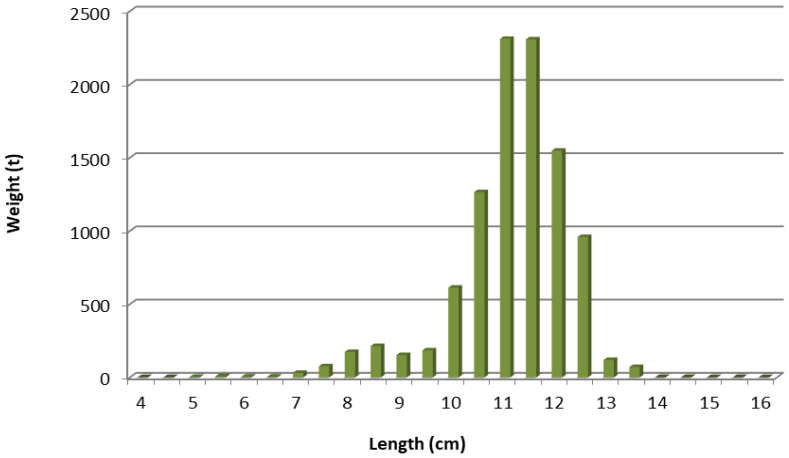


Figure 2.4.5. Anchovy (ANE) biomass in tons by length (LFD) in GSA 10. MEDIAS 2024.

Age length key (ALK) for sardine in GSA 10, MEDIAS 2024, was composed of four year classes. The number of otoliths readings was 240 (no. of individuals) (Fig. 2.4.6).

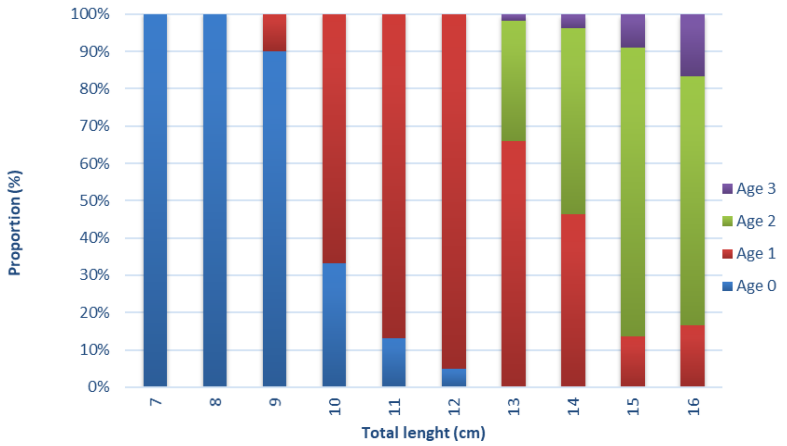


Figure 2.4.6. Sardine ALK in GSA 10. MEDIAS 2024.

Anchovy ALK in GSA 10 was composed by four year classes; the number of otoliths readings was 358 (no. of individuals).

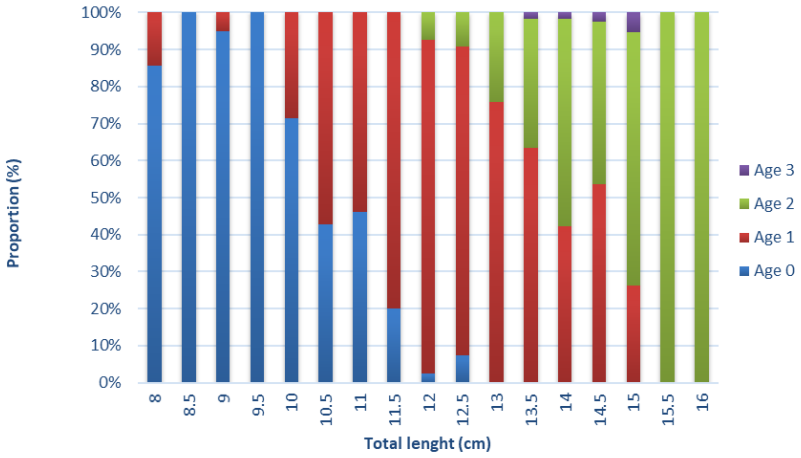


Figure 2.4.7. Anchovy ALK in GSA 10. MEDIAS 2024.

h) Abundance indices of target species

Spatial distribution of sardine and anchovy in GSA 10 during the survey in 2024 is shown in Fig 2.4.8 and 2.4.9.

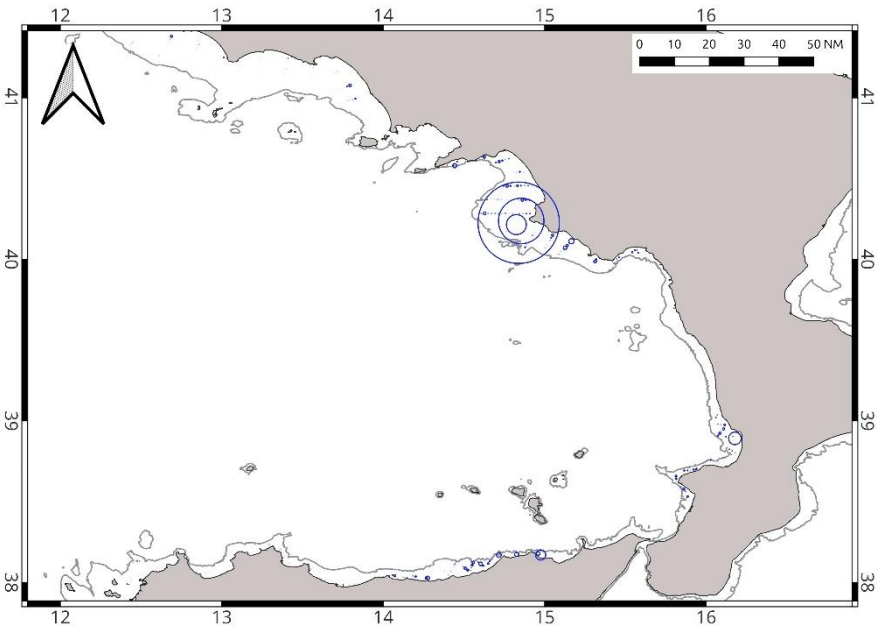


Figure 2.4.8. Sardine (PIL) spatial distribution in GSA 10. MEDIAS 2024.

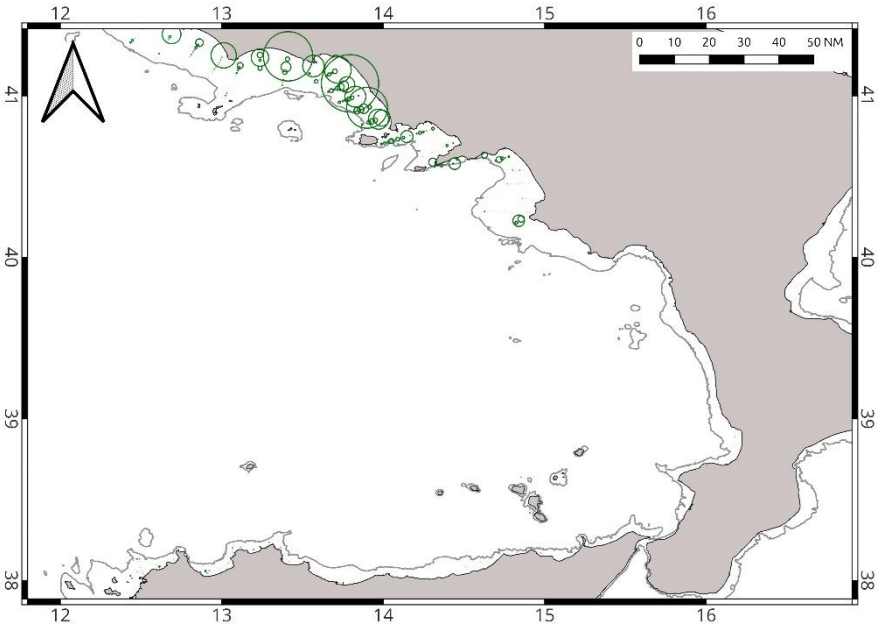


Figure 2.4.9. Anchovy (ANE) spatial distribution in GSA 10. MEDIAS 2024.

Abundance of sardine (Sardina pilchardus) in GSA 10 is reported in Fig. 2.4.10. During this survey, three main length modes were evident (8.5 cm, 11 cm and 13 cm) in GSA 10.

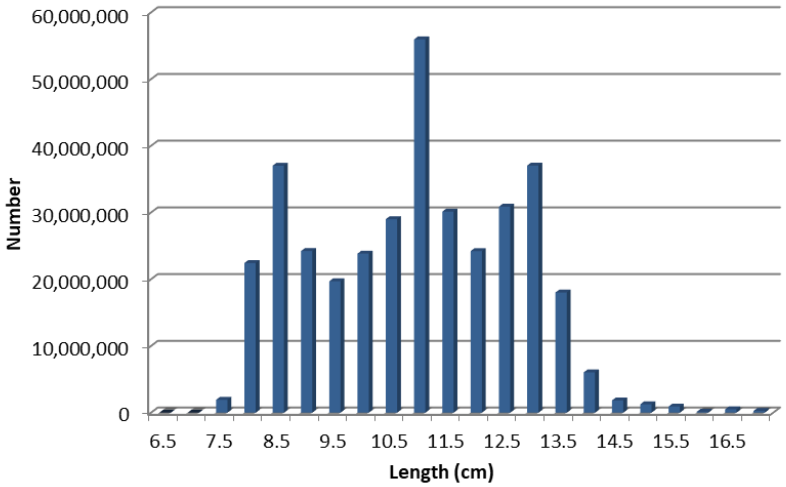


Figure 2.4.10. Sardine (PIL) abundance in numbers by length (LFD) in GSA 10. MEDIAS 2024.

Abundance of anchovy (Engraulis encrasicolus) estimated in GSA 10 revealed the presence of two modes centered at 8.5 cm and 11 cm (Fig. 2.4.11).

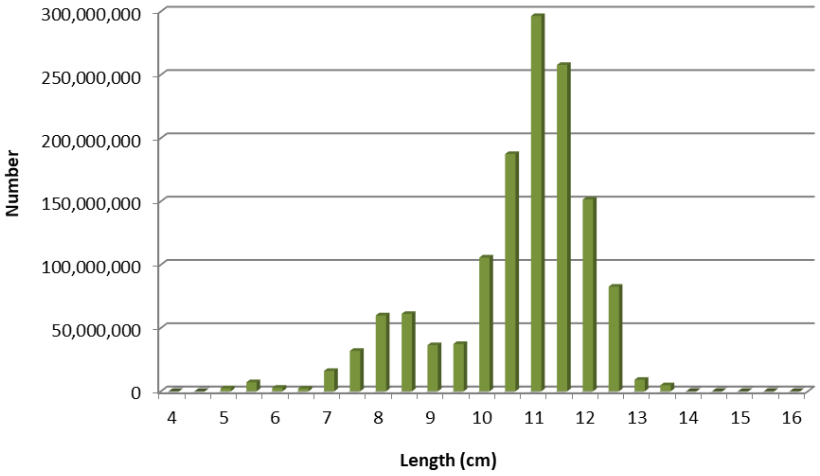


Figure 2.4.11. Anchovy (ANE) abundance in numbers by length (LFD) in GSA10. MEDIAS 2024.

2.5. Presentation of the 2024 acoustic surveys in GSA 15 - Malta (MAFA-ARM)

Kelly Camilleri, Michelle Mizzi, Giancarmelo Ales, Jurgen Mifsud, ARM

a) General information on the survey

MEDIAS 2024 acoustic survey was conducted between 26th and 28th November 2024 (~3 days at sea). It was conducted in the western GSA15, following MEDIAS protocol (MEDIAS

Handbook, 2023) with the help of our Sicilian colleagues. The Vessel used was the Research/Survey Vessel G. Dallaporta (35.7m length, 1086HP).

b) Type of echosounders and frequencies in use

The equipment was composed by a split beam echo sounder used was SIMRAD EK80, with the 38, 120 and 200 kHz frequencies. The threshold for acquisition was –80dB and that for processing was -60 dB with a pulse duration of 1024ms. The mean surveying acoustic vessel speed was 7.5 knots. The Echoview software was used to visualize and analyse acoustic data.

c) Calibration results

The acoustic system was calibrated at Syracuse on the 9th of October 2024.

Table 2.5.1: Calibration results in MEDIAS 2024.

Frequency (kHz)	Transducer model	Serial number	Beam angles (deg)	Athw. Beam angles (deg)	Athw. Offset Beam angles (deg)	Along Beam angles (deg)	Along Offset Beam angles (deg)	Transducer Gain (dB)	Sa Correction (dB)	RMS (dB)
38	ES38-7	502	7	6.71	0.14	6.63	-0.05	27.36	-0.51	0.1
120	ES120-7C	480	7	6.66	0.58	6.54	-0.43	26.06	-0.11	0.32
200	ES200-7C	365	7	7.71	-0.7	7	-0.13	23.62	-0.22	0.34

d) Survey design

Acoustic data were collected through 6 parallel transects (Fig 2.5.1). The total nautical miles effectively used for acoustic analysis (minus pelagic trawls tracks and linking transects) were 396.18.

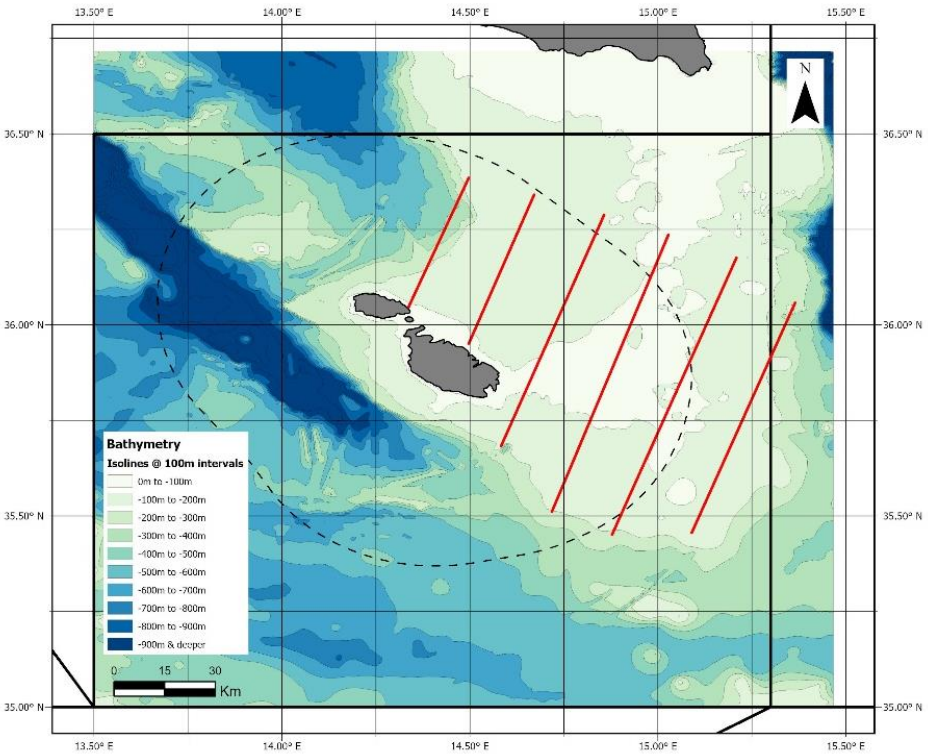


Figure 2.5.1. Acoustic survey design (show transects as lines). MEDIAS 2024.

e) Fish sampling

During the Autumn of 2024, five pelagic hauls were conducted in GSA15; one (for anchovy) of the five hauls were successful (Figure 2.5.2). The echogram data collected was analysed and scrutinised using the software Echoview. The pelagic net used had a total length of 78m. The initial mesh size was 182 by 800mm with a lateral mesh size of 400mm. The Cod-end mesh had a mesh size of 18mm, with the vertical opening being 7m and the horizontal opening being 13m. Only anchovies were caught.

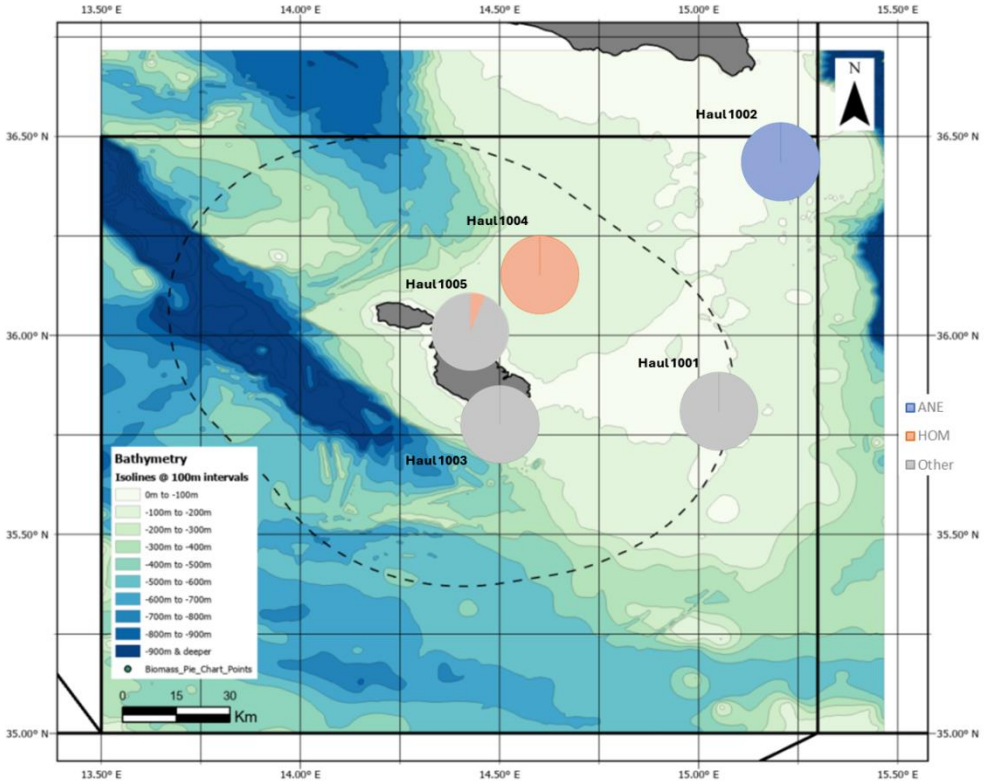


Figure 2.5.2. Pelagic hauls (5) composition carried out during the acoustic survey in GSA15. MEDIAS 2024.

f) Oceanographic parameters

During the survey in summer 2024, 16 hydrological stations have been conducted in GSA15 using a SBE 9/11plus CTD which measures conductivity, temperature, pressure, fluorescence, PAR (Photosynthetically active radiation), pH, oxygen and turbidity (Fig 2.5.3).

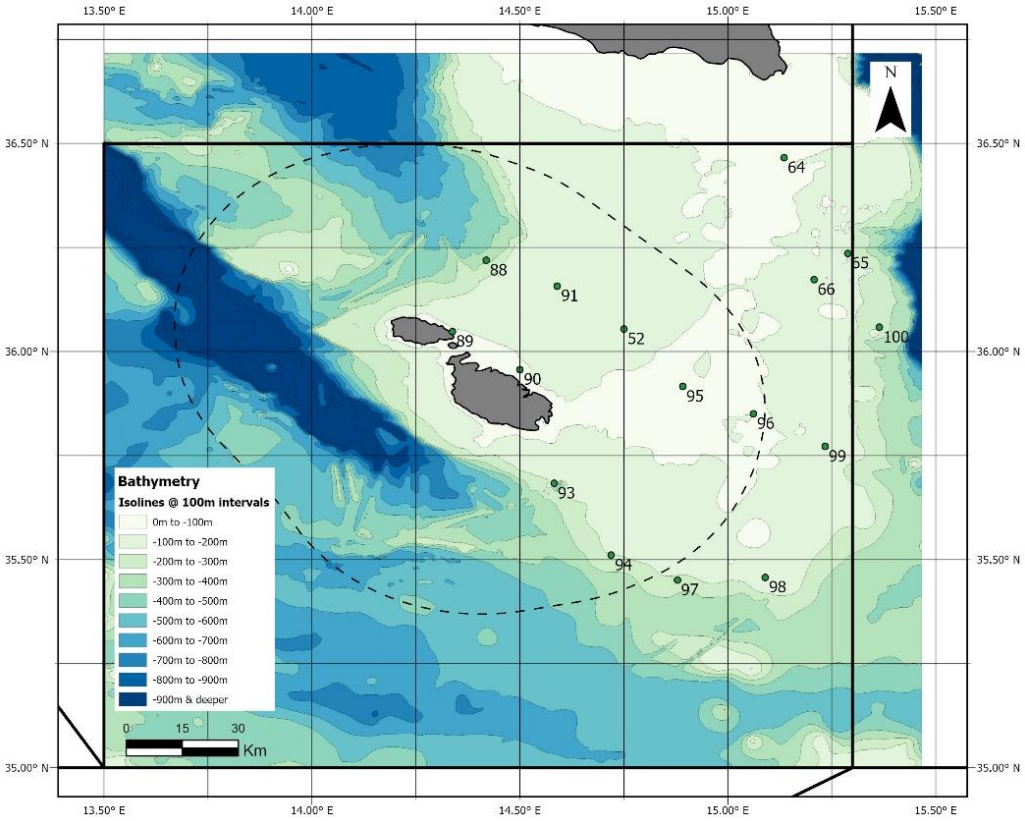


Figure 2.5.3. CTD stations (16) carried out during the acoustic survey in GSA15. MEDIAS 2024.

g) Biomass estimations of target species

Biomass calculation as: mean * area and CV from weighted average simulations.

Anchovy: Total Area: 2099

Total Biomass: 2000.3t (CV: 37.2 %)

Age length key (ALK) for anchovy in GSA15, MEDIAS 2024, was composed by 3-year classes. The number of otolith readings was 428 (no. individuals) (Fig. 2.5.4).

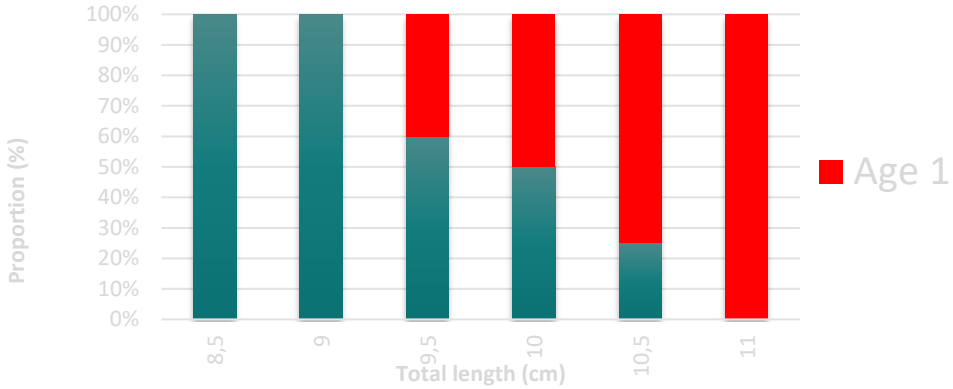


Figure 2.5.4. Anchovy ALK GSA15. MEDIAS 2024.

h) Abundance indices of target species

Spatial distribution of anchovy in GSA 15 in November 2024 is reported in Fig 2.5.5.

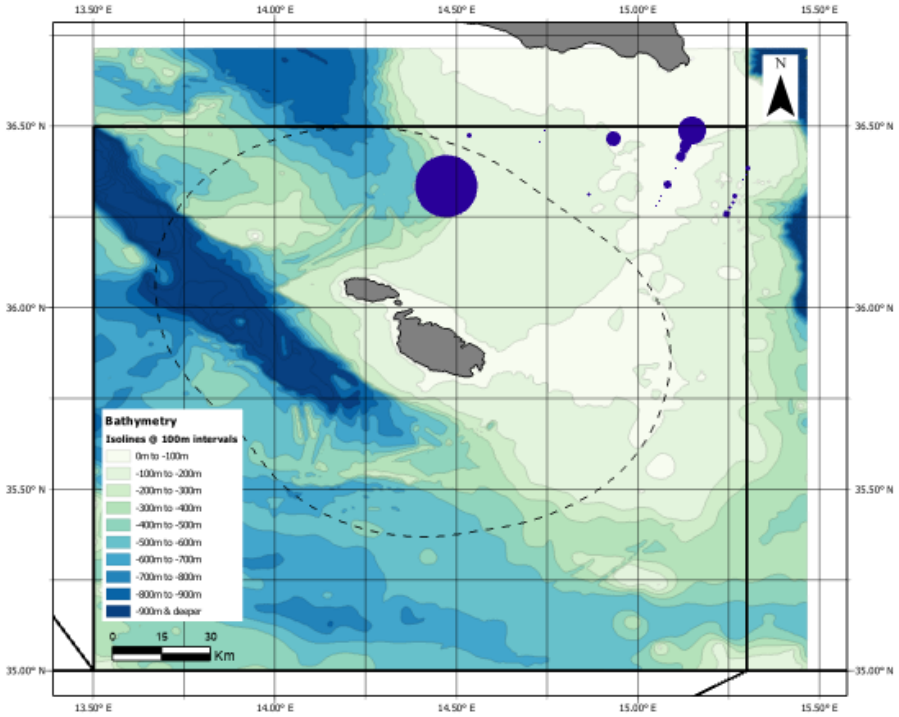


Figure 2.5.5. Anchovy (ANE) spatial distribution in GSA15 in November. MEDIAS 2024.

The LFD for this survey is characterized by a main mode at 9cm (Figure 2.5.6).

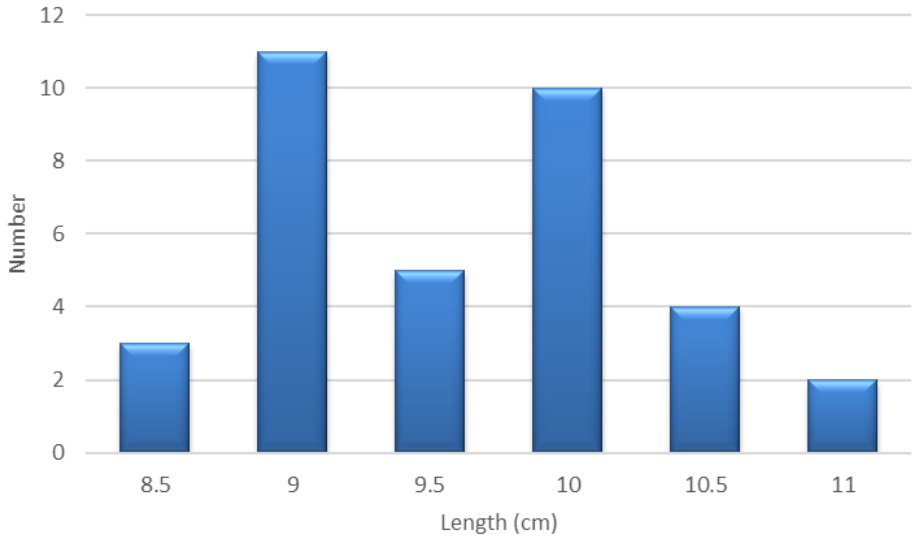


Figure 2.5.6. Anchovy (ANE) abundance in thousands by length (LFD) in GSA15. MEDIAS 2024.

2.6. Presentation of the 2024 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

a) General information on the survey

MEDIAS 2024 in GSA 16 took place in the period 4 – 19 November (lasts 21 days at sea) and covered the continental shelf along the southern coast of Sicily (3603 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 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°02.810 N 15°16.948 E) on October 9, 2024. The calibration results are reported in the section belonging to the MEDIAS 2024 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. During the survey in 2024, 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 560.

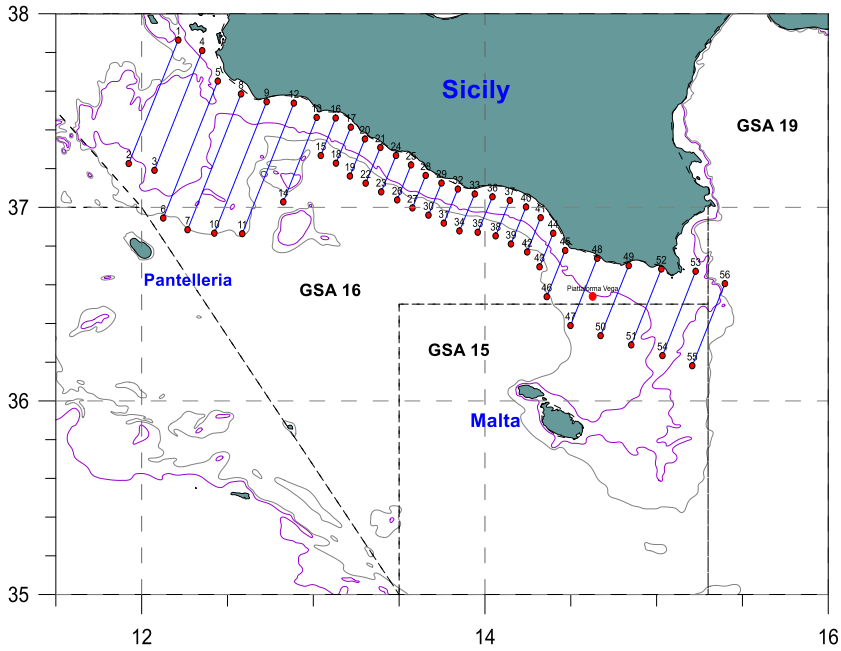


Figure 2.6.1. Acoustic survey design in GSA 16, partially covering GSA 15. MEDIAS 2024.

e) Fish sampling

Pelagic fishes are identified with a pelagic haul. During the survey in 2024, fourteen (14) pelagic hauls were carried out in GSA 16 to be used for echograms scrutinizing. Trawl hauls performed both in GSA 16 and in GSA 15 are shown in Fig 2.6.2.

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.

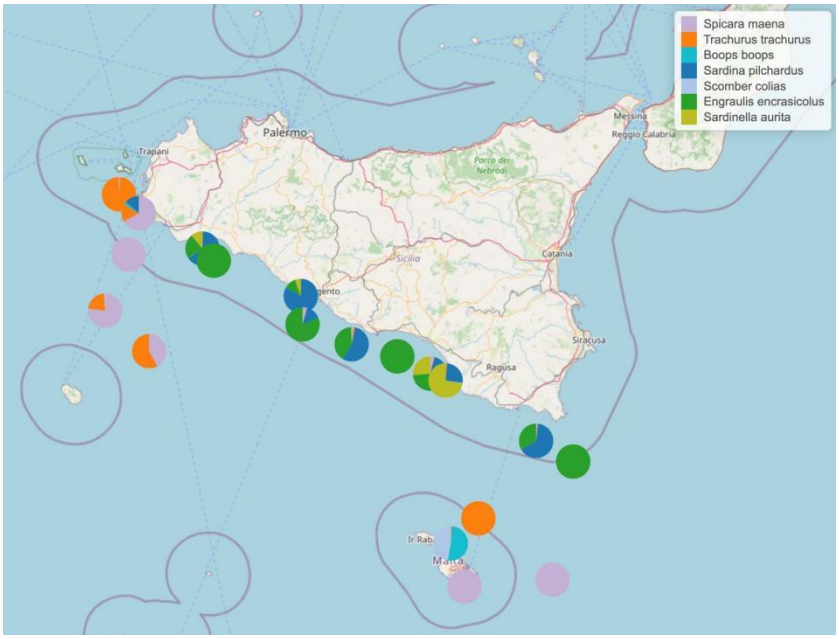


Figure 2.6.2. Map with pie charts reporting percentages in weight of anchovy, sardine and other pelagic species for hauls carried out during the acoustic survey in GSAs 15 and 16. MEDIAS 2024.

f) Oceanographic parameters

During the survey in 2024, 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).

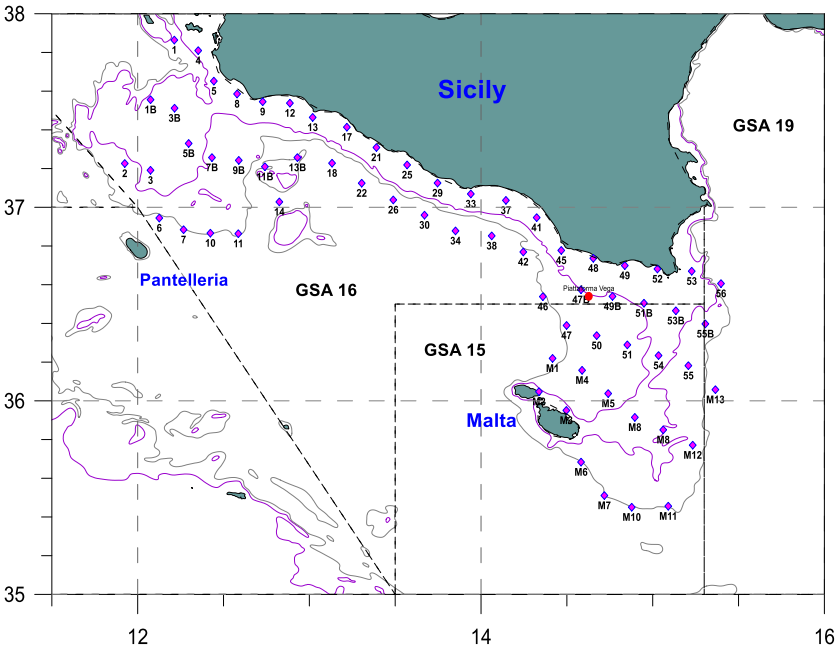


Figure 2.6.3. CTD stations performed during the echosurvey in GSAs 15 and 16. MEDIAS 2024.

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:

	GSA 16	
	Biomass (t)	**CV**
Anchovy	8675.5	17.5
Sardine	4091.8	13.9

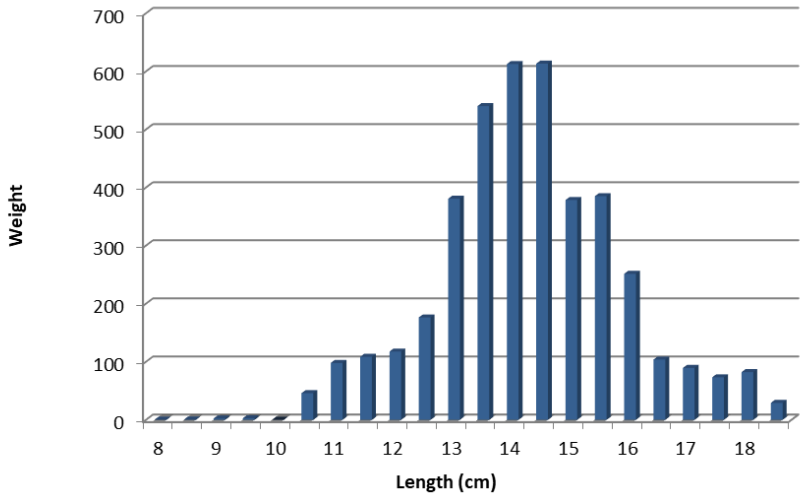


Figure 2.6.4. Sardine (PIL) biomass in tons by length (LFD) in GSA 16. MEDIAS 2024.

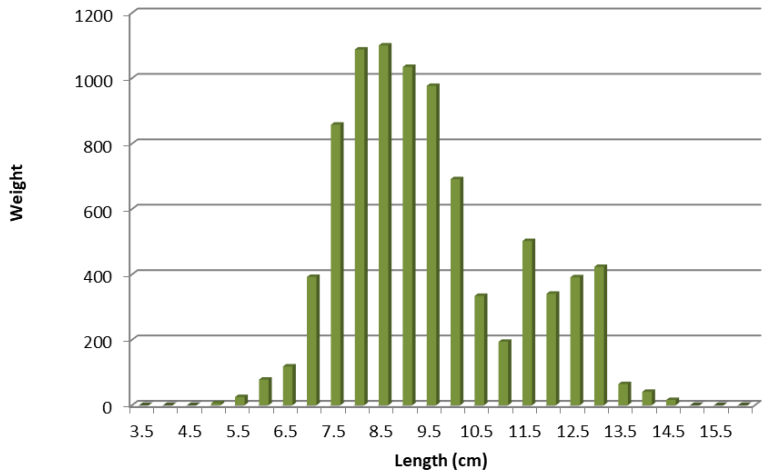


Figure 2.6.5. Anchovy (ANE) biomass in tons by length (LFD) in GSA 16. MEDIAS 2024.

Age length key (ALK) for sardine in GSA 16, MEDIAS 2024, was mainly composed of three year classes. The number of otoliths readings was 301 (no. of individuals) (Fig. 2.6.6).

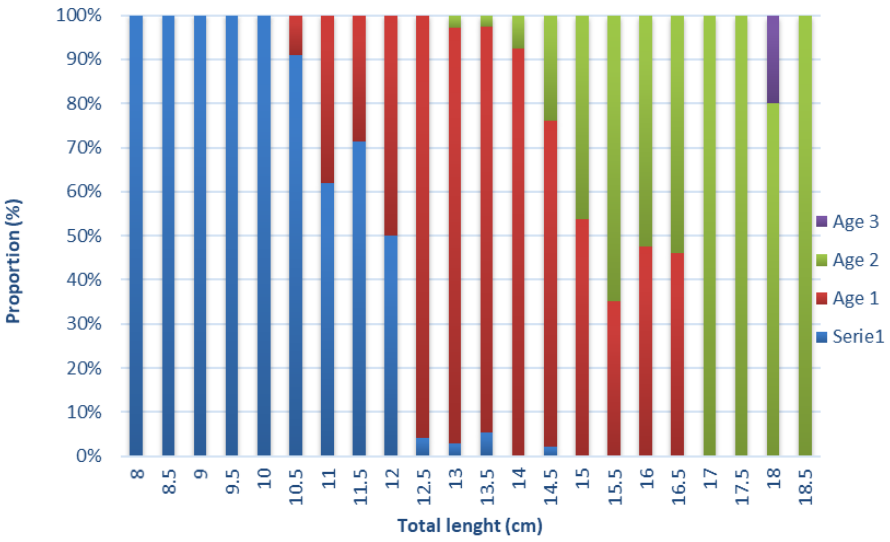


Figure 2.6.6. Sardine ALK in GSA 16. MEDIAS 2024.

Anchovy ALK in GSA 16, MEDIAS 2024, was mainly represented by three year classes; the number of otoliths readings was 428 (no. of individuals) (Fig. 2.6.7).

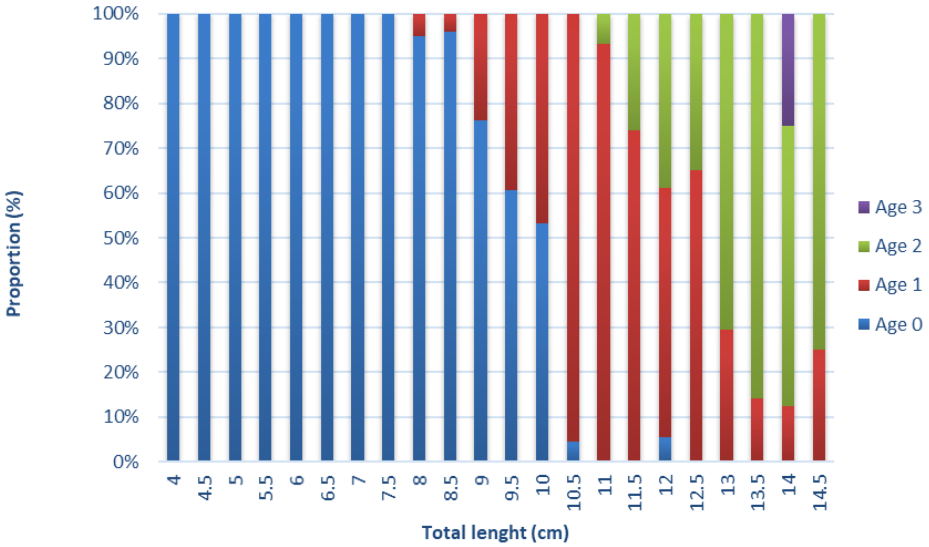


Figure 2.6.7. Anchovy ALK in GSA 16. MEDIAS 2024.

h) Abundance indices of target species

Spatial distribution of sardine and anchovy in GSA 16 during the survey in 2024 is shown in Fig 2.6.8 and 2.6.9, respectively.

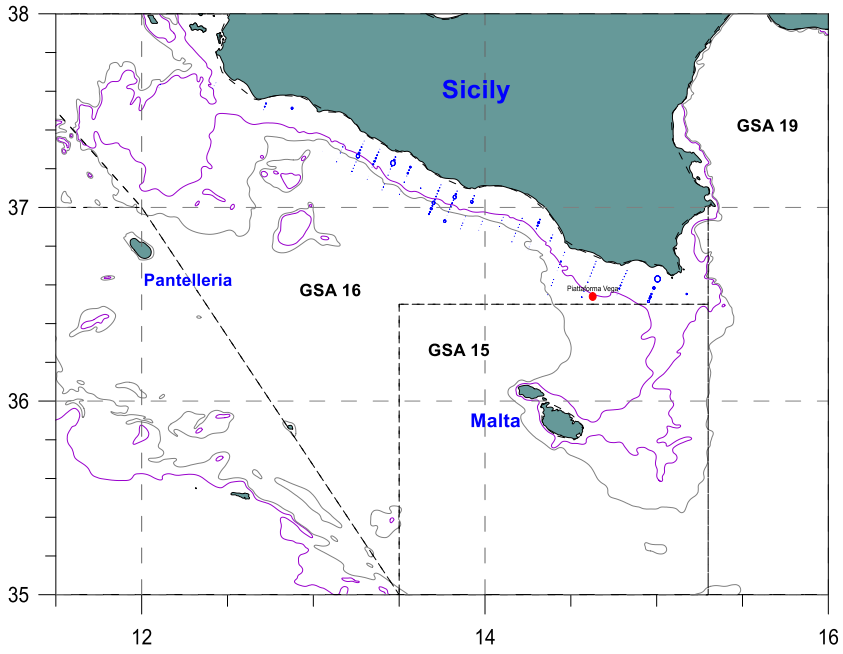


Figure 2.6.8. Sardine (PIL) spatial distribution in GSA 16. MEDIAS 2024.

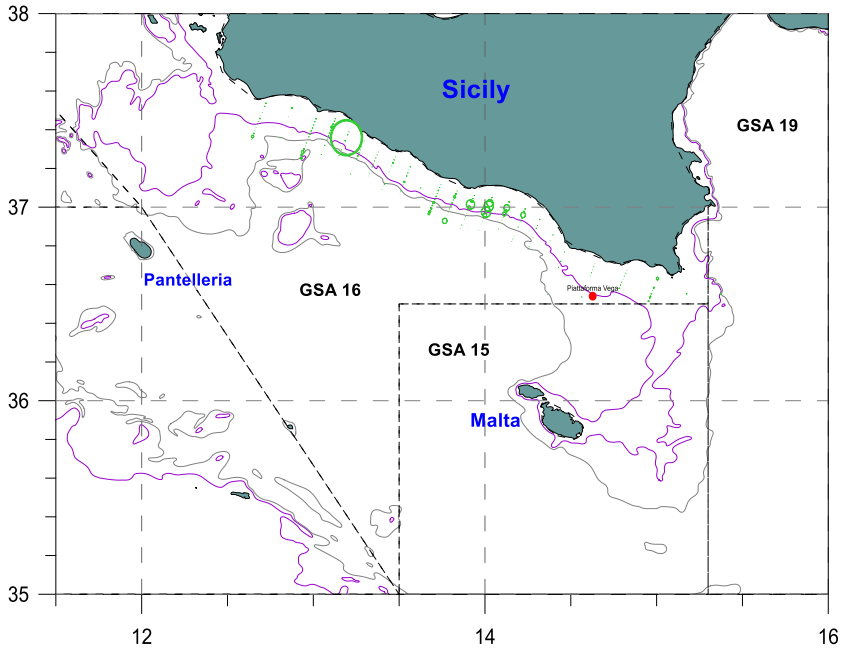


Figure 2.6.9. Anchovy (ANE) spatial distribution in GSA 16. MEDIAS 2024.

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 11 cm and 14 cm.

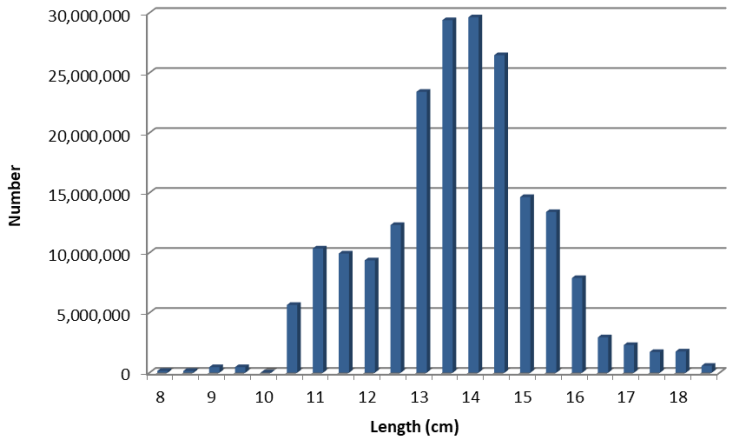


Figure 2.6.10. Sardine (PIL) abundance in numbers by length (LFD) in GSA 16, MEDIAS 2024.

Abundance of anchovy (Engraulis encrasicolus) estimated in GSA 16 revealed a main mode for LFD centered at 8 cm (Fig. 2.6.11).

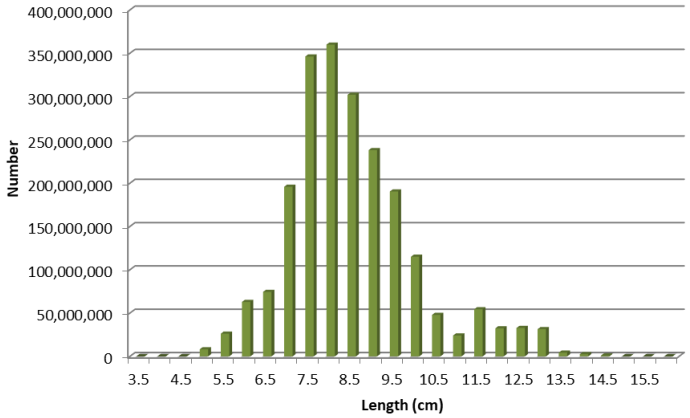


Figure 2.6.11. Anchovy (ANE) abundance in numbers by length (LFD) in GSA 16, MEDIAS 2024.

2.7. Presentation of the 2024 acoustic survey in the eastern part of GSA 17 - Northern Adriatic Sea (IZOR)

Vanja Čikeš Keč, Tea Juretić, Marija Boban, Denis Gašparević, IZOR

a) General information on the survey

Acoustic survey on the eastern part of GSA 17 in 2024 was performed in two periods due to the combination of equipment malfunction and vehicle availability. First part of expedition was performed from 01/09/2024. to 07/09/2024. Second part continued from 16/10/2024. to 05/11/2024. For echogram recording, in total, R/V BIOS DVA (length: 36m, engine power:

1200HP) was used for 28 days, in order to survey the area of 13.578 nmi2. For sampling biological material, R/V BIOS DVA was used for 4 days in the first leg of the expedition, and trawler Orka was used for 10 days in second leg of the expedition.

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 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 at the 1st day of the survey (01/09/2024.) in the Kašjuni 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, 2024)

CALIBRATION RESULTS:	
Frequency (kHz):	38
Transducer model:	ES38B
Serial number:	30825
Date:	02.09.2024.
Latitude:	43°30,302' N
Longitude:	16°23,771' E
Bottom depth (m):	33
Temperature (C°):	20,8
Salinity (psu):	38,3
Beam Width Alongship:	6,88
Beam Width Athwartship:	6,97
Angle Offset Alongship:	0,00
Angle Offset Athwartship:	0,04
Transducer Gain (dB):	22,85
SA Correction (dB):	-0,4800

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. In 2024, due to limitations in time, 6 of the most southern transects were done in a zig-zag pattern, and the southern inner sea was done with a simplified route. Number of nautical miles effectively processed for biomass estimation in 2024 was 1273.

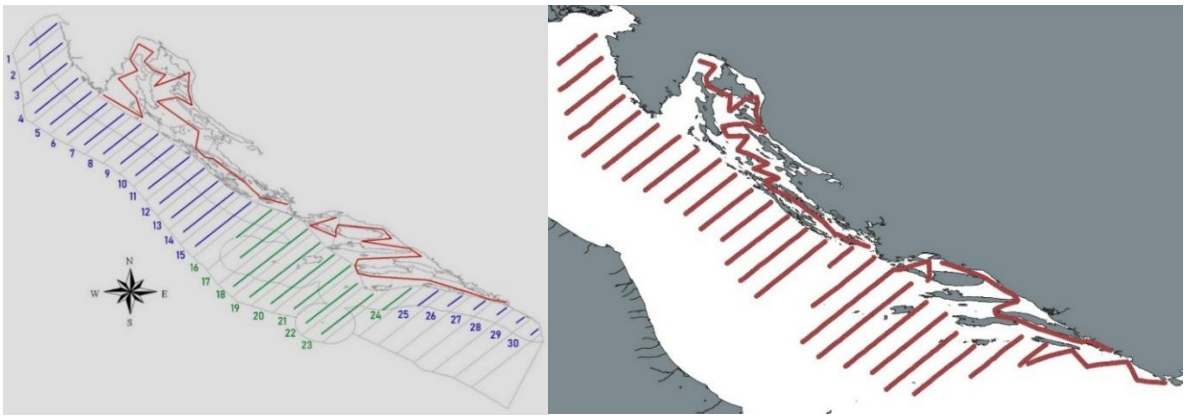


Figure 2.7.1. Planned acoustic survey design in the eastern part of GSA 17 (red transects in inner sea, green and blue transects in open sea) on the left, and the routes realized in 2024 on the right.

e) Fish sampling

36 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. Locations and species composition of samples obtained are shown in Fig 2.7.2.

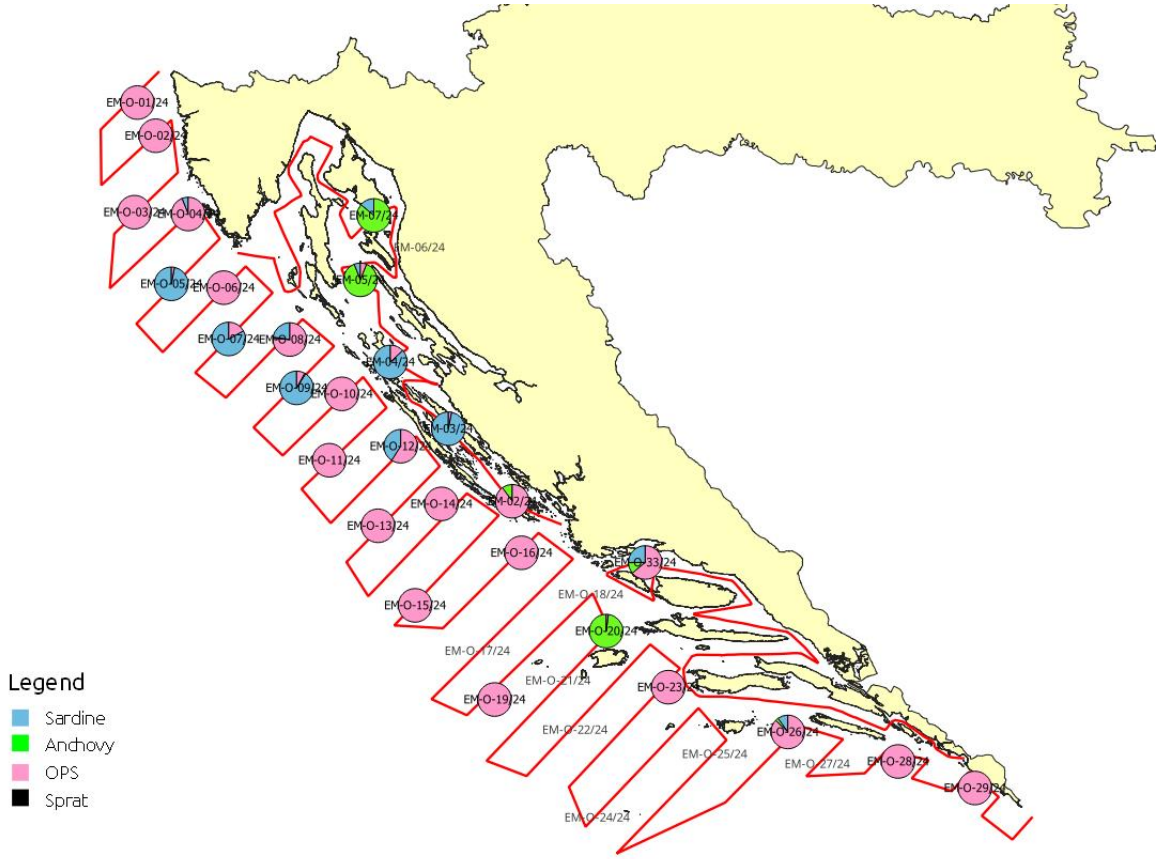


Figure 2.7.2 Pelagic hauls (36) composition (W%) carried out during the acoustic survey in the eastern part of GSA17 (MEDIAS, 2024).

f) Oceanographic parameters

Oceanographic parameters (temperature and salinity) were measured by CTD probe at 70 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.

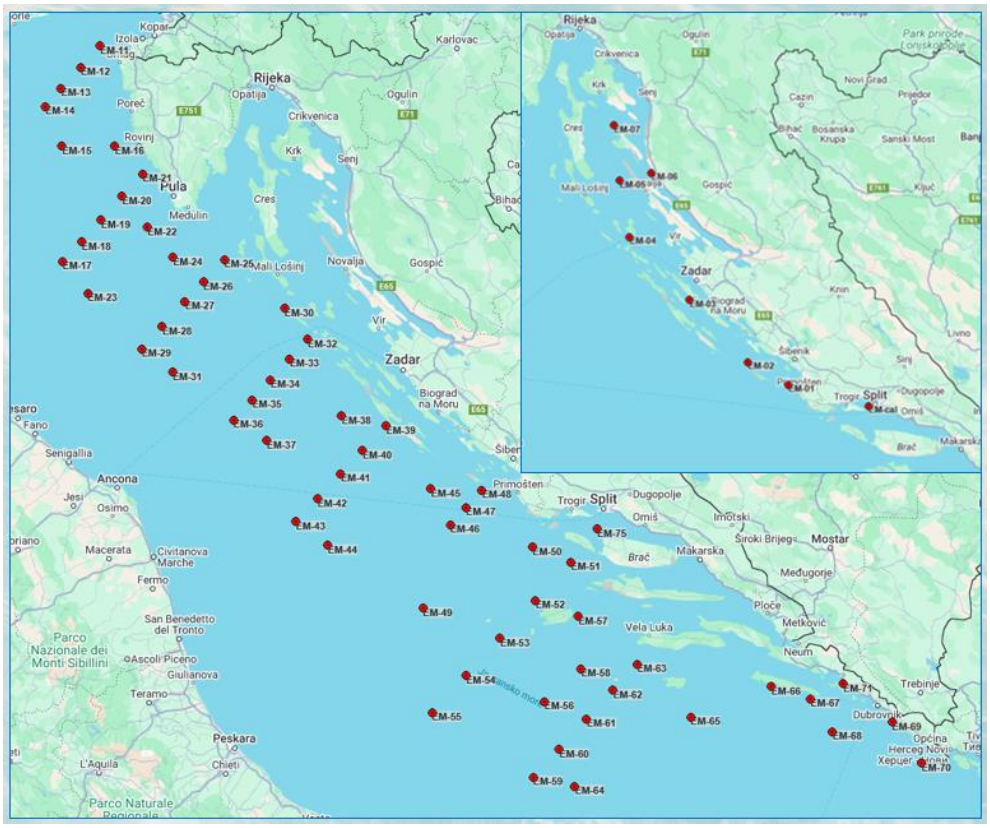


Figure 2.7.3. CTD stations (87) carried out during the acoustic survey in the eastern part of GSA17 (MEDIAS, 2024).

g) Biomass estimations of target species

In the eastern part of GSA17 were estimated 34 015 tons of anchovy. Anchovy length frequency distribution was from 6 to 16 cm, mostly 13-15 cm. Also, 35 295 tons of sardine were estimated. Sardine length frequency distribution was from 10 to 17 cm, mostly 13-15cm. Biomass estimates per length classes are shown in the Fig 2.7.4. Time series of biomass estimated for anchovy and sardine are shown in Figure 2.7.5. a); and time series of average density are shown in Figure 2.7.5. b).

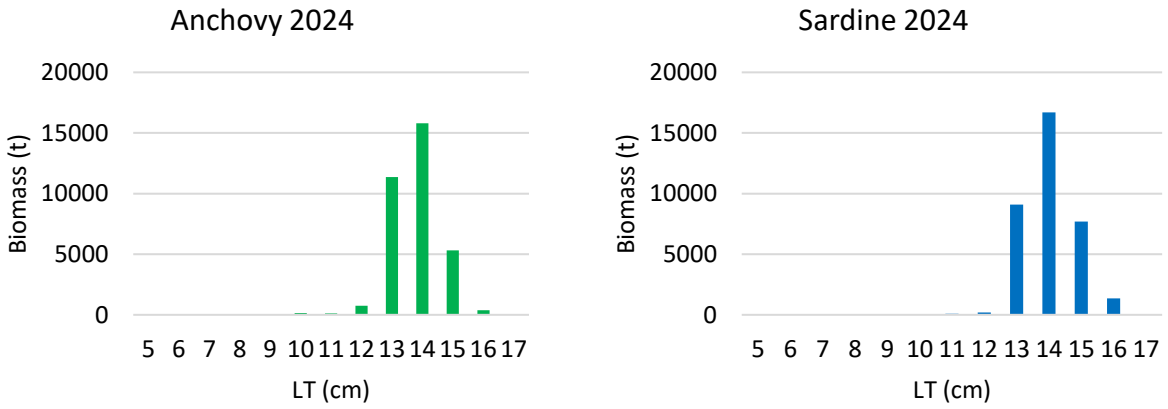
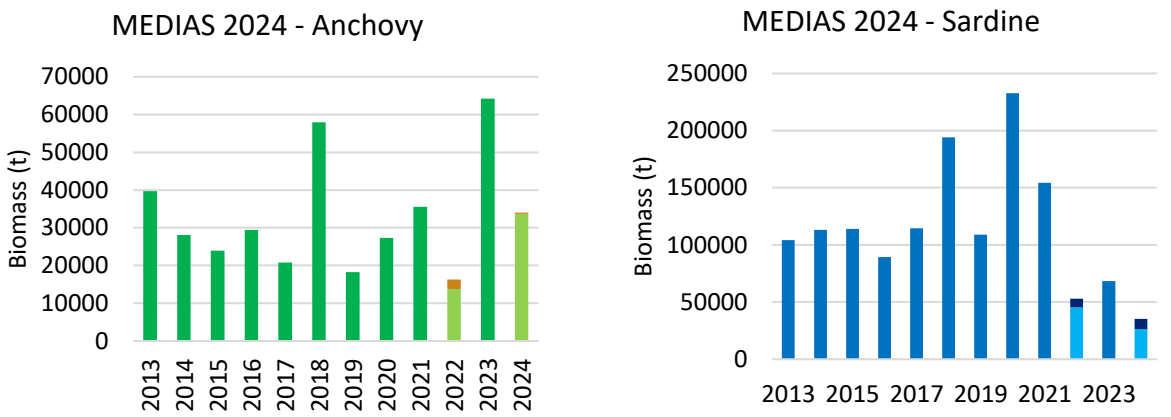


Figure 2.7.4. Biomass estimates per length classes in the eastern part of GSA17 (MEDIAS, 2024).

a)



b)

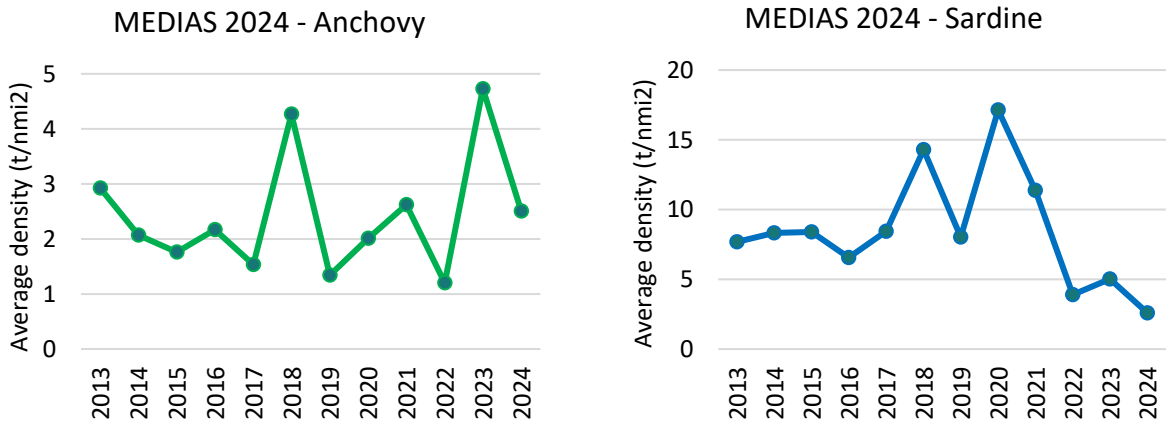


Figure 2.7.5 a) Time series of biomass estimation for anchovy and sardine in the eastern part of GSA17 (MEDIAS, 2024). Two different shades of colours indicate two periods of survey: the first leg of expedition (light shade) and the second leg of expedition (dark shade). b) Time series of average density for anchovy and sardine in the eastern part of GSA17.

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 populations consisted of two age groups (0 and 1), while sardine's consisted of three (0, 1 and 2). The number of otolith readings for anchovy and sardine was 173 and 231 respectfully. During Medias 2024 survey, in terms of biomass, age group 1 was dominant in both anchovy and sardine's population (Fig. 2.7.7).

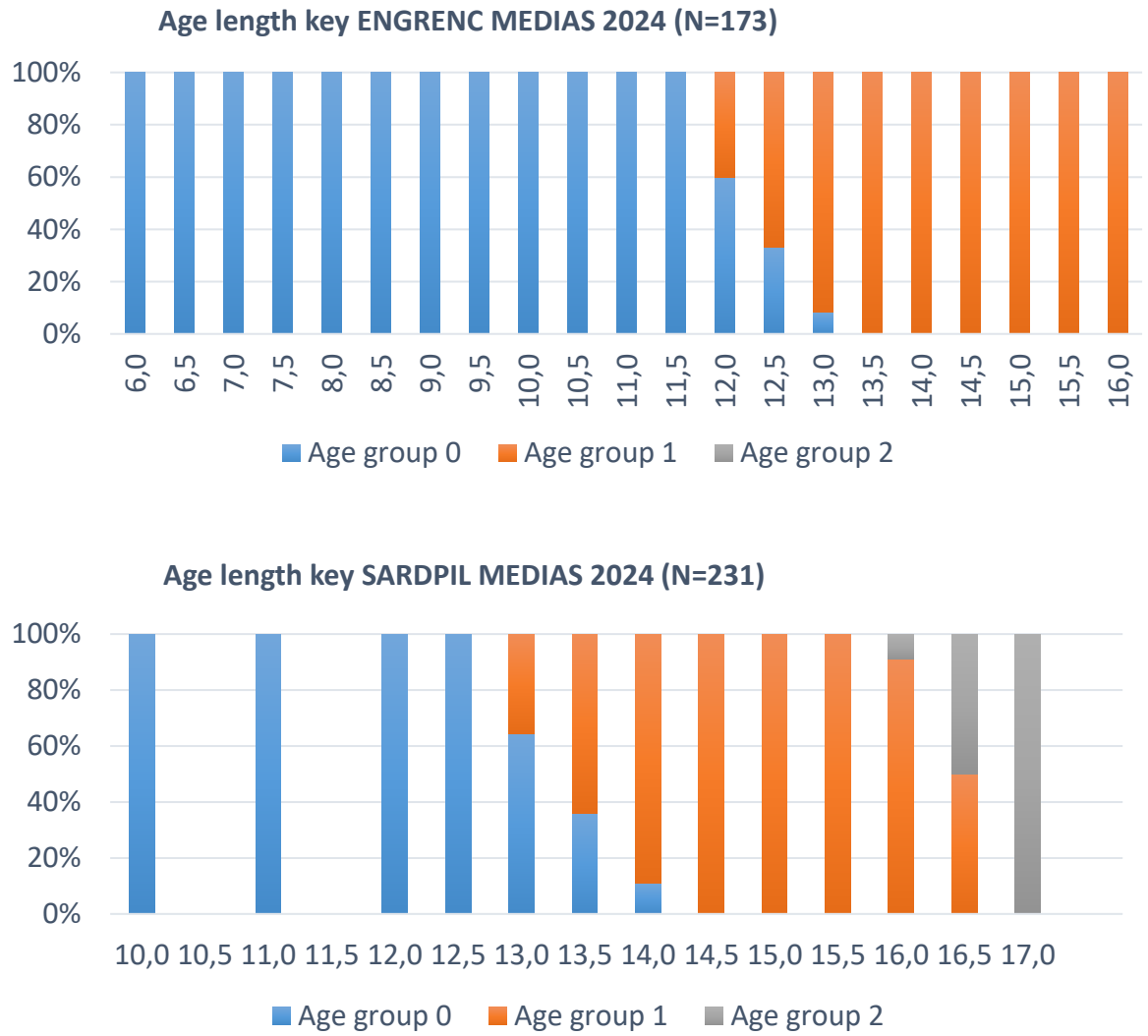


Figure 2.7.6. Age length keys (ALK) for anchovy (above) and sardine (below) in GSA17, MEDIAS 2024, were composed of three age groups (0, 1 and 2). The number of otolith readings was 173 for anchovy and 231 for sardine.

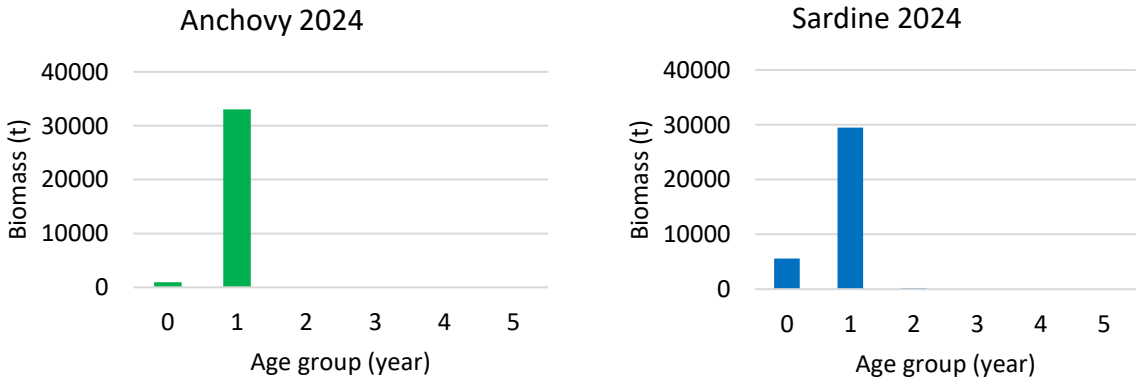


Figure 2.1.7. Biomass of anchovy and sardine estimates per age groups (MEDIAS, 2024).

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 Fig 2.7.8 and 2.7.9. Spatial distribution of anchovy shows majority of stock concentrated within northern channels between coast and islands (Fig. 2.7.8). 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).

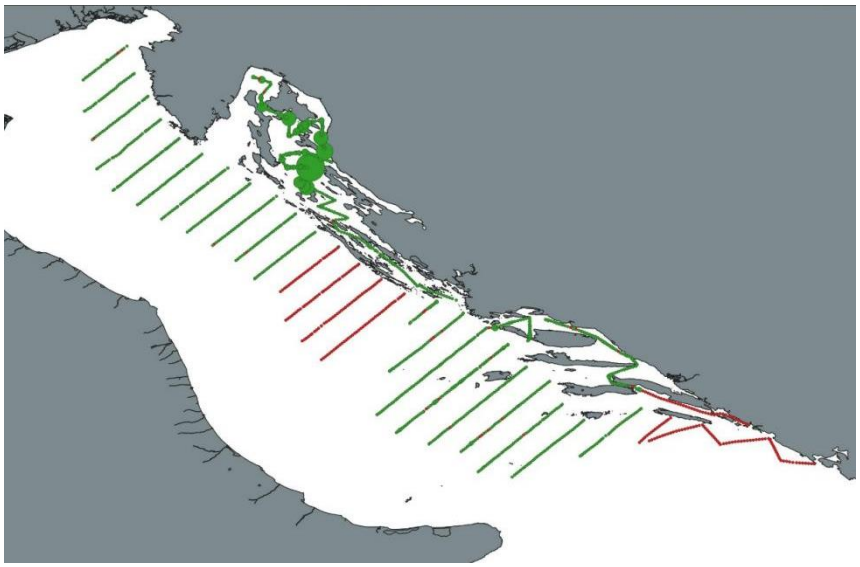


Figure 2.7.7. Anchovy spatial distribution in the eastern part of GSA17 (MEDIAS, 2024).

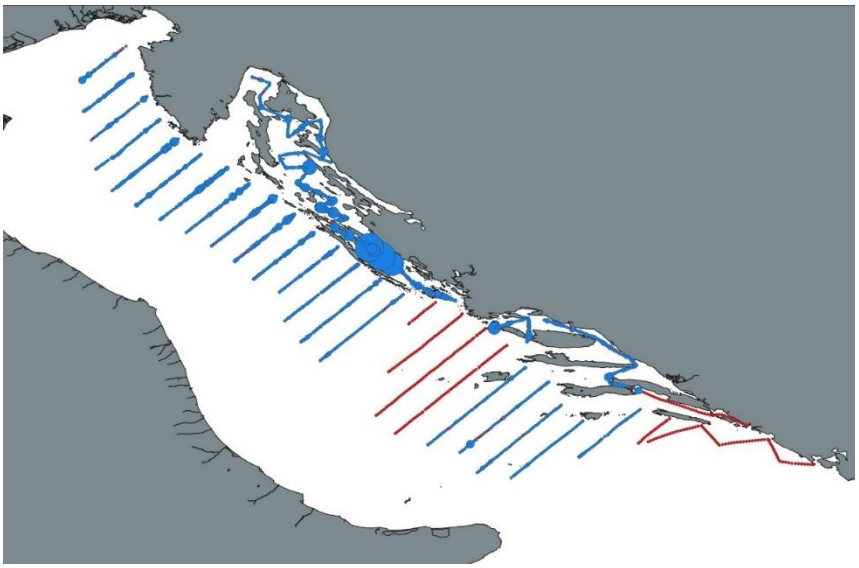


Figure 2.7.9. Sardine spatial distribution in the eastern part of GSA17 (MEDIAS, 2024).

Abundance (x10^3) per length for anchovy and sardine are shown in Fig 2.7.10. In total 2 115 104 thousand of individuals of anchovy and 1 448 899 thousand of individuals of sardine were estimated. Graphical view of anchovy shows long tale with small individuals, but majority of abundance is recorded at 13-15 cm. While sardine had no individuals smaller than 10 cm, it shared the range of 13-15 cm, with a peak at 14 cm.

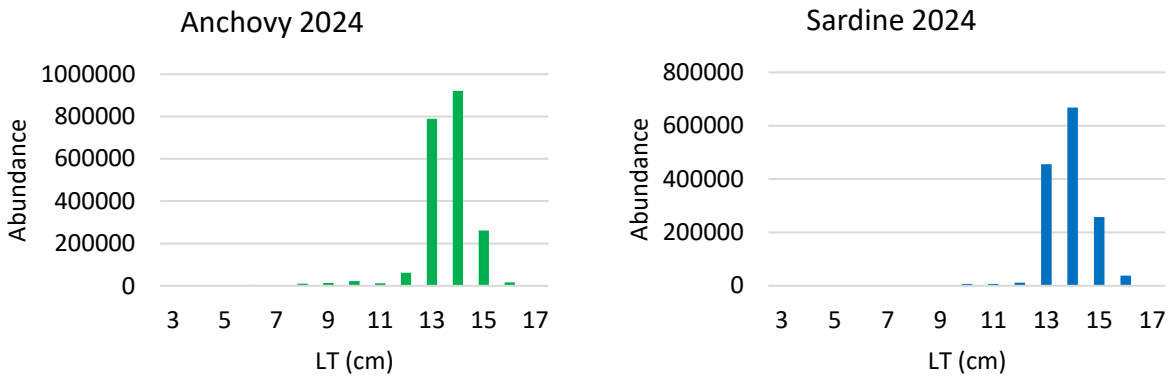


Figure 2.7.10. Abundance (x103) per length for anchovy and sardine in the eastern part of GSA17 (MEDIAS, 2024).

2.8. Presentation of the 2024 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 Palermino, Samuele Menicucci, Greta Di Martino. CNR-IRBIM

General information on the survey

MEDIAS 2024 acoustic survey was carried out in the period August 14 – September 30, 2024 (2 months delay in vessel availability). It was conducted in the western GSA 17, following MEDIAS protocol (MEDIAS Handbook, 2024), in the planned area of ~ 11,000 nmi2 . The cruises were conducted on board the research vessel “G. Dallaporta” (built in 2001, 35.30 m, 285 GT, 1100 CV). GSA 18 survey was not conducted due to very bad weather conditions especially in September.

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 8th of August 2024 at 38, 70, 120 and 200 kHz, using the standard sphere method.

Table 2.8.1. Calibration results in MEDIAS 2024

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		08/08/2024	Ancona	43° 38.0'	13° 42.8'	30.0	18.3	39.0	1521.5

Freq. (kHz)	Echosounder type	Transducer 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)	Calibrated TS gain	Time (GMT)	RMS	Sa corr.
38	SIMRAD EK80	502	-42.4	1.024	-20.7	25.50	3395	10:38 – 10:51	23.0	Max	26.93	8:38 – 8:51	0.106	-0.146
70	SIMRAD EK80	271	-41.6	1.024	-20.7	27	2529	10:57 – 11:07	23.0	Max	26.94	8:57 – 9:07	0.201	-0.192
120	SIMRAD EK80	924	-39.6	1.024	-20.7	27	3491	11:11 - 11:24	23.0	Max	26.36	9:11 – 9:24	0.121	-0.060
200	SIMRAD EK80	365	-38.9	1.024	-20.7	26	3921	11:28 – 11:42	23.0	Max	25.13	9:28 – 9:42	0.237	-0.196

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.

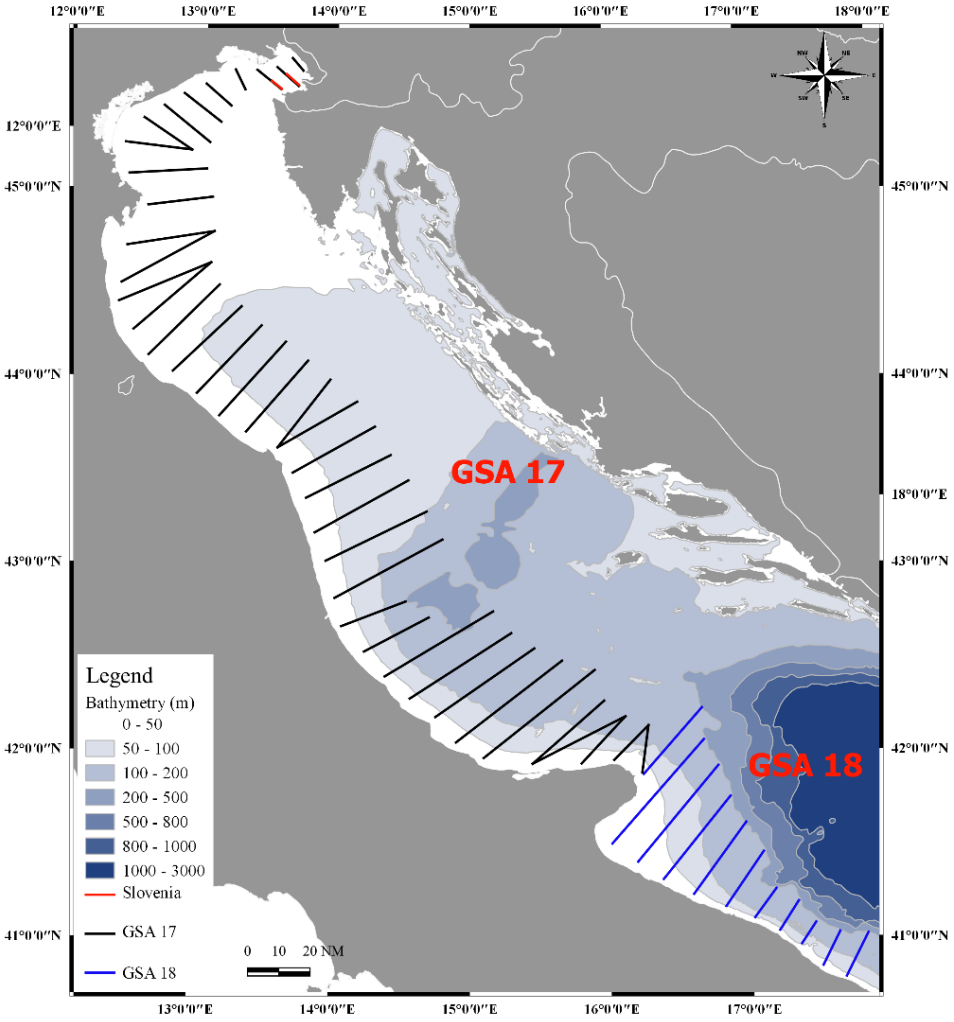


Figure 2.8.1. Acoustic survey design in the western part of GSA 17 and GSA 18. MEDIAS 2024.

Survey period of the MEDIAS 2024 acoustic survey in western GSA 17 was from August 14 – to September 30, 2024; area coverage was 95% over a total area of 10,519 nmi² and 36 transects. The number of nautical miles effectively processed for biomass estimation was 997 (1284 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.

In western Adriatic Sea, in 2024, 26 pelagic hauls were done in GSA 17 (Fig. 2.8.2). Catch composition, desumed from pelagic hauls, showed among the most abundant species Engraulis encrasicolus and Sardina pilchardus.

Other pelagic fish species minor for occurrence were: Sprattus sprattus, Trachurus mediterraneus, Trachurus trachurus, Spicara spp, Scomber colias, Scomber scombrus, Sarda sarda, Sardinella aurita, Boops boops, Aphia minuta.

Other species found in some catches were: Loligo volgaris, Illex coindetii, Alloteuthis media, Mullus barbatus, Merlangius merlangus, Aequorea Aequorea, Pagellus erythrinus, acarne, Diplodus annularis, Callinectes sapidus.

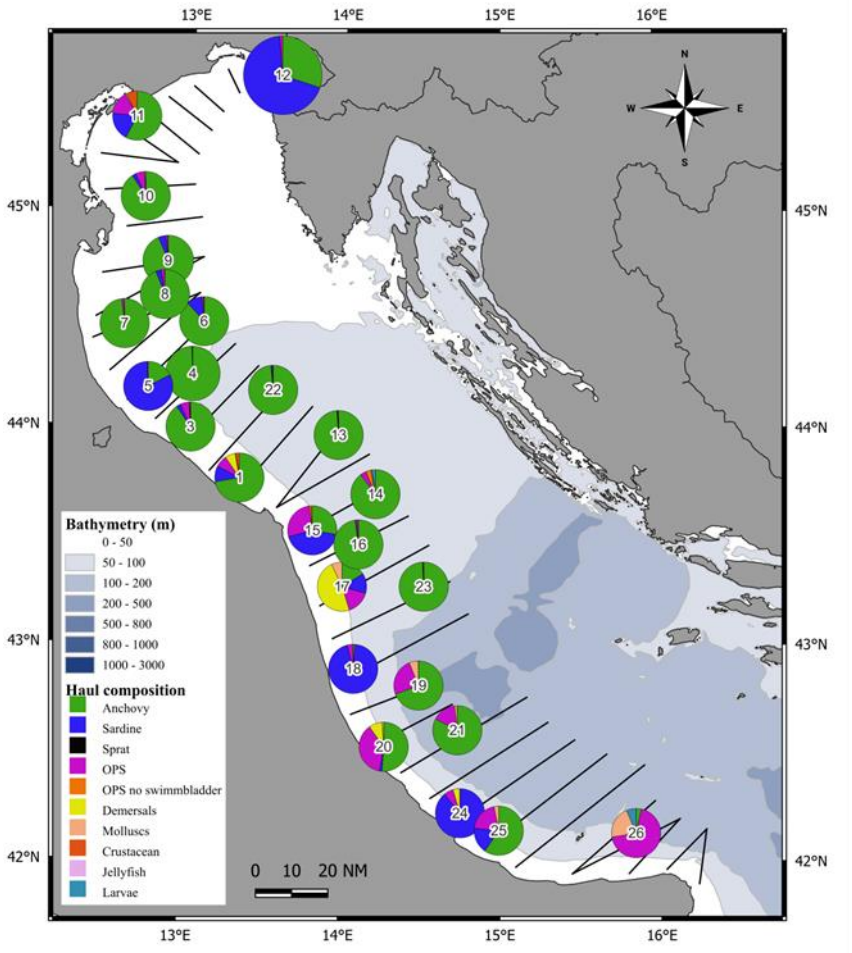


Figure 2.8.2. Pelagic hauls composition (26) carried out during the acoustic survey in western GSA 17. MEDIAS 2024.

Oceanographic parameters

In total, 60 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 activity samplings 44 mesozooplankton stations were done in GSA 17 using a WP2 vertical net.

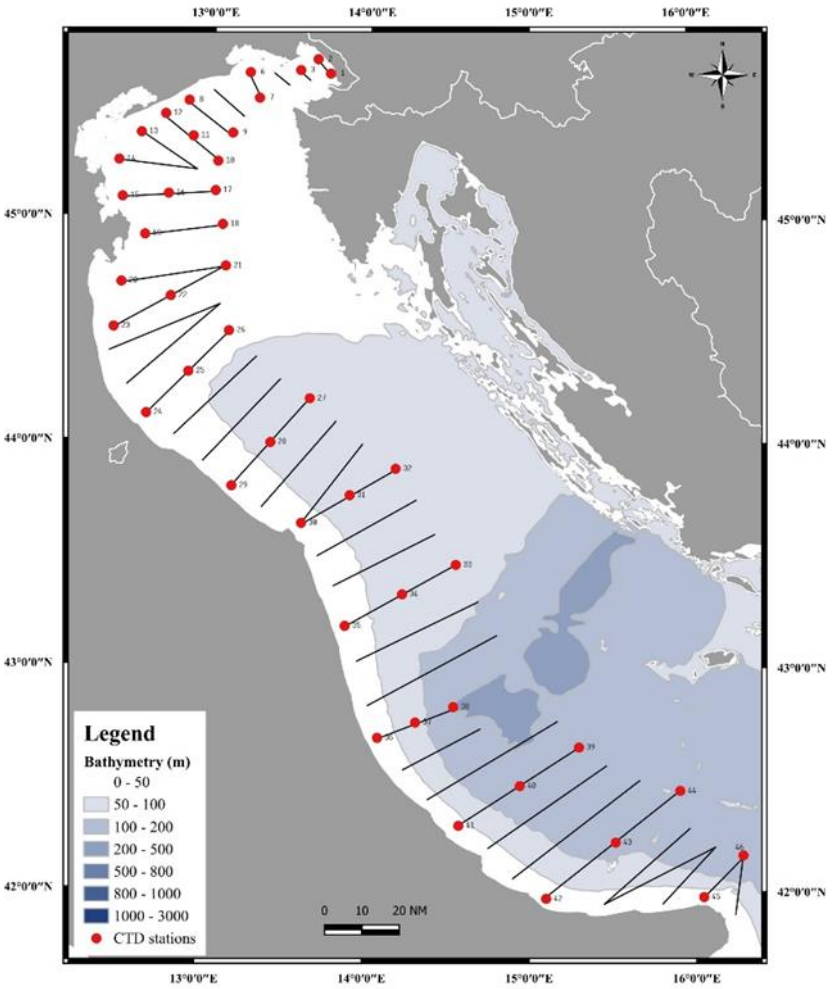


Figure 2.8.3. Planned CTD stations carried out during the acoustic survey in the western part of GSA 17. MEDIAS 2024.

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 2024, in western GSA 17, were estimated in:

Year	Sardine	CV	Anchovy	CV	Sampled Area
2024	93,020 t	9.5%	281,878 t	9%	10,519 nmi^2

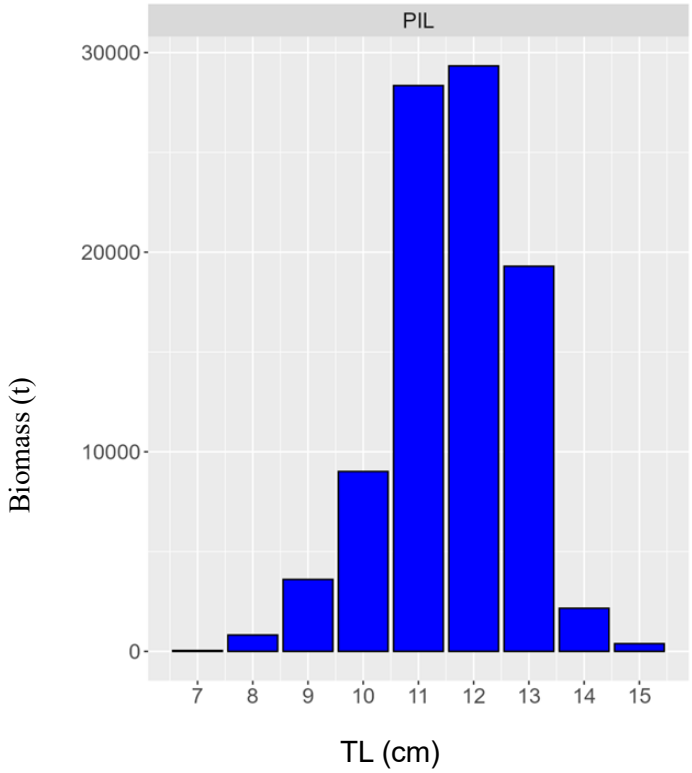


Figure 2.8.4. Sardine (PIL) biomass in tons by length (LFD) in western GSA 17. MEDIAS 2024.

For sardine, biomass per length class is concentrated in the range 9-14 cm (Fig. 2.8.4).

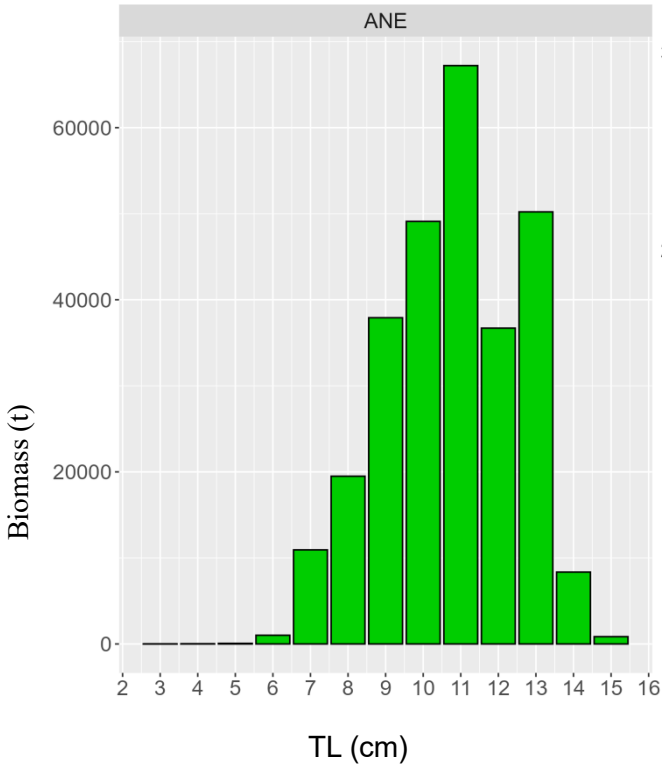


Figure 2.8.5. Anchovy (ANE) biomass in tons by length (LFD) in western GSA 17. MEDIAS 2024.

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

Biomass time series

In 2024, we see, in western GSA 17 MEDIAS (Fig. 2.8.5b), a slight increase in sardine biomass, but it remains around the average value of the last 9 years. Anchovy has a further increase in 2024, but it remains around the average value of the last 8 years.

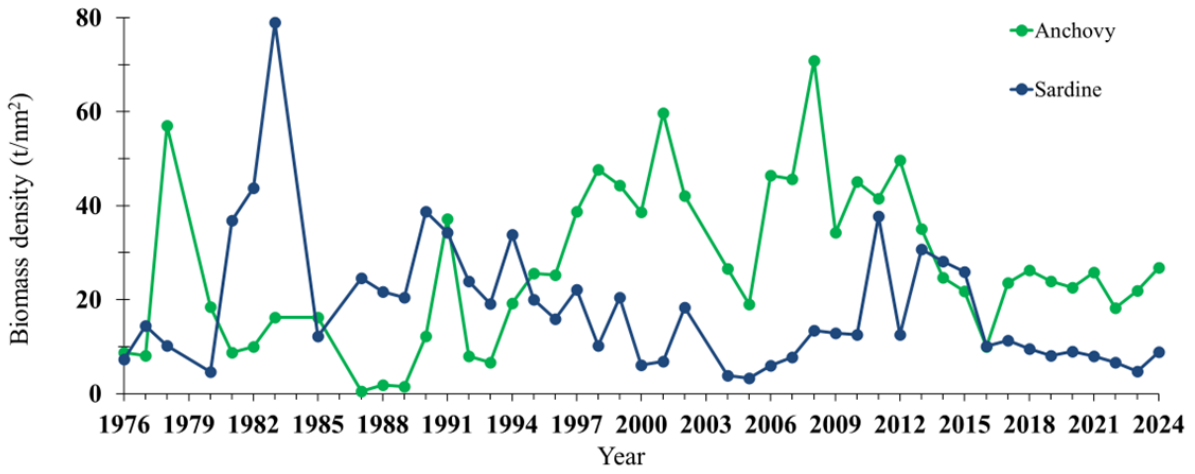


Figure 2.8.5b. Historical trends in Northwestern Adriatic Sea 1976-2024.

Age length key (ALK) for sardine in western GSA 17, MEDIAS 2024, was composed by 3 years classes: age 0, age 1 and age 2. The number of otoliths readings was 445 for sardine (no. individuals) (Fig. 2.8.6).

Anchovy ALK in western GSA 17, MEDIAS 2023, was represented by 3 years classes: age 0, age 1 and age 2. The number of otoliths readings was 661 for anchovy (no. individuals) (Fig. 2.8.7).

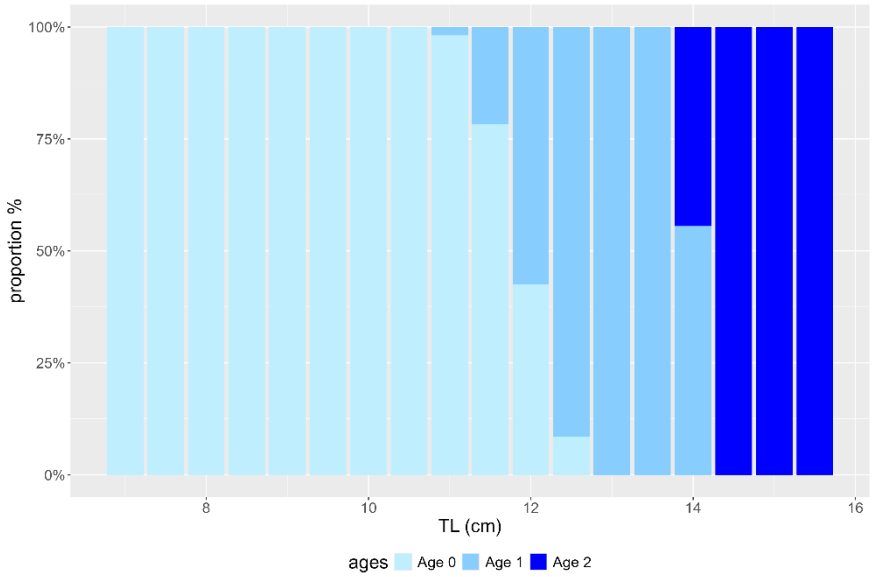


Figure 2.8.6. Sardine ALK western GSA17, MEDIAS 2024.

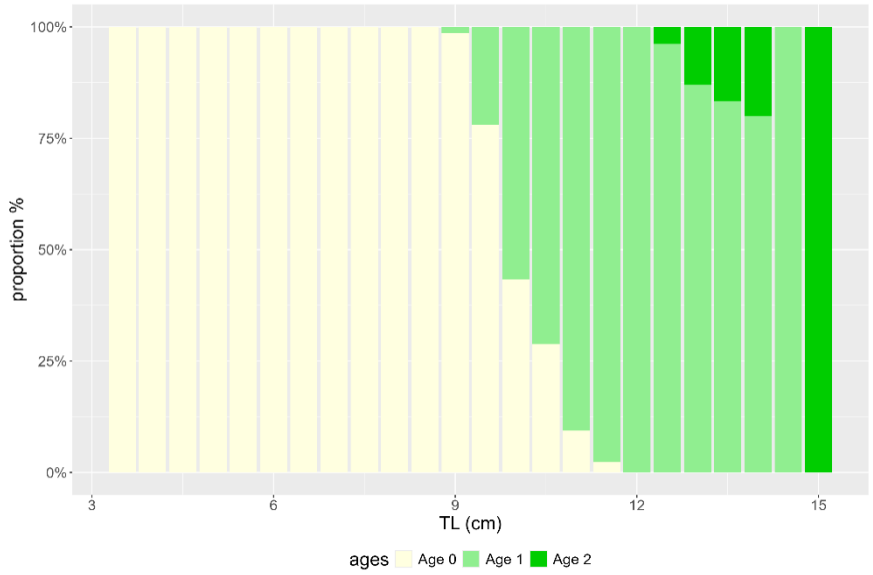


Figure 2.8.7. Anchovy ALK western GSA17, MEDIAS 2024.

Sardine and anchovy biomass per age were estimated using the above reported ALKs.

Sardine biomass at age (Fig. 2.8.8) was mainly composed by age group 0, 1 (both dominants) and 2. Age group 0 was particularly abundant due to the shift in the survey period (larger sizes for the shift between 0 and 1 age).

Anchovy biomass at age distribution (Fig. 2.8.9) showed that there were 3 age groups: 0, 1, 2. Age 1 was dominant. Age group 0 was abundant due to the shift in the survey period that allowed to catch juveniles. Recruitment was present due to the survey period (August - September 2024), while in 2023 there was no recruitment.

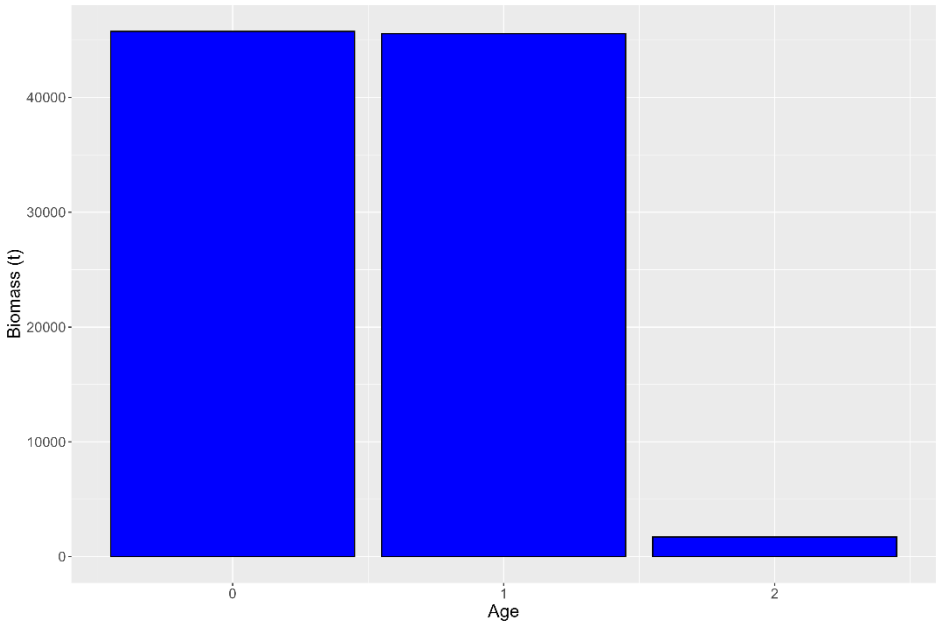


Figure 2.8.8. Sardine biomass at age in western GSA 17 in 2024.

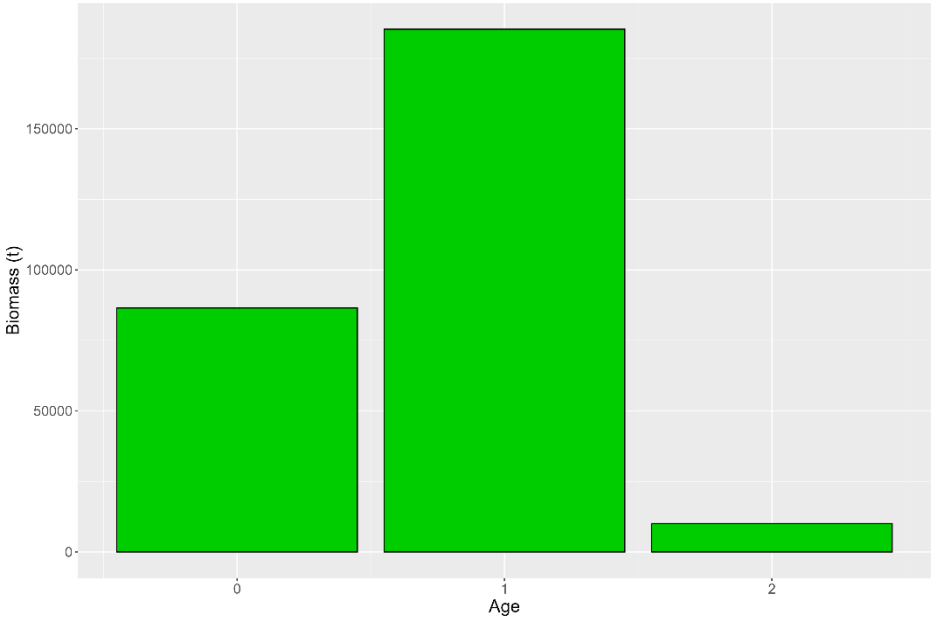


Figure 2.8.9. Anchovy biomass at age in western GSA 17 in 2024.

Abundance indices of target species:

Spatial distribution of sardine and anchovy in western GSA 17 in August - September 2024 is reported in Figures 2.8.10 and 2.8.11.

Sardine covers mainly the northern part of the basin, particularly north and south of the Po River mouth area, while in the central part it is scarce and mainly present along the coast.

Anchovy covers all the continental shelf in GSA 17 (also in the Trieste Gulf). Anchovy is also present offshore except in the Middle Adriatic.

The period of the year (two months later than usual) and the mucilage are possible causes of less anchovies in front of Po River mouth.

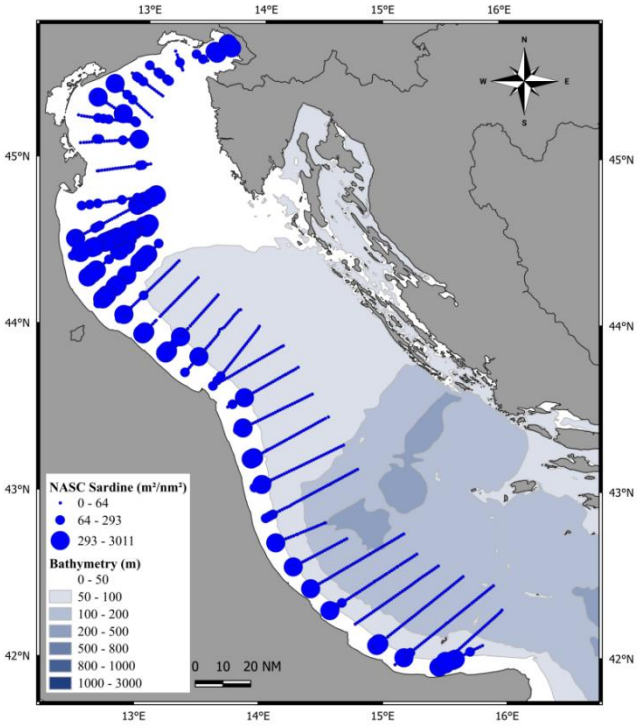


Figure 2.8.10. Sardine spatial distribution in western GSA 17 in August-September. MEDIAS 2024.

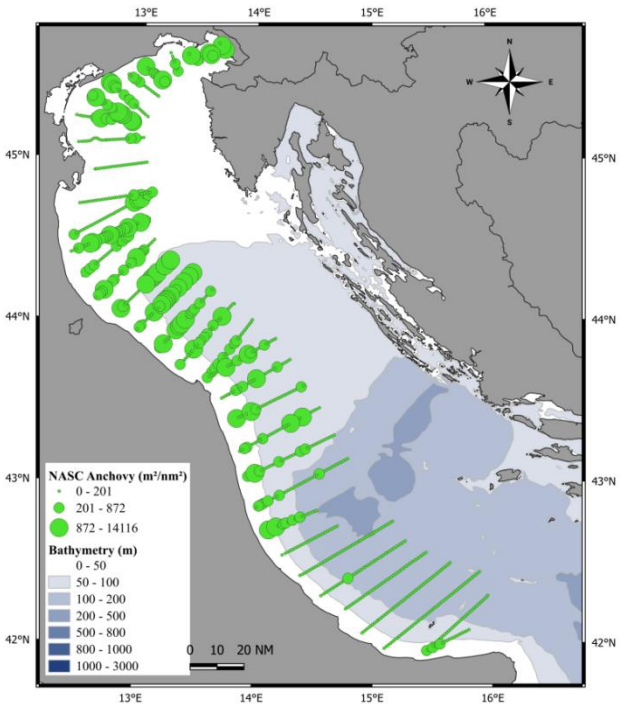


Figure 2.8.9. Anchovy spatial distribution in western GSA 17 in August-September. MEDIAS 2024.

2.9. Presentation of the 2024 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 2024 acoustic surveys covered 5019 nmi^2 in northern Aegean Sea during June - July, and 3246 nmi^2 in eastern Ionian Sea during September - October with the fishery Research Vessel PHILIA (26 m length, 2× 340 HP). In 2024, GSA22 (northern Aegean Sea) was only partially covered as a) the cruise commenced with a 12-days delay due to crew-related issues (strike), and b) followed by a 6-day interruption caused by an engine malfunction on the vessel. Since the research vessel was unavailable after July 12th, due to commitments to another international project, it was not possible to conduct sampling in the Thermaikos and North Evoikos Gulfs, located in the western part of the northern Aegean Sea.

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 2024 in northern Aegean Sea.

Table 2.9.1 Calibration results of the MEDIAS 2024.

	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
Beam Angle [deg]	7	7	7	7
Adjusted Gain [dB]	25.99	28.92	28.19	23.09
Sa correction [dB]	-0.07	-0.06	-0.08	-0.11

	38 kHZ (ES38-7)	120 kHz (ES120-7c)	200 kHz (ES200-7c)	333 kHz (ES333-7c)
Offset alongship [deg]	-0.01	-0.07	0.06	0.10
Offset athwartship [deg]	-0.05	0.00	0.08	-0.06
Beamwidth alongship [deg]	8.04	6.42	6.49	6.13
Beamwidth athwartship [deg]	8.16	6.39	6.36	7.11
Depth (sphere, bottom) [m]	13.4, 31	13.4, 31	13.4, 31	13.4, 31
RMS TS error [dB]	0.07	0.07	0.10	0.89

d) Survey design

Acoustic data were collected from 28 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 732 in GSA 22 and 356 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 2024, the survey design for the Thracian Sea (GSA22) was modified by reducing the intertransect distance to 5 nmi, which led to 7 additional transects (21 transects in the traditional scheme vs 28 transects in 2024). This adjustment was made to improve the precision of sardine abundance estimates. Geostatistical analysis from the previous year 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

Echotraces are identified with pelagic hauls. Twenty-three (23) pelagic hauls were carried out in GSA 22 and twenty-eight (28) 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

57 hydrological stations have been conducted in GSA 22 and 78 hydrological stations in GSA 20 in 2024, 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).

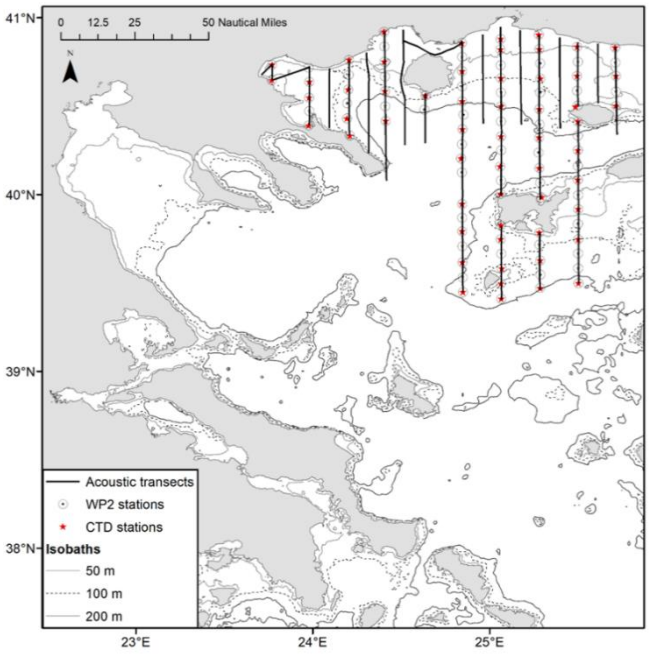


Figure 2.9.1. Acoustic transects sampled in the MEDIAS of the Hellenic part of northern Aegean Sea (GSA 22) in June - July 2024. The position of CTD stations and WP2 stations sampled are also shown.

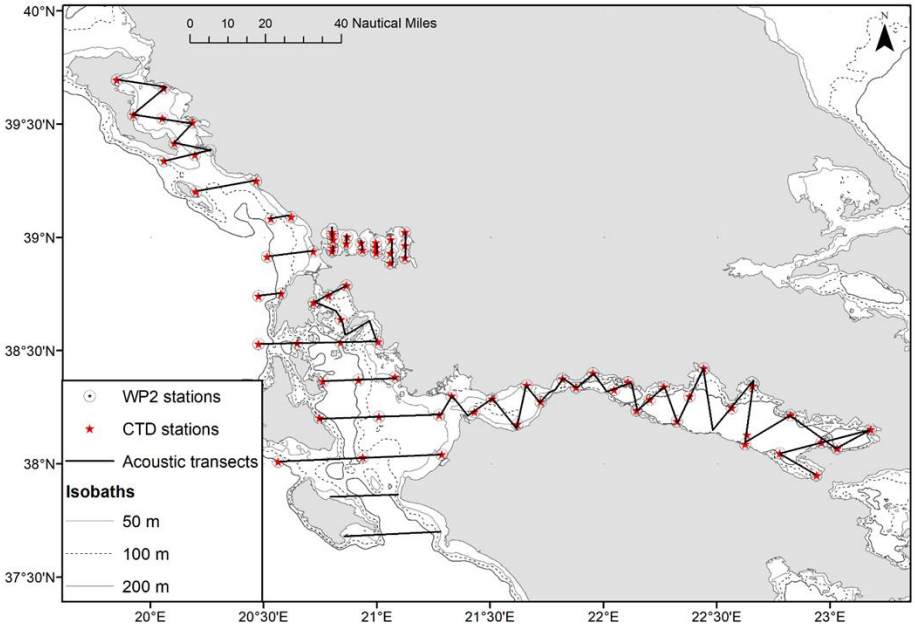


Figure 2.9.2. Acoustic transects sampled in the MEDIAS of the Hellenic part of eastern Ionian Sea (GSA 20) in September - October 2024. The position of CTD stations and WP2 stations sampled are also shown.

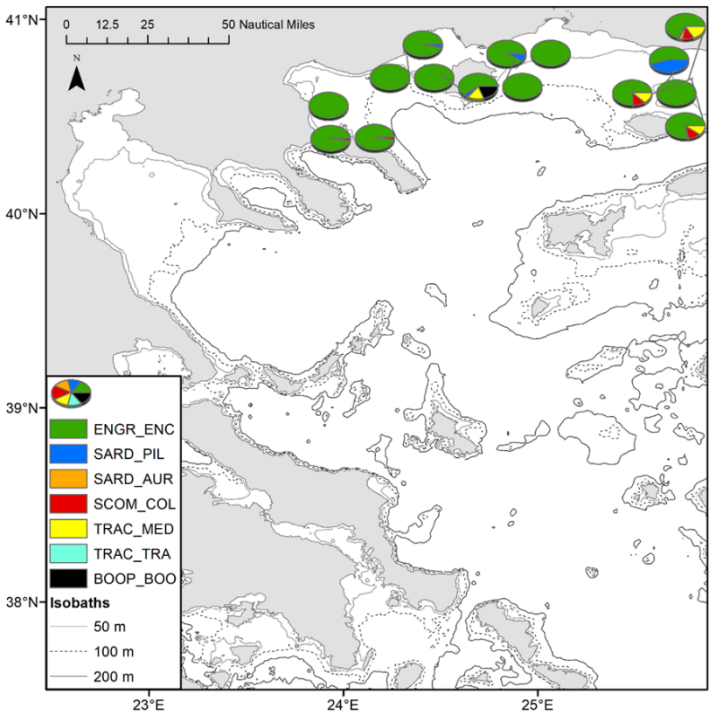


Figure 2.9.3. The catch compositions of the hauls (species kg/haul) weighted per hauling hour in northern Aegean Sea (GSA 22) during June - July 2024.

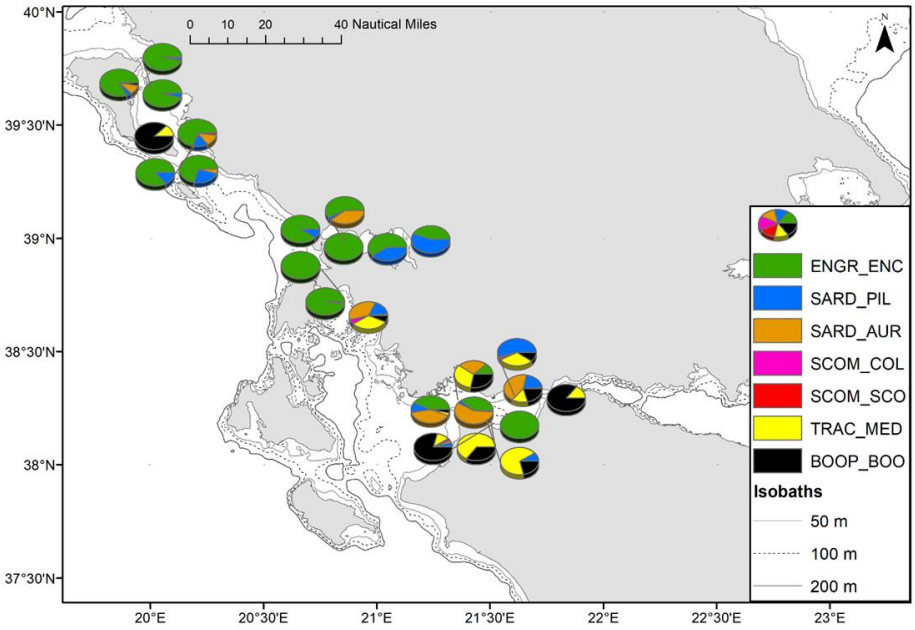


Figure 2.9.4. The catch compositions of the hauls (species kg/haul) weighted per hauling hour in eastern Ionian Sea (GSA 20) during September - October 2024.

g) Biomass estimations of target species

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 2024.

	GSA 22		GSA 20	
	Biomass (t)	CV	Biomass (t)	CV
Anchovy	47638	13.6 %	41362	14.9 %
Sardine	8816	23.6 %	14811	19.3 %

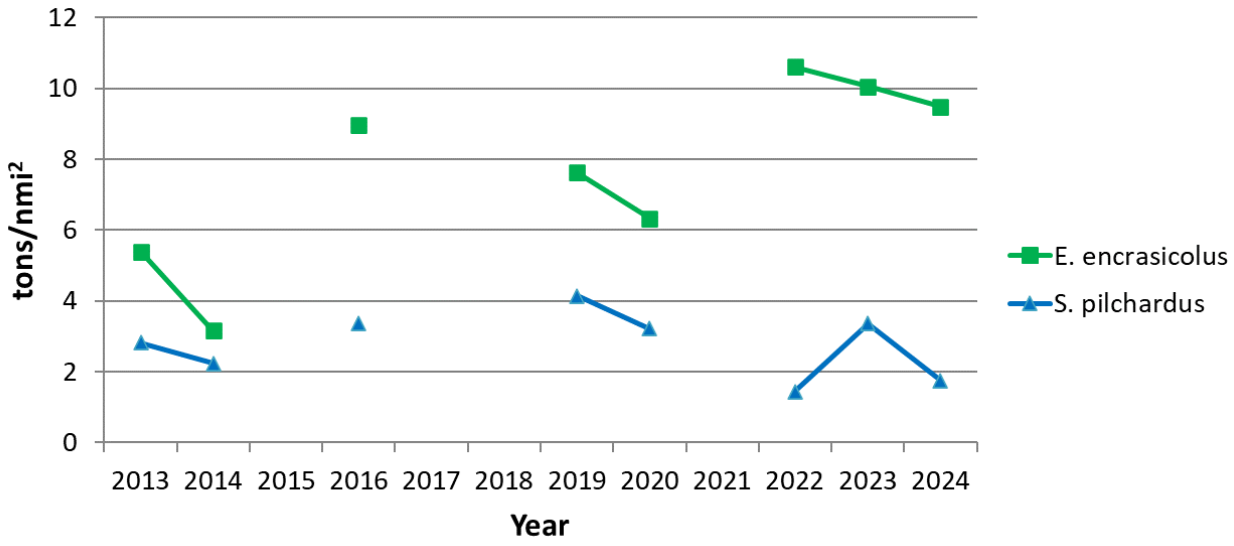


Figure 2.9.5. Historical trends in GSA 22 (northern Aegean Sea).

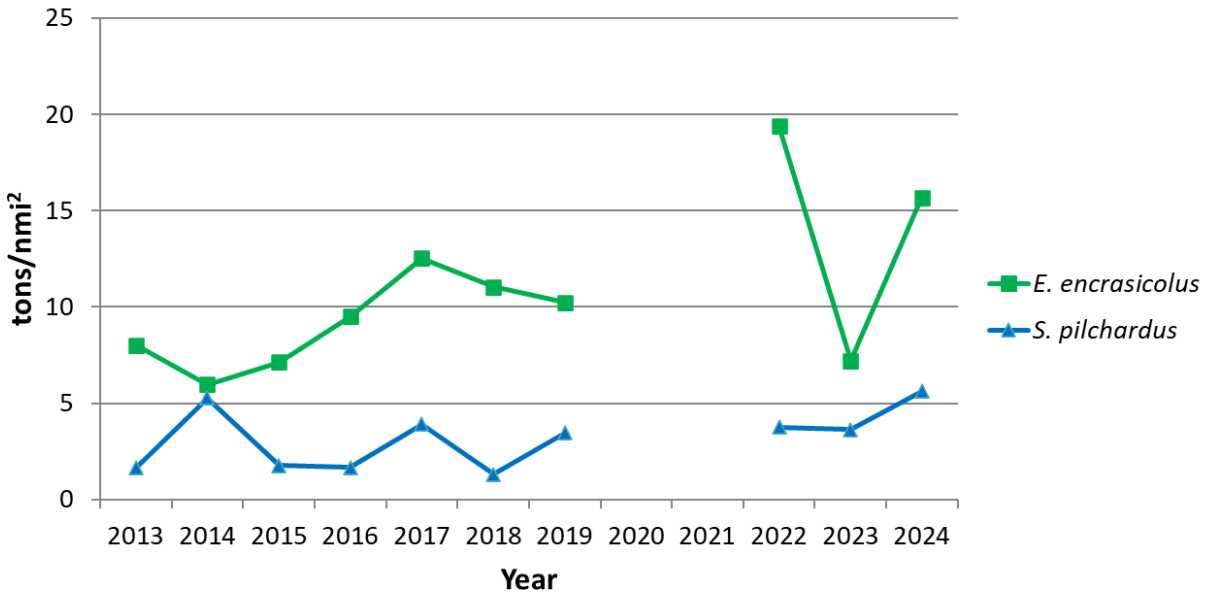


Figure 2.9.6. Historical trends in GSA 20 (eastern Ionian Sea).

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.

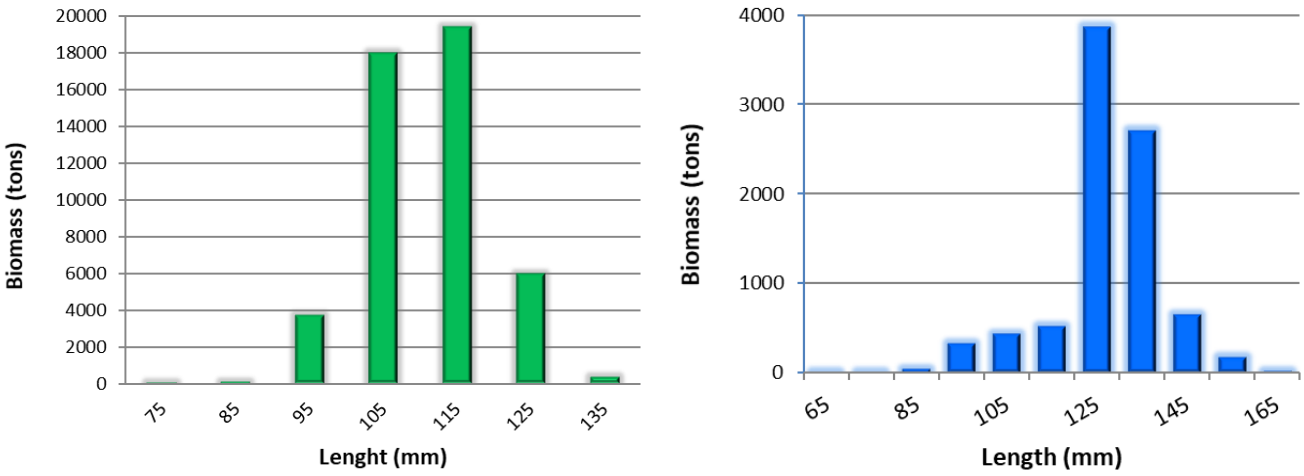


Figure 2.9.7. The anchovy (green) and sardine (blue) biomasses (in tons) per length class in northern Aegean Sea (GSA 22) during June - July 2024.

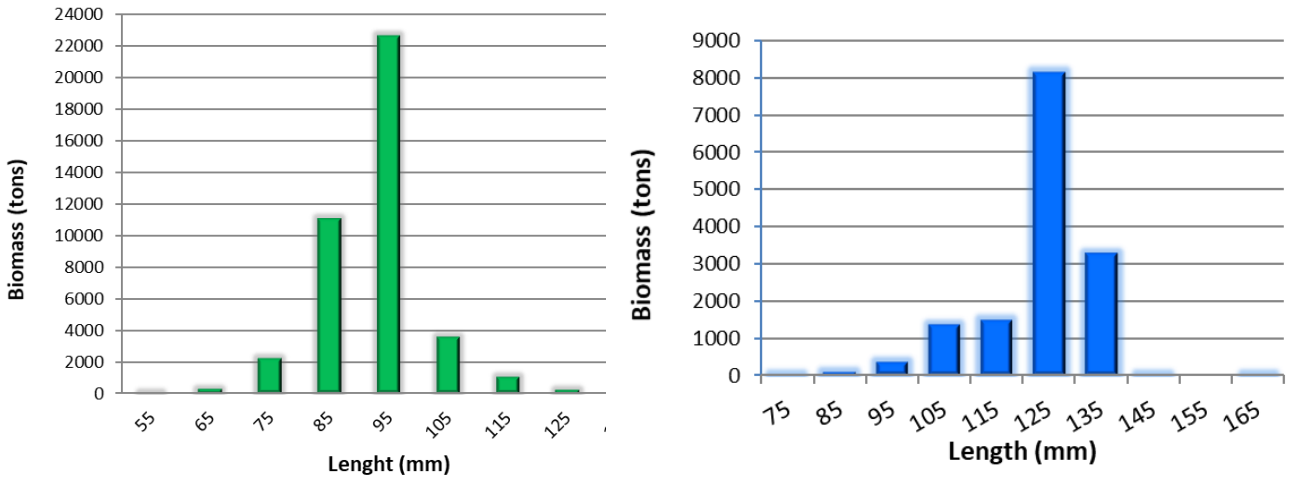


Figure 2.9.8. The anchovy (green) and sardine (blue) biomasses (in tons) per length class in eastern Ionian Sea (GSA 20) during September – October 2024.

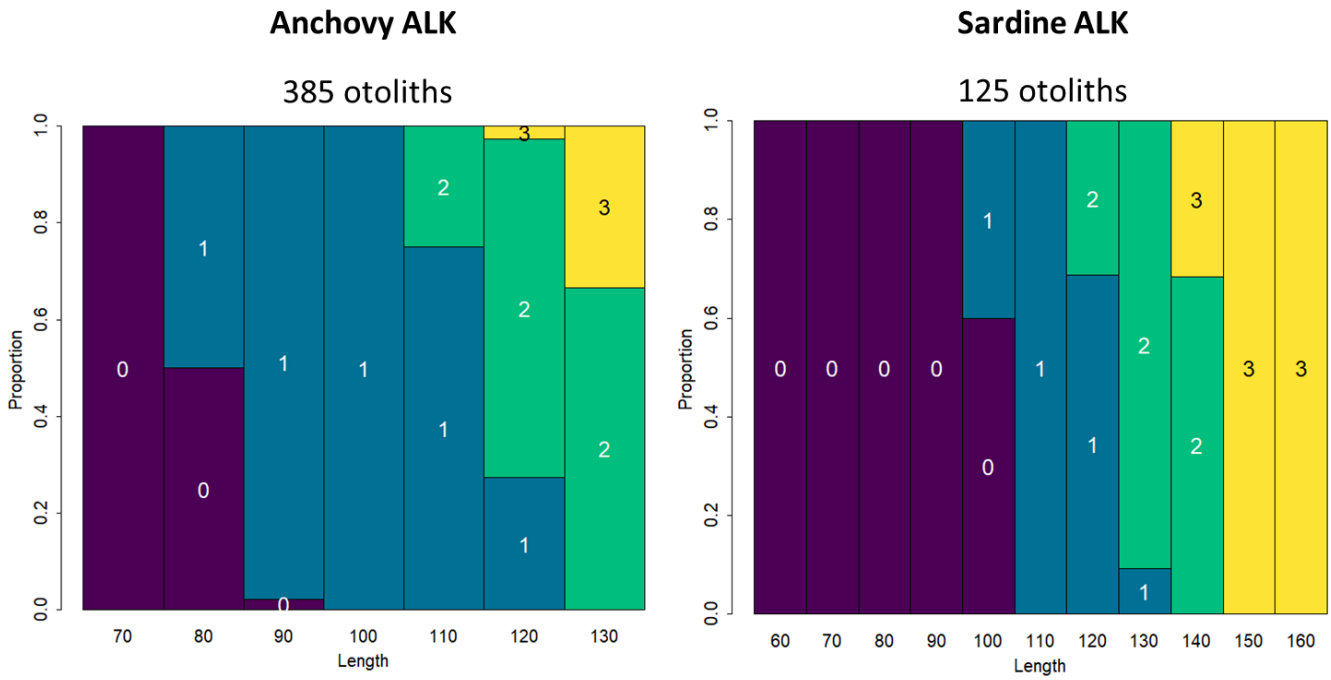


Figure 2.9.9. Age-length key assessed for anchovy and sardine in GSA 22 during June - July 2024.

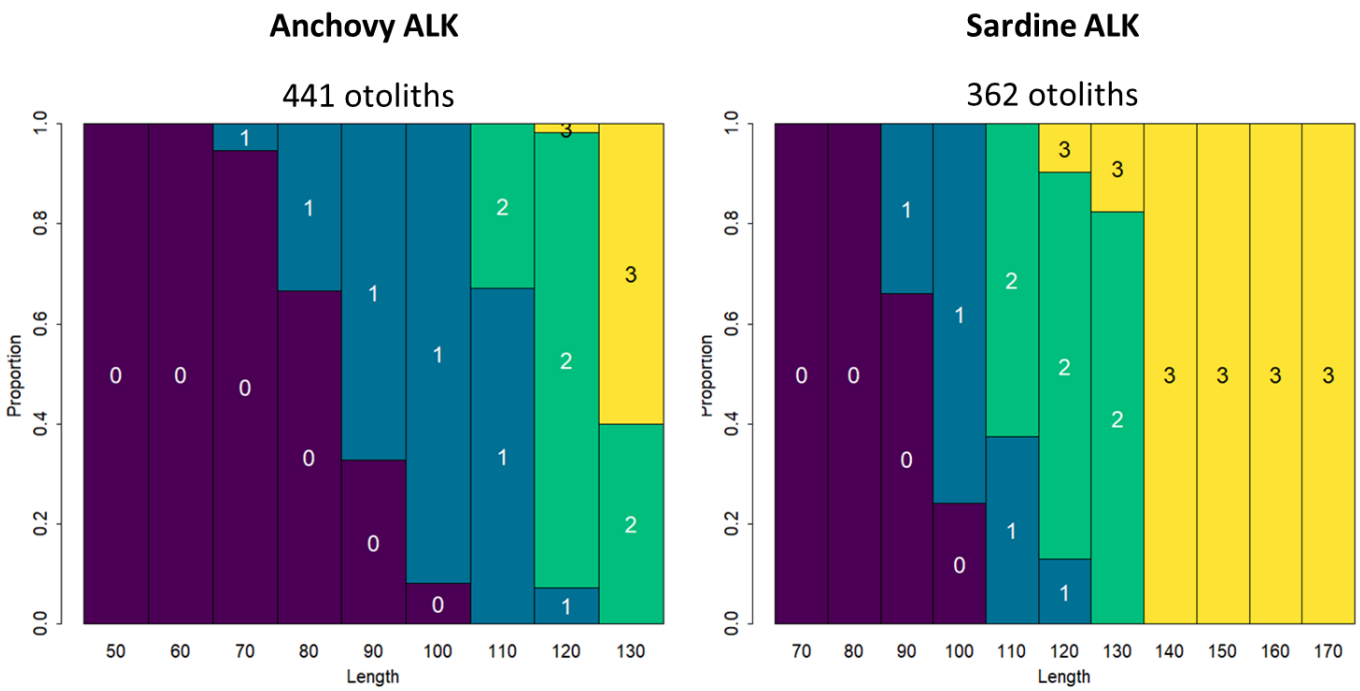


Figure 2.9.10. Age-length key assessed for anchovy and sardine in GSA 20 during September - October 2024.

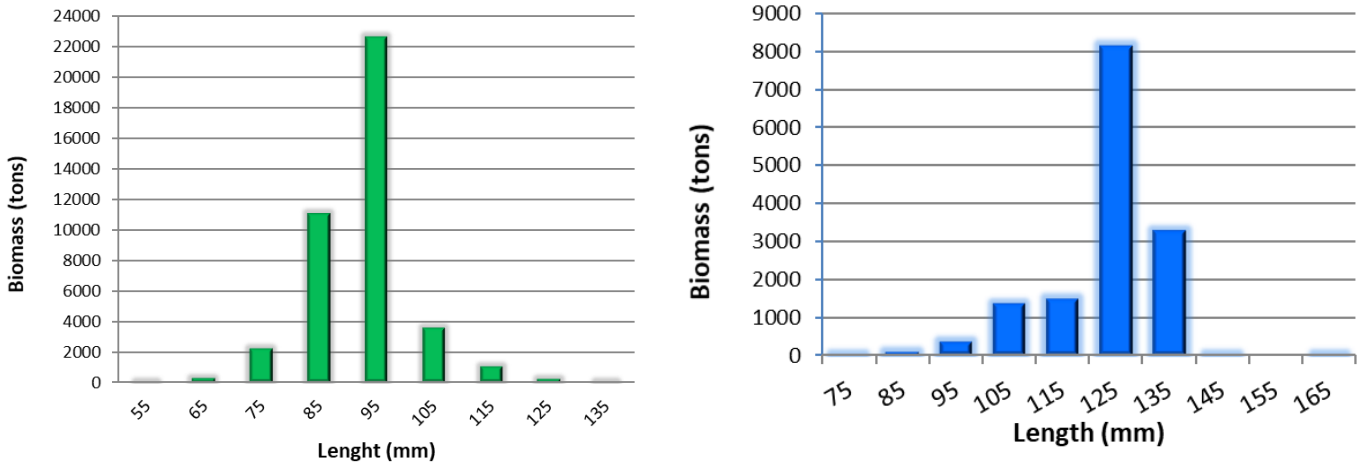


Figure 2.9.11. Anchovy (green) and sardine (blue) biomasses (in tons) per length class in northern Aegean Sea (GSA 22) during June - July 2024.

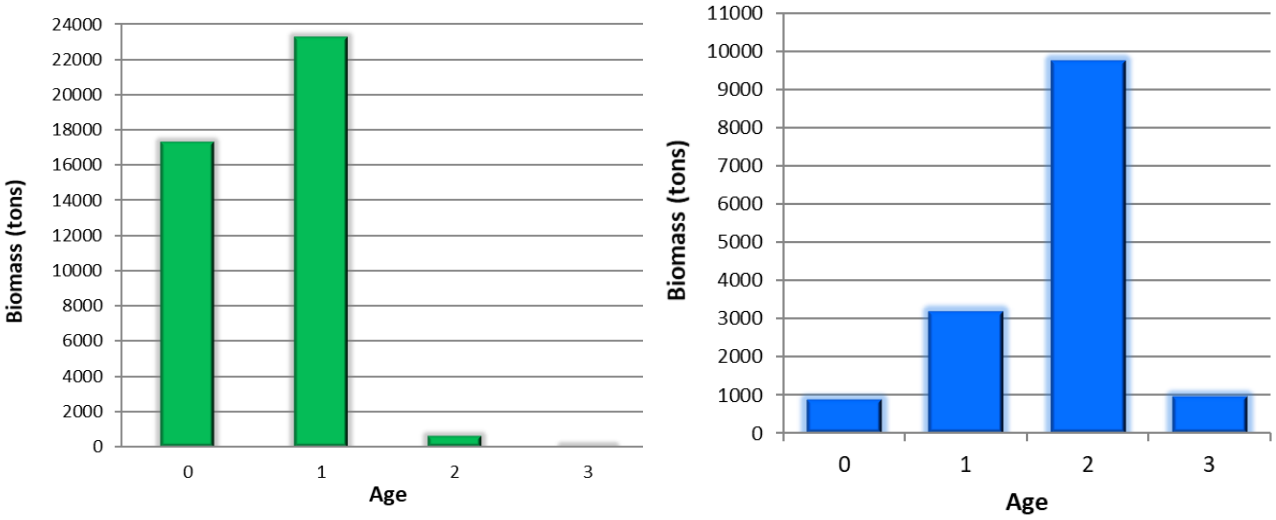


Figure 2.9.12. Anchovy (green) and sardine (blue) biomasses (in tons) per age class in eastern Ionian Sea (GSA 20) during September - October 2024.

h) Abundance indices of target species

Spatial distributions of anchovy and sardine abundance indices, in terms of NASC (m2/nmi2) 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 (m2/nmi2) is given in figures 2.9.21 and 2.9.22.

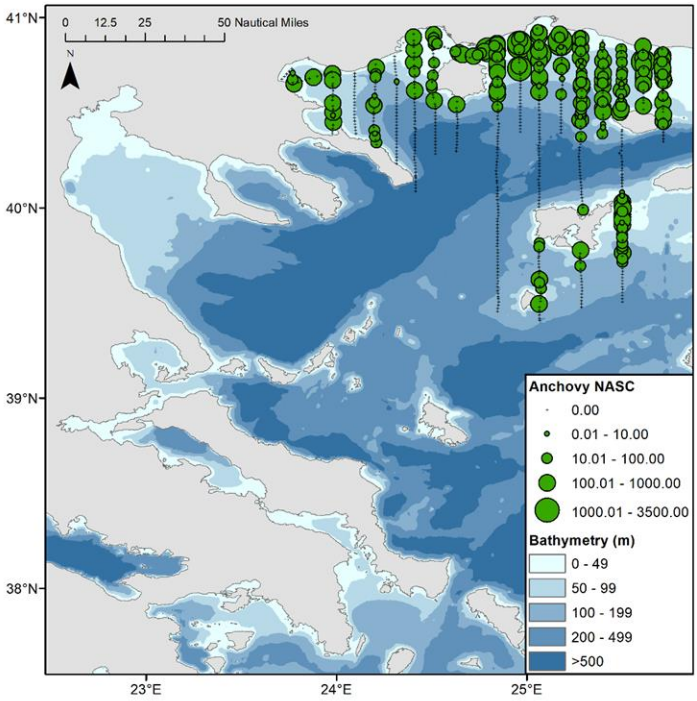


Figure 2.9.13. The distribution of anchovy NASC (m2/nmi2) per EDSU in northern Aegean Sea (GSA 22) during June - July 2024.

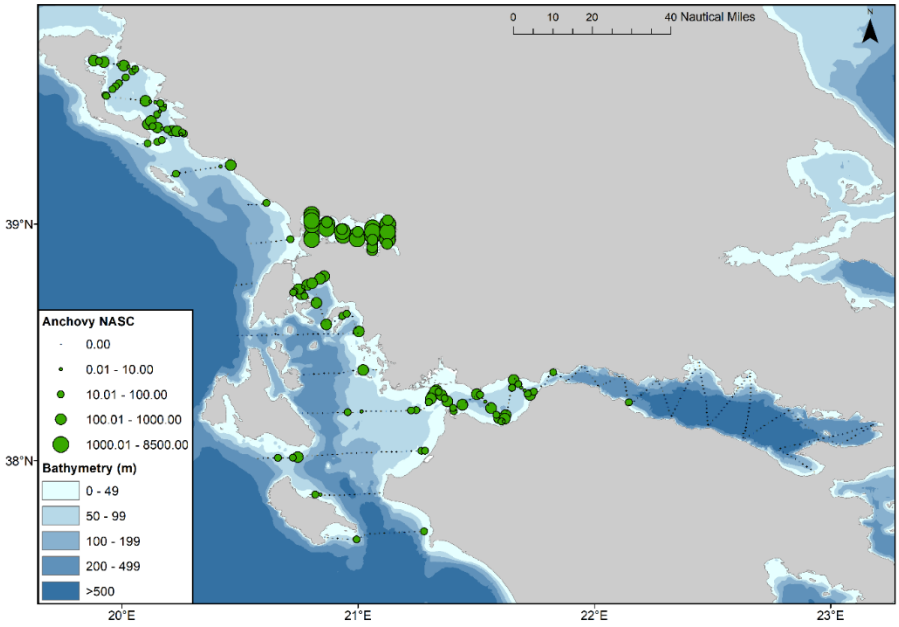


Figure 2.9.14. The distribution of anchovy NASC (m2/nmi2) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2024.

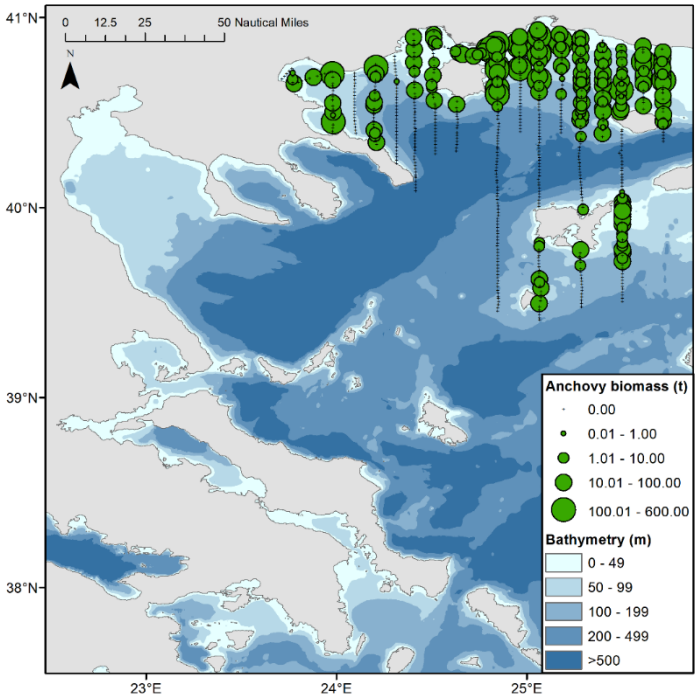


Figure 2.9.15. The distribution of anchovy biomass (t) per EDSU in northern Aegean Sea (GSA 22) during June - July 2024.

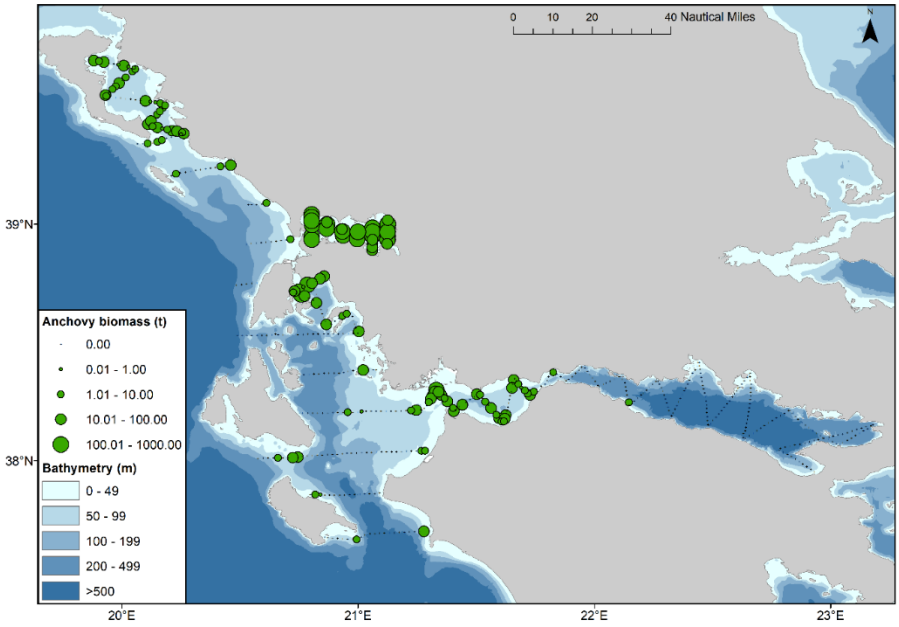


Figure 2.9.16. The distribution of anchovy biomass (t) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2024.

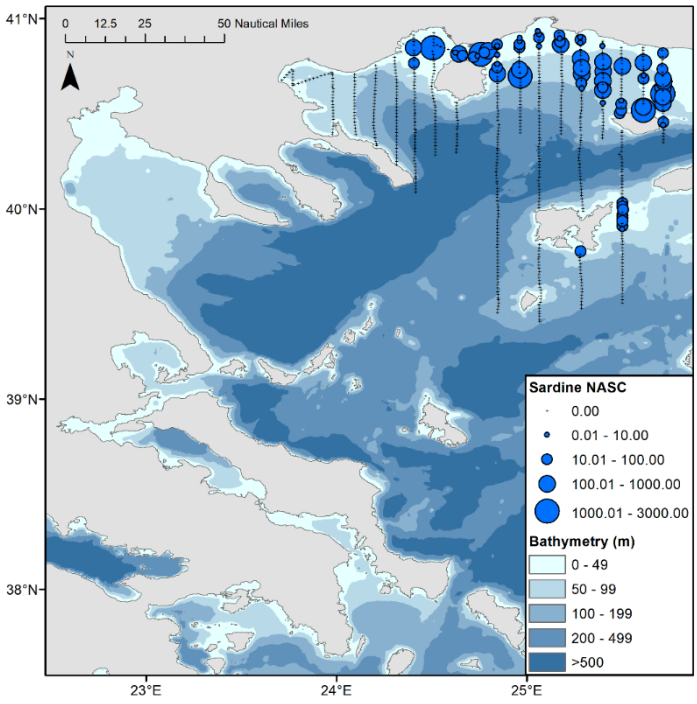


Figure 2.1.17. The distribution of sardine NASC (m2/nmi2) per EDSU in northern Aegean Sea (GSA 22) during June - July 2024.

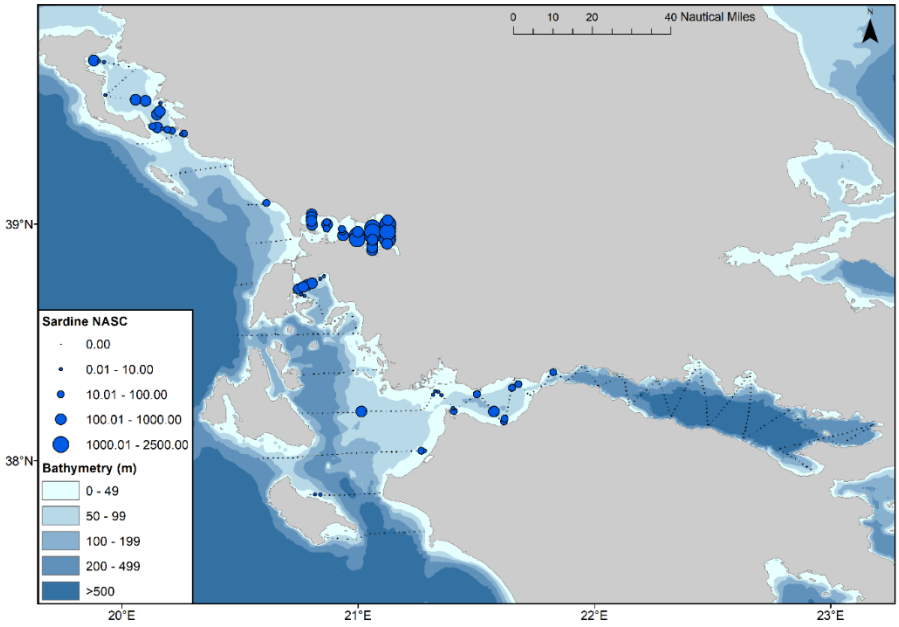


Figure 2.9.18. The distribution of sardine NASC (m2/nmi2) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2024.

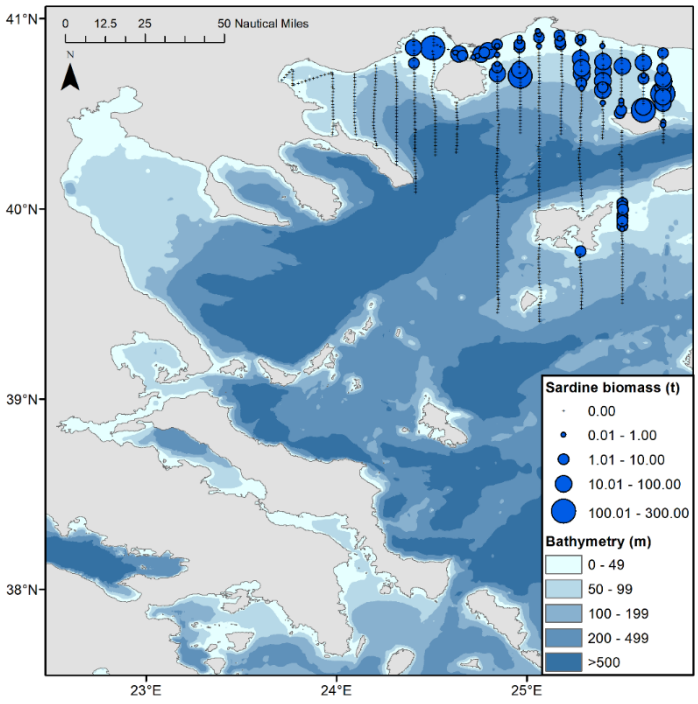


Figure 2.9.19. The distribution of sardine biomass (t) per EDSU in northern Aegean Sea (GSA 22) during June - July 2024.

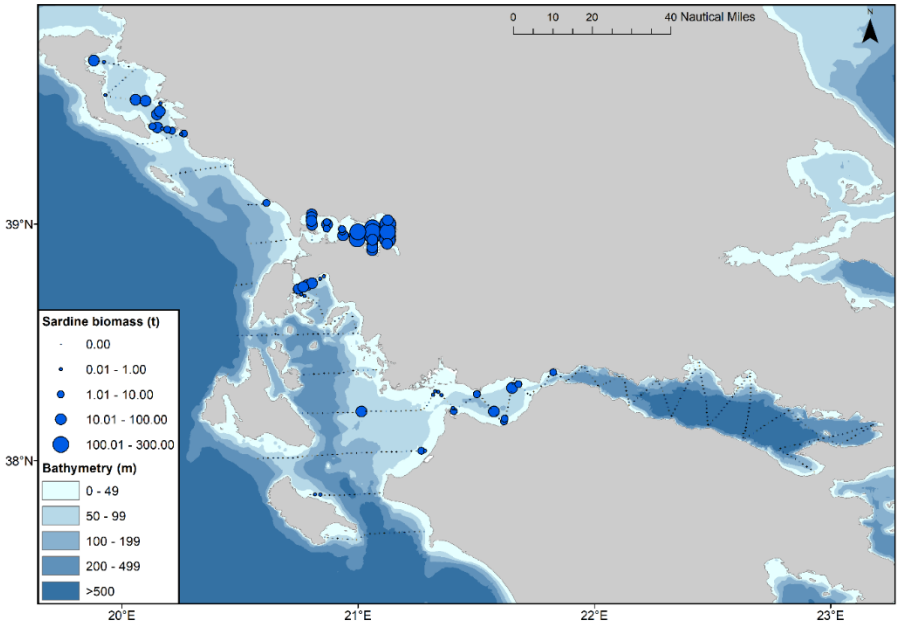


Figure 2.9.20. The distribution of sardine biomass (t) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2024.

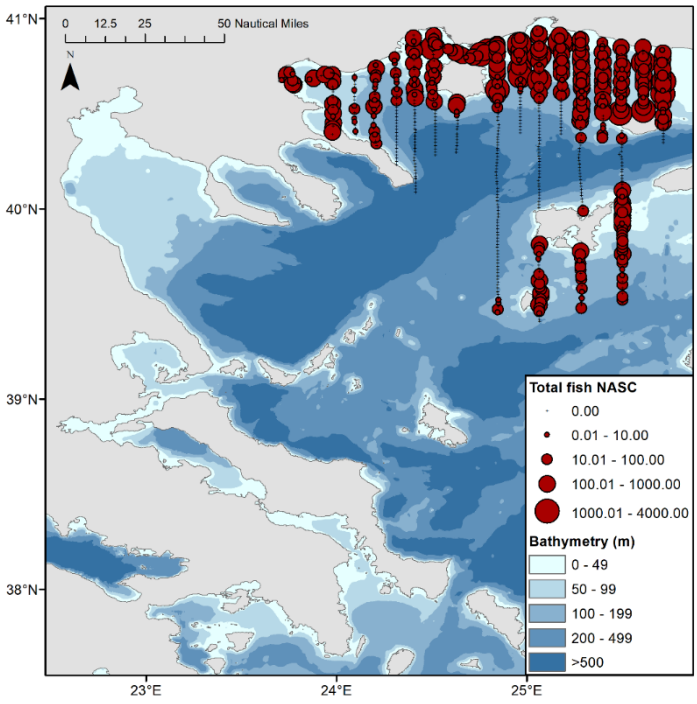


Figure 2.9.21. The distribution of total fish NASC (m2/nmi2) per EDSU in northern Aegean Sea (GSA 22) during June - July 2024.

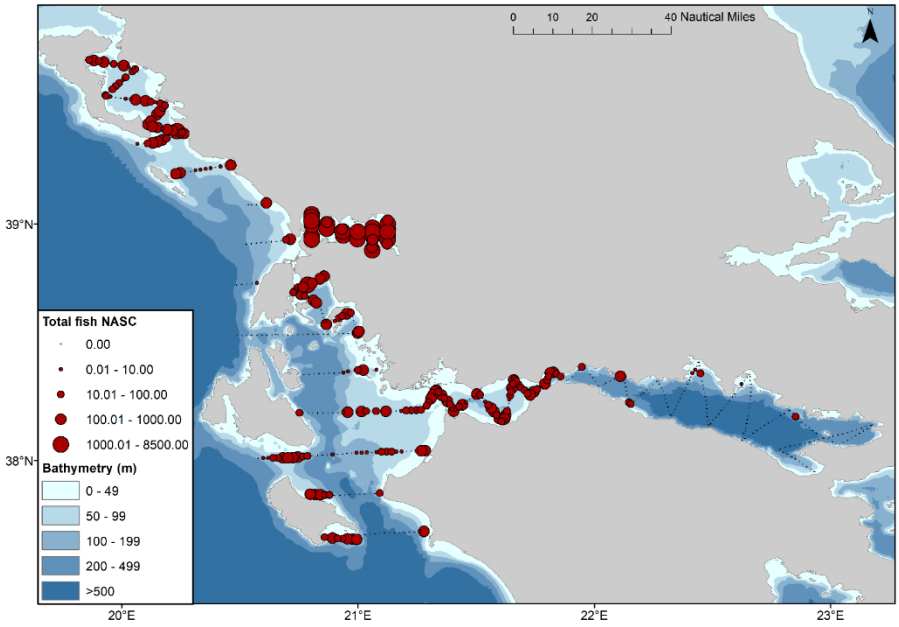


Figure 2.9.22. The distribution of total fish NASC (m2/nmi2) per EDSU in eastern Ionian Sea (GSA 20) during September - October 2024.

2.10. Presentation of the 2024 surveys in the GSA 29 - Black Sea: Bulgarian survey (IO-BAS)

Dimitar Dimitrov and Violin Raykov

a) General information on the survey

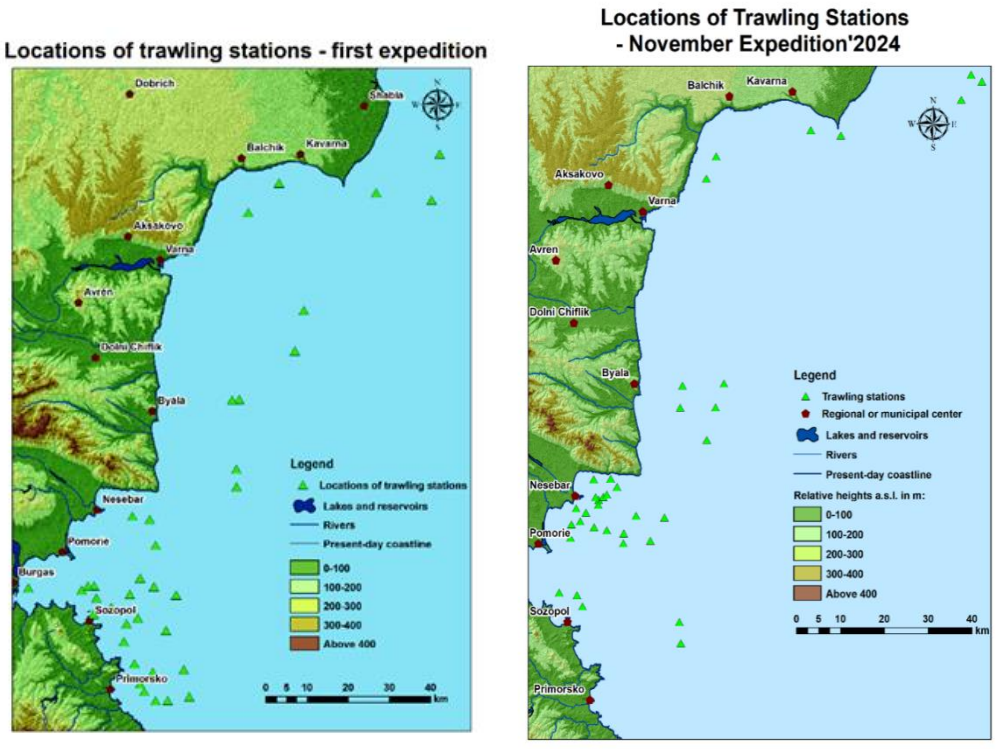
Pelagic trawl survey in the Black Sea (PTSBS) for sprat stock assessment is planned for June -July (spring season) and October - November (autumn season) applying the swept area method in the Bulgarian Black Sea area. The Pelagic Trawl survey (PT) was accomplished on board of R/V HaitHabu. The main characteristics of the ship are given bellow: IMO = 8862686; MMSI = 207139000; Call sign = LZHC; Flag = Bulgaria [BG]; AIS Vessel Type = Other; Gross Tonnage = 142; Length Overall x Breadth Extreme = 24.53m × 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;
- 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 km^2 (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).



(a) (b)

Figure 2.10.1. Pelagic trawl planned distribution points, (a) Spring season and (b) autumn season. MEDIAS 2024

b) Fish sampling

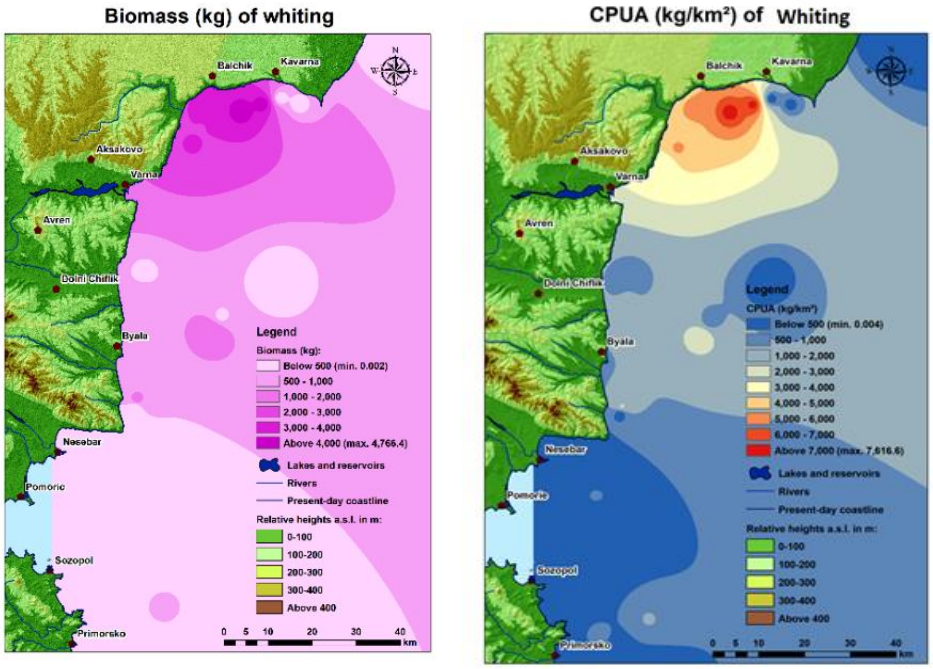
The dimensions of the pelagic trawl employed are as follows: type of pelagic trawl = 50/35 – 74 m; Length of the head rope = 40 m; Horizontal spread of trawl = 16 m; Vertical spread of trawl = 7 m; Mesh size of the net = 7x7 mm; Effective part of wingspread = 27 m; Pelagic doors = 3.5 m^2 The hauls were 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: Best practice guideline and methodology.

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

During the survey, the whiting was ubiquitous, with biomass values being highest in the 30–50 m layer: 1589.8 t, followed by 1030.6 t (50–75 m) and 472.8 t (15–30 m) (Fig. 2.10.2).



a b

Figure 2.10.2. Whiting biomass at different depth layers in September 2024 (a), Catch per unit area (CPUA kg.km^{-2}), September 2024 (b)

The total investigated area was 8010.24 km^2, and the amount of the total biomass of whiting was 3093.2 t (table 2.10.1). The densest aggregations were observed in front of Balchik, "Zlatni pyasatsi" resort, and Aladzha Bank.

Table 2.10.1. Area method for surveying stocks in the month of September 2024 – average values of catch per unit area (CPUA), biomass (kg), Ax – area and number of fields

CPUA, average	Depth	Biomass	Ax area	Number of field
228.94	15-30	472.7932	2065.14	33
567.9	30-50	1589.745	1814.82	29
384.9	50-75	1030.636	4130.28	66
		3093.174	8010.24	128

Whiting was represented in the composition of catches during the first part of the expedition conducted in September 2024 with the highest distribution density of the species recorded in the area of Balchik, Kavarna, Aladzha Bank, in front of the mouth of the river Kamchia, Burgas Bay (Fig. 2.10.2). In a depth layer of 30–50 m, the highest values for CPUA were recorded – 1745.7 kg.km^{-2}, with an average value of 228.9 kg.km^{-2}. In the depth layer 15–30 m, 488.8 kg.km^{-2} and 50–75 m – 723.2 kg.km^{-2}, the species was recorded in separate trawls (Fig 2.10.2).

The size structure of the whiting stock is presented in Fig 2.10.3. The distribution of lengths in the whiting was normal (Gaussian), with 1 – bell shape, as the most common lengths in the samples were in the range 8.5–10 cm. A peak was observed in the 10.5 cm size group.

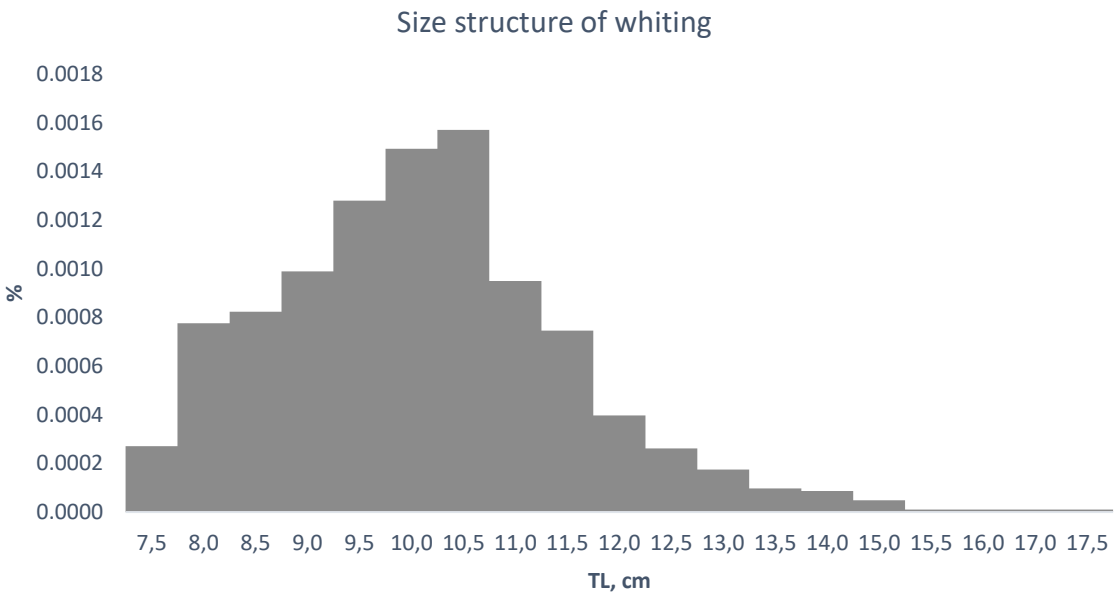


Figure 2.10.3. Size structure of whiting, September 2024

Horse mackerel is a migratory species off the Bulgarian coast. The species is a carnivore and is an important component of the food chain of other larger predators such as turbot and dolphins. Horse mackerel was not significantly represented in the catches.
During the study, horse mackerel was ubiquitous, with biomass values highest in the 50–100 m layer: 956.5 t (Fig 2.10.4), followed by 612.32 t (30–50m) and 593.38 t (15–30m).

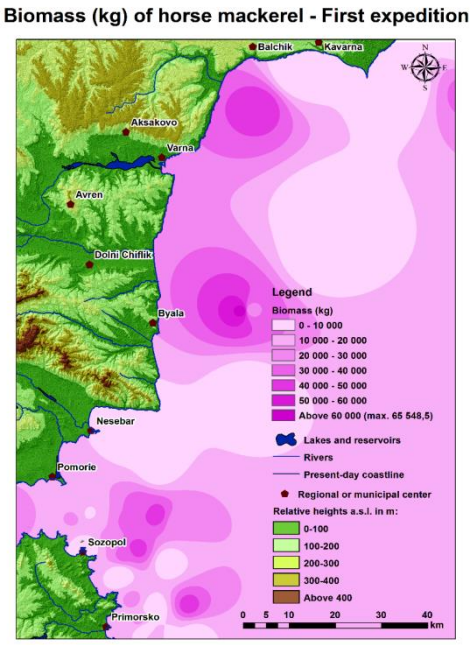


Figure 2.10.4. Horse mackerel biomass by strata, September 2024

The total investigated area was 8010.24 km^2, and the total biomass of horse mackerel was 2162.2 t (Table 2.10.2 and. 2.10.4). The densest aggregations were observed in front of Byala, Sozopol, Primorsko, Burgas Bay, and Maslen Nos.

Table 2.10.2. Swept area method for stock survey in September 2024 – average values of catch per unit area (CPUA), biomass (kg), Ax – area and number of fields

CPUA average	strata	Biomass (kg)	Ax Surface	No. of stations
287.332	15-30	593.3808065	2065.14	33
337.4	30-50	612.320268	1814.82	29
321.58	50-100	956.4902424	4130.28	66
		2162.191	**8010.24**	**128**

Horse mackerel was represented in the composition of the catches during the first part of the expedition conducted in September 2024 with the highest density of the species recorded in the water area of Byala, "Aladzha Bank", Sozopol, Maslen Nos, Primorsko (Fig 2.10.5.a). In the depth layer 30–50 m, the highest values for CPUA were recorded – 1627.27 kg.km^{-2}, with an average value of 337.4 kg.km^{-2}. In the depth layer 15–30 m, 698.3 kg.km^{-2} and 50–75 m – 723.2 kg.km^{-2}, the species was recorded in separate trawls (Fig 2.10.5.b).

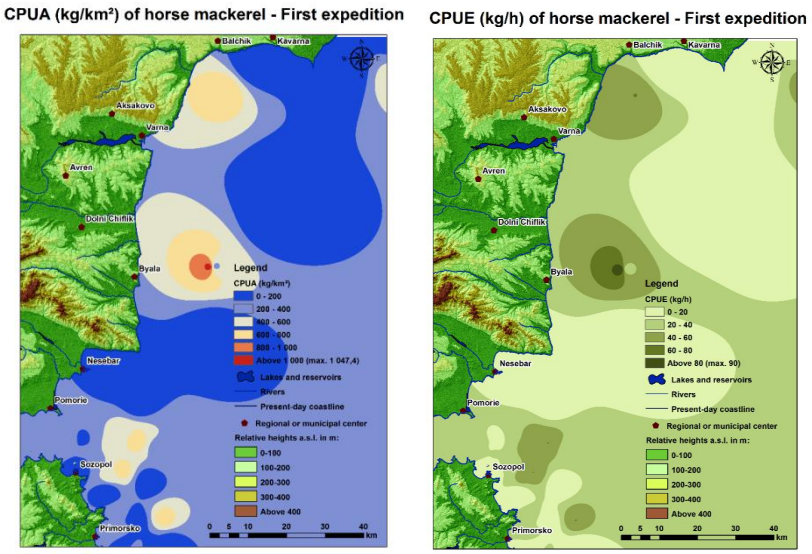


Figure 2.10.5. Catch per unit area (CPUA kg.km^{-2}), September 2024 (a), Catch per unit effort (CPUE kg kg*h^{-1}) for horse mackerel by strata (b)

The catch per unit effort (CPUE) for the species is presented graphically in Fig 2.10.5 (b). The highest CPUE values (kg.h^{-1}) were observed off Byala, Primorsko, Sozopol, and Aladzha Bank ("Zlatni Pyasatsi" resort).

The percentages of females, males and immatures in sprat, red mullet and horse mackerel were as follows: 50:45:5%; 48:44:8%; 50:45:5%; 46:48:6% (Fig 2.10.6).

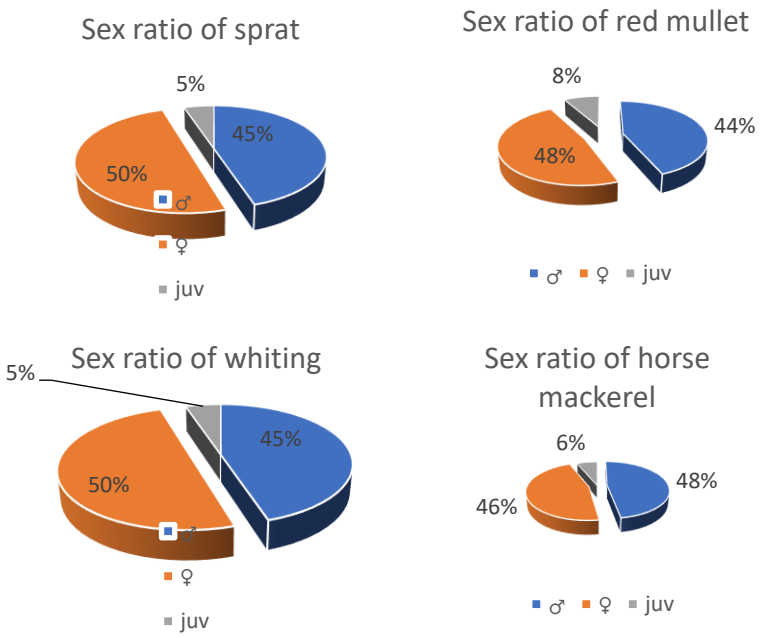


Figure 2.10.6. Sex ratio (females – ♀, males – ♂ и juv – juveniles) for the studied species, September 2024

The sexual maturity of the analyzed species by size classes is presented in Fig 2.10.7.

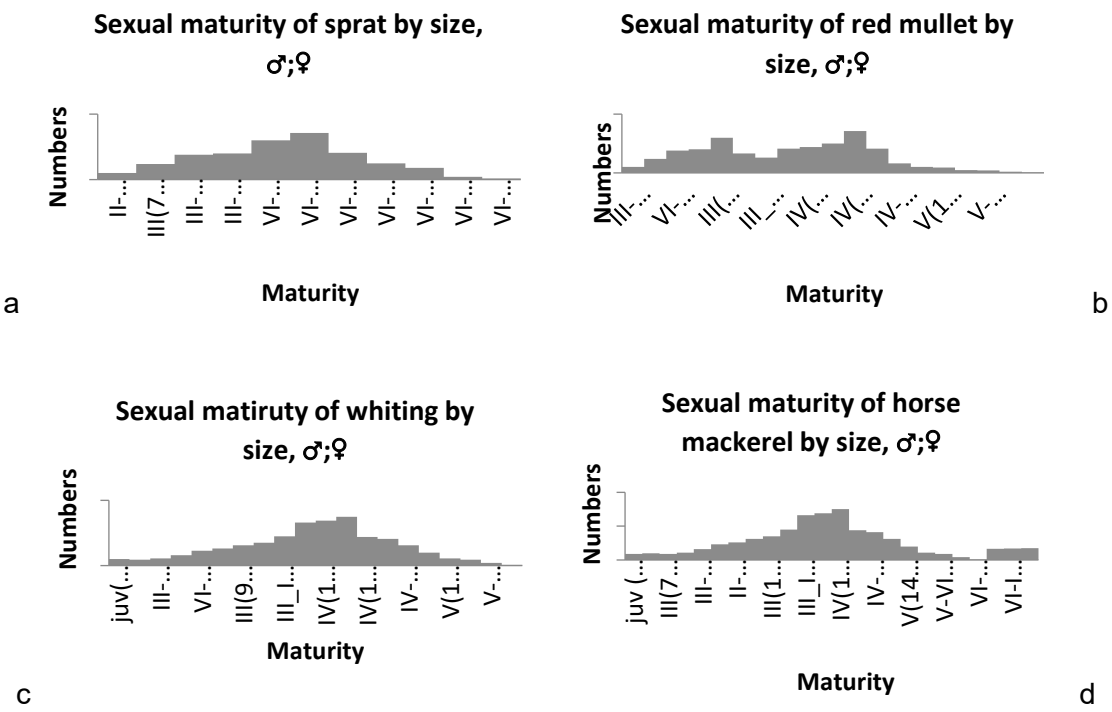


Figure 2.10.7. Sexual maturity of the stidued species, analysed by size classes (females – ♀, males – ♂ и juv – juveniles), a) sprat b) red mullet c) whiting d) horse mackerel

The gonadosomatic index GSI (%) of sprat is indicative of the portioned spawning $R^2 = 0.93$ (Fig 2.10.7). For red mullet and whiting there is a very strong correlation between the weight of the glands and the gonadosomatic index ($R^2 = 0.66–0.96$), which is an indication of mass reproduction processes and active maturity of the sexual products during the studied period (Fig 2.10.7). For horse mackerel, the coefficient of determination was $R^2 = 0.76$.

The dependence of the weight (W, g) on the linear dimensions (L, cm) of the examined specimens was described by the following formulas:

(1) Sprat: $W\ (g) = 0.0023*L\ (cm)^{3.3889}$; ($R2 = 0.93$, $p<0.001$)

(2) Horse mackerel: $W\ (g) = 0.0063*L\ (cm)^{3.1142}$; ($R2 = 0.98$, $p<0.001$)

(3) Anchovy: $W\ (g) = 0.0072L\ (cm)^{2.8695}$; ($R2 = 0.96$, $p<0.001$)

(4) Whiting: $W\ (g) = 0.0068*L\ (cm)^{3.0329}$; ($R2 = 0.93$, $p<0.001$)

The growth of all species except anchovy is positively allometric, with a coefficient $b > 3$, while that of anchovy is negatively allometric.

Correspondingly, the mean multiannual ISF value for spratis was 0.91 % BW, while for horse mackerel, data in 2021 showed a mean value of 0.35 % BW ± 0.27 SD, in 2022–0.66 % BW ±

0.59 SD, and in 2023 – 0.37 % ± 1.24 (SD). The current study found lower feeding intensity for sprat compared to the 2023 data, but for horse mackerel, it was comparable to the average. An analysis of the spatial distribution of ISF (% BW) can only be performed for horse mackerel and anchovy data, as sprat and whiting samples were sparse during the survey season. More intensive feeding of horse mackerel and anchovy was found off the central and southern coasts between Obzor/Eminne and Cape Maslen (Fig 2.10.8).

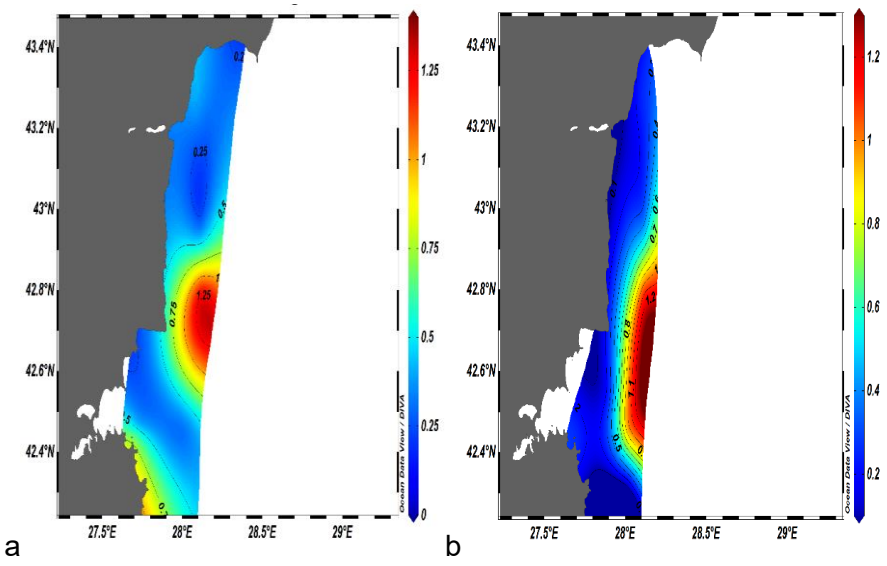


Figure 2.10.8. Spatial distribution of ISF (% BW) of horse mackerel (a) and anchovy (b) in 09. 2024.

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

The highest mean number of prey was found in horse mackerel stomachs, 64.11 ind/stomach ± 14.86 SE, with a maximum number of prey organisms, 834 ind/stomach, in relation to consumption of *Decapoda larvae*. The mean number of prey items in the diet of anchovy was 29.20 ind/stomach ± 6.09 SI, that of whiting was 1.40 ind/stomach ± 0.42 SI, and that of sprat was 1.2 ind/stomach ± 0.66 SI (Fig 2.10.8).

In zooplankton samples from the marine environment, 28 species and groups were identified, and a significant proportion (20 species/groups) were present as components in the diet of horse mackerel and anchovy, as well as seven species/groups in the diet of whiting and two species/groups in the diet of sprats.

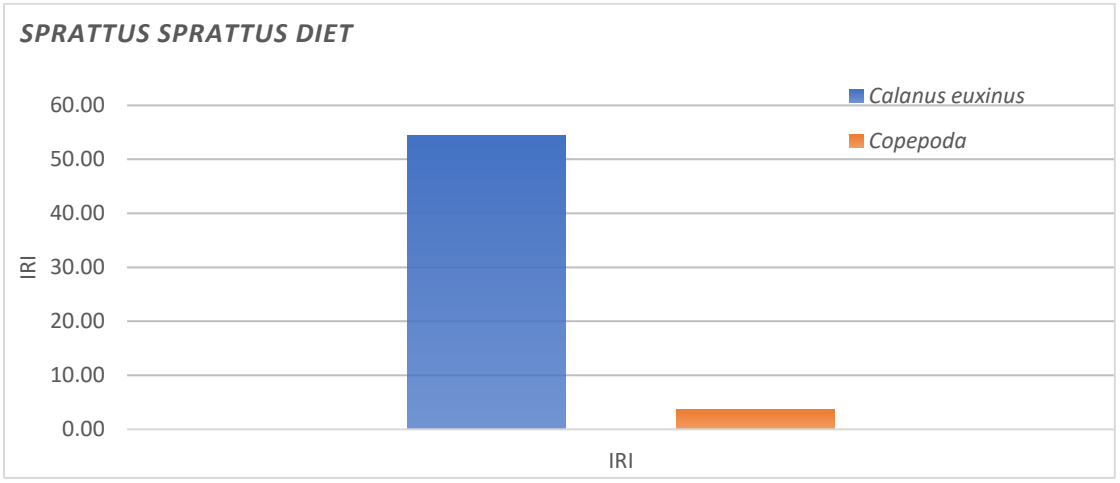
The following groups and species are present in the sprat diet: Copepoda (oar-footed crustaceans), mainly *Calanus euxinus*.

Horse mackerel diet was composed of the following groups and species: Mysida - *Paramysis spp.*; Copepoda - *Calanus euxinus, Paracalanus parvus, Acartia clausi, Oithona davisae, Centropages ponticus, Harpacticoida spp;* Cladocera - *Penilia avirostris;* meroplankton - *Lamellibranchia veliger, Gastropoda veliger, Polychaeta larvae, Cirripedia larvae, Decapoda*

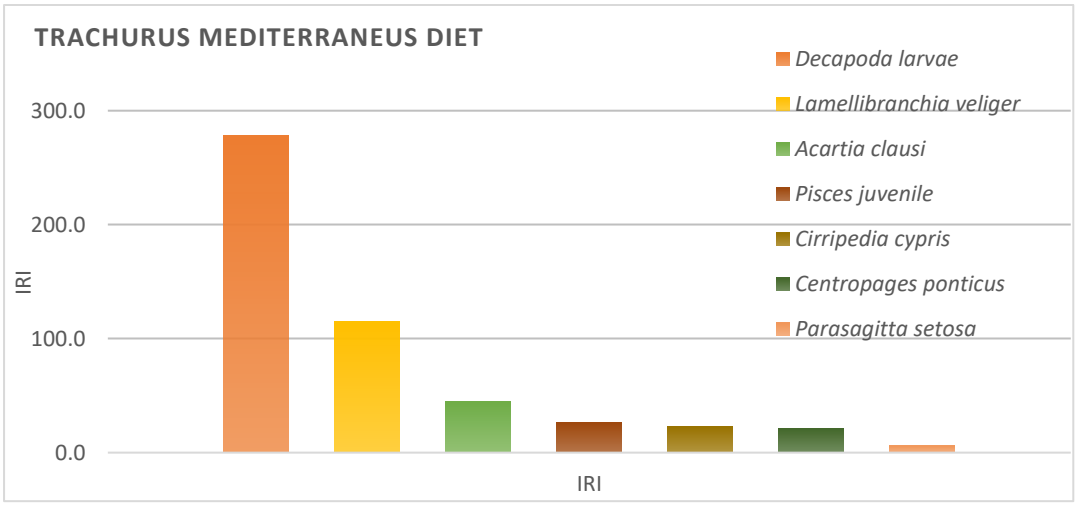
larvae; class Appendicularia was represented from the species *Oicopleura dioica*; phylum Chaetognatha was represented by *Parasagitta setosa*, and from phylum Chordata there are single larvae of *Branchiostoma lanceolatum*, as well as larval stages of fishes.

The anchovy diet consisted of Mysida - *Paramysis spp.*; Copepoda - *Calanus euxinus, Pseudocalanus elongatus, Paracalanus parvus, Acartia clausi, Oithona davisae, Centropages ponticus, Harpacticoida spp.*; Cladocera, *Penilia avirostris, Pleopis polyphemoides, Pseudevadne tergestina*; Meroplankton, Lamellibranchia veliger; Gastropoda veliger, phylum Chaetognatha is represented by *Parasagitta setosa*, and phylum Chordata is represented by larval stages in fishes.
The diet of the whiting includes various arthropods, such as representatives of Mysida (*Paramysis sp.*), Decapoda, Amphipoda (family Caprellidae) and Tanaidacea. In addition, their diet included polychaete worms (Polychaeta) and unspecified fish species.

In the samples studied, Copepoda, mainly *C. euxinus* played a dominant role in the diet of the sprat (Fig 2.10.9). The diet of horse mackerel was dominated by meroplanktonic larvae - *Decapoda larvae* and *L. veliger*, and that of anchovy by meroplanktonic larvae and zooplanktonic copepods. The whiting diet is mainly composed of mysids and polychaetes (Fig 2.10.9).



a



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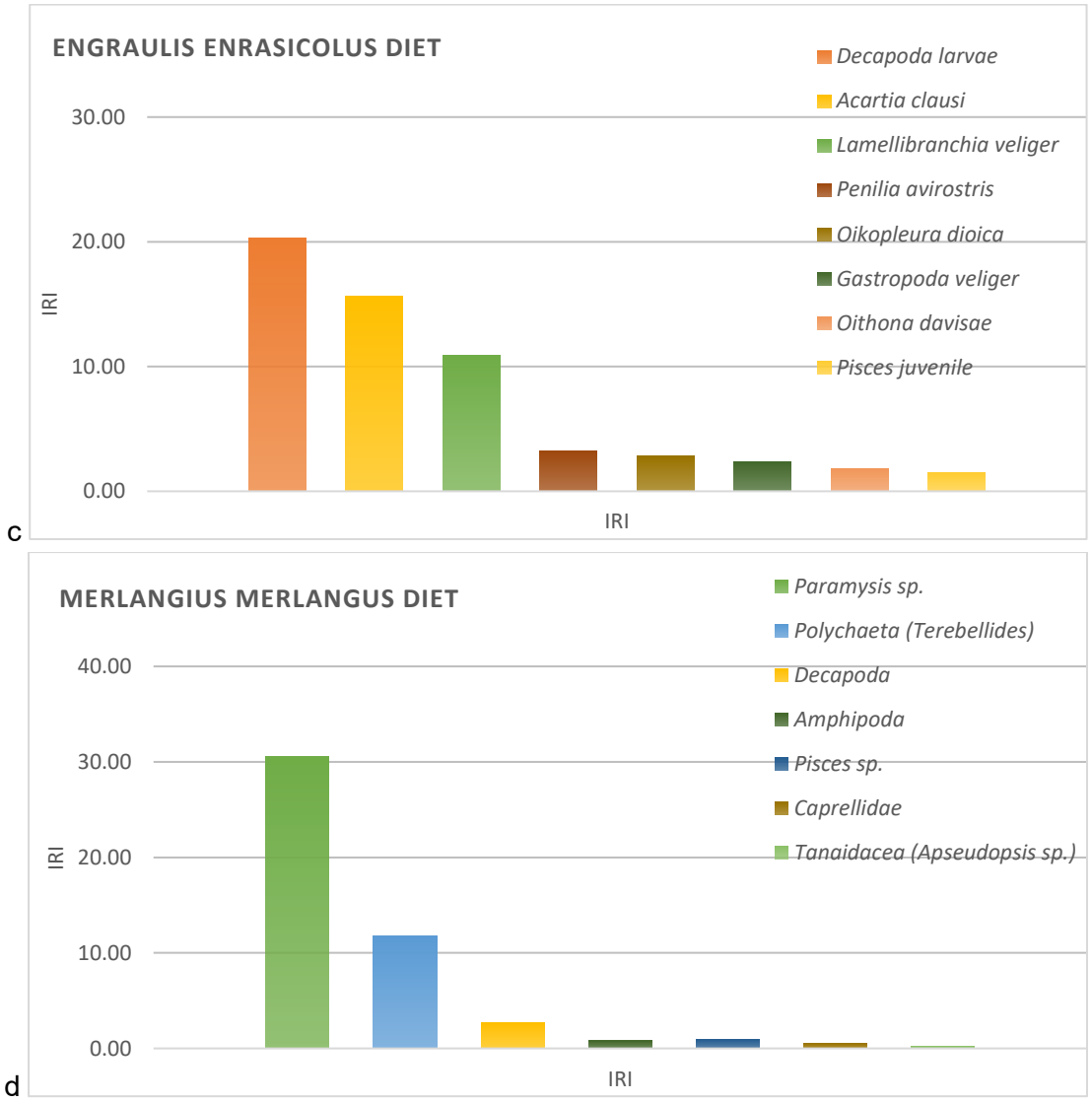


Figure 2.10.9. Average relative importance index (IRI) of the main species in the diets of newt (a), anchovy (b), horse mackerel (c), and whiting (9) in 09. 2024

At the time of the survey, the mesozooplankton biomass peaked at ~200 mg.m^{-3} along the central and southern parts of the coast (Fig 2.10.10. a). Protozoa were distributed in areas above Capes Kalikara and Emine, and in Burgas Bay, but with a low biomass of < 4 mg.m^{-3} (Fig 2.10.10 b), and the main accumulation of gelatinous zooplankton, 3.48 g.m^{-3}, was found in front of Cape Kalikara (Fig 2.10.10 c).

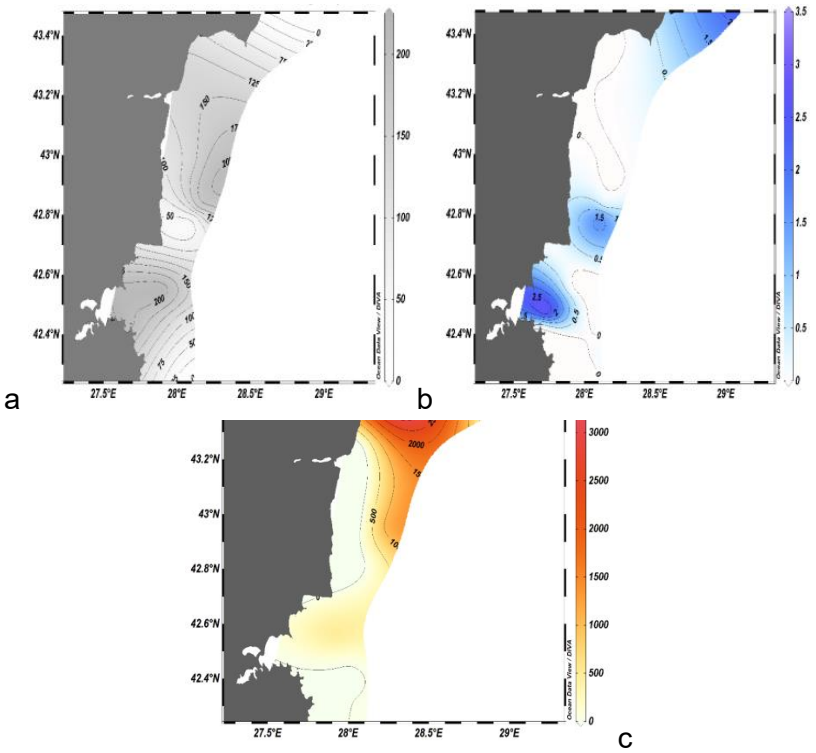


Figure 2.10.10. Spatial distribution of biomass (mg.m^{-3}) of mesozooplankton (a), protozoa (b), and gelatinous zooplankton (c), in 09. 2024

f) Biomass estimations of target species in autumn survey

Horse mackerel is a migratory species along the Bulgarian coast. It is a carnivorous fish and plays an important role in the food chain, serving as prey for larger predators such as turbot and dolphins. Horse mackerel was significantly represented in the catches in November 2024.

The total area surveyed was 8010.24 km², and the total biomass of horse mackerel was estimated at 3093.2 t (Table 2.10.3). The densest aggregations were observed off the coast of Byala and in Nesebar Bay. The highest biomass was recorded in the 30–50 m depth stratum, with 2138 t, followed by 1511.348 t (15–30 m) and 1281.708 t (50–100 m).

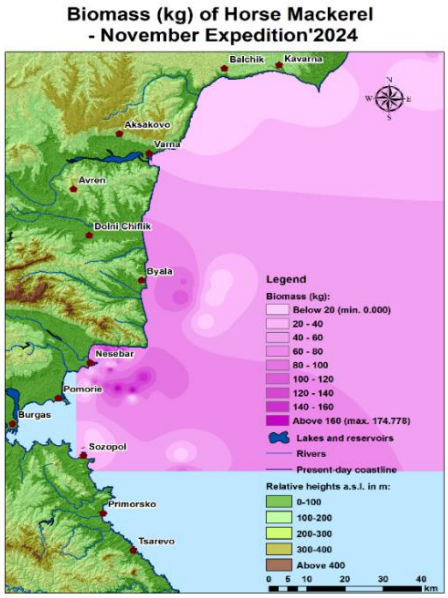


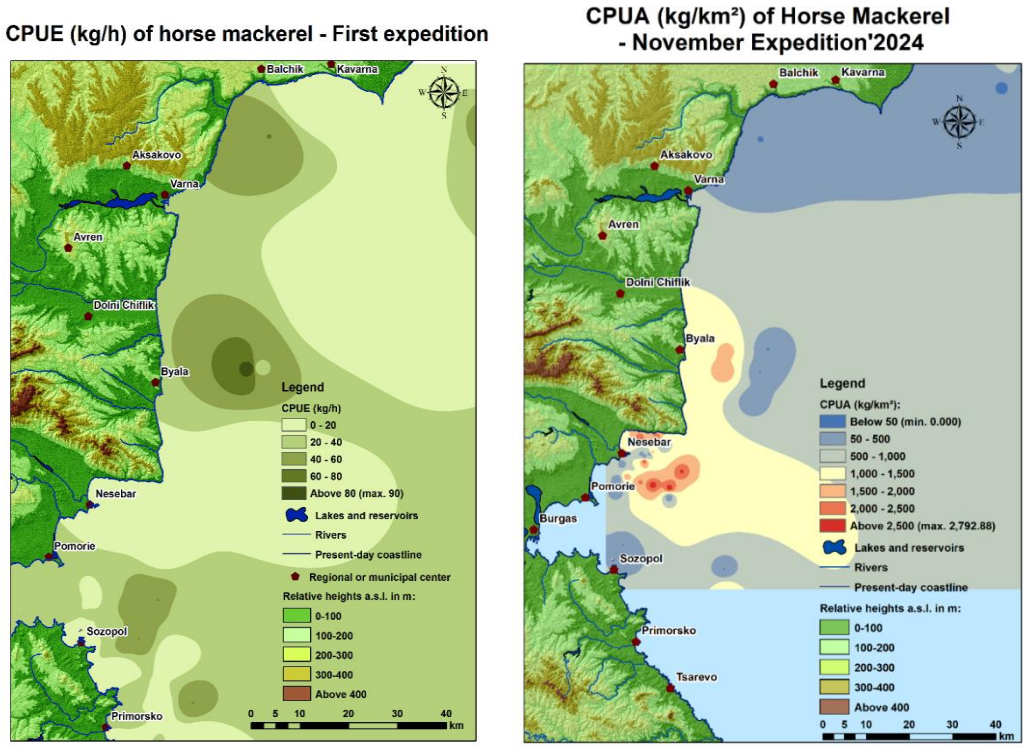
Figure 2.10.11. Horse mackerel biomass by strata, November 2024

Table 2.10.3. Swept area method for stock survey in November 2024 – average values of catch per unit area (CPUA), biomass (kg), Ax – area and number of fields

CPUA average	Strata	Biomass (kg)	Ax Surface	Number of stations
731.838	15−30	1511.348	2065.14	33
1178.246	30−50	2138.304	1814.82	29
310.32	50−100	1281.708	4130.28	66
		4931.36	8010.24	128

Horse mackerel was recorded at the highest densities in the waters off Byala, Nesebar Bay, the "Elenite" resort, Pomorie, Sozopol, and Burgas Bay (Fig 2.10.11).

The highest values of CPUA were registered in the 30–50 m depth layer, reaching 1178.3 kg.km^{-2}, with an average value of 731 kg.km^{-2}. In the 15–30 m and 50–100 m depth layers, the species was recorded in individual trawls with values of 731 kg.km^{-2} and 310.3 kg.km^{-2}, respectively (Fig 2.10.12).



a b

Figure 2.10.12. Catch per unit effort (CPUE kg.h^{-1}) for horse mackerel by strata, September 2024 (a), Catch per unit area (CPUA kg.km^{-2}), November 2024 (b)

The catch per unit effort (CPUE) for the species is presented graphically in Fig 2.10.12. The highest CPUE values (kg.h^{-1}) were observed off Nesebar Bay, Byala, "Elenite" resort, Pomorie, and Burgas Bay.

Figure 2.10.13. Sex ratio (females – ♀, males – ♂) of horse mackerel, November 2024

The total surveyed area was 8010.24 km², and the total biomass of red mullet was 496 t (Table 2.10.4). The species was recorded at 24 stations (out of a total of 36). The densest aggregations were observed off Cape Kaliakra, in Nesebar Bay, Burgas Bay, and west of Sozopol. A biomass peak was recorded in the 15–30 m depth range (258 t) and in the 30–50 m range (225 t), with lower values found in the 75–100 m stratum (12 t) (Fig 2.10.14; Table 2.10.4).

Table 2.10.4. Area-based method for stock assessment in November 2024 – average catch per unit area (CPUA), biomass (kg), A_x – area, and number of fields.

CPUA average	Strata	Biomass (kg)	Ax Surface	Number of stations
125.3215	15−30	258.8064	2065.14	33
124.128	30−50	225.27	1814.82	29
2.912974	75−100	12.0314	4130.28	66
		496.1078	8010.24	128

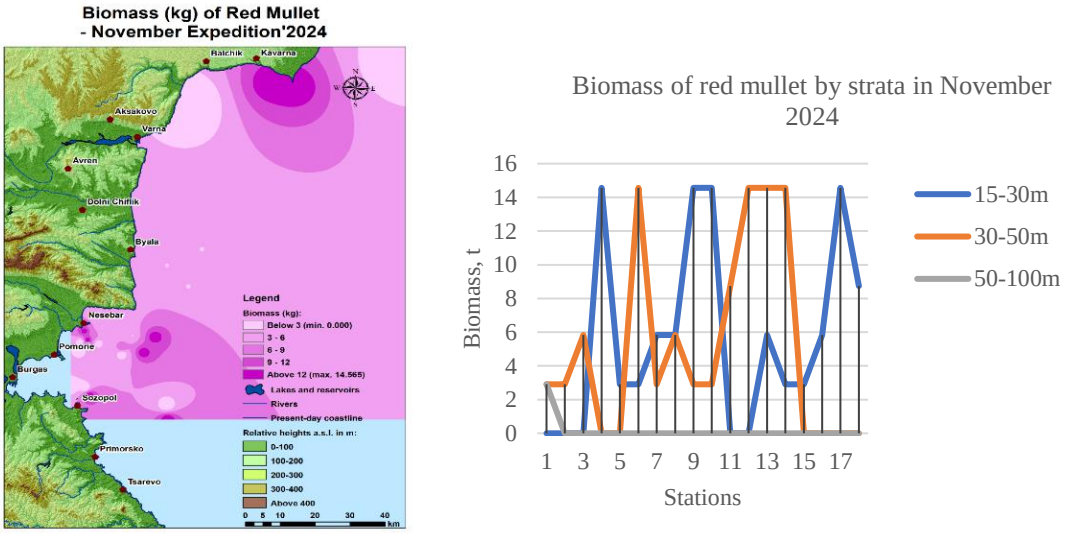


Figure 2.10.14. Biomass of red mullet in November 2024

The catch per unit area in the 15–30 m stratum was 125 kg.km^{-2}. In the 30–50 m and 50–100 m strata, the values were 124 kg.km^{-2} and 2.9 kg.km^{-2}, respectively. The average catch per unit area ranged between 15–310 kg.km^{-2} (Fig 2.10.14).

From the analysis of catch per unit area and catch per unit effort (Fig 2.10.14), it is evident that the highest densities and abundances were recorded in the 30–50 m depth zone, followed by the 15–30 m zone.

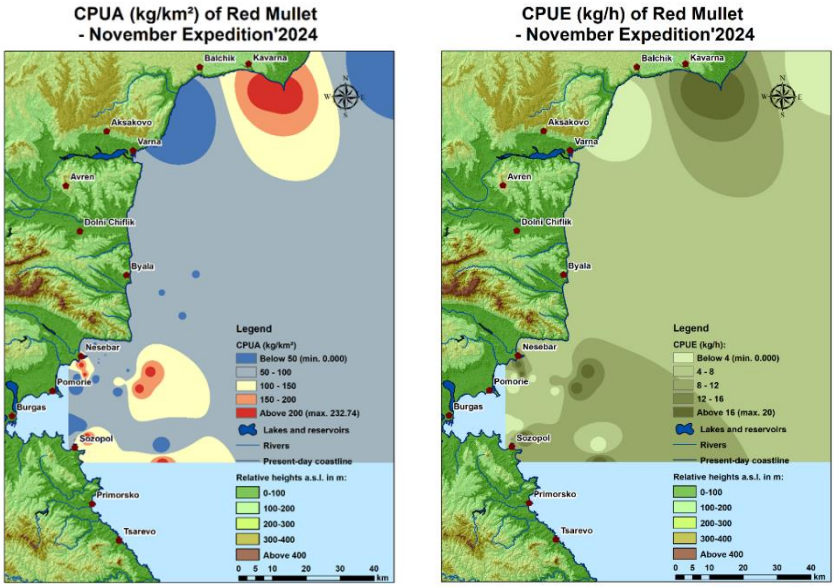


Figure 2.10.15. Catch per unit area (CPUA kg.km^{-2}) of red mullet in November 2024 (a), Catch per unit effort (CPUE kg.h^{-1}) of red mullet in November 2024 (b)

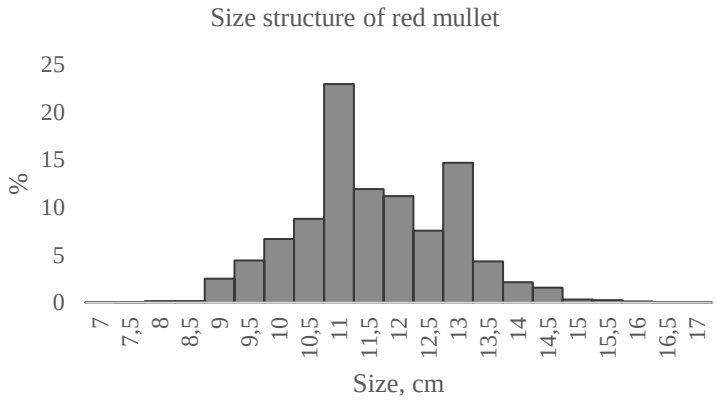


Figure 2.10.16. Size structure of red mullet

Age group 1–1+ years was dominant, followed by 2–2+ and 3–3+ years. The remaining age groups had a negligible presence in the catches during November 2024 (Fig 2.10.17).

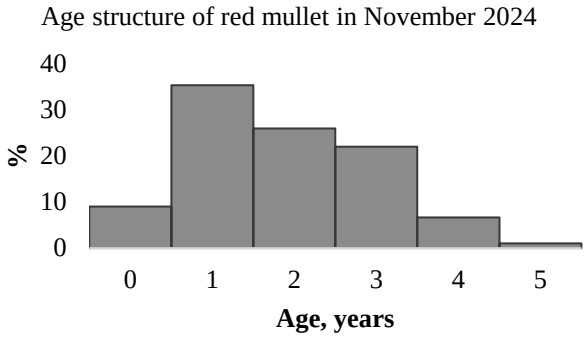


Figure 2.10.17. Age structure of red mullet

The growth parameters of red mullet, calculated using the von Bertalanffy model, indicate an asymptotic length of 18.41 cm and higher values of the coefficient that defines the rate of approaching the asymptote.

The percentage representation of females, males, and sexually immature individuals in red mullet was as follows: 48% females, 44% males, and 8% immature (Fig 2.10.18).

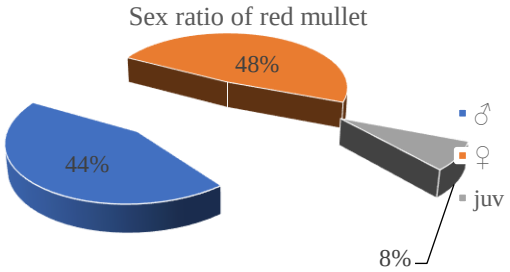


Figure 2.10.18. Sex ratio (females – ♀, males – ♂, and juveniles – juv) of red mullet in November 2024

The sexual maturity of the analyzed species by length classes is presented in Fig 2.10.19, and by age groups in Fig 2.10.20.

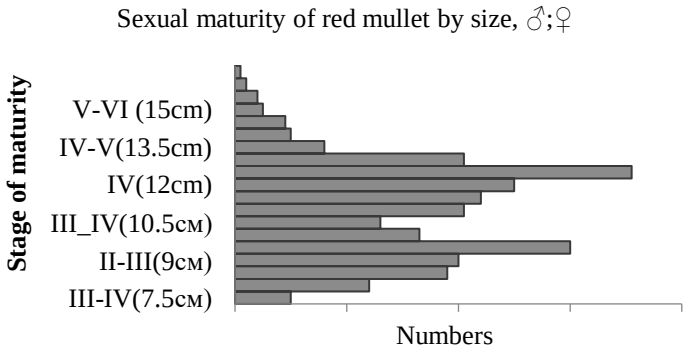


Figure 2.10.19. Sexual maturity of the studied species, analysed by size classes (females – ♀ and males – ♂) of red mullet

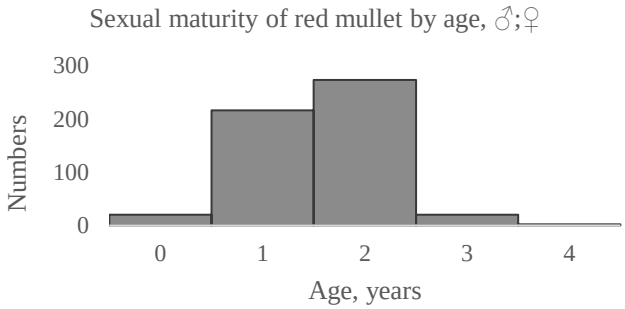


Figure 2.10.20. Sexual maturity (females – ♀ and males – ♂) of the studied species, analysedby age groups

The weights of the whiting specimens ranged from 3.22 to 26.8 g in the present study.

An analysis of the spatial distribution of ISF (% BW) can only be performed for horse mackerel data, as the samples for sprat and anchovies were insufficient during the study season. More intensive feeding of horse mackerel was observed off the central coasts of Cape Galata and Cape Emine (Fig 2.10.21).

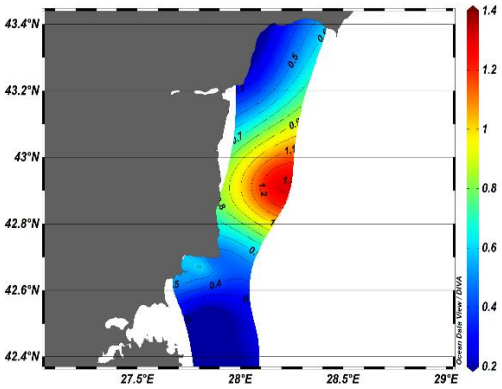


Figure 2.10.21. Spatial distribution of ISF (% BW) of horse mackerel in November 2024

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

The highest average number of prey items was recorded for horse mackerel at 88.58 ind/stomach ± 11.88 SE, with a maximum number of food organisms reaching 624 ind/stomach, primarily due to the consumption of *Cirripedia larvae*. The average number of prey items in the diet of sprat was 6.70 ind/stomach ± 1.90 SE.

In the zooplankton samples from the marine environment, 25 species/groups were identified, with a significant portion (20 species/groups) being present as components in the diet of horse mackerel and 2 species/groups in the diet of sprat.

The following groups and species are present in the sprat diet: Copepoda, mainly the species *Calanus euxinus*, and meroplankton larvae of *Cirripedia*.

Accordingly, the horse mackerel diet consisted of the following groups and species: *Mysida-Paramysis* spp.; Malacostraca - *Upogebia pusilla*; Copepoda - *Calanus euxinus, Pseudocalanus elongatus, Paracalanus parvus, Acartia clausi, Oithona davisae, Centropages ponticus, Harpacticoida spp.*; Diplostraca – *Pleopis polyphemoides, Penilia avirostris*, meroplankton - *Lamellibranchia veliger, Gastropoda veliger, Cirripedia larvae, Decapoda larvae*; the class Appendicularia is represented by the species *Oicopleura dioica*; the type Annelida is represented by larvae of the class Polychaeta, the type Protozoa of the species *Noctiluca scintillans*; type Chaetognatha - from *Parasagitta setosa*, and from Chordata fish eggs and larval stages are found.

The indices of relative importance for the main dietary components, their percentage contribution by abundance and biomass, as well as their frequency of occurrence, are presented in Fig. 2.10.22. for the studied pelagic fish species.

In the analyzed samples, the diet of sprat is predominantly composed of Copepoda - specifically *Calanus euxinus*. The diet of horse mackerel is dominated by meroplankton larvae, including *Cirripedia cypris* and *nauplii*, as well as copepods (Fig. 2.10.22.).

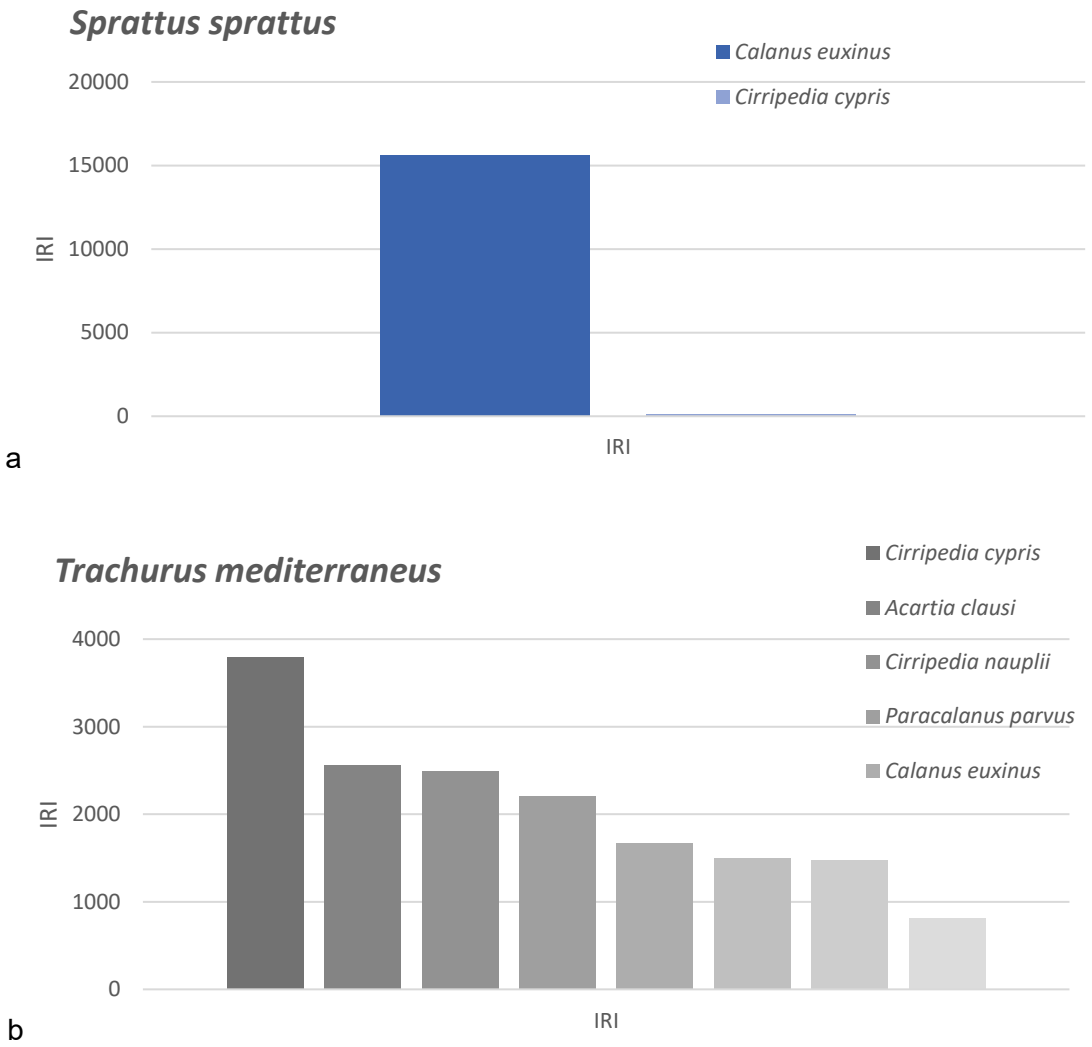


Figure 2.10.22. Average relative importance index (IRI) of the main species in the diets of sprat (a) and horse mackerel (b) in November 2024

During the study period, zooplankton biodiversity was comprised of 25 species and groups of organisms.

Copepoda (50.23 %), Diplostraca (20.34 %), and meroplankton (18.97 %) played a dominant role in forming the mesozooplankton biomass. Gelatinous zooplankton are represented by three species: *Aurelia aurita, Pleurobrachia pileus*, and *Beroe ovata*, with *Aurelia aurita* being the most dominant. In terms of abundance, the dominant groups were Protozoa (70.79 %), Copepoda (18.15 %), and meroplankton (6.22 %) (Fig 2.10.22).

The presented summarized the statistical data on the total biomass of zooplankton and its main constituent subgroups: mesozooplankton, gelatinous zooplankton, and protozoa. The total zooplankton biomass has average levels of 3800 mg·m^{-3} ± 2051.76 (SE) and is primarily formed by gelatinous species (2830.131 mg·m^{-3} ± 1981.43 (SE). The biomass of mesozooplankton (42.86 mg·m^{-3}) is comparable to the seasonal average.

During the study, the mesozooplankton biomass reaches its highest values of approximately 77.20 mg·m^{-3} off the northern part of the coast (Fig. 2.10.23.a). The quantities of Protozoa increased in the northern region, with a maximum of 2778 mg·m^{-3}, as well as in Burgas Bay (Fig 2.10.23.b). The concentration of gelatinous zooplankton increased off the central and northern parts of the coast, reaching a maximum of 26 g·m^{-3} (Fig 2.10.23.c).

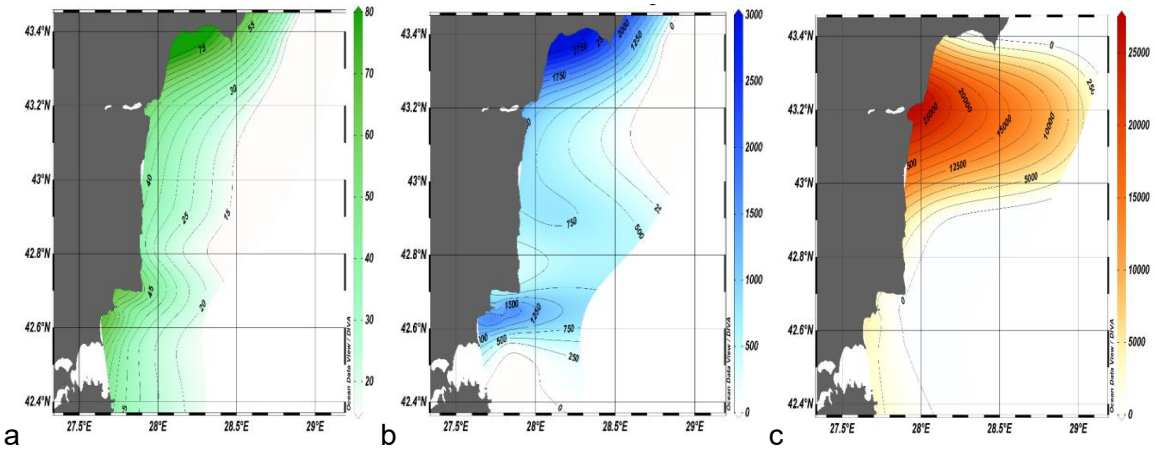


Figure 2.10.23. Spatial distribution of the biomass (mg.m^{-3}) of mesozooplankton (a), protozoa (b), and gelatinous zooplankton (c) in November 2024

3. Minutes from the 18th MEDIAS Coordination Meeting on 8-10 April 2025

3.1. General Discussion (on surveys presented)

There continue to be challenges related to the timing of surveys and technical issues with research vessels. 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.

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.

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

Venetia Kostopoulou, DG-MARE

Venetia Kostopoulou (VK, DG MARE, Unit C3) presented MEDIAS specific issues, the relevant outcomes of the Regional Coordination Group (RCG) Med & BS, Framework Contract (FWC) Med & BS studies, upcoming meetings and COM priorities.

Regarding **MEDIAS specific issues**, she gave an overview of the main outcomes of the 2024 MEDIAS meeting, namely: (i) the inclusion of new GSAs (GSA 15, GSA 25 and GSA 5), (ii) the agreement to set a specific period to run the survey for each GSA, with a buffer period of plus or minus one month, (iii) the agreement of making MEDIAS data publicly available, (iv) the dedicated RDBFIS data call for disaggregated MEDIAS data, (v) the end user requests for raw survey data and the need for MEDIAS to set up a group to work on this, (vi) the ongoing work on a document addressed to end users and (vii) the possible impact that offshore floating wind turbines may have on MEDIAS survey. A number of topics for further discussion and future work included how to address recurrent implementation issues, how to improve and share best practices, what could be the role of the RCG Secretariat in assisting the MEDIAS Group, and how to cooperate with other groups, such as MEDITS and survey groups of the North Sea basins. VK informed that the MEDITS Group is interested in discussing with MEDIAS Group, with the aim to share best practices.

On the **RCG Med & BS**, she invited the MEDIAS Group to take part in the discussion on the vision of the future RCG Med & BS. To this end, a consultation document will be distributed among the RCG Med & BS participants, that will be discussed at the RCG Med & BS meeting. VK explained the process - following the agreement of Member States - of making survey data publicly available through JRC and asked the MEDIAS Group to provide feedback, in order to improve the process next year. As part of the process of releasing data, a number of issues were identified in the JRC data sets, so DG MARE will follow up with Member States.

With respect to the **FWC Med & BS studies**, VK presented the next phase of RDBFIS (Regional Database Fisheries Information System) that started on 1 April 2025 with a 13-month duration. The objectives of the third phase of RDBFIS are the following:

- continue the hosting, maintenance, fine-tuning and further development of RDBFIS;
- finalize the population of RDBFIS with data and agree on an all-encompassing data call;
- use RDBFIS for submission to data calls and reporting obligations;
- provide support and training.

The specific contract project coordinator is Dr. Irida Maina (HCMR) and the scientific information technology coordinator is Stefanos Kavadas.

In relation to the regional database of the Med & BS, there are ongoing discussions on finding a permanent host and, on 2 April 2025, a consultation document on the hosting of the regional database for the Med & BS was distributed to National Correspondents from the RCG Secretariat, with a deadline 2 May 2025. VK invited the MEDIAS Group to be involved in this process.

VK also presented the QualiTrain (Quality checking of Mediterranean & Black Sea data and training for Member State experts) study. The project finished end 2024. The main goals were the following:

- Enhance quality checks and data validation processes;
- Organize technical training sessions;
- Run quality checks on Med & BS data.

The work initiated by QualiTrain will be continued by the ISSG on data quality and will be ensured under the next phase of RDBFIS.

On the subject of meetings, VK informed the MEDIAS Group of RCG meetings, STECF EWG meetings and ISSG (Inter Sessional SubGroup) planned work.

On the topic of **policy priorities**, VK presented the ongoing evaluation of the Common Fisheries Policy Regulation. The aim of this exercise is to assess the performance against initial expectations. The Commission launched a 12-week public consultation running until 21 April 2025. Dedicated sessions are planned with different actors (including Advisory Councils, STECF, COM Expert Group for Fisheries & Aquaculture etc). The final product will be an evaluation report that will feed into the next step of the decision-making cycle.

3.3. Review of issues discussed in other meetings held in relation to MEDIAS (RCG Med&BS Recommendation

Tarek Hattab, IFREMER

MEDIAS Chair presented to Steering Committee an overview of some outcomes of past international meetings related to the activities of EU-MEDIAS including the main recommendations of the regional coordination meeting Med&BC mentioned by Venetia Kostopoulou earlier. He also recalled that two workshops were organized in October 2024 with the participation of representatives of the MEDIAS group and the coordinators of the RDBFIS II project, which enabled progress to be made on defining the structure of the regional database.

The Chair informed also MEDIAS SC about his participation as a guest member to the RDBFIS statistical workshops, which took place in January 2025, and during which the issue of MEDIAS data raising from the disaggregated to the aggregated level (i.e. total biomass and abundance per age estimates) was brought up. The Chair emphasized the need for a common procedure and script to carry out this task, which would require the organization of a meeting to specifically address this issue later this year.

3.4. 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. Seven of the sixteen surveys were partially covered, with percentages ranging from 22% to 83% of coverage. When GSA01 could not be completed due to time constraints, priority was given to the preferred distribution areas of the target species, sardine and anchovy, especially the bays of Almeria and Malaga. For biomass reconstruction, a standard grid was constructed containing the total EDSUs of the GSA01, and the average biomass value for the three nearest years was estimated in each non-covered EDSUs. This method allowed the time series to be completed. However, in some years completely covered (2013, 2016, and 2019), the biomass assessed during the survey was still inconsistent with landing data. These years shared the peculiarity that the proportion of target species (sardine and anchovy) was less than 10%. Therefore, the massive presence of other pelagic species, mainly *Trachurus* spp., *Scomber colias*, *Sardinella aurita* or *Boop boops*, masked the presence of anchovies and sardines. For this reason, the echograms were re-scrutinized, applying, based on expert judgment, direct species allocation instead of the species proportion of the nearest haul. The figure shows the final result for sardine, which was presented at the data preparation meeting for small pelagics carried out in Malaga 07–11 October 2024 and at the recent WASASP, with positive results.

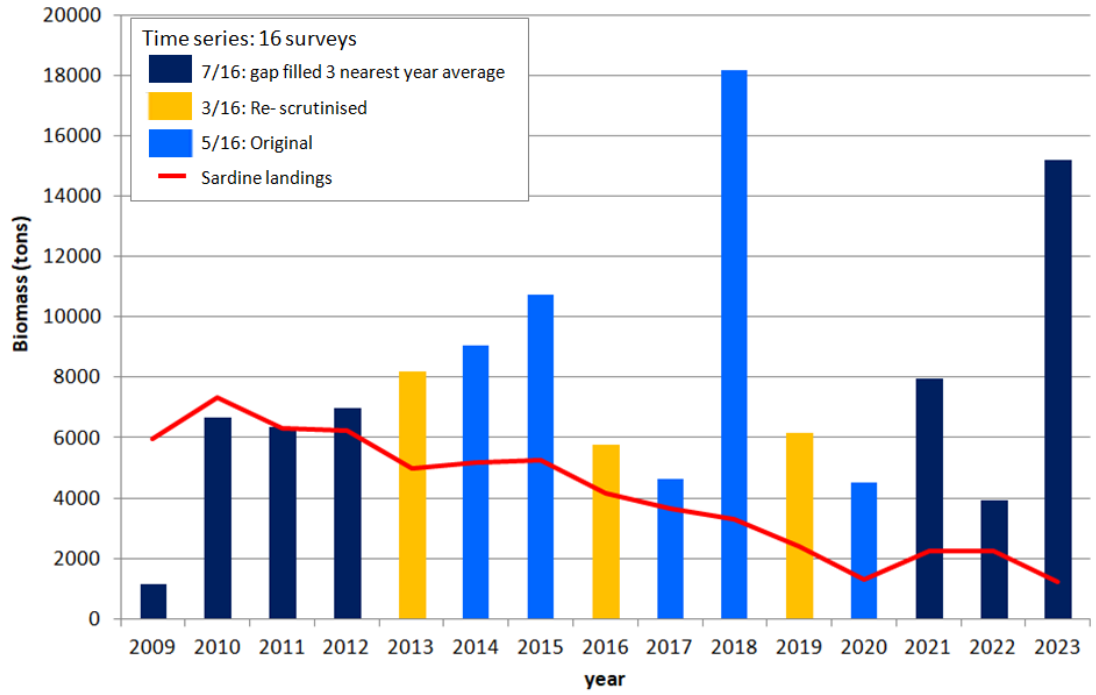


Figure 3.4.1. *Sardine Pilchardus* biomass reconstruction in GSA01.

3.5. Progress update on standardization of age reading and maturity estimates

Rosalia Ferreri, CNR-IAS

Taking forward the work begun last year and following up on what was discussed at the last MEDIAS meeting, the exchange exercise on sexual maturity estimates for *Engraulis encrasicolus* and *Sardina pilchardus* continued. Although most of the Institutes that had not yet participated in the program sent in their estimates of the images that had already been shared, Greece unfortunately could not yet participate. Also, not all groups were able to share photos.

Currently, the pictures of *S. pilchardus* have been shared but not yet the estimates. Otherwise, results on 136 pictures of fresh *E. encrasicolus* have been obtained. Individuals not staged by at least two operators (e.g., imaged not in focus) has been excluded (n=4). The sexual maturity estimates on fresh individuals turn out to be more certain and appropriate, since the images could be affected by light, colour distortion, as well as difficulties in evaluate the turgidity. For these reasons, the estimate provided by the research team catching that fish has been considered the right one. The proportion of agreement (PA) among the “original estimate” and these ones carried out by other MEDIAS teams have been calculated for both sexes, for each maturity stages and overall. The PA is around 50% for both males and females, separately and combined. Also, the evaluations of maturity stages did not reach good agreement levels, except for male I and II, which, however, include only one individual each.

According to the literature, stages III and V are macroscopically similar, and several external factors can cause a stage III gonad to appear as a stage V, particularly when identification has been carried on images. Combining results of individuals staged as III and V may be considered a reasonable compromise for some specific applications, such as distinguish

between mature and immature individuals. For this reason, the PA was also calculated by joining these stages, reaching about 76% for females and about 85% for males.

Despite the generally low PA values, some picture evaluations were fully (or almost fully) agreed upon by all the participants. These pictures will be included in a reference collection for MEDIAS people. The exchange program and collection of reference photos should be completed by the 19th MEDIAS meeting.

3.6. Work on MEDIAS regional database

Stefanos Kavadas, RDBFIS-II 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:

- 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.

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 Med&BS RDBFIS-III project, aims to the establishment of the Regional Database for the Mediterranean and Black Seas. The project focuses on maintaining, fine-tuning, and expanding RDBFIS while finalizing its population with historical and current data. Certain components include uploading MEDITS data from 1994–2001 and launching new data calls, including for 2023. Additional efforts target tool fine tuning and further development, especially updating the RoME and BioIndex tools to improve data quality and compatibility. Improvements on these tools include adapting to new MEDITS handbook updates, harmonizing data formats, and improving error detection. The project builds on prior initiatives (RDBFIS II, QualiTrain) and integrates feedback from trainings or advice from questionnaires and meetings that are useful for fine tuning and further development.

3.6. Explore the use of EchoR for data processing

Previous efforts to employ the EchoR package for biomass estimation within the MEDIAS group were hindered by challenges related to the interpretation and handling of the input data structure. These difficulties prompted extensive discussions, which ultimately led to the consensus that adapting the EchoR package to support the RDBFIS data format is essential. Such an adaptation would enable the group to capitalize on recent progress made in the standardization of data formats and the development of a regional database.

In parallel, the group engaged in a broader methodological reflection, particularly focusing on the divergences that exist among member states in terms of acoustic data processing. Central to these discussions were the definitions and classifications of echotypes, as well as the procedures for attributing trawl information to NASC (Nautical Area Scattering Coefficient) data. The objective was to identify and catalogue the different scenarios that any new functionality would need to accommodate.

Given the complexity of these issues and the limited time available during the meeting, the group agreed to convene a series of dedicated workshops towards the end of the year. These meetings will be coordinated by Tarek Hattab from IFREMER and will include detailed presentations of the methodologies currently applied in each member state.

Finally, the group recognized the need to further evaluate whether it would be more appropriate to develop a MEDIAS-specific package based on the core functionalities of EchoR, or instead to integrate the newly required features directly into the existing EchoR package. This decision will be further explored during the upcoming workshops.

3.7. Drafts a document addressed to end users describing any changes in the sampling design through the years

In the follow-up action to recommendation #5 of the Med&BC regional coordinating meeting on “Public availability of survey data”, the MEDIAS Group was asked to draft a document addressed to end users describing any changes in the sampling design through the years. This document will contain the metadata associated with MEDIAS data already publicly available on the Joint Research Centre Data Catalogue.

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 3.7.1. Summary table of changes in MEDIAS surveys over time

Year	GSA	Change	Duration of change	Reason	Possible imapct 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 calender	Very low
2020	GSA7	Change of period of the survey	One year	Delay due to the COVID19 pandemic	Increased contribution of juveniles of anchovy to total biomass
2024	GSA9	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
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

Year	GSA	Change	Duration of change	Reason	Possible imapct in term of biomass estimates
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
2024	GSA17 East	Survey done with 2 ships, one collecting acoustic data, one collecting biological data ; southern open sea recorded in zig-zag pattern ; southern inner sea route simplified ; number of trawls reduced	One year	Malfunction on fishing gear	possible lower precision of estimated biomass
2023	GSA17 East	Echoview data processing team changed	Permanent	Change in project personnel	possiblity in different assessment, could efect time series
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, decerease 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	One year	Delay due to bureaucratic procedures	Increased contribution of juveniles to

Year	GSA	Change	Duration of change	Reason	Possible imapct in term of biomass estimates
		to August-September		for renting the research vessel	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
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

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

Marco Barra, CNR-IAS

Before the meeting, all MEDIAS participants shared anchovy and sardine NASC data from the 2023 surveys, which allowed us to update the NASC-map time series for both species (Fig 3.8.1 and 3.8.2). The NASC maps were generated using the IDW (Inverse Distance Weighting) interpolation method, with a search radius limited to the nearest ten points. In accordance with what was discussed at the previous meeting, interpolation grid resolution was reduced to 1 nmi to avoid problems in the narrow sectors between the islands; strictly zero values were explicitly included in the color scale to highlight possible changes in the area covered during each survey.

All maps are published on the MEDIAS website (https://www.medias-project.eu/index.php/maps). Maps will also be updated on in IFREMER's Geoportal SEXTANT (https://sextant.ifremer.fr/eng/Data/Catalogue#/metadata/7c4c6bfe-15a8-496b-8778-d8ccb829bf1f and https://sextant.ifremer.fr/eng/Data/Catalogue#/metadata/4e0c8b6e-9050-4816-a5f3-457dae10c72d).

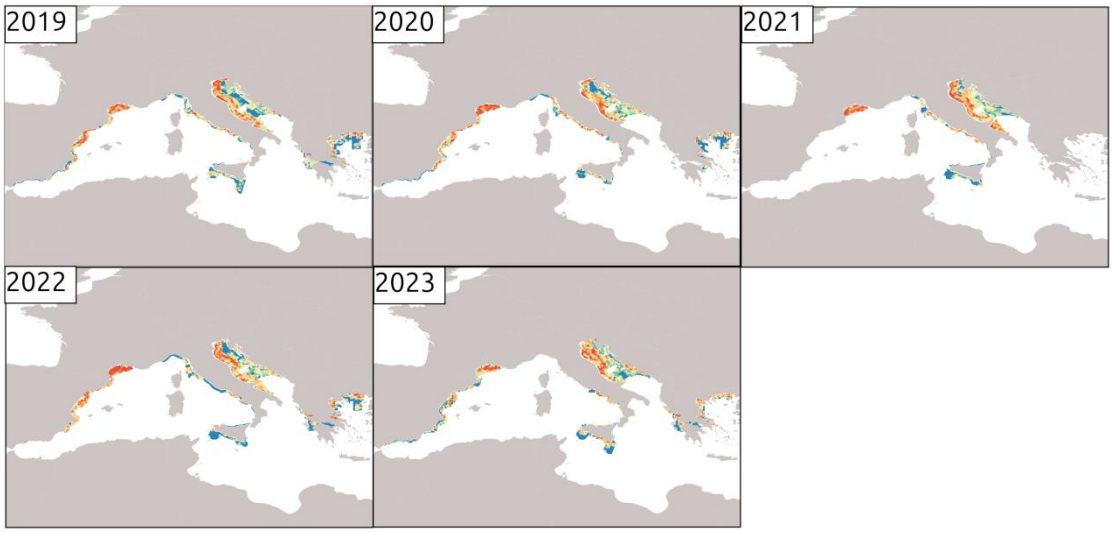


Figure 3.8.1. Anchovy maps 2019 - 2023

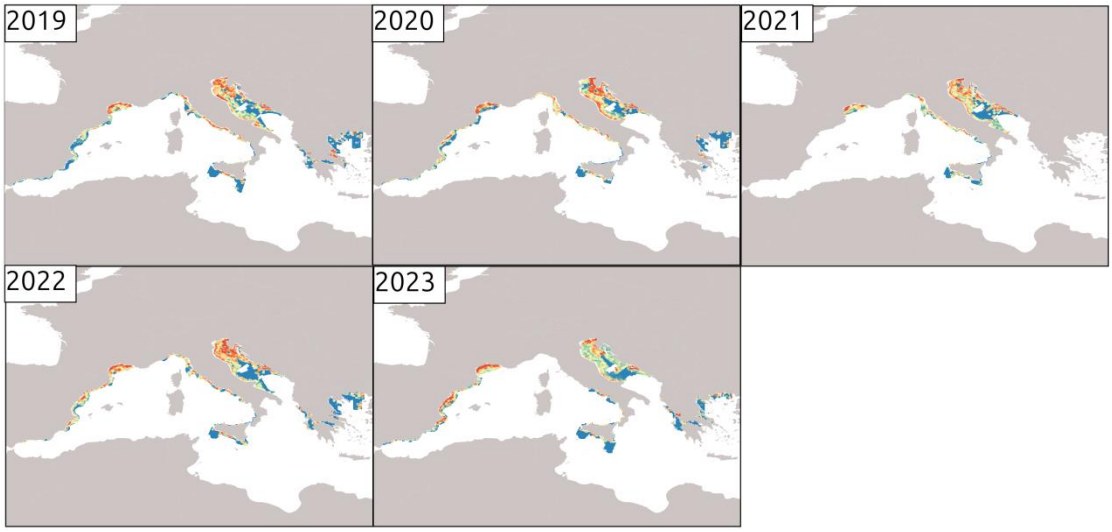


Figure 3.8.2. Sardine maps 2019 - 2023

3.9. Presentation of the new MEDIAS website

Marco Barra, CNR-IAS

The updated website presented at the 17th MEDIAS meeting is now online and hosted on a CNR server (www.medias-project.eu). The CNR IT team routinely carries out website backups. Registration is intended mainly for access to the working documents presented during MEDIAS meetings, and is only available to MEDIAS meeting participants. Conversely, all users (unregistered) can access meeting reports, the handbook, and the publication list.

Specific website sections collect images related to surveys and laboratory operations, as well as standardized anchovy and sardine NASC maps.

The working group (WG) agreed to provide summary information about the research vessels involved in the acoustic surveys in a specific website section. To this end, each group will share a summary document containing a picture of the vessel used for MEDIAS surveys, as well as information about the vessel's characteristics and equipment.

3.10. Update on the progress of the TS anchovy estimation work

Zacharias Kapelonis, HCMR

A progress report was presented on the use of acoustic data from the MEDIAS survey to develop a common target strength (TS) model for anchovy, intended for use by the entire group. The methodology was briefly reviewed: it involves collecting nighttime acoustic measurements during pelagic hauls with monospecific anchovy catches, along with their corresponding biological samples. The subsequent analysis consists of extracting TS information from echograms in the trawling area and combining this with biological samples to produce (L, TS) pairs, from which an approximate TS model is derived through regression.

To date, the dataset—comprising 43 hauls—offers good spatial coverage of the eastern Mediterranean basin, but data from the western Mediterranean remain limited. Major challenges in completing the analysis include: (1) the spatial and temporal distribution of available data; (2) variability in sampling protocols (e.g. number of frequencies, trawl monitoring, and length measurements); (3) the need to balance methodological accuracy with data availability; and (4) the lack of independent data to validate the in-situ analysis method.

To finalize this study, the following steps are necessary: (1) spatial enrichment of the in-situ dataset, particularly in the western Mediterranean; (2) partitioning of the data, if needed, based on analysis capabilities (e.g. multi-frequency availability); and (3) the integration of numerical simulations as an independent approach for methodological assessment (as further elaborated by Antonio Palermino)

Despite the difficulties associated with carrying out monospecific night trawls in some regions, the Spanish and French teams are dedicated to expanding their data collection efforts. Meanwhile, the Spanish and Sicilian teams plan to revisit historical datasets in order to pinpoint any relevant night trawls with monospecific anchovy catches, which could be shared with Zacharias Kapelonis (HCMR) to contribute to the ongoing analyses.

3.11. Data collection for anchovy backscatter modeling

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

In order to improve the estimation of anchovy TS from in-situ samplings (monospecific nighttime hauls), backscattering modelling could be applied as a benchmark to support and validate measurements taken in the field.

Three methods are generally applied to collect data for backscattering model application, fish dissection, X-Ray scans or Coumputer Tomography (CT) (Ok & Gucu, 2019; Sobradillo et al., 2021; Boswell et al., 2020). These methods allow to obtain a 2D or 3D model of the swimbladder, which is responsible for more than 90% of the backscatter of a fish (Ona, 1990), fish body and bones that are used as input parameters for the application of analytical, approximation or numerical models.

The aforementioned methods are briefly described herein through proposing protocols for the data collection from the net to the image acquisition. Moreover, advantages and disadvantages of each protocol are underlined.

Protocol for fish dissection/slicing (Gastauer S., confidential): Fish have to be collected as soon as possible from the net and dissected using a cutter or scalpel without damaging the swimbladder to make its shape visible as shown in Figure 3.11.1. Finally, the fish have to be photographed laterally and dorsally from a fixed framework preferably fixed on graph paper or on ichthyometer.

Figure 3.11.1. Example of dissected fish on ichthyometer.

Table 3.11.1. Advantages and disadvantages of fish dissection/slicing.

Advantages	Disadvantages
Easy to apply	Possible damages to the swimbladder during dissection
Does not require medical or veterinary instruments	Require a higher number of samples
Possibility to collect images for modelling straight onboard	It is time comsuming during the survey
Possibility to work on fresh fish	Limited to the application of approximation models

Protocol for X-ray scans and computer tomography (TC) (Palermino et al., 2023; Palermino et al., 2025): Fish have to be collected as soon as possible from the net and successively measured and weighed. Once measured, the smaples have to be frozen at the lowest available temperature (ideally at -80° or with liquid nitrogen). Finally the Fish have to be scanned dorsally and laterally through X-ray or CT at veterinary or medical facilities to obtain swimbladder images as shown in Figure 3.11.2.

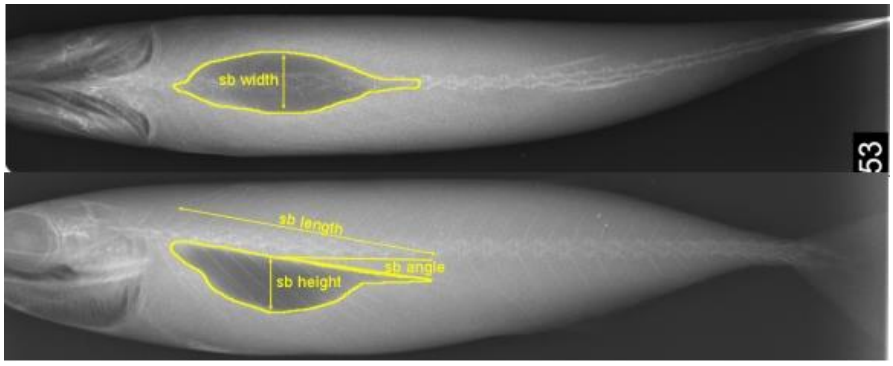


Figure 3.11.2. Examples of dorsal and lateral x-ray scan on fish.

Table 3.11.2. Advantages and disadvantages of x-ray scans and TC on fish.

Advantages	Disadvantages
More precise compared to dissection	Required medical or veterinary facilities

Few time required for specimens' collection onboard (measurements can be taken even after scan)	Work on frozen fish
X-ray allows easy adjustments of instrument settings	Costs (should be around 1000/2000€ depending on specimens' number)
X-ray is widely employed with a lot of supporting literature	Limited to the application of approximation models
TC scan gives the possibility to measure the density of flesh, swimbladder and other organs and to apply numerical models	Less common compared to X-ray with few supporting literature

Whatever the decision on the selection of the method to collect the data to be used in a backscattering model of anchovy samples, the aim should be to try to cover as many length classes as possible and collect samples from different areas of the Mediterranean Sea. It should be taken into account the possibility that some samples could get damaged from the applied procedures; therefore, a proper number of samples should be collected.

Jpeg or png images obtained with a photograph or X-ray can be analysed with software like Image J/R to obtain xyz coordinates of the swimbladder for the application of approximation models, while DICOM images obtained through TC can be analysed through 3D image processing software like 3D slicer or COMSOL for numerical model computation (Palermino et al., 2023; Palermino et al., 2025). In this case, the swimbladder is meshed in small triangles to compute and sum the backscatter of each point as shown in Figure 3.11.3. From DICOM files, it is even possible to obtain xyz coordinates to compute the approximation models.

Based on data collection, the Kirchhoff Ray approximation Mode model (KRM) or the numerical models Finite Element Method (FEM) and Boundary Element Method (BEM) will be applied (Jech et al., 2015).

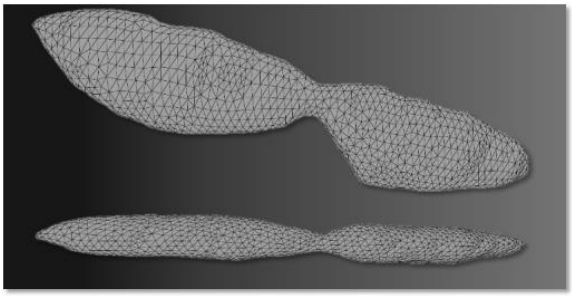


Figure 3.11.3. Example of swimbladder meshed in small triangles for numerical modelling computations.

Group discussion

Several participants raised the issue about the number of specimens to be collected, therefore, a number of ≈ 100 specimens was proposed and accepted. As an example, it has been suggested to collect 20 specimens from 5 different hauls to cover as much as possible the area of each country.

All the countries expressed their availability in participating in the experiment, but taking into account the time constraints onboard, all the participants suggested to collect the specimens following the protocol for the CT scan. Tarek Hattab suggested performing the CT scan using the same veterinary facilities for all countries. Despite the costs, all the participants agreed to

send the samples as soon as possible after the survey to the CNR-IRBIM, which has been proposed as responsible for the CT scan, taking into account the previous experience in this kind of experiment. Angelo Bonanno expressed the interest of CNR-IAS in contributing to the costs of the scans.

A detailed protocol for data collection developed by CNR-IRBIM, along with a quotation for the CT scan, will be circulated in advance of the 2025 surveys.

3.12. Application of the Daily Egg Production Method in Greek waters during the last decade

By Eudoxia Schismenou, Konstantinos Markakis, Apostolos Siapatis, Chrysoula Rokana, Maria Myrto Pyrounaki, Zacharias Kapelonis, Konstantinos Tsagarakis, Athanassios Machias, Marianna Giannoulaki and Stylianos Somarakis, HCMR

The Daily Egg Production Method (DEPM) has been applied 4 times (2014, 2016, 2019, 2022) in the last decade for the estimation of anchovy spawning stock biomass in the North Aegean Sea. The surveys for the collection of ichthyoplankton and adult fish samples were conducted on board the R/V PHILIA during June-July, (anchovy peak spawning period) concurrently with the acoustic survey.

The spawning stock biomass (SSB, metric tons) was estimated according to the model:

SSB= k*P*A*W/(R*F*S)

where k is the conversion factor from grams to metric tons, P is the daily egg production (number of eggs per sampling unit, m2), A is the total survey area (in sampling units, m2), W is the average weight of mature females (g), R is the sex ratio (fraction of mature females by weight), F is the batch fecundity (mean number of eggs per mature females per spawning), and S is the fraction of mature females spawning per day (spawning frequency).

Based on patterns of horizontal distribution of eggs and spatial differences in topographic and hydrographic the surveyed area was post-stratified into an eastern (I) and western (II) stratum (Fig. 3.12.1) and parameter and biomass estimation was carried out separately for each stratum.

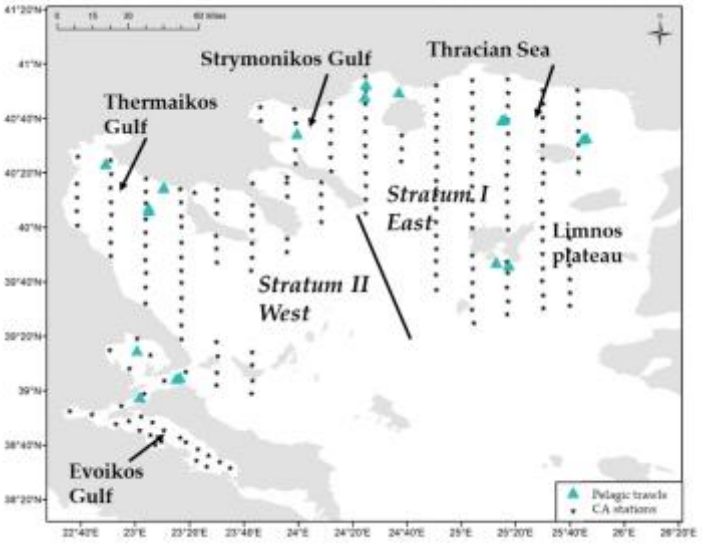


Figure 3.12.1. Map of the survey area showing the location of sampling stations in 2016.

Ichthyoplankton samples were collected with vertical plankton tows using a CALVET net (mesh-size: 0.200 mm). Temperature and salinity profiles were also sampled using a CTD. Adult fish samples were collected with a pelagic trawl; each sample was a random collection of ~50 anchovies. In the laboratory eggs and larvae were sorted from the plankton samples, anchovy eggs and yolk sac larvae were staged and then aged using a temperature dependent model of anchovy developmental rate. The daily egg production, P was estimated using an exponential mortality model. Processing of an adult sample in the laboratory consisted of sexing (R), total length, total weight (W), gonad free weight measurements, fecundity measurements on females for batch fecundity estimation (F) and histological analysis for spawning frequency estimation (S). Batch fecundity was estimated using the hydrated oocyte method; spawning frequency was estimated using the postovulatory follicle method.

Fig 3.12.2 illustrates the distribution and abundance of anchovy eggs in June 2016 as an example of anchovy spawning area. In general, the main spawning ground of the northern Aegean anchovy stock was located in continental shelf waters of Stratum I (Thracian Sea). In the west (Stratum II), the highest egg abundances were recorded in Thermaikos and Evoikos Gulfs. Estimates of daily egg production (P) were variable, ranging from 25.53 to 199.78 eggs m^{-2}.

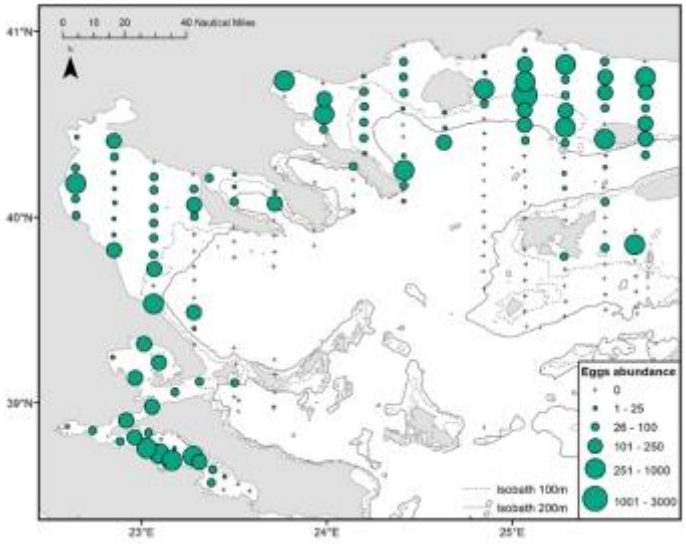


Figure 3.12.2. Distribution and abundance (eggs m−2) of anchovy eggs in the North Aegean Sea in June 2016.

The average weight of mature females (W) was higher in the east (9.43-11.83 g) than in the west stratum (6.1-9.34 g). The weight specific sex ratio (R) in both strata was close to 0.5 with the exception of the west stratum in 2016 (0.38; male-biased) and the east stratum in 2022 (0.60; female-biased). In the east stratum, batch fecundity (F) was ~4000 eggs per batch. In the west, F was lower ranging from 1652 to 3472 eggs per batch. In the east stratum, spawning fraction (S) ranged from 0.33 to 0.38, i.e., females spawned every ~3 days. In the west stratum, spawning frequency was more variable: in 2014 females spawned almost every 2 days (S = 0.44) and in 2022 every 4 days (S = 0.25).

Both in the east and the west strata anchovy SSB increased over the years and total SSB in the North Aegean Sea ranged from ~14000 t in 2014 to ~86000 t in 2022 (Fig 3.12.3). When compared with the acoustic biomass estimate (Fig 3.12.3), it was clear that both estimates demonstrated the increasing trend of anchovy stock biomass in the North Aegean Sea during the last decade.

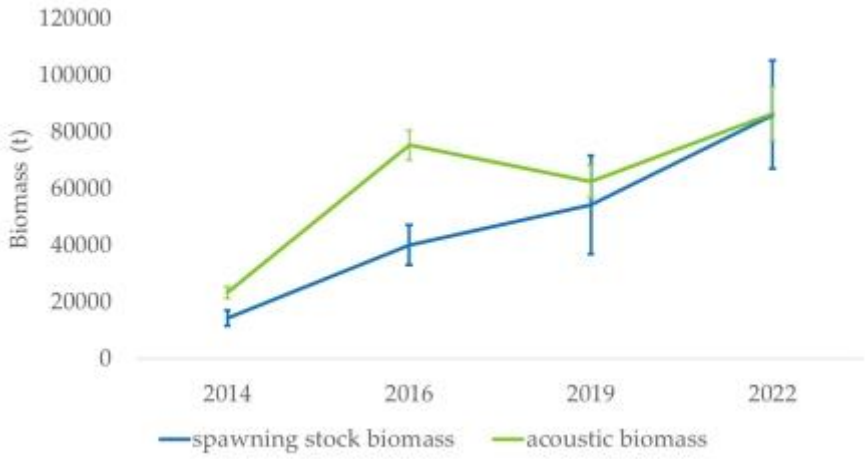


Figure 3.12.3. Anchovy spawning stock biomass and acoustic biomass estimates during 2014-2022.

3.13. 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 information from RDBFIS concerning table structure, syntax verification and the coding system.

3.14. Election/nomination of a new MEDIAS Chair

Kelly Camilleri (ARM, Malta) 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. Kelly will assume her responsibilities starting in September, following the Regional Coordination Meeting, during which the current Chairperson will present the outcomes of the MEDIAS WG and facilitate the transition.

3.15. Terms of reference for the next meeting (2026); dates and venue of next meeting

MEDIAS SC discussed and accepted the Terms of References (ToR) for the next, 19th MEDIAS coordination meeting in 2026. 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 standardization of maturity estimates
- Present updates related to regional NASC mapping
- Presentation of the results of adaptation of the core EchoR package functions to the RDBFIS format
- Presentation of the outcome of the standardization of echo-trace representation

The next meeting will take place from April 28 to 30, 2026. Giannoulaki Marianna from HCMR have kindly agreed to organize the 19th MEDIAS SC in Heraklion, Crete.

3.16. Closure of the meeting

The Chair thanked all experts for their participation in the 18th meeting of the MEDIAS Steering Committee and particularly to Kelly Camilleri (ARM) for hosting the meeting the efficient organization and technical support of this hybrid meeting. The 18th MEDIAS Steering Committee was closed on 10 April 2025 at 13:00.

4. Conclusions and decisions of the 18th MEDIAS Steering Committee

1. A new RDBFIS Workshop will be organized following the MEDIAS meeting to support Phase 3 of the project and further develop the database. Key areas of focus will include the integration of survey coverage polygons, procedures for estimating total biomass and abundance by study area, and refinement of the quality control process. This work will be undertaken by the sub-group that has already begun developing the MEDIAS RDBFIS tables.

2. Preliminary results from the gonad photo exchange exercise—aimed at determining maturity stages—were presented, revealing a low level of agreement among operators. The exercise will continue for both to enlarge the collection with missing maturity stages and, to include photographs or the interpretation of the existing material by teams, which are not yet contributed. A dedicated meeting will be organized with the support of the RCG Secretariat, well in advance of the next coordination meeting, to establish a detailed timeline and clarify the remaining steps required to complete this exercise.

3. The Steering Committee developed a standardized template for teams to report any changes in the MEDIAS survey protocol over the course of the time series. This table will collect information on the type and duration of protocol deviations, the reasons for these changes, and any potential impact on biomass estimations. The completed tables will be submitted alongside the survey summaries and compiled in the final meeting report, which will then be shared with end-users and included as metadata with the publicly available MEDIAS dataset.

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. Building on progress made in hosting MEDIAS data in the RDBFIS format, the Working Group decided to leverage this structure to harmonize data processing. The main constraint identified with the use of the EchoR package was the formatting of input data. Therefore, the WG agreed to develop a new R package tailored to the MEDIAS context, based on EchoR's core functionalities but fully adapted to the RDBFIS format. This package will accept input tables in RDBFIS format (e.g., trawl, NASC, and echotype tables) and generate outputs in the same format, including acoustic estimates by species and length class. An expert sub-group will convene ahead of the next coordination meeting to advance this work.

6. 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. Although conducting monospecific night trawls remains challenging in some areas, the Spanish and French teams are committed to intensifying data collection. 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.

7. Still in connection with the TS model development for anchovy, the WG agreed to send frozen anchovy samples to CNR-IRBIM as part of an ongoing study on modeling anchovy backscattering. A protocol will be circulated to all WG members outlining the procedures for sample collection and preparation. These samples will subsequently be used for CT or X-ray scans of the swim bladders. Furthermore, it was decided to centralize the scanning process at CNR-IRBIM to minimize methodological variability and reduce analytical costs.

8. The Working Group has decided to include echograms showing typical echo-traces observed in the different GSAs 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. An exception is made for France, which will provide layouts in a different format to indicate the location of the echo-traces, as they use different software for acoustic data processing.

9. Finally, a new template produced by the RCG Secretariat for the preparation of survey presentations and reports has been created. These templates will be shared with the entire group and will be used starting from the next meeting 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.

10. 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 Independe... - 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 2023. European Commission, Joint Research Centre (JRC) [Dataset] doi: 10.2905/f25092c4-3f0f-449f-ba60-5fbfe385defc PID: http://data.europa.eu/89h/f25092c4-3f0f-449f-ba60-5fbfe385defc'. MEDIAS is included in the keywords. The data set will be updated every year, adding one more year.

11. Kelly Camilleri from MAFA ARM was elected as the new MEDIAS Chair for the next three years

5. References

Boswell, K.M., Pedersen, G., Taylor, J.C., Labua, S., Patterson, W.F., “Examining the relationship between morphological variation and modeled broadband scattering responses of reef-associated fishes from the Southeast United States,” Fish. Res., vol 228, 2020.

Jech, J.M., Horne, J.K., Chu, D., Demer, D.A., Francis, D.T.I., Gorska, N., Jones, B., Lavery, A.C., Stanton, T.K., Macaulay, G.J., Reeder, D.B., Sawada, K., “Comparisons among ten models of acoustic backscattering used in aquatic ecosystem research,” J. Acoust. Soc. Am., vol 138, pp. 3742– 3764, 2015.

Ok, M., Gücü, A.C., 2019. A study on European anchovy (Engraulis encrasicolus) swimbladder with some considerations on conventionally used target strength. Turk. J. Zool. 43, 203–214. https://doi.org/10.3906/zoo-1809-21.

Ona, E., 1990. Physiological factors causing natural variations in acoustic target strength of fish. J. Mar. Biol. Assoc. U.K. 70, 107–127. https://doi.org/10.1017/S002531540003424X.

Palermino A., De Felice A., Canduci G., Biagiotti I., Costantini I., Centurelli M., Leonori I. 2023. Application of an analytical approach to characterize the target strength of ancillary pelagic fish species. Scientifc Reports, 13:15182, https://doi.org/10.1038/s41598-023-42326-4.

Palermino A., Gastauer S., De Felice A., Canduci G., Biagiotti I., Leonori I. 2025. Characterization of European sprat acoustic backscatter through modeling techniques: A comparison with in situ observations in the Mediterranean Sea. Fisheries Research, 283:107298. https://doi.org/10.1016/j.fishres.2025.107298.

Petitgas, P. (2001), Geostatistics in fisheries survey design and stock assessment: models, variances and applications. Fish and Fisheries, 2: 231-249. https://doi.org/10.1046/j.1467-2960.2001.00047.x

Sobradillo B., Boyra G., Perez-Arjona I., Martinez U., and Espinosa V. 2021. Ex situ and in situ target strength measurements of European anchovy in the Bay of Biscay. ICES Journal of Marine Science, doi:10.1093/icesjms/fsaa242.

Annex I. Participants list 8th – 10th April 2025

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Andrea De Felice	CNR-IRBIM	IT	andrea.defelice@cnr.it	Online
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Eudoxia Schismenou	HCMR	GR	schismenou@hcmr.gr	Online
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Marija Boban	IZOR	HR	marebo@izor.hr	Online
Marthese Degabriele	MAFA-ARM	MT	marthese.degabriele@gov.mt	In-person
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MEDIAS Coordination Meeting Report

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Simona Genovese	CNR-IAS	IT	simona.genovese@cnr.it	Online
Stefanos Kavadas	HCMR	GR	stefanos@hcmr.gr	Online
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Tea Juretić	IZOR	HR	juretic@izor.hr	In-person
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Venetia Kostopoulou	DG MARE	EU	venetia.kostopoulou@ec.europa.eu	Online
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Zacharias Kapelonis	HCMR	GR	zkapelonis@hcmr.gr	Online

Annex II. Agenda April 2025

MEDIAS Coordination Meeting in April 2025

8th April

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

09:30 Presentation of the 2024 acoustic surveys in GSA 1 - Northern Alboran Sea and GSA 6 - Northern Spain (IEO) - Magdalena Iglesias, Ana Ventero and Pilar Córdoba

10:00 Presentation of the 2024 acoustic surveys in the GSA 7 - Gulf of Lion (IFREMER) - Tarek Hattab and Jean-Hervé Bourdeix

10:30 Presentation of the 2024 acoustic survey in GSA 9 – Ligurian Sea and GSA 10 - Tyrrhenian Sea (CNR-IAS and CNR-ISMAR) - Angelo Bonanno, Marco Barra, Simona Genovese, Gualtiero Basilone and Rosalia Ferreri

11:00 Coffee break

11:30 Presentation of the 2024 acoustic surveys in GSA 15 - Malta (MAFA-ARM) - Kelly Camilleri, Mizzi Michelle and Mifsud Jurgen

12:00 Presentation of the 2024 acoustic surveys in GSA 16 - South Sicily (CNR-IAS and CNR-ISMAR) - Angelo Bonanno, Marco Barra, Simona Genovese, Gualtiero Basilone and Rosalia Ferreri

12:30 Presentation of the 2024 acoustic survey in the eastern part of GSA 17 - Northern Adriatic Sea (IZOR) - Vanja Čikeš Keč, Nedo Vrgoc and Tea Juretic

13:00 Lunch break

14:30 Presentation of the 2024 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 Palermino, Samuele Menicucci and Greta Di Martino

15:00 Presentation of the 2024 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

15:30 Presentation of the 2024 surveys in the GSA 29 - Black Sea: Bulgarian survey (IO-BAS) - Dimitar Dimitrov and Violin Raykov

16:00 Coffee break

16:30 General Discussion (on surveys presented)

18:000 Closing of the session

9th 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)

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

10th 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

Annex III. MEDIAS HANDBOOK (Version: April 2025)

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 1 and Figure 1. 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 1. 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	4
Greece	HCMR	Eastern Ionian Sea	2800 NM^2	3
France	IFREMER	Gulf of Lion	3300 NM^2	3
Slovenia	CNR-	Adriatic Sea (Slovenia)	117 NM^2	1
Italy	CNR-IRBIM	Adriatic Sea (Italy)	13200 NM^2	4
Italy	CNR-IAS	Sicily Channel	4300 NM^2	1
Italy	CNR-IAS	Sardinia (east)*	3207 NM^2	**
Italy	CNR-IAS	Tyrrhenian and Ligurian	6644 NM^2	3
Spain	IEO/CSIC	Iberian coast	8829 NM^2	3
Malta	MAFA	Malta (east)	1868 NM^2	4
Croatia	IOR	Adriatic Sea (Croatia)	13578 NM^2	3
Bulgaria	IO-BAS	Black Sea	3400 NM^2	2
Romania	NIMRD	Black Sea	4300 NM^2	2

* Official inclusion of this survey in DFC is pending

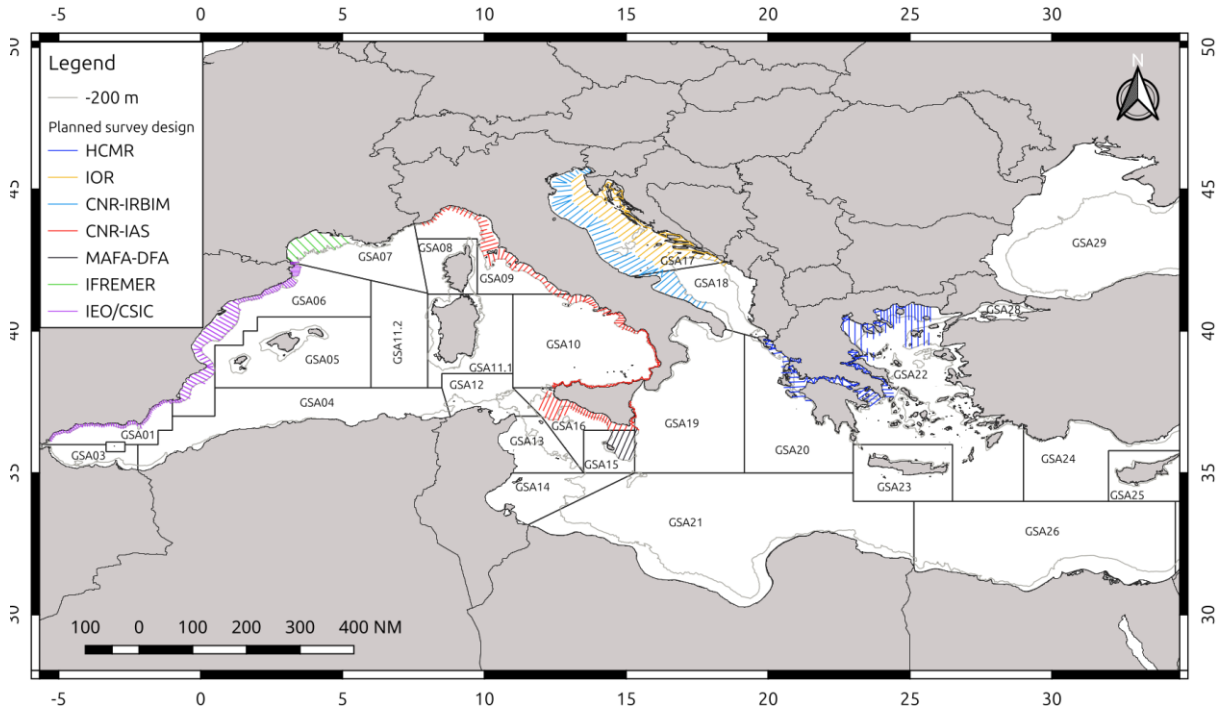

Figure 1. Surveys designs in the EU-MEDIAS.

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.

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

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

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 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.

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 b20= -72.6 dB), IFREMER also will continue to use a b20=-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 b20 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.

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

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

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 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.
- 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.

Biological and oceanographic parameters

The following biological parameters should be estimated in each survey:

- 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 L_{50} 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.

Database

In the framework of the RDBFIS I & II projects as well as a MEDIAS workshop, a common database design has been decided for all MEDIAS surveys. The 18th MEDIAS coordination

meeting agreed to use this database framework to store acoustic and biological data collected within the acoustic surveys in the Mediterranean Sea. 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 V.

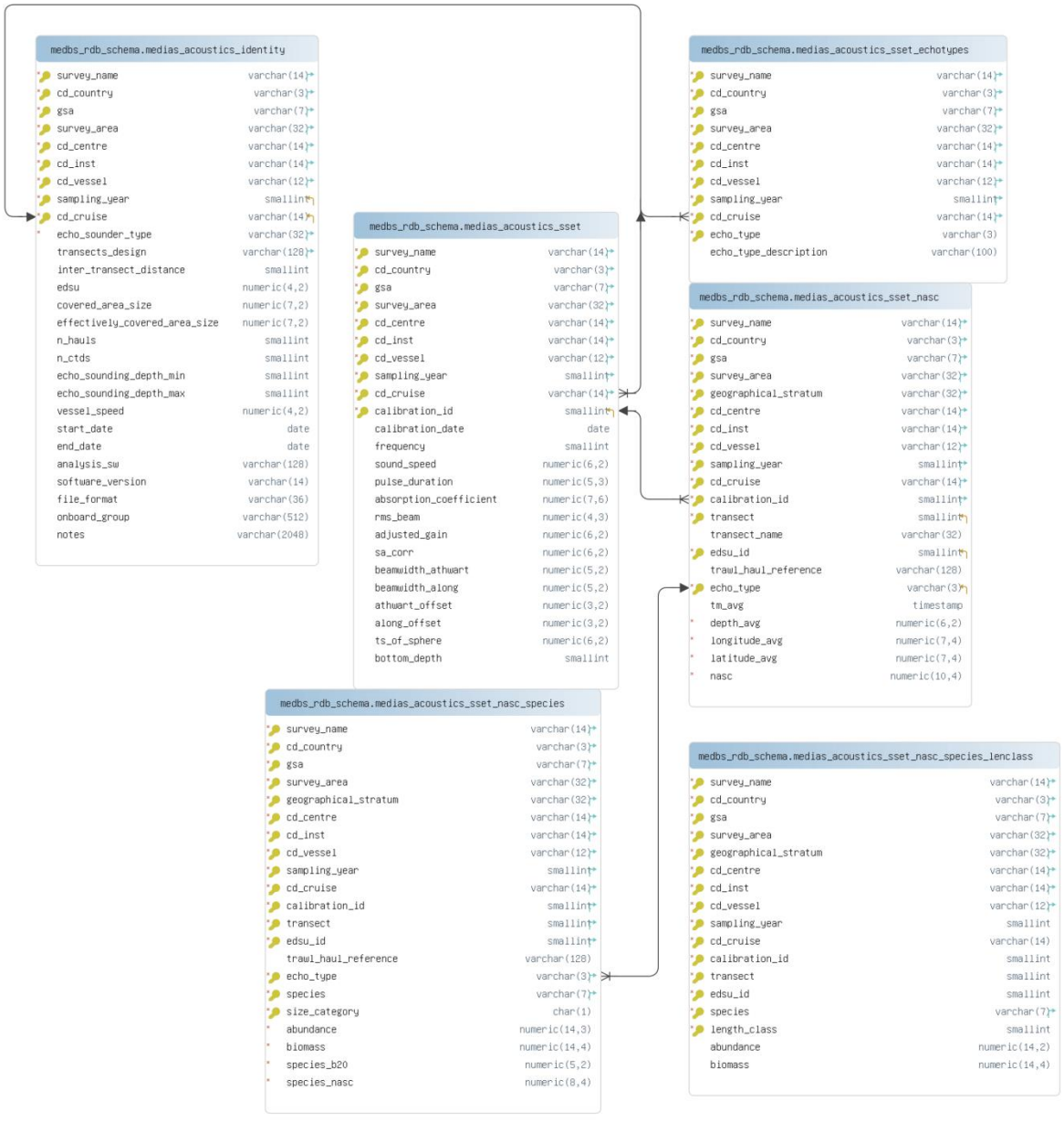

Figure 2. Database schema diagram for MEDIAS acoustic tables.

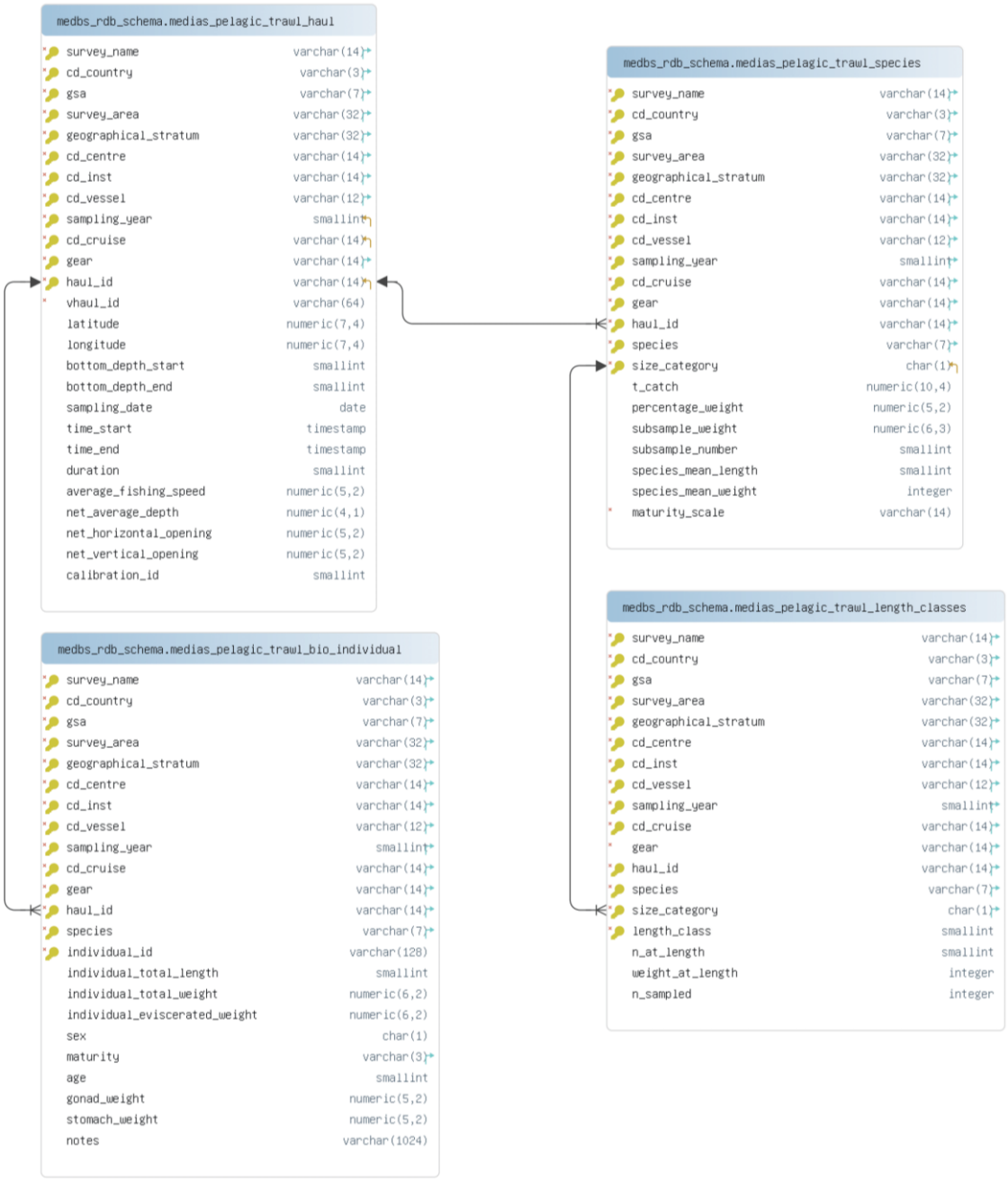

Figure 3. Database schema diagram for MEDIAS pelagic trawl tables.

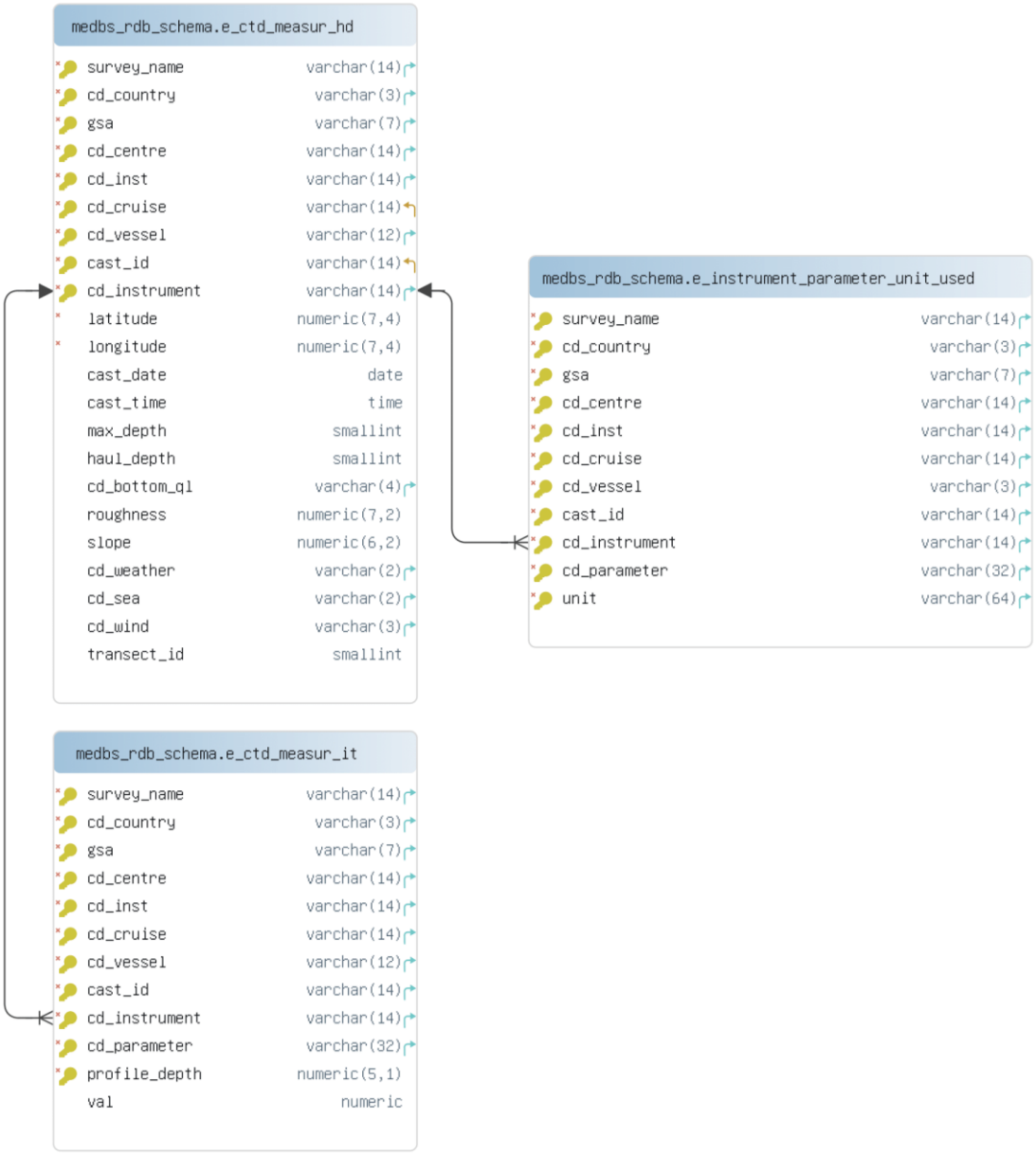

Figure 4. Database schema diagram for MEDIAS CTD sampling tables.

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.

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			

					Habitat condition	Hydrological condition	Temperature (i.e. SST: average at 10m, estimated as the interpolated mean value for the whole area)
							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)	xxx_Abundance

Biomass (biomass per species per sex and length class)	xxx_Biomass
Abundance biomass (abundance and biomass per species per sex and age class)	xxx_Abund_Biom

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.

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 results per survey are presented in the Annual MEDIAS report which is freely available in the MEDIAS website;

3) Overall biomass and abundance estimates are available through the DCF Data Call;

4) Include annual distribution maps of NASC per species along with the respective metadata information in a GEOportal.

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

References

Anonymous 2012. “AcousMed: Harmonization of the Acoustic Data in the Mediterranean 2002- 2006”. Final Report. MARE/2009/09, 212 pp.

Bonanno, A., Barra, M., De Felice, A., Giannoulaki, M., Iglesias, M., Leonori, I., Ventero, A., Aronica, S., Biagiotti, I., Tičina, V., Canduci, G., & Genovese, S. (2021). Acoustic correction factor estimate for compensating vertical diel migration of small pelagics. *Mediterranean Marine Science*, *22*(4), 784–799. https://doi.org/10.12681/mms.25120

Demer, D.A., Berger, L., Bernasconi, M., Bethke, E., Boswell, K., Chu, D., Domokos, R., et al. 2015. Calibration of acoustic instruments. ICES Cooperative Research Report No. 326. 133 pp.

Giannoulaki, M., Zwolinski, J., Cemal Gucu, A., De Felice, A., & Somarakis, S. (2021). The “MEDiterranean International Acoustic Survey”: An introduction. *Mediterranean Marine Science*, *22*(4), 747–750. https://doi.org/10.12681/mms.29068

ICES, 2017. Report of the Workshop on Age estimation of European anchovy *(Engraulis encrasicolus*). WKARA2 2016 Report 28 November - 2 December 2016. Pasaia, Spain. ICES CM 2016/SSGIEOM:17. 223 pp.

ICES, 2008. Report of the Workshop on Small Pelagics (*Sardina pilchardus, Engraulis encrasicolus*) maturity stages (WKSPMAT), 10–14 November 2008, Mazara del Vallo, Italy. ICES CM 2008/ACOM:40, 82 pp.

Leonori, I., Tičina, V., Giannoulaki, M., Hattab, T., Iglesias, M., Bonanno, A., Costantini, I., Canduci, G., Machias, A., Ventero, A., Somarakis, S., Tsagarakis, K., Bogner, D., Barra, M., Basilone, G., Genovese, S., Juretić, T., Gašparević, D., & De Felice, A. (2021). History of hydroacoustic surveys of small pelagic fish species in the European Mediterranean Sea. *Mediterranean Marine Science*, *22*(4), 751–768. https://doi.org/10.12681/mms.26001

Machias A., Pyrounaki M.M., Leonori I., Basilone G., Iglesias M., De Felice A., Bonanno A., Giannoulaki M. 2013. Catch of pelagic hauls in Mediterranean acoustic surveys: Is it the same between day and night? Scientia Marina, 77(1): 69-79. http://dx.doi.org/10.3989/scimar.03656.21D

Walline, P.D. 2007. Geostatistical simulations of eastern Bering Sea walleye pollock spatial distributions, to estimate sampling precision. ICES Journal of Marine Science, 64: 559–569.

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.

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

	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	
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; obtain species composition;

	get biological samples.
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

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.

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 represent 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 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.

Annex V. Structure of MEDIAS database tables

Table 1. Acoustic table structure and validation rules

#	Primary key	Field name	Data type	Description	Validation Scheme
			Medias_acoustics_identity TABLE 1		
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, EIonSea-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

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	date in the format dd/mm/yyyy; the year must

				operational date ?] [auto filled]	be the same as the sampling year
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, EIonSea-GRC-IMBRIW, GLion-FRA-IFREMER, IberCoast-ESP-CNIEO, SardEast-ITA-IAS,

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

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
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 alongtship 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]
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)

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, EIonSea-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

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]

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
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, EIonSea-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
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 vhauls.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)

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 (form 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, EIonSea-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	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]

				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)

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, EIonSea-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

Table 2. Trawl table structure and validation rules

#	Primary key	Field name	Data type	Description	Validation Scheme
medias_pelagic_trawl_haul TABLE 1					
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, EIonSea-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]
10	Ö	**cd_cruise**	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	Ö	**gear**	varchar(14)	Gear code	any(P1MO4, 4FF176, 4PM159, 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
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
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, 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, EIonSea-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]
10	Ö	**cd_cruise**	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	Ö	**gear**	varchar(14)	Gear code	any(P1MO4, 4FF176, 4PM159, 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)	Catch (Kg), all organisms	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 avalilable]	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 avalilable]	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					
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, EIonSea-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]
10	Ö	**cd_cruise**	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	Ö	**gear**	varchar(14)	Gear code	any(P1MO4, 4FF176, 4PM159, 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					
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, EIonSea-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]
10	Ö	**cd_cruise**	varchar(14)	Cruise code	non-empty string of up to 14 characters
11	Ö	**gear**	varchar(14)	Gear code	any(P1MO4, 4FF176, 4PM159, 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
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

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