https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

The ABRACOS dataset: a multidisciplinary marine ecosystem baseline for the western tropical Atlantic (2015–2017)

Arnaud Bertrand[1], Monique Simier[1], Gabriel Vinícius Felix Afonso[2], Gaël Alory[3], Alejandro Ariza[4], Ramilla Assunção[5], Jean-Christophe Auguet[6], François Baurand[7], Beatrice Bec[6], Delphine Bonnet[6], Léandro Ferreira Cabanez[8], Claire Carré[6], Alexis Chaigneau[9], Adilma de Lourdes Montenegro Cocentino[5], Isis Amalia Cordeiro[8], Alex Costa da Silva[5], Martin Coubard[10], Mauro de Melo Junior[11], Juan-Carlos Molinero[1], Jeremy Devesa[12], Gilles Domalain[1], Leandro Nole Eduardo[1], Gérard Eldin[9], Gabriel Bittencourt Farias[5], Guilherme Ferreira[13], Gabriela Guerra Araújo Abrantes Figueiredo[5], Thierry Frédou[11], Xiomara Diaz Garcia[14], Everton Giachini Tosetto[1], Júlio Guazzelli Gonzalez[11], Jacques Grelet[7], Sandrine Hillion[7], Anne Justino[11], Marina Cavalcanti Jales[8], Sírleis Rodrigues Lacerda[15], François Le Loc'h[12], Anne Lebourges-Dhaussy[12], Rayssa Siqueira Lima[11], Nathalia Lins-Silva[5], Alex Souza Lira[16], Simone Maria de Albuquerque Lira[11], Catarina Marcolin da Rocha[17], Júlia Rodrigues Martins[2], Anaïs Médieu[12], Catarina Melo[18], Pedro Augusto Mendes de Castro Melo[5], Michael Maia Mincarone[2], Magali Monnier[10], Jean-Marie Munaron[12], Sigrid Neumann-Leitão[5], Junior Miodeli Nogueira[19], Matheus Oliveira[1,5], Beatrice Padovani Ferreira[5], Latifa Pelage[1], David Point[20], Ulisses Pinheiro5, Fabrice Roubaud[7], Gildas Roudaut[12], Pierre Rousselot[7], Julianna de Lemos Santana[5], Ralf Schwamborn[5], Maria da Glória Gonçalves Silva-Cunha[8], Andrey Soares[11], Jesser Fidelis Souza Filho[5], Jean-François Ternon[1], Paulo Travassos[11], Gary Vargas[11], Teodoro Vaske Jr.[21], Renata P. S. Campelo[5], Bárbara Teixeira Villarins[2], Flávia Lucena-Frédou[11]

[1]MARBEC, Univ Montpellier, CNRS, Ifremer, IRD, Sète, France
[2]Universidade Federal do Rio de Janeiro (UFRJ), Instituto de Biodiversidade e Sustentabilidade, Macaé, Brazil
[3]Université de Toulouse, Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS), Toulouse, France
[4]DECOD, Ifremer, INRAE, Institut Agro, Nantes, France
[5]Universidade Federal de Pernambuco (UFPE), Recife, Brazil
[6]MARBEC, Univ Montpellier, CNRS, Ifremer, IRD, Montpellier, France
[7]Institut de Recherche pour le Développement, IMAGO, Plouzané, France
[8]Phytoplankton Laboratory, Departamento de Oceanografia, Universidade Federal de Pernambuco (UFPE), Recife, Brazil
[9]IRD, Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS), Brest, France
[10]MARBEC, Univ Montpellier, CNRS, Ifremer, IRD, Recife, Brazil
[11]Universidade Federal Rural de Pernambuco (UFRPE), Recife, Brazil
[12]IRD, Univ Brest, CNRS, Ifremer, LEMAR, F-29280 Plouzané, France
[13]Universidade Federal do Rio de Janeiro (UFRJ), Rio de Janeiro, Brazil
[14]Universidade Federal Rural da Amazônia, Belém, Brazil
[15]Regional University of Cariri (URCA), Crato, Brazil
[16]Universidade Federal de Sergipe (UFS), Aracajú, Brazil
[17]Universidade Federal do Sul da Bahia, Centro de Formação em Ciências Ambientais, Brazil
[18]Ministério da Pesca e Aquicultura (MPA), Brasília, Brazil
[19]Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, João Pessoa, Brazil
[20]IRD, Géosciences Environnement Toulouse (GET), UMR CNRS 5563/IRD 234, Université Paul Sabatier, Toulouse, France
[21]Universidade Estadual Paulista (UNESP), São Vicente, Brazil

Correspondence to: Arnaud Bertrand (arnaud.bertrand@ird.fr)

Abstract. The western tropical Atlantic off Northeast Brazil is a dynamically complex region where major current systems contribute to interhemispheric exchanges, yet it remains one of the least observed ocean areas in terms of integrated, depth-resolved, and ecosystem-wide measurements. The two ABRACOS (Acoustics along the BRAzilian COaSt) surveys, conducted during austral spring 2015 (ABRACOS 1) and austral autumn 2017 (ABRACOS 2) aboard the R/V ANTEA, were designed to address this gap through coordinated multidisciplinary observations spanning the continental shelf, slope, seamounts, and open ocean along the Fernando de Noronha Ridge. Although each survey represents a synoptic seasonal snapshot, hydrographic and current observations from both campaigns have been shown to be representative of canonical spring and autumn conditions in the region.

The dataset combines continuous underway measurements — thermosalinograph, ship-mounted ADCP, multifrequency active acoustics (38, 70, 120, and 200 kHz), and meteorological data — with station-based physical, biogeochemical, and biological

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

sampling at 117 oceanographic stations. Station-based observations include 96 CTD-O_2 profiles, 881 discrete rosette bottle samples (salinity, dissolved oxygen, nutrients, pigments, cytometry, and phytoplankton abundance), 266 plankton net deployments, and 116 trawl operations targeting demersal and deep-pelagic communities from 10 to 1,100 m depth. Biological sampling yielded 172,241 taxonomically identified specimens representing 1,532 taxa across planktonic, nektonic, and demersal compartments. The dataset is further complemented by 3,466 stable isotope measurements ($\delta^{13}C$ and $\delta^{15}N$) across particulate organic matter, zooplankton, and demersal and deep-pelagic organisms, as well as mercury concentrations and microplastic occurrence data for 194 and 381 individuals, respectively, collected during ABRACOS 2.
All datasets are quality-controlled, harmonised across surveys using consistent station identifiers and taxonomic referencing against WoRMS and Eschmeyer's Catalog, and publicly archived in the SEANOE repository under dedicated DOIs. Having already supported more than 80 peer-reviewed publications across nine thematic domains — from physical oceanography and taxonomy to trophic ecology, anthropogenic contamination, and ecosystem connectivity — the ABRACOS dataset constitutes a unique multi-trophic, multi-compartment, and multi-contaminant baseline for the western tropical Atlantic, designed to support comparative analyses, ecosystem modelling, and synthesis efforts at regional to global scales.
The datasets described in this paper are publicly available through SEANOE (https://www.seanoe.org).

1. Introduction

Tropical marine ecosystems play a central role in global climate regulation, ocean circulation, and marine biodiversity, yet large regions of the tropical Atlantic remain comparatively under-sampled, particularly below the surface layer. The western tropical Atlantic off Northeast Brazil is a key oceanographic corridor where major current systems — including the North Brazil Current (NBC) and the North Brazil Undercurrent (NBUC) — contribute to interhemispheric exchanges linked to the Atlantic Meridional Overturning Circulation (AMOC)(Assunção et al., 2020; Dossa et al., 2021; Marcello et al., 2026).
At the same time, recent research has revealed that deep-pelagic realms (> 200 m depth) harbour extensive and still insufficiently documented biodiversity, with complex trophic pathways and vertical connectivity linking surface production to deeper ocean layers (Eduardo et al., 2022, 2023, 2024). These subsurface ecosystems remain among the least observed components of the global ocean, particularly in tropical regions. A major limitation has been the scarcity of multidisciplinary surveys designed to simultaneously characterise environmental conditions, biological communities, and trophic functioning across the full water column and along cross-shelf gradients.
The two *Acoustics along the BRAzilian COaSt* (ABRACOS) surveys were conceived to address this gap by providing the first integrated, ecosystem-scale observations of the western tropical Atlantic off Northeast Brazil (Fig.1). Conducted in austral spring 2015 (ABRACOS 1; (Bertrand, 2015) and austral autumn 2017 (ABRACOS 2; Bertrand, 2017), these expeditions combined physical and biogeochemical oceanography, active acoustics, and biological sampling across continental shelf, slope, oceanic seamounts, and island systems along the Fernando de Noronha Ridge. Sampling extended from nearshore waters to the open ocean, and from the surface to deep pelagic and demersal habitats, thereby capturing both horizontal and vertical ecosystem gradients. Although each survey provides a synoptic, single-season snapshot, independent analyses of the regional thermohaline structure and current system have shown that conditions observed during ABRACOS 1 (spring) and ABRACOS 2 (autumn) are representative of canonical seasonal conditions for this region, when compared with other years (Assunção et al., 2020; Dossa et al., 2021).
The resulting dataset provides a rare three-dimensional description of a tropical marine ecosystem, linking hydrodynamic structure, acoustic backscatter, planktonic communities, micronekton, demersal fauna, and trophic tracers. Measurements include hydrography and currents (CTD, vessel-mounted ADCP), multifrequency active acoustics, net sampling of phytoplankton, zooplankton, and micronekton, demersal trawls, as well as biogeochemical variables such as nutrients, pigments, particulate organic matter, stable isotopes, and contaminants. Together, these observations allow the exploration of ecosystem structure from microbes to higher trophic levels and from coastal zones to deep offshore environments.

ABRACOS was specifically designed to resolve three complementary dimensions of tropical marine ecosystem functioning:

i. **Physical structure and circulation.** High-resolution *in situ* hydrographic and current measurements document the stratification and flow patterns shaping the regional environment. These data support the analysis of cross-shelf exchanges, connections between coastal and oceanic systems, and the physical context underlying biological distributions. They also provide valuable validation data for regional hydrodynamic models and for satellite-derived products in a region where nearshore remote sensing is often limited.
ii. **Ecosystem acoustics and vertical structure.** Multifrequency active acoustics were used to characterise the distribution of scattering layers and pelagic organisms across diel cycles and depth ranges. Combined with targeted net and trawl sampling, these observations enable the attribution of acoustic signals to zooplankton, gelatinous organisms, micronekton, and fish, and to generate spatially continuous view of ecosystem structure that complements point-based biological sampling.
iii. **Biodiversity and trophic functioning.** *In situ* biological sampling of planktonic, pelagic, and demersal organisms was conducted alongside measurements of trophic tracers, including stable isotopes and particulate organic matter (POM). These data support the investigation of food-web structure, vertical connectivity, and the transfer of energy and contaminants across depth layers, as well as generate taxonomic inventories and biodiversity baselines for a still under-documented region.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

Over the past decade, subsets of the ABRACOS data have already supported more than 80 studies addressing: (i) circulation and physical oceanography (8 studies; e.g., (Assunção et al., 2020; Costa da Silva et al., 2021; Dossa et al., 2021); (ii) plankton dynamics and microbial communities (12 studies; e.g., (Farias et al., 2022; Figueiredo et al., 2025b; Tosetto et al., 2024b); (iii) trophic ecology (13 studies; e.g., (Eduardo et al., 2023; Pelage et al., 2022; Santana et al., 2026); (iv) deep-pelagic and demersal biodiversity (14 studies; e.g., (Eduardo et al., 2018, 2022; Mincarone et al., 2020); (v) taxonomy and new species records (18 studies; e.g., (Andrade et al., 2021; Rodrigues et al., 2018; Villarins et al., 2024); (vi) functional ecology and morphometrics (8 studies; e.g., (Aparecido et al., 2023; Eduardo et al., 2024; Reis-Júnior et al., 2023); (vii) anthropogenic contamination (6 studies; e.g., (Eduardo et al., 2026; Ferreira et al., 2023; Justino et al., 2022); (viii) fisheries and socio-ecological systems (5 studies; e.g., (Angelini et al., 2025; Barros et al., 2021; Eduardo et al., 2020); and (ix) ecosystem connectivity and cross-scale integration (6 studies; e.g., (Ariza et al., 2023; Fock et al., 2026; Tosetto et al., 2024b). However, the dataset holds substantial potential for future integrative investigations and, until now, the full multidisciplinary and depth-resolved structure of the dataset has not been described and made publicly available in a unified and accessible form.

The ABRACOS dataset currently comprises 117 oceanographic stations, 96 CTD casts, and 6,600 nautical miles (nm) of acoustic transects, covering continental shelf, slope, seamount, and oceanic environments across diel cycles. Biological sampling includes 266 plankton net deployments, 116 midwater and demersal trawls, and 172,241 taxonomically identified biological samples, representing 1,532 taxa across planktonic, pelagic, and demersal compartments. In addition, the dataset contains 692 discrete nutrient samples, 662 pigment analyses, 3,466 stable isotope measurements, and 575 contaminant analyses. Overall, the ABRACOS programme provides more than 1,167,300 individual measurements (602 million when including acoustic data) distributed across physical, acoustic, biological, and biogeochemical variables, forming a three-dimensional and multi-trophic description of the western tropical Atlantic ecosystem.

This data paper provides a comprehensive overview of the ABRACOS dataset, detailing its spatial coverage, sampling strategy, measured variables, and data organisation. By making these coordinated physical, acoustic, biological, and biogeochemical observations fully documented and interoperable, we aim to facilitate future studies of tropical marine ecosystems and to support comparative, modelling, and synthesis efforts at regional to global scales.

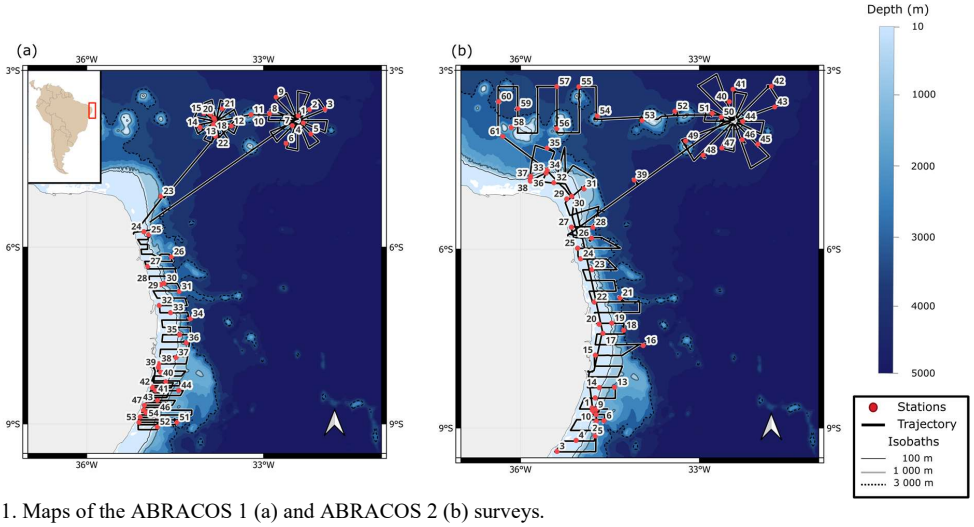


Figure 1. Maps of the ABRACOS 1 (a) and ABRACOS 2 (b) surveys.

2. Data acquisition, processing and quality control

2.1. Data organisation

This data paper provides a comprehensive description of the datasets generated during and after the two ABRACOS surveys. All datasets are archived in the SEANOE repository (Sea Scientific Open Data Publication, https://www.seanoe.org). Data from ABRACOS 1 (2015) and ABRACOS 2 (2017) are distributed in separate files but follow a harmonised structure, using consistent station identifiers and sampling codes, to facilitate cross-survey analyses.

Tabular datasets are provided in CSV format, with variables organised in columns, decimal values indicated using a period (.), and fields separated by semicolons (;). Multidimensional physical datasets are distributed in NetCDF format, while acoustic data are available in both raw and processed formats. Metadata files accompany each dataset and document variable definitions, units, processing steps, and quality-control procedures.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Data acquisition followed two main sampling modes: (i) continuous measurements acquired along the vessel track and (ii) station-based sampling conducted at fixed locations. The dataset architecture reflects this distinction (Fig.2).

2.1.1. Continuous datasets

Continuous datasets provide high-resolution spatial coverage along the ship track and include thermosalinograph (TSG) data, ship-mounted ADCP (SADCP) current data, multifrequency active acoustic backscatter data, and meteorological data (wind speed and direction, air temperature, atmospheric pressure, and relative humidity). These datasets are archived in SEANOE under their respective DOIs (Table 1) and are distributed in standard formats compatible with oceanographic processing software.

2.1.2. Station-based datasets

Station-based datasets correspond to measurements and biological sampling conducted at fixed stations (station positions differ between ABRACOS 1 and ABRACOS 2). Some variables were collected during one survey only, as noted below.

Hydrographic profiles
CTD-O_2 profiles included temperature, salinity, oxygen, fluorescence, transmission, and irradiance. Additional RBR Concerto CTD profiles and XBT temperature profiles were collected during ABRACOS 2 only.

Rosette bottle data
Rosette bottle sampling provided bottle salinity (calibration data), dissolved oxygen, dissolved inorganic nutrients, phytoplankton pigments, and nano- and microphytoplankton abundance, biovolume, and carbon biomass for both surveys. Microbiome data were collected during ABRACOS 1 only, while picoplankton, nanophytoplankton, and heterotrophic bacteria cytometry data were collected during ABRACOS 2 only.

Net and trawl biological sampling
Net and trawl sampling included phytoplankton net samples, zooplankton net samples from bongo and WP2 nets, and demersal and deep-pelagic macroalgae, invertebrates, and fishes from bottom and midwater trawls.

Stable isotope datasets
Carbon and nitrogen stable isotope data ($\delta^{13}C$ and $\delta^{15}N$) were collected for particulate organic matter (POM), zooplankton, micronekton, and demersal organisms.

Contaminant datasets
Contaminant datasets, collected during ABRACOS 2 only, include mercury concentration data and microplastic occurrence data from individual stomach contents (shape, colour, and size).

2.2. Data volume

The ABRACOS dataset includes 6,600 nautical miles of acoustic transects representing 59 days of multifrequency backscatter data, 117 oceanographic stations, 96 CTD casts, 881 discrete rosette bottle samples, 266 plankton net deployments, 116 trawl operations, and 172,241 individual biological specimens processed and identified, in addition to 203,964 amplicon sequence variants (ASVs) identified from microbiome samples.

2.3. Data accessibility and interoperability

Data files are structured to allow cross-referencing between surveys, stations, gears, and biological compartments using consistent station identifiers and sampling codes. Figure 2 illustrates the general organisation of the ABRACOS dataset, showing the correspondence between sampling mode, variable type, and data repository structure.

Table 1: General organisation of the ABRACOS dataset (A1: ABRACOS 1; A2: ABRACOS 2), showing the correspondence between dataset components and their associated DOIs.

Level 1	Level 2	Level 3	A1	A2	DOI
Survey Logbooks	Logbook		x	x	https://doi.org/10.17600/15005600 https://doi.org/10.17600/17004100
Continuous Data	Thermosalinograph		x	x	https://doi.org/10.17882/76696 https://doi.org/10.17882/76352
	ADCP		x	x	https://doi.org/10.17882/76696 https://doi.org/10.17882/76352
	Acoustic		x	x	https://doi.org/10.17882/77035 https://doi.org/10.17882/91135
	Meteo		x	x	https://doi.org/10.17882/76696 https://doi.org/10.17882/76352

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

Station_Operation_Data	CTDO		x	x	https://doi.org/10.17882/76696 https://doi.org/10.17882/76352
	RBR-CTD			x	https://doi.org/10.17882/76352
	XBT			x	https://doi.org/10.17882/76352
	Rosette data	Salinity	x	x	https://doi.org/10.17882/76696
		Oxygen	x	x	https://doi.org/10.17882/76696
		Nutrients	x	x	https://doi.org/10.17882/95172
		Bacteria diversity	x		https://doi.org/10.17882/109069
		Phytoplankton pigment	x	x	https://doi.org/10.17882/95171
		Picoplankton, Nanophytoplankton & heterotrophic bacteria cytometry		x	https://doi.org/10.17882/95241
		Nano & Microphytoplancton abundance	x	x	https://doi.org/10.17882/98867
	Phytoplankton Net	Nano & Microphytoplancton occurrence	x	x	https://doi.org/10.17882/98867
	Zooplankton	Zooplankton abundance Bongo & WP2	x	x	https://doi.org/10.17882/109464
		Planktonic cnidarians abundance	x	x	https://doi.org/10.17882/92011
		Large microzooplankton abundance	x	x	https://doi.org/10.17882/98869
	Demersal and deep-pelagic macroalgae, invertebrates and fishes	Bottom trawl, Meso, Micro	x	x	https://doi.org/10.17882/107231
	Isotopes	POM	x	x	https://doi.org/10.17882/108735
		Zooplankton	x	x	
		Nekton	x	x	
	Contaminants	Mercury		x	https://doi.org/10.17882/118084
		Microplastics		x	https://doi.org/10.17882/118089

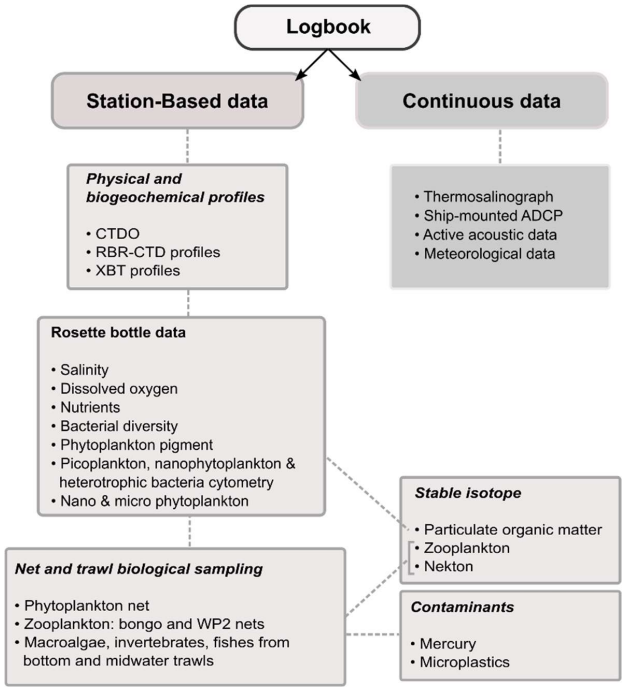


Figure 2: General organisation of the ABRACOS dataset, showing the correspondence between sampling mode, variable type, and data repository structure. DOIs for each dataset component are provided in Table 1.

2.4. Survey logbooks and dataset integration

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

To provide a common spatial and temporal reference for all sampling operations, a dedicated survey logbook was created for each cruise. A new entry was automatically recorded every 60 seconds. These logbooks are distributed as CSV format files and contain a continuous record of vessel position and activity throughout each survey (Table 2).

Each row is associated with a unique identifier (*Id_Survey_Pos*), constructed from the survey code (A1 for ABRACOS 1; A2 for ABRACOS 2) and a sequential record number (e.g., A1_296). This identifier is systematically included in all station-based and continuous datasets, ensuring direct relational linkage across tables and facilitating dataset integration.

Logbook structure

Each logbook entry includes:

- Geographic position (*Latitude* and *Longitude* in decimal degrees)
- Date and time (UTC; *DateFull_mn* field)
- *Activity* field describing the survey mode (e.g., Station, Transect)
- *Operation* field indicating the sampling activity (e.g., BONGO, BotTrawl, CTD)

Following the surveys, additional spatial metrics were computed and appended to the logbooks:

- *Dist_Point*: distance between consecutive log entries
- *Dist_Shore*: shortest distance to the continental shoreline
- *Bottom_Depth*: seabed depth at vessel position
- *Dist_Bathy100*: shortest distance to the 100 m isobath (coastal or island shelf break)
- *Dist_Bathy100_Coast*: shortest distance to the coastal 100 m isobath

These derived variables facilitate spatial analyses of cross-shelf gradients, proximity to geomorphological features, and the positioning of biological and physical observations relative to bathymetric structures.

Data volume

The logbooks contain 29,253 records for ABRACOS 1 and 39,131 records for ABRACOS 2, corresponding to 22 and 29 days of continuous acquisition, respectively.

Data availability

Both logbooks are publicly available via SEANOE at:

- https://doi.org/10.17600/15005600, ABRACOS 1; (Bertrand, 2015)
- https://doi.org/10.17600/17004100, ABRACOS 2; (Bertrand, 2017)

Table 2: Format of the logbook CSV files, including field names, descriptions, and units, for the ABRACOS 1 and ABRACOS 2 surveys.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

Field name	Definition	Modalities / Units
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Leg	Leg identification	"Leg1"; "Leg2"
Activity	Type of activity	"Station"; "Transect" (for A1/A2) "Magic_Square"; "Stop for calibration"; "Calibration" (A2 only)
Id_Survey_Pos	Survey_Sequential record number	"A1_N° of line" – e.g., A1_296
Id_Station	Survey_Station Identification	"A1_N° Station" – e.g., A1_01
Station	Station Number	1-> 55 (A1) 1-> 61 (A2)
Operation	Type of Operation: "BONGO": Zooplancton net (four mesh: 64, 120, 300, 500 µm) "BotTrawl": Bottom Trawl (Gov 2 faces Le Drezen) "CTD": CTDO SBE911+ (temperature, conductivity, salinity, depth, fluorescence, dissolved oxygen) + Rosette (12 bottles) "GOPRO": Camera Gopro "GRAB": Sediment grab (Van Veen) "MESO": Mesopelagic trawl "MICRO": Micronectonic trawl "PHYTO": Phytoplancton net "WP2": Zooplancton closing WP2 net "NoOp": No Operation	BotTrawl"; "CTD"; "GOPRO"; "GRAB"; "MESO"; "MICRO"; "PHYTO"; "WP2"; "NoOp"
Operation_Code	Survey_Operation_Station	E.g., "A1_CTD_01"
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Diff_Time	Difference between timestamp and next timestamp	s
Dist_Point	Distance between one point and the next one	m
Dist_Shore	Shortest distance from the continental shoreline	m
Bottom_Depth	Bottom depth, combining different origins: <750 m bottom depth from the EK60 echosounder >750 m: bottom depth from the EA18 echosounder if 1) or 2) are not available then bottom depth is extracted from the SRTM15 database (resolution: 15 arcsec)	m
Dist_Bathy100	Shortest distance from island or coastline	m
Dist_Bathy100_Coast	Shortest distance from coastline	m

2.5. Continuous data

These datasets comprise near-surface and upper-ocean measurements continuously acquired along the vessel track and include physical, current, meteorological, and active acoustic observations (Tables 3–6; Figs. 3–6). All continuous measurements were time-referenced to the ship navigation system, allowing precise spatial and temporal co-registration across sensors.

2.5.1. Thermosalinograph data

Near-surface temperature and salinity were continuously recorded using a Sea-Bird SBE21 thermosalinograph coupled with a Sea-Bird SBE38 thermometer for intake temperature measurement, installed on board the R/V ANTEA. Measurements were acquired at a nominal temporal resolution of 1 minute throughout both surveys.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Processing and quality control

Instrument are regularly calibrated. Date were processed and controlled using the TSG-QC software (https://forge.ird.fr/us191/TSG-QC/) within the framework of the SNO SSS programme (Alory et al., 2015; Gaillard et al., 2015). Quality control procedures included the flagging of harbour transits and spurious values associated with air intake and flow problems. Surface salinity measurements were periodically corrected for instrumental drift using discrete salinity samples collected from the CTD rosette at selected stations.

Data products

Data are provided as processed NetCDF files (Table 3; Fig.3). For conductivity, salinity, and temperature, the dataset provides raw, calibrated, and adjusted values. Calibrated data, identified by the suffix *'_CAL'*, are obtained from raw measurements by applying instrument calibration and linearisation coefficients. Adjusted products, identified by the suffix *'_ADJUSTED'*, are further corrected using independent reference observations such as CTD casts, Argo float profiles, and XBT profiles. Additional variables used in the calibration and adjustment procedures — including errors, quality flags, and coefficients — are included in the NetCDF files but are not listed in Table 3.

Data volume

The thermosalinograph dataset comprises, for ABRACOS 1 and ABRACOS 2 respectively, 22 and 29 days of continuous acquisition, 29,433 and 38,757 one-minute records, covering a total of 6,993 nm of vessel track (A1: 3,070 nm; A2: 3,923 nm). Detailed dimensions for each survey are presented in Table 3 (ABRACOS 1: 14,720 records; ABRACOS 2: 19,548 records).

Data availability

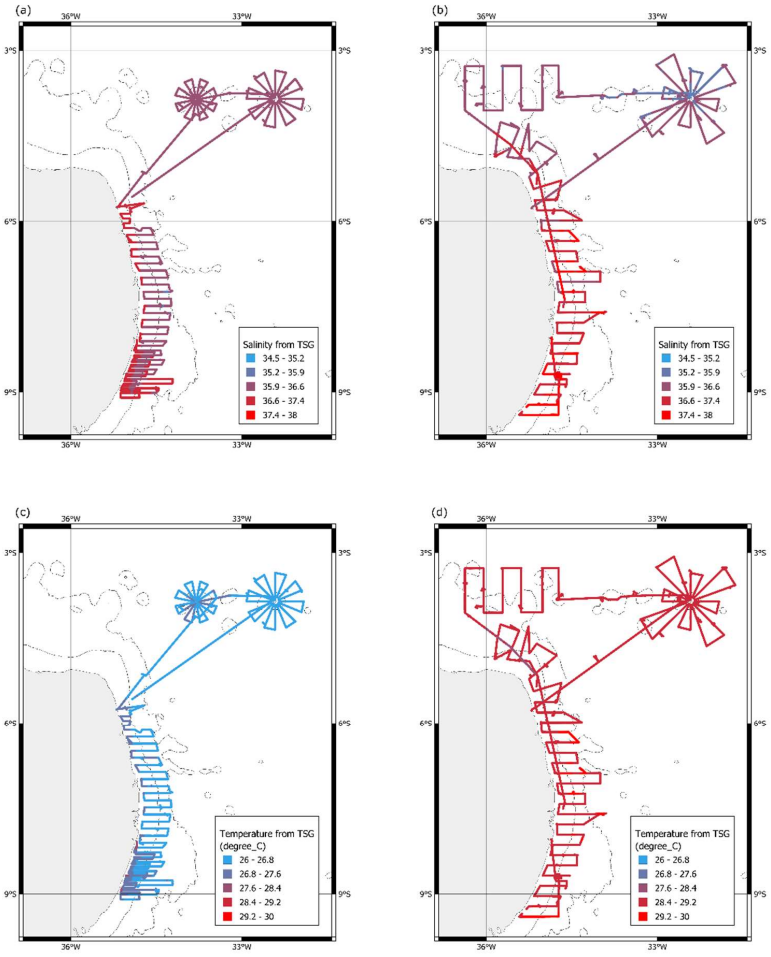
Thermosalinograph data are publicly available through SEANOE at:

- https://doi.org/10.17882/76696, ABRACOS 1; (Bertrand et al., 2024a)
- https://doi.org/10.17882/76352, ABRACOS 2; (Bertrand et al., 2024b)

Table 3: Format of the thermosalinograph (TSG) NetCDF data files, including variable names, descriptions, and units, for the ABRACOS 1 and ABRACOS 2 surveys.

Coordinate	**Definition**	**Dimension**	**Units**
DAYD	Julian day of the measurement since REFERENCE_DATE_TIME	(time)	Relative julian days with decimal part (as parts of the day)
Variables	**Definition**	**Dimension**	**Units**
DATE	Date of instrument measurement	(time)	YYYYMMDDHHMMSS
LONX	Longitude	(time)	Decimal degrees east
LATX	Latitude	(time)	Decimal degrees north
SPDC	Ship speed computed from navigation	(time)	Knots
FLU2	Fluorescence measured with external sensor	(time)	mg/m3
CNDC	Electrical conductivity	(time)	S/m
SSJT	Sea surface water jacket temperature	(time)	°C
SSPS	Sea surface practical salinity	(time)	PSS-78
SSTP	Sea surface temperature	(time)	°C

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026



300 Figure 3: Thermosalinograph data from the ABRACOS 1 (a), (c) and ABRACOS 2 (b), (d) surveys. Panels (a) and (b) show sea surface salinity; panels (c) and (d) show sea surface temperature (°C).

2.5.2. Ship-mounted ADCP data

305 **Instrumentation and acquisition**

Upper-ocean current velocities were measured using a 75 kHz Ocean Surveyor ship-mounted ADCP (SADCP). The instrument measured zonal and meridional velocity components over a nominal depth range of approximately 15–700 m (Table 4; Fig.4). Raw data were acquired at a ping interval of 3 s in deep-water areas (bottom depth > 150 m) and 2 s in shallow-water areas (bottom depth < 150 m), using a vertical bin size of 16 m and 8 m respectively. Individual pings were vector-averaged into 5-
310 minute ensembles.

The SADCP was synchronised with the EK60 echosounders using OSEA software (version 4.1). Under this configuration, the SADCP operated in slave mode to reduce acoustic interference: ADCP acoustic transmissions were automatically triggered following EK60 pings, with a delay corresponding to 50% of the EK60 ping interval, thereby minimising the risk of cross-instrument acoustic contamination.

315

Processing and quality control

Data processing was carried out using CODAS software (University of Hawaii). Relative velocities were rotated into the Earth reference frame using gyrocompass data, and absolute velocities were computed using GPS-derived ship motion. Calibration procedures followed the method described in Pollard and Read (1989).

320 Note that over continental shelf areas shallower than ~70 m, data quality is reduced due to bottom echo contamination.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Data products
Final SADCP products consist of hourly-averaged vertical profiles covering approximately the 19–600 m depth range (Table 4). Data are provided as processed NetCDF files.

Data volume
The SADCP dataset comprises, for ABRACOS 1 and ABRACOS 2 respectively, 530 and 695 hours of current measurements, yielding 3,883 and 6,618 valid vertical profiles. Detailed dimensions for each survey are presented in Table 4 (ABRACOS 1: 5,272 temporal ensembles and 90 vertical bins; ABRACOS 2: 7,566 temporal ensembles and 80 vertical bins).

Data availability
SADCP data are publicly available through SEANOE at:

- https://doi.org/10.17882/76696, ABRACOS 1; (Bertrand et al., 2024a)
- https://doi.org/10.17882/76352, ABRACOS 2; (Bertrand et al., 2024b)

Table 4. Format of the ship-mounted ADCP (SADCP) NetCDF data files, including variable names, descriptions, and units, for the ABRACOS 1 and ABRACOS 2 surveys.

Coordinate	**Definition**	**Dimension, size**	**Units**
time	Time	(time)	Decimal day
Variables	**Definition**	**Dimension, size**	**Units**
lon	Longitude	(time)	Degrees east
lat	Latitude	(time),	Degrees north
depth	Depth of ADCP bins	(time, depth cell)	meter
u	Eastward velocity component	(time, depth cell)	m/s
v	Northward velocity component	(time, depth cell)	m/s
amp	Received signal strength	(time, depth cell)	-
uship	Zonal ship velocity	(time)	m/s
vship	Meridional ship velocity	(time)	m/s
heading	Ship heading	(time)	Degrees
tr_temp	ADCP transducer temperature	(time)	°C

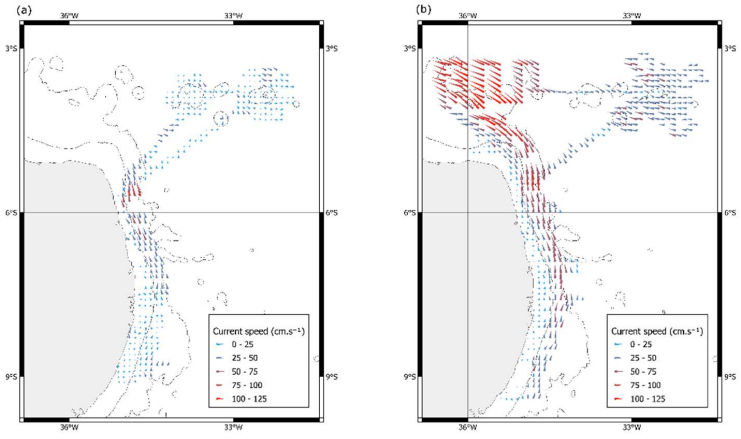


Figure 4: Surface current speed (colour scale, cm s^{-1}) and direction (arrows) from ship-mounted ADCP (SADCP), depth-averaged over 0–70 m, for ABRACOS 1 (a) and ABRACOS 2 (b). Zonal (U) and meridional (V) velocity components were averaged over 0.1° horizontal intervals prior to computing current speed as $\sqrt{(U^2 + V^2)}$.

2.5.3. Active acoustic data

Instrumentation and acquisition
Continuous acoustic measurements were collected using four Simrad EK60 scientific echosounders operating at 38, 70, 120, and 200 kHz. The system was hull-mounted on board the R/V ANTEA and operated continuously during transects and at hydrological stations.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

All frequencies were configured with a pulse duration of 512 µs. Two acquisition configurations were used during both ABRACOS surveys, depending on bottom depth: a continental shelf configuration (bottom depth < 150 m, ping interval of 0.45 s) and an offshore configuration (bottom depth ≥ 150 m, ping interval of 2.4 s). Maximum reliable depth ranges were approximately 750 m (38 kHz), 500 m (70 kHz), and 250 m (120 kHz). The 200 kHz channel was primarily used for near-surface observations.

Calibration

Calibrations followed standard sphere procedures (Demer et al., 2015; Foote, 1987) using a 38.1 mm tungsten carbide reference sphere. Calibrations were conducted on 30 September 2015 (ABRACOS 1) and 25 April 2017 (ABRACOS 2) in the vicinity of the Fernando de Noronha Archipelago. A single calibration was performed per survey; derived calibration coefficients were applied consistently throughout each survey.

Processing and quality control

Data processing was conducted using Matecho (version 20191213V6; Perrot et al., 2018). Processing steps included the automatic detection and removal of multiple noise sources, such as transient noise, impulsive noise, attenuated signal, and background noise (De Robertis and Higginbottom, 2007; Ryan et al., 2015). Additional manual quality control was applied to refine bottom detection, and remove false bottom in the water column (Blackwell et al., 2019). Near-surface ringing was removed by excluding acoustic data shallower than 10 m depth. To avoid low signal-to-noise regions, data were conservatively truncated to maximum analysis depths of 750 m (38 kHz), 450 m (70 kHz), and 200 m (120 kHz). Acoustic measurements are expressed as volume backscattering strength (Sv, dB re 1 m^{-1}).

Data products

Processed acoustic data are provided as gridded NetCDF files following the ICES metadata convention (ICES, 2016). Two gridded products are available (Table 5; Fig.5): a high-resolution grid of 3 pings × 1 m vertical bins (integration threshold −90 dB) and a low-resolution grid of 0.1 nautical mile × 5 m vertical bins (integration threshold −80 dB).

Data volume

The complete acoustic dataset comprises approximately 59 days of acquisition, covering a total of 6,600 nautical miles of transects, and yielding 600 million (high-resolution) or 15.8 million (low-resolution) gridded Sv cells.

Data availability

Active acoustic data are publicly available through SEANOE:

- https://doi.org/10.17882/77035, ABRACOS 1; (Bertrand et al., 2015)
- https://doi.org/10.17882/91135, ABRACOS 2; (Bertrand et al., 2017)

Table 5: Format of the active acoustic NetCDF data files, including variable names, descriptions, and units, for the ABRACOS 1 and ABRACOS 2 surveys.

Coordinate	**Definition**	**Dimension**	**Units**
time	Mean time of pings in processing cell	(time)	UTC, ISO 8601 format
depth	Mean depth of integration layer	(depth)	m
channel	Acoustic frequency channel: 38, 70, 120 or 200	(channel)	kHz
Variables	**Definition**	**Dimension**	**Units**
latitude	Mean latitude of ping in the processing cell	(time)	Decimal degrees north
longitude	Mean longitude of ping in the processing cell	(time)	Decimal degrees east
day	Diurnal period	(time)	1=Night, 2=Sunrise, 3=Day, 4=Sunset
mean_depth	Mean cell depth	(channel, time, depth)	m
mean_height	Mean cell height	(channel, time, depth)	m
Sv	Mean volume backscattering strength	(channel, time, depth)	dB re 1 m^{-1}
Sv_unfilt	Mean volume backscattering strength including bad data	(channel, time, depth)	dB re 1 m^{-1}
Sv_pcnt_good	Percent of Sv samples included in the mean	(channel, time, depth)	%
sA	Nautical area scattering coefiicient	(channel, time, depth)	m^2 nmi^{-2}

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

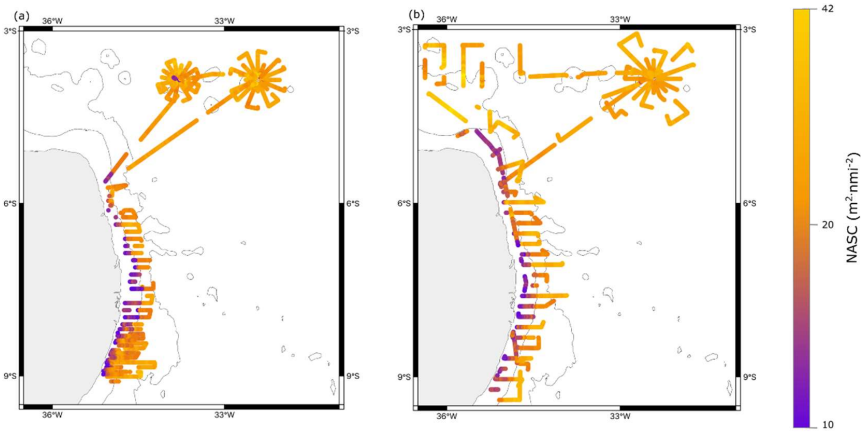


Figure 5: Nautical area scattering coefficient (NASC, dB re 1 m² nmi⁻¹) at 38 kHz, integrated over 10–670 m depth (or to the seabed where bottom depth < 670 m), for ABRACOS 1 (a) and ABRACOS 2 (b).

2.5.4. Meteorological data

Instrumentation and acquisition

Meteorological variables were continuously recorded along the vessel track using a BATOS 1.1 D meteorological station operated by Météo-France (Table 6; Fig.6). The system measured standard atmospheric parameters, including air temperature, atmospheric pressure, wind speed, wind direction, and relative humidity. Measurements were synchronised with the vessel navigation system to ensure consistent spatial and temporal referencing.

Processing and quality control

Meteorological data were subjected to routine quality control procedures to remove outliers and periods affected by sensor malfunction, harbour operations, or maintenance events. Temporal consistency and physical plausibility checks were applied prior to final validation. The quality-controlled dataset is synchronised with the survey logbook time reference to ensure compatibility with all other continuous and station-based datasets.

Data products

The final validated meteorological dataset is provided in CSV format, with variables organised in columns and timestamps expressed in UTC. The dataset includes the following variables: air temperature (°C), atmospheric pressure (hPa), wind speed (m s⁻¹), wind direction (degrees), and relative humidity (%).

Data volume

The meteorological dataset comprises, for ABRACOS 1 and ABRACOS 2 respectively, 22 and 29 days of continuous acquisition and 29,254 and 40,420 one-minute time-stamped records.

Data availability

Meteorological data acquired during the ABRACOS 1 and ABRACOS 2 surveys are publicly available through SEANOE at:

- https://doi.org/10.17882/76696, ABRACOS 1; (Bertrand et al., 2024a)
- https://doi.org/10.17882/76352, ABRACOS 2; (Bertrand et al., 2024b)

Table 6: Format of the meteorological CSV data files, including variable names, descriptions, and units, for the ABRACOS 1 and ABRACOS 2 surveys.

Field name	Definition	Modalities / Units
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Survey_Sequential record number	"A1_N° of line" – e.g., A1_296
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
SSTP	Sea Surface temperature	°C
DRYT	Dry Temperature	°C
WSPD	Wind Speed	knot
WDIR	Wind Direction	DD
ATMS	Atmospheric pressure	hPa
RELH	Relative Humidity	%

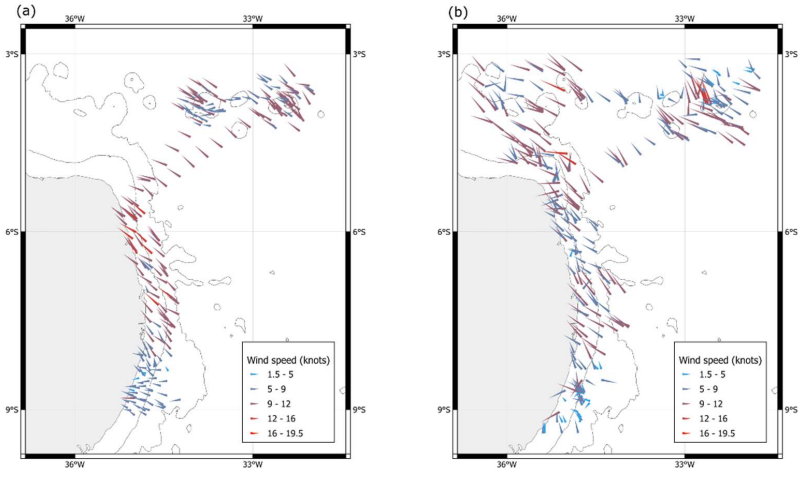


Figure 6: Wind speed (colour scale, knots) and direction (arrows) from the BATOS 1.1D meteorological station, for ABRACOS 1 (a) and ABRACOS 2 (b).

2.6. Station operation data

2.6.1. Hydrographic profiles

CTD profiles (SBE911+ and RBR Concerto)

Instrumentation and deployment

Hydrographic profiles were acquired using two complementary CTD systems: a rosette-mounted Sea-Bird SBE911+ deployed during both surveys, and a portable RBR Concerto deployed during ABRACOS 2 only.

CTD-O_2 profiles were collected at fixed stations using the Sea-Bird SBE911+ system, equipped with dual conductivity and temperature sensors, a dissolved oxygen sensor, a Wetlabs® ECO-FLNTU fluorometer, a transmissometer, and downwelling irradiance sensors. Profiles were typically conducted from the surface down to 1000 m depth, or to approximately 10 m above the seabed depending on local bathymetry (Table 7; Fig.7). Sensor accuracies were approximately: conductivity 0.3 $mS.m^{-1}$, temperature 0.001 °C, pressure 0.1 dbar, dissolved oxygen 0.05 mL L^{-1}, and salinity 0.003 PSU. The ECO-FLNTU fluorometer operates over a nominal range of 0–50 µg L^{-1} with a sensitivity of approximately 0.025 µg L^{-1}.

During ABRACOS 2, a RBR Concerto CTD was additionally mounted on the pelagic trawl for deployments shallower than 750 m. Equipped with pressure, temperature, conductivity, and fluorescence sensors, this instrument provided high-resolution hydrographic profiles of the water masses sampled by the trawl, thereby contributing additional vertical profiles and supporting the interpretation of acoustic data.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Processing and quality control

All sensors were annually calibrated, enabling quality assessment before and after each cruise. Conductivity and dissolved oxygen sensors are known to exhibit nonlinear drift over the course of a survey. These drifts were monitored and corrected using discrete water samples collected from Niskin bottles at multiple depths (typically three per station). Sensor calibration coefficients were adjusted through an iterative optimisation procedure minimising differences between CTD-derived values and reference measurements obtained from bottle samples, using the ctdProcessing software (https://forge.ird.fr/us191/ctdprocessing). Fluorescence measurements provide a relative proxy for chlorophyll-a concentration.

Data products

Final CTD-O_2 datasets are quality-controlled and distributed in NetCDF format. Each profile includes depth-resolved measurements of temperature, salinity, dissolved oxygen, fluorescence, beam transmission, and downwelling irradiance. Together, these variables support integrated analyses of hydrographic structure and biogeochemical variability from the continental shelf to the slope and mesopelagic domain. Note that quality flag variables are associated with each measured variable but are not listed in Table 7.

RBR Concerto data are distributed in CSV format as two complementary files: a data file (Table 8) and a metadata file (Table 9), the latter providing one row per profile and enabling linkage with other ABRACOS 2 datasets. Each profile includes depth-resolved measurements of temperature, salinity, density anomaly, sound velocity, dissolved oxygen, fluorescence, and light transmission.

Data volume

The CTD-O_2 dataset comprises 96 profiles across both surveys: 47 profiles (1,005 depth levels) during ABRACOS 1 and 49 profiles (1,011 depth levels) during ABRACOS 2, as detailed in Table 7. All profiles reach up to 1000 m depth or near-bottom, and are accompanied by bottle-calibrated oxygen and salinity measurements. Note that for each variable having time and depth dimensions, a quality flag variable is associated but not presented in this table.

ABRACOS 2 additionally includes 49 RBR Concerto profiles, of which 35 were collected during trawl operations and 14 independently, reaching depths of up to 1000 m (Tables 8, 9). A dedicated variable in the data files indicates the number of scans averaged by the instrument for each recorded measurement.

Data availability

CTD profiles acquired during the ABRACOS 1 and ABRACOS 2 surveys are publicly available through SEANOE:

- https://doi.org/10.17882/76696, ABRACOS 1 ; (Bertrand et al., 2024a)
- https://doi.org/10.17882/76352, ABRACOS 2 ; (Bertrand et al., 2024b)

Table 7: Format of the CTD-O_2 NetCDF profile data files, including variable names, descriptions, and units, for the ABRACOS 1 and ABRACOS 2 surveys.

Coordinate	**Definition**	**Dimension**	**Units**
TIME	Time	(time)	Number of seconds since 01/01/1970 00:0, UTC
DEPTH	Measurement depth	(depth)	m
LATITUDE	Measurement latitude	(latitude)	Degrees north
LONGITUDE	Measurement longitude	(longitude)	Degrees east
Variables	**Definition**	**Dimension**	**Units**
PROFILE	Index of the profile	(time)	Integer
BATH	Bathymetric depth	(time)	m
PRES	Sea water pressure	(time, depth)	dbar
TEMP	Sea water temperature	(time, depth)	°C
CNDC	Sea water electrical conductivity	(time, depth)	mS cm^{-1}
PSAL	Sea water practical salinity	(time, depth)	PSU
DOX1	Sea water dissolved oxygen concentration	(time, depth)	ml/l
DOX2	Moles of oxygen per unit mass in sea water	(time, depth)	µmol kg^{-1}

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

FLU2	Sea water fluorescence	(time, depth)	mg m^{-3}
TUR3	Sea water light transmission	(time, depth)	%

Table 8: Format of the RBR Concerto CSV profile data file (ABRACOS 2), including variable names, descriptions, and units.

Field name	**Definition**	**Modalities / Units**
Id_Survey	Survey Identification	"Abracos_2"
Id_Survey_Pos	Survey_Sequential record	"A2_N° of line" – e.g., A2_415
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD
DateDeb	Date and Time of the beginning of profile	dd/MM/yyyy hh:mm; UTC
Profil	Number of the profile	1 to 61
DEPTH	Depth	m
ETDD	Elapsed time	s
PRES	Pressure	dbar
TEMP	Temperature	°C
PSAL	Salinity	PSU
DENS	Density anomaly	$kg.m^{-2}$
SVEL	Sound velocity	$m\ s^{-1}$
DOX2	Dissolved oxygen concentration	$\mu mol\ L^{-1}$
FLU2	Fluorescence	mg m^{-3}
TUR3	Light transmission	%
NAVG	Scans averaged	%

490

Table 9: Format of the RBR Concerto CSV metadata file (ABRACOS 2), including field names, descriptions, and units.

Field name	**Definition**	**Modalities / Units**
Id_Survey	Survey Identification	"Abracos_2"
Id_Survey_Pos	Survey_Sequential record	"A2_N° of line" – e.g., A2_415
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD
DateFull_mn	Date and Time (Same as DateDeb)	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Bottom_Depth	Bottom depth	m
Dist_Shore	Shortest distance from the continental shoreline	m
Profil	Number of the profile	1 to 61
DateDeb	Date and Time of the beginning of profile	dd/MM/yyyy hh:mm; UTC
DateFin	Date and Time of the end of profile	dd/MM/yyyy hh:mm; UTC

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

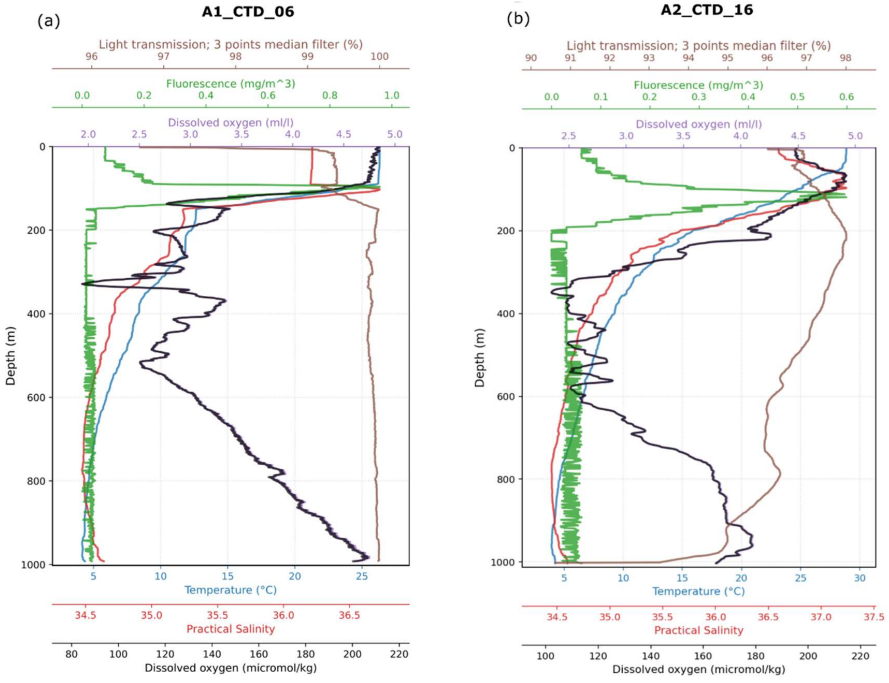


Figure 7: Examples of CTD-O_2 profiles for (a): ABRACOS 1 and (b): ABRACOS 2, including Light transmission (%), Fluorescence (mg m^{-3}), Dissolved oxygen (ml L^{-1} and µmol kg^{-1}), Temperature (°C) and Practical Salinity. Whole profile (left) and zoom for the layer 0-200m (right).

XBT profiles (ABRACOS 2 only)

Instrumentation and deployment
Expendable Bathythermograph (XBT) profiles were collected exclusively during the ABRACOS 2 survey (Table 10). A total of 29 XBT casts were deployed along the ship track, providing depth-resolved temperature measurements. All profiles were acquired using T-7 XBTs, with a terminal depth of 900 m.

Processing and quality control
Raw XBT temperature profiles were processed using the standard fall-rate equations and checked for outliers and unrealistic gradients prior to validation. The T-7 fall-rate equation is:

$$z = 6.691t - 0{,}00225t^2 , \quad (1)$$

where z is depth (m) and t is the elapsed time since probe deployment (s).

Derived variables (density and sound velocity) were calculated from temperature using standard equations of state, assuming a reference salinity value of 35 PSU. Sound velocity was calculated following Chen and Millero (1977), and density following Fofonoff and Millard (1983).

Data products
XBT data complement CTD-O_2 observations by increasing horizontal thermal resolution and documenting mesoscale and submesoscale variability across the survey area. Each XBT data file includes the following variables: profile identification number (1–29; Profile), measurement depth (m; Depth), seawater temperature (°C; Temp), practical salinity (Psal; not measured by XBT and reported as NaN), potential density (sigma-theta, kg m^{-3}; Dens; derived using the reference salinity value described above), and sound velocity (m s^{-1}; SVel; derived using the same reference salinity value).

Data volume
A total of 29 XBT profiles were collected during ABRACOS 2.

Data availability
XBT profiles acquired during ABRACOS 2 are publicly available through SEANOE:

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

- https://doi.org/10.17882/76352 (Bertrand et al., 2024b)

Table 10: Format of the XBT CSV profile data file (ABRACOS 2), including variable names, descriptions, and units.

Field name	Definition	Modalities / Units
Id_Survey	Survey Identification	"Abracos_2"
Id_Survey_Pos	Survey Sequential record	"A2_N° of line" – e.g., A2_415
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD
DateFull_mn	Date and Time (Same as DateDeb)	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Profil	Number of the profile	1 to 29
Type	Profile type identifier	C (Cast)
Bot_Depth	Bottom Depth	m
Depth	Depth of the measurement	m
Temp	Temperature	°C
Psal	Salinity	PSU
Dens	Density (sigma-theta)	mg m^{-3}
Svel	Sound velocity	m s^{-1}

2.6.2. Rosette bottle data

Common metadata structure

Discrete water samples were collected at each CTD station using a rosette sampler equipped with 12 Niskin bottles. All rosette-based datasets share a common metadata structure (Table 11).

Each bottle is uniquely identified by two fields: *Id_Station_Bottle* (survey identifier, station number, and bottle number) and *Id_Station_CTDO* (survey identifier, station number, and CTD pressure corresponding to the sampling depth).

Additional metadata include *Targeted_Depth* (m), *Depth_exact* (m, derived from CTD pressure), *Type_Fluo* (fluorescence sampling modality), *Bottom_Depth* (m), and *Dist_Shore* (m, derived from the survey logbook). Surface samples collected from the onboard seawater intake are identified by *Bottle* = 0 and were obtained at a subset of stations during both surveys.

This metadata structure is identical across all rosette-based datasets (salinity, dissolved oxygen, nutrients, microbiome, pigments, cytometry, and nano- and microphytoplankton abundances) and is therefore not repeated in the sections below.

Table 11: Common metadata structure of rosette bottle CSV files, including field names, descriptions, and units.

Field name	Definition	Modalities / Units
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Survey_Sequential record	"A1_N° of line" – e.g., A1_296
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Station	Station Number	1-> 54 for A1; 1-> 61 for A2
Id_Station	Survey_Station number	"A1_N° Station" – e.g., A1_01
Operation	Type of operation "CTD": CTDO SBE911+ (temperature, conductivity, salinity, depth, fluorescence, dissolved oxygen) + Rosette (12 bottles) "Tap": Tap on the boat deck	"CTD" / "Tap"
Operation_Code	Survey_Operation_Station	E.g., A1_CTD_01
Bottle	Bottle number in the Rosette or 0 if Tap	1-12 if bottle; 0 if Tap
Id_Station_Bottle	Id_Station_Bottle number	E.g., "A1_01_12" for Station 1, Bottle 12
Id_CTDO	Id_Station_CTDO pressure (from CTDO)	E.g., "A1_01_200" for Station 1, Pressure=200 dbar

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Targeted_Depth	Targeted depth at the beginning of Operation	m
Pressure	Pressure at the time of sampling	dbar
Depth_Exact	Exact depth of measurement (from CTDO)	m
Type_Fluo	Fluorescence modalities	"Fbottom" / "Fmax" / "INF" / "SUP" / "Surface" / "Tap" / NaN
Bottom_Depth	Bottom Depth	m
Dist_Shore	Shortest distance from the continental shoreline	m

Salinity

Instrumentation and sampling
Discrete salinity measurements were obtained from Niskin bottle samples and used as reference values to calibrate and correct CTD salinity profiles. Salinity was measured onboard using a Guildline Portasal salinometer calibrated with IAPSO standard seawater supplied by OSIL.

Processing and quality control
Bottle salinity values were compared with CTD conductivity-derived salinity to assess and correct sensor drift as described in Section 2.3.1. Calibration adjustments were applied during CTD data processing.

Data products
Salinity is reported in practical salinity units (PSU) and is associated with full bottle metadata in CSV format.

Data volume
A total of 89 and 125 salinity samples were collected during ABRACOS 1 and ABRACOS 2, respectively.

Data availability
Salinity data are publicly available through SEANOE:

- https://doi.org/10.17882/76696, ABRACOS 1; (Bertrand et al., 2024a)
- https://doi.org/10.17882/76352, ABRACOS 2; (Bertrand et al., 2024b)

Dissolved Oxygen

Instrumentation and sampling
Dissolved oxygen from Niskin bottle samples was determined using the Winkler titration method and used to calibrate and correct CTD oxygen sensor profiles.

Processing and quality control
Bottle measurements were used to correct nonlinear CTD oxygen sensor drift. Analytical consistency was verified through replicate titrations at stations where initial values appeared anomalous.

Data products
Oxygen concentrations are reported in four units to facilitate interdisciplinary use, and are associated with full bottle metadata in CSV format: dissolved oxygen in mL L^{-1} (*Dissolved_oxygen_a*), mg L^{-1} (*Dissolved_oxygen_b*), µmol L^{-1} (*Dissolved_oxygen_c*), and µmol kg^{-1} (*Dissolved_oxygen_d*).

Data volume
A total of 84 and 126 oxygen samples were collected during ABRACOS 1 and ABRACOS 2, respectively.

Data availability
Dissolved oxygen data are publicly available through SEANOE:

- https://doi.org/10.17882/76696, ABRACOS 1; (Bertrand et al., 2024a)
- https://doi.org/10.17882/76352, ABRACOS 2; (Bertrand et al., 2024b)

Dissolved inorganic nutrients data

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

595 **Instrumentation and sampling**

Dissolved inorganic nutrients (nitrate, NO_3^-; nitrite, NO_2^-; phosphate, PO_4^{3-}; and silicate, $Si(OH)_4$) were collected and analysed following Aminot and Kérouel (1998) and Becker et al. (2020).

Depending on station depth, up to 12 discrete water samples were collected per station, covering the full vertical structure of the water column. After triple rinsing, seawater was transferred into 30 mL narrow-mouth polypropylene bottles. Bottles were
600 tightly sealed (using pliers to secure the cap) and pasteurised at 80 °C for 2.5 h. Samples were then stored at room temperature in the dark until analysis. Protection from light was ensured throughout storage to limit potential photochemical alteration of organic matter and preserve long-term sample integrity.

At each station, duplicate bottle samples were systematically collected at a single depth in order to assess potential sampling artefacts (e.g., Niskin malfunction or contamination during handling). Duplicate bottles differed between stations. Nutrient
605 analyses on the auto-analyser were not run in analytical duplicates; instead, quality control relied on these field duplicates and laboratory reference materials.

Analytical procedures

Analyses were performed on shore using continuous segmented flow auto-analysers (Seal Analytical AA3 HR system; 2004–
610 2023). All analytical methods follow the protocols detailed in Aminot and Kérouel (1998) and Becker et al. (2020). The baseline solution used for all analyses was ultrapure water. Primary standard solutions were prepared by gravimetric dilution of ultrapure nutrient salts. Secondary standards used for calibration were prepared in low-nutrient seawater (LNSW) collected during cruises (approximately 200 L collected in oligotrophic equatorial waters). The use of a seawater matrix minimises optical and matrix effects inherent to continuous flow colorimetric analysis.

615

Detection limits

Detection limits were 0.01 µmol L^{-1} for NO_3^-, 0.002 µmol L^{-1} for NO_2^-, 0.003 µmol L^{-1} for PO_4^{3-}, and 0.04 µmol L^{-1} for $Si(OH)_4$. Values below detection limits are reported as such.

620 **Quality control**

Each analytical batch was validated using Certified Reference Materials (CRM) for nutrients supplied by KANSO (Japan). Multiple CRM concentration levels were available, and the appropriate reference material was selected according to the expected concentration range of the analysed samples (oligotrophic versus nutrient-rich waters). CRM measurements were used to verify analytical accuracy and instrument stability over time.

625

Data products

Dissolved inorganic nutrient concentrations are reported in two units, µmol L^{-1} (e.g., *NO2_a*) and µmol kg^{-1} (e.g., *NO2_b*), and are associated with full bottle metadata in CSV format (Table 12; Fig. 8).

630 **Data volume**

A total of 335 and 357 nutrients samples were collected during ABRACOS 1 and ABRACOS 2, respectively.

Data availability

Nutrient data (Table 12) are publicly available through SEANOE:

635 • https://doi.org/10.17882/95172 (Farias et al., 2015a)

Table 12: Format of the rosette bottle nutrient CSV data file, including variable names, descriptions, and units.

Field name	Definition	Modalities / Units
Metadata Rosette		
Ref_echantillon	Sample identifier	NaN for Abracos1, "002 Btl01" for Abracos2
NO2_a	nitrite concentration (µmol L^{-1})	µmol L^{-1}
NO2_b	nitrite concentration (µmol kg^{-1})	µmol kg^{-1}
NOX_a	nitrite + nitrate concentration (µmol L^{-1})	µmol L^{-1}
NOX_b	nitrite + nitrate concentration (µmol kg^{-1})	µmol kg^{-1}
NO3_a	nitrate concentration (µmol/l) (= the difference between NOX_a and NO2_a)	µmol L^{-1}
NO3_b	nitrate concentration (µmol/l) (= the difference between NOX_b and NO2_b)	µmol kg^{-1}
Phosphate_a	phosphate concentration (µmol L^{-1})	µmol L^{-1}
Phosphate_b	phosphate concentration (µmol kg^{-1})	µmol kg^{-1}
Silicate_a	silicate concentration (µmol L^{-1})	µmol L^{-1}
Silicate_b	silicate concentration (µmol kg^{-1})	µmol kg^{-1}

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

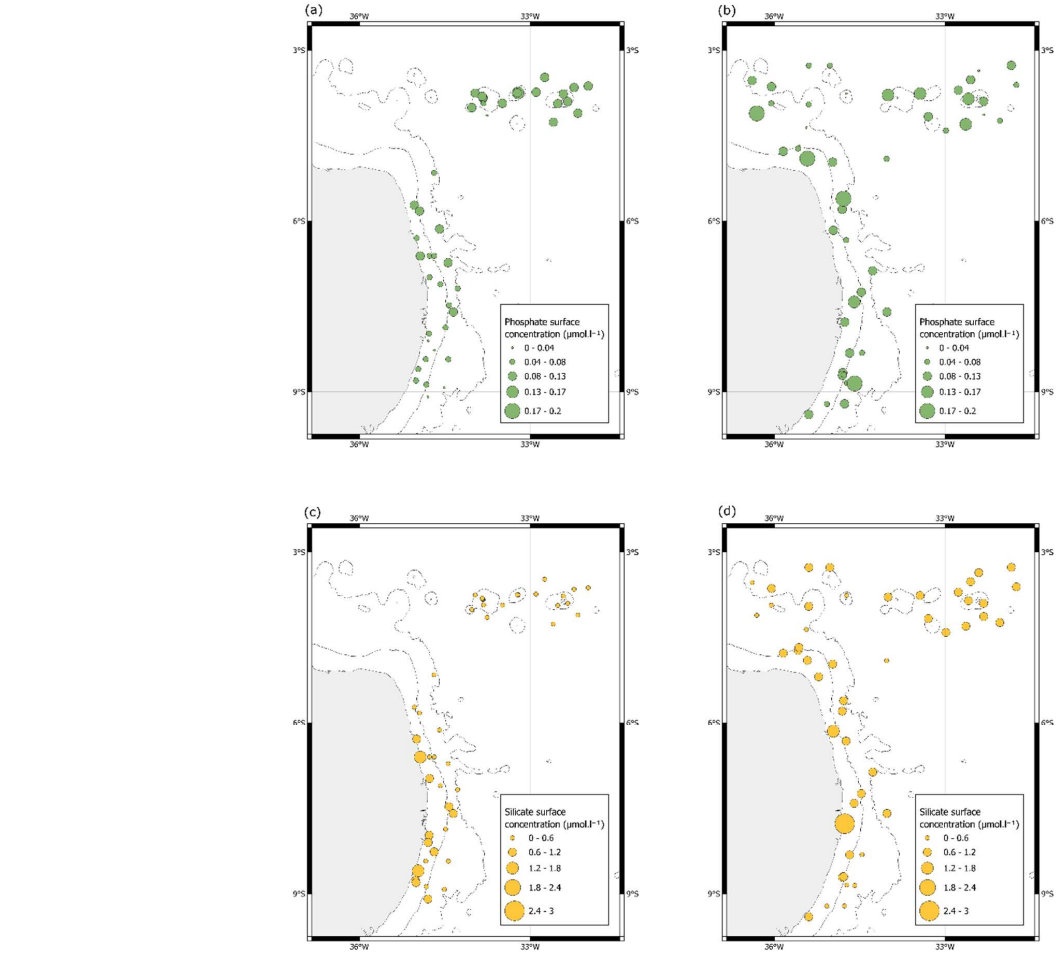


Figure 8: Surface phosphate (a), (b) and silicate (c), (d) concentrations (µmol L^{-1}) for ABRACOS 1 (a), (c) and ABRACOS 2 (b), (d).

Microbiome data (ABRACOS 1 only)

Instrumentation and sampling

Seawater samples were collected at multiple depths, selected according to the vertical fluorescence maximum, using a 10 L sterile Niskin bottle mounted on the CTD rosette. For each depth, approximately 500 mL of seawater were pre-filtered through a 20 µm mesh to remove large particles and subsequently filtered onto 0.22 µm Sterivex-GP filter units (Millipore®) to collect planktonic prokaryotes. Filters were immediately stored at −80 °C until DNA extraction.

Molecular analyses

DNA extraction, amplification of the V4–V5 region of the 16S rRNA gene, Illumina MiSeq sequencing, and bioinformatic processing (DADA2 pipeline in R) followed standard procedures. ASVs were taxonomically assigned using the SILVA database (nr_v132). Contaminants were removed using the decontam package and manual curation.

Total genomic DNA was extracted from Sterivex filters using the MagAttract PowerSoil® DNA kit (Qiagen, Courtaboeuf, France), following the manufacturer's instructions. Extractions were performed using an automated liquid handling system (KingFisher Flex™, ThermoScientific®, Waltham, MA, USA). Nucleic acids were eluted in molecular-grade water (Merck

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Millipore™) and quantified using a NanoDrop 8000™ spectrophotometer (ThermoScientific®). DNA extracts were stored at −20°C until PCR amplification.

The V4–V5 region of the 16S rRNA gene was amplified using the universal primers 515F–Y (5′-GTGYCAGCMGCCGCGGTAA-3′) and 926R (5′-CCGYCAATTYMTTTRAGTTT-3′) (Parada et al., 2016), coupled with Illumina platform-specific adaptor sequences. PCR reactions (50 µL) contained Phusion® High-Fidelity PCR Master Mix with GC Buffer (New England Biolabs®), primers (10 µM), template DNA, DMSO, and molecular-grade water. Amplifications were performed with an initial denaturation step at 98°C for 30 s, followed by 35 cycles of denaturation (98°C, 10 s), annealing (60°C, 1 min), and extension (72 °C, 1.5 min), and a final extension at 72 °C for 10 min.

PCR products were verified by electrophoresis on 2.0% agarose gels to confirm the expected amplicon size (~450 bp). DNA extraction blanks and standard mock communities (ZymoBIOMICS™ Microbial Community DNA Standards II, Zymo Research) were included to assess potential contamination and the overall quality of the analytical pipeline. Sequencing was performed on an Illumina MiSeq platform by the GeT-Biopuces facility (INSA, Toulouse, France).
Raw sequencing data were processed in R (v.4.1.1) using the DADA2 pipeline (Callahan et al., 2016). Sequences were trimmed and filtered based on quality profiles (maxN = 0; maxEE = [2,2]; truncQ = 2; truncLen = [250,250]). Amplicon Sequence Variants (ASVs) were inferred using the DADA2 denoising algorithm after pooling dereplicated reads from all samples. Forward and reverse reads were merged, and chimeric sequences were removed.
Taxonomic assignment of ASVs was carried out using the naive Bayesian RDP classifier implemented in DADA2, with the SILVA reference database (nr_v132). ASV tables, taxonomy, and sequences were compiled into a phyloseq object using the phyloseq package (v.1.28.0; McMurdie and Holmes, 2013).
Potential contaminants were identified and removed using a two-step approach. First, the R package decontam (Davis et al., 2018) was applied using a prevalence-based method. Second, additional ASVs corresponding to known reagent contaminants (e.g., *Bradyrhizobium*, *Cupriavidus*; (Salter et al., 2014) were manually excluded from the final dataset. Microbial taxonomic diversity was quantified using ASV richness.

Data products
Microbiome data are distributed in CSV format as two complementary files. The first contains a long-format occurrence table describing the presence of ASVs across samples (Table 13; Fig. 9). The second provides the associated taxonomic reference list, assigning each ASV to its classification from kingdom to genus level (Table 14).

Data volume
A total of 203,964 records describing the occurrence of 4,434 ASVs across 46 microbiome samples were collected during the ABRACOS 1 survey.

Data availability
Microbiome data are publicly available through SEANOE:

- https://doi.org/10.17882/109069 (Auguet, Jean-Christophe et al., 2025)

Table 13: Format of the microbiome ASV occurrence CSV data table, including variable names, descriptions, and units.

Field name	Definition	Modalities / Units
Metadata Rosette		
Id_Sample	Sample Identifier	ROS1_TCGTTC
Id_Taxon	Taxon Identifier	"Otu00001"
Value	Number	

Table 14: Format of the microbiome ASV taxonomic reference list (CSV), including variable names, descriptions, and units

Field name	Definition	Modalities / Units
Metadata Rosette		
Species	Species identifier to be combined to occurrence data file	"Otu00001"
Kingdom	Kingdom	Archea / Bacteria / unclassified / unknown
Phylum	Phylum	
Class	Class	
Order	Order	
Family	Family	
Genus	Genus	

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

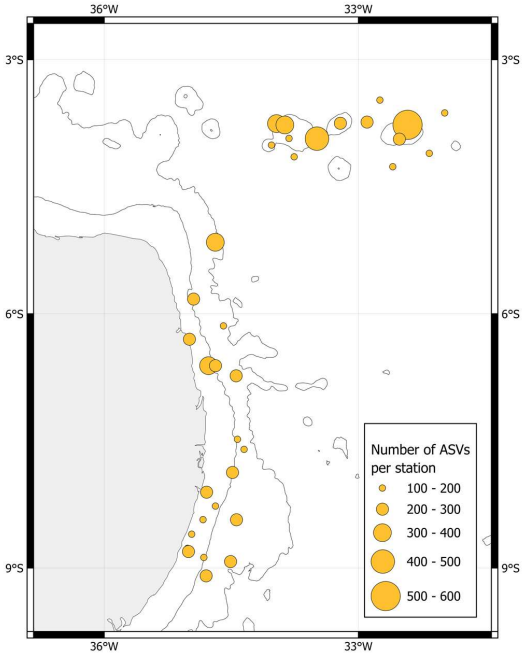


Figure 9: Microbial ASV richness (number of ASVs) at surface stations during ABRACOS 1.

Phytoplankton pigment data

Sampling strategy

Water samples for pigment analyses were collected using a CTD rosette at four depths defined from the vertical structure of each CTD profile: surface, mixed layer, deep chlorophyll maximum (DCM), and 200 m. The DCM occurred at a mean depth of approximately 100 m during ABRACOS 1 and 80 m during ABRACOS 2. At shallow stations (bottom depth < 50 m), where no distinct fluorescence maximum was observed, the DCM and 200 m samples were replaced by a single sampling depth located approximately 10 m above the seabed.

For each station and sampled depth, 500 mL of seawater were filtered onto Whatman GF/F glass-fibre filters for the determination of total phytoplankton pigment concentrations. Size-fractionated samples were obtained by pre-filtering seawater through 20 µm mesh nylon filters to separate picoplankton and nanophytoplankton (< 20 µm) from the total phytoplankton community. The microphytoplankton fraction (> 20 µm) was estimated by subtracting the < 20 µm pigment concentrations from total pigment concentrations. Filters were stored at −80 °C until laboratory analysis.

Pigment extraction and HPLC analysis

Pigment extraction and chemotaxonomic analyses were performed using high-performance liquid chromatography (HPLC) following the LOV method described in Hooker et al. (2000), using an Agilent Technologies 1200 Series HPLC system. Pigments were extracted in 100% methanol in the dark for 5 min at 4 °C, followed by sonication and filtration through cellulose acetate filters to remove particulate debris.

An aliquot of 600 µL was diluted with 150 µL of Milli-Q water, and 125 µL of this solution was mixed in the injection loop with 125 µL of a 28 mM tetrabutyl ammonium acetate solution. Pigments were separated on a ZORBAX Eclipse XDB-C8 column (3 mm internal diameter, 150 mm length, 3.5 µm particle size). The column temperature was maintained at 60 °C, and the flow rate at 0.55 mL min^{-1}. Separation was achieved using a linear gradient between methanol/tetrabutyl ammonium acetate (28 mM; 70:30, v/v) and 100% methanol.

The HPLC system was calibrated using external pigment standards (DHI Water and Environment, Hørsholm, Denmark). Chlorophyll-a and divinyl chlorophyll-a were used to estimate total phytoplankton biomass (TChl-a), while accessory pigments were used as diagnostic markers for major phytoplankton groups.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Data products

Pigment concentrations are reported in µg L^{-1} and are associated with full bottle metadata in CSV format (Table 15; Fig. 10). When concentrations were below the analytical detection limit, values are reported as missing (NaN). Crocoxanthin concentrations were measured during ABRACOS 1 only, and, because this pigment was not calibrated at the time of analysis, results are expressed as chromatographic peak area rather than concentration.

Data volume

A total of 239 and 423 phytoplankton pigment samples were collected during ABRACOS 1 and ABRACOS 2, respectively.

Data availability

Phytoplankton pigment data are publicly available through SEANOE:

- https://doi.org/10.17882/95171 (Farias et al., 2015b)

Table 15: Format of the phytoplankton pigment CSV data file, including variable names, descriptions, and units.

Field name	Definition	Modalities / Units
Metadata Rosette		
Ref_echantillon	Sample identifier	NaN for Abracos1, "002 Btl01" for Abracos2
Type_HPLC	Fraction of sample for HPLC	total / <20µm / >20µm
Filtered_volume	Filtered volume	mL
Chlorophyll_C3		µg L^{-1}
Chlorophyll_C2		µg L^{-1}
Peridinin		µg L^{-1}
BF19	19-Butanoyloxyfucoxanthin	µg L^{-1}
Fucoxanthin		µg L^{-1}
Neoxanthin		µg L^{-1}
Prasinoxanthin		µg L^{-1}
Violaxanthin		µg L^{-1}
HF19	19-Hexanoyloxyfucoxanthin	µg L^{-1}
Diadinoxanthin		µg L^{-1}
Alloxanthin		µg L^{-1}
Diatoxanthin		µg L^{-1}
Zeaxanthin		µg L^{-1}
Divinyl_chlorophyll_b		µg L^{-1}
Chlorophyll_b		µg L^{-1}
a_carotene		µg L^{-1}
b_carotene		µg L^{-1}
Divinyl_chlorophyll_a		µg L^{-1}
Chlorophyll_a		µg L^{-1}
Pheophytin_a		µg L^{-1}
Crocoxanthin_surface_of_peak	Corcoxanthin (ABRACOS 1 only); this pigment has not been yet calibrated, the results are given as "peak area" instead of concentration.	arbitrary units

Picoplankton and Nanophytoplankton *cytometry data (ABRACOS 2 only)*

Instrumentation and sampling

During the ABRACOS 2 survey, picoplankton and nanophytoplankton communities were characterised using flow cytometry to quantify cell abundances, size structure, and biomass of autotrophic and heterotrophic microbial compartments. Seawater samples for cytometric analyses were collected at the same depths as pigment and nutrient sampling, defined from CTD profiles: surface, mixed layer, deep chlorophyll maximum (DCM), and 200 m. At shallow shelf stations (< 50 m bottom depth) where no fluorescence maximum was detected, the DCM and 200 m samples were replaced by a single sampling depth located

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

approximately 10 m above the seabed. Immediately after collection, samples were fixed with formaldehyde (2 % final concentration), flash-frozen in liquid nitrogen, and stored at −80 °C until laboratory analysis.

Cell counts and size distributions were obtained using a FACSCalibur flow cytometer (Becton Dickinson, San Jose, CA, USA), equipped with a HeNe air-cooled laser (633 nm, 20 mW). Autotrophic cells were detected based on forward-angle (FALS) and right-angle (RALS) light scatter signals, as well as orange (576/26 nm) and red fluorescence (660/20 nm and 675/20 nm), corresponding to phycoerythrin, phycocyanin, and chlorophyll pigments, respectively. Heterotrophic bacteria were stained with SYBR Green I and quantified based on green fluorescence.

Fluorescent calibration beads (Fluoresbrite® YG, Polysciences) of known diameters were added to each sample to calibrate size classes (1–2 µm for picoplankton; 3, 6, and 10 µm for nanophytoplankton). True count beads (Becton Dickinson) were also added to determine the analysed volume and ensure accurate cell concentration estimates.

This approach enabled the discrimination and quantification of several microbial groups, including picocyanobacteria (*Prochlorococcus* and *Synechococcus*), picoeukaryotes, nanophytoplankton, and heterotrophic bacteria.

Cell abundances were converted to carbon biomass using published conversion factors: 29 fg C cell^{-1} for *Prochlorococcus*, 100 fg C cell^{-1} for *Synechococcus*, 1500 fg C cell^{-1} for picoeukaryotes (Zubkov et al., 2000), 3140 fg C cell^{-1} for nanophytoplankton (Pelegrí et al., 1999), and 12 fg C cell^{-1} for heterotrophic bacteria (Fukuda et al., 1998). Biomass is reported in µg C L^{-1}.

List-mode cytometry files were analysed using BD CellQuest software following standard protocols (Marie et al., 1997). The final dataset includes depth-resolved abundances and biomass estimates for picoplankton and nanophytoplankton and heterotrophic bacteria.

Data products

Depth-resolved abundances and carbon biomass estimates (µg C L^{-1}) are reported for *Prochlorococcus*, *Synechococcus*, picoeukaryotes, nanophytoplankton, and heterotrophic bacteria, and are associated with full bottle metadata in CSV format (Table 16).

Data volume

A total of 119 picoplankton and nanophytoplankton cytometry samples were collected during the ABRACOS 2 survey.

Data availability

Picoplankton and nanophytoplankton cytometry data acquired during the ABRACOS 2 survey are publicly available through SEANOE:

- https://doi.org/10.17882/95241 (Farias et al., 2017)

Table 16: Format of the picoplankton and nanophytoplankton cytometry CSV data file, including variable names, descriptions, and units.

Field name	Definition	Modalities / Units
Metadata Rosette		
IdCTDO_IdTaxon	Id_CTDO + '_' + Id_TAXON	"1_2_Nanoflagellates spp. "
Name_Sample	Sample name	"01-2017-surf-pico.001"
ID_TAXON	Taxon name	"Nanoflagellates spp. "
Abundance	Abundance of the corresponding taxon	cells L^{-1}
Biomass	Biomass of the corresponding taxon	µgC L^{-1}
KINGDOM	Kingdom	
PHYLUM	Phylum	
CLASS	Class	
ORDER	Order	
FAMILY	Family	
GENUS	Genus	
COMMENTS	Possible comment	e.g. "with Cryptophyceae (3-10 x µm) / 2-3µm / <1µm"
AphiaID	Worms AphiaID	
Images_links	Link to available images of taxa inserted in C. Carré's phytoplankton image database. If available	https://data.oreme.org/plankton/plankton_gallery/index/phyto#photo_taxon_list
Food_behaviour	Information of the food behaviour of the taxon	Autotrophic / Heterotrophic / Mixotrophic

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

Nano- and Microphytoplankton abundance data

Nano- and microphytoplankton datasets were generated using two complementary sampling approaches during ABRACOS 1 and ABRACOS 2: (i) quantitative abundance data derived from Rosette Niskin bottle samples (described in the present section); and (ii) taxonomic occurrence data derived from vertical phytoplankton net hauls (described in the following section). Both datasets share a common taxonomic reference framework.

Species identification and global species list

Taxonomic identification was performed to the highest possible resolution (class, genus, or species) using classical phytoplankton taxonomy references (Balech, 1988; Gómez et al., 2008; Hoppenrath, 2020; Licea, 1995; Taylor, 1976; Tomas, 1997). Species names and taxonomic status were verified using the World Register of Marine Species (WoRMS) and AlgaeBase, and AphiaIDs were assigned whenever available.

A global species list compiling all taxa observed during ABRACOS 1 and ABRACOS 2 from both Rosette and net samples is provided in the format described in Table 17.

Whenever possible, taxa were photographed for reference. Images were acquired using an upright microscope (AxioScope 1, Zeiss, with AxioCam MRc camera) for net samples and an inverted microscope (TCM 400, Labomed, with iVu 5000 camera) for Rosette samples.

All available images were incorporated into the World Phytoplankton Recognition and Identification database (Carré and Fabre, 2021; https://data.oreme.org/plankton/plankton_gallery/index/phyto).

For each species or taxon, functional traits were indicated, including trophic behaviour: autotrophic, heterotrophic, or mixotrophic.

Biovolume and carbon content estimation

For taxa counted in Rosette samples (243 taxa), cell biovolumes (µm³) were estimated using published values when available (e.g., Harrison et al., 2015) or measured directly following standard geometric approaches (Hillebrand et al., 1999; Sun and Liu, 2003). Cellular carbon content (pg C cell^{-1}) was calculated from biovolume estimates using the relationships proposed by Menden-Deuer and Lessard, (2000). Metadata include detailed information on the method used for biovolume determination for each taxon. Biovolume (µm³) and carbon content (pg C cell^{-1}) for the 243 taxa quantified in rosette samples are compiled in a file whose format is described in Table 18.

Abundance data from Rosette Niskin bottle sampling

Seawater samples for nano- and microphytoplankton counts were collected at multiple stations and depths using Niskin bottles mounted on a CTD rosette. During ABRACOS 1, approximately 1 L of seawater was collected per sample. During ABRACOS 2, 2 L per sample were collected, concentrated by filtration onto 5 µm, 47 mm polycarbonate filters, and resuspended in 30 mL of 0.2 µm-filtered seawater. Users should note that differences in sample volume and concentration procedure between surveys may affect the comparability of absolute abundance estimates. All samples were fixed with Lugol's iodine solution (4% final concentration) and stored at 4 °C in the dark until laboratory analysis.

Nano- and microphytoplankton abundances were determined using inverted microscopy (Axiovert 40C, Zeiss; TCM 400, Labomed) following the Utermöhl (1958) method and AFNOR standard protocols (2006). Each sample was concentrated to approximately 50 mL and allowed to settle in Utermöhl chambers. Initial sample volumes were recorded to calculate final cell abundances. Entire chambers were counted for each sample, with a target of at least 400 individuals whenever possible to ensure statistical robustness. Most taxa were identified and counted at species level; however, some groups (*Oscillatoriales*, *Goniodoma* sp., *Heterocapsa* spp., and coccolithophorids) were grouped at higher taxonomic levels due to limitations in morphological discrimination. Species-level abundances (×10³ individuals L^{-1}) for all rosette phytoplankton samples are compiled in a file whose format is described in Table 19.

Data volume

A total of 55 and 111 nano- and microphytoplankton Rosette samples were collected during ABRACOS 1 and ABRACOS 2, respectively.

Data availability

Nano- and microphytoplankton abundance data are publicly available through SEANOE:

- https://doi.org/10.17882/98867 (Carré et al., 2024)

Table 17: Format of the global phytoplankton species list (rosette and net samples) CSV file, including variable names, descriptions, and units.

Field name	Description	Modalities / Units
KINGDOM	Taxon taxonomic kingdom name	Chromista / Plantae / Bacteria / NaN

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

PHYLUM	Taxon taxonomic phylum name	E.g., Ochrophyta
CLASS	Taxon taxonomic class name	E.g., Bacillariophyceae
ORDER	Taxon taxonomic order name	E.g., Coscinodiscales
FAMILY	Taxon taxonomic family name	E.g., Heliopeltaceae
GENUS	Taxon taxonomic genus name	E.g., Actinoptychus
SPECIES	Species or identification/differentiating lowest rank	E.g., sp., spp., sp1, sp2, tessalatum, 31
ID_TAXON	Unique taxonomic identifier including sp, sp1, etc.	E.g., Amphisolenia schroederi, Asterionella sp2
COMMENTS	Reminder of changes/refinements in identification over time; explanations linked to taxon counting methods	
AphiaID	Species denomination in WorMs and Algaebase bases	number - 6 digits
Images_links	Link to available images of taxa inserted in C. Carré's phytoplankton image database if available	https://data.oreme.org/plankton/plankton_gallery/index/phyto#photo_taxon_list
Food_behaviour	Information of the food behaviour of the taxon	Autotrophic / Heterotrophic / Mixotrophic

Table 18: Format of the phytoplankton cell biovolume and carbon content CSV data file, including variable names, descriptions, and units.

Field name	**Description**	**Modalities / Units**
KINGDOM	Taxon taxonomic kingdom name	Chromista / Plantae / Bacteria / NaN
PHYLUM	Taxon taxonomic phylum name	E.g., Ochrophyta
CLASS	Taxon taxonomic class name	E.g., Bacillariophyceae
ORDER	Taxon taxonomic order name	E.g., Coscinodiscales
FAMILY	Taxon taxonomic family name	E.g., Heliopeltaceae
GENUS	Taxon taxonomic genus name	E.g., Actinoptychus
SPECIES	Species or identification/differentiating lowest rank	E.g., sp., spp., sp1, sp2, tessalatum, 31
ID_TAXON	Unique taxonomic identifier including sp, sp1, etc.	E.g., Amphisolenia schroederi, Asterionella sp2
Food_behaviour	Information of the food behaviour of the taxon	Autotrophic / Heterotrophic / Mixotrophic
Biovolumes	Biovolumes	μm^3
Carbon_cell	Carbon content per cell	pg C $cell^{-1}$
Biovolumes_Precisions	Precisions on the method used for biovolumes determination or measure (in French)	

855

Table 19: Format of the nano- and microphytoplankton abundance CSV data file (rosette samples), including variable names, descriptions, and units.

Field name	**Definition**	**Modalities / Units**
Metadata Rosette		
Name_Sample	Sample identifier (Id_Station + Targeted Depth)	E.g., "A1_06_50"
Type_Fluo	• Fluorescence modalities: • 200m: Bottle Rosette sampling realized at 200 m depth • DCM: Bottle Rosette sampling realized at chlorophyll maximum depth • ML: Bottle Rosette sampling realized in the mixed layer, in a middle depth, between DCM and surface	200m / DCM / ML / NaN / SB / Tap / Surface

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

	• NaN: Bottle Rosette sampling realized at an intermediate depth, with an unidentified fluorescence modality • SB: Bottle Rosette sampling realized near the bottom at shallow stations • Tap: Supplementary sampling realized with the on-board tap • Surface: Bottle Rosette sampling realized at the surface	
Zone	• Zones according to Assunção et al., 2020 (modified)	Seamounts / SECS / Shelf / WBCS
243 columns columns corresponding to all the taxa identified during Abracos 1 and Abracos 2 surveys using Rosette sampling	density of the corresponding taxon	nb individuals. L^{-1}

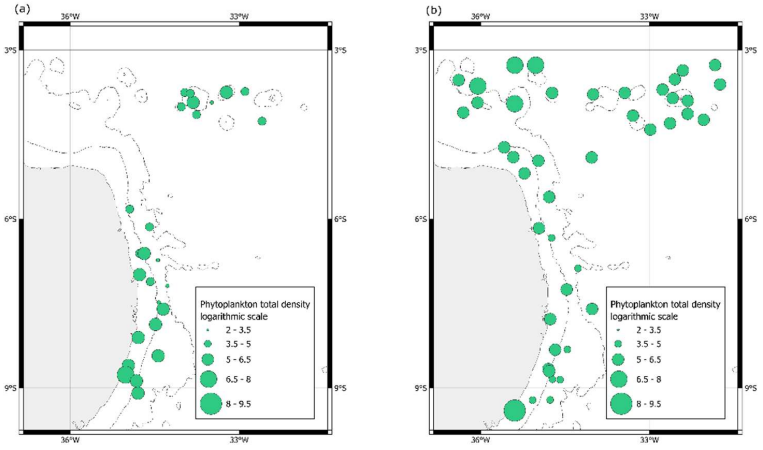


Figure 10: Total phytoplankton abundance (ind. L^{-1}, log scale) in the mixed layer from rosette bottle sampling, for ABRACOS 1 (a) and ABRACOS 2 (b).

2.6.3. Nano- and Microphytoplankton occurrence data from phytoplankton nets

In addition to rosette samples, nano- and microphytoplankton occurrence data were obtained using vertical net hauls during the ABRACOS 1 and ABRACOS 2 surveys (Table 20).

Sampling and analyses

Net tows were performed from 200 m depth to the surface whenever possible, or from the bottom to the surface at shallower stations, using a 20 µm mesh phytoplankton net. Samples were concentrated into 250 mL bottles, fixed with buffered formaldehyde (4% final concentration), and stored at room temperature in the dark until analysis.

Phytoplankton net samples were observed between slides and coverslips (about ten slides for each concentrated sample) with ×20, ×40 (with or without differential interference contrast, DIC), and ×100 objectives, using an upright microscope (AxioScope 1, Zeiss) equipped with an AxioCam MRc Zeiss camera.

Taxonomic consistency

Taxonomic identification followed the same criteria and reference species list as for rosette samples, allowing direct comparison across sampling methods. Net samples extend the taxonomic coverage by improving detection of rare, fragile, or patchily distributed taxa that may be underrepresented in discrete bottle samples.

Data volume

A total of 6 and 8 nano- and microphytoplankton net samples were collected during ABRACOS 1 and ABRACOS 2, respectively.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Data availability

Net-based occurrence data are publicly available through SEANOE, in the same deposit as rosette-based nano- and microphytoplankton count data:

- https://doi.org/10.17882/98867 (Carré et al., 2024)

Table 20: Format of the nano- and microphytoplankton net occurrence CSV data file, including variable names, descriptions, and units.

Field name	Definition	Modalities / Units
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Survey Sequential record	"A1_N° of line" – e.g., A1_296
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
Id_Station	Survey_Station number	"A1_N° Station" – e.g., A1_01
Operation	Type of Operation: PHYTO	CTD: CTDO SBE911+ (temperature, conductivity, salinity, depth, fluorescence, dissolved oxygen) + Rosette (12 bottles) Tap: Tap on the boat deck
Operation_Code	Survey_Operation_Station	E.g., A1_CTD_01
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD
Bottom_Depth	Bottom Depth	m
Dist_Shore	Shortest distance from the continental shoreline	m
Survey_area_station	Identifier of the station for the images database including the survey number, the area and the station. The area can be one of these: • ADR (Atol das Rocas) • FDN (Fernando de Noronha Archipelago) • NECoast (along Natal Coast) • SM (SeaMounts)	E.g., "A1_FDN_01"
209 columns columns corresponding to all the taxa identified during ABRACOS 1 and ABRACOS 2 surveys using phytoplankton net sampling	Occurrence of the taxa in the sample: 1 if the taxon is present in the sample or 0 if absent	0/1

2.6.4. Zooplankton data from closing WP2 net and bongo nets

Zooplankton communities were sampled during the ABRACOS 1 and ABRACOS 2 surveys using complementary sampling gears targeting different size classes and vertical strata (Fig. 11). Sampling combined vertical tows using a closing WP2 net (200 µm) and oblique bongo net hauls with multiple mesh sizes (64, 120, 300, and 500 µm). Together, these datasets provide taxonomic composition, abundance, and biovolume estimates across a broad zooplankton size spectrum.

All zooplankton sampling operations are documented in a master sampling file summarising gear type, mesh size, tow depth, filtered volume, and station metadata (Table 21). All zooplankton taxa identified using both WP2 and bongo nets are described in a global taxonomic list (Table 22).

Table 21: Format of the zooplankton sampling description CSV file, including variable names, descriptions, and units.

Field Name	Definition	Modalities / Units
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Survey Sequential record	"A1_N° of line"; "A2_N° of line"
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

Bottom_Depth	Bottom Depth	m
Dist_Shore	Distance to Shore	m
Lower_Haul_Depth	Depth of lower Haul	m
Upper_Haul_Depth	Depth of upper Haul	m
Station	Station Number (inside the survey)	1-> 55 for A; 1-> 61 for A2
Id_Station	Survey_Station number	"A1_Station"; "A2_Station"
Operation	Type of Operation	"BONGO" / "WP2"
Operation_Code	Survey_Operation_Station	E.g., "A1_BONGO_03a" NB: for BONGO operations, a/b stand for taxonomy/isotope objective of the sample; for WP2 operations, a/b stands for inf/sup layer
Id_OpCode_Net	Operation_Code_Net	E.g., "A1_BONGO_03a_300"
Net	Net mesh size: 64, 120, 300, 500 µm (BONGO) or 200 µm (WP2)	µm
Fraction	Fraction of the sample used for taxonomy	1 (BONGO A1 & WP2) or 0.5 (BONGO A2)
Sestonic_Weight	Sample total weight	g
Filtered_Volume	Seawater volume filtered by the net	m^3
Biomass	Total Biomass of the sample = 1000 x (Sestonic_Weight / Filtered_Volume) / Fraction	mg m^{-3}

Table 22: Format of the global zooplankton taxonomic reference list CSV file, including variable names, descriptions, and units.

Field Name	**Definition**	**Modalities / Units**
Taxon	Taxon unique identifier	E.g., "Acartia_Acartia_danae"
Compartment	Minimum taxonomic compartment	"ZOOPLANKTON"
Group	Zoological group	"Invertebrata" / "Vertebrata" / "Protist" / NaN
AphiaID_Worms	Worms Aphia ID	E.g., 103357
Scientific_Name_Worms	Worms Scientific name	Taxon name according to Worms, to be used for E.g., "Acartia (Acartia) danae"
Authority_Worms	Worms Authority, i.e. Descriptor of the taxon	E.g., "Giesbrecht, 1889"
Kingdom	Kingdom	"Animalia" / "Chromista" / NaN
Phylum	Phylum	E.g., "Arthropoda"
Class	Class	E.g.,"Copepoda"
Order	Order	E.g., "Calanoida"
Family	Family	E.g., "Acartiidae"
Genus	Genus	E.g., "Acartia"
Rank	Identification level	"Species" / "Genus" / "Family" / "Order" / "Class" / "Phylum" / NaN...

In the data files below, which describe the results of the analyses of zooplankton samples, the metadata relating to the stations and the taxonomic description correspond to fields 1 to 20 and 21 to 34, respectively, whilst the specific information is provided in the subsequent fields and is detailed for each gear type and mesh size.

Zooplankton WP2 data

Sampling strategy
Vertical zooplankton sampling was conducted using a WP2 closing net (200 µm mesh size). At each station, two vertical tows were performed: one from a depth of 200 m to the lower thermocline limit, and the other from the thermocline to the surface, identified respectively as "inf" and "sup" in the *Layer* field of the data files. Samples were preserved in 4% buffered formaldehyde.

Sample processing by mesh size
Organisms were identified to the finest possible taxonomic resolution and counted under a stereomicroscope. Abundances were standardised to individuals per cubic metre (ind m^{-3}) and reported as *Density* in the data files.

Zooplankton bongo net data

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

General zooplankton bongo dataset

The general zooplankton bongo dataset includes abundance or biovolume by taxon and by sample, estimated for all mesh sizes. In addition, a dataset dedicated to cnidarians derived from the 300 µm samples is described in the following subsection.

Sampling strategy

Zooplankton was collected using a standard bongo frame, towed at approximately 2 knots for a duration of approximately 7 minutes, equipped with four nets: 64 µm mesh (30 cm mouth diameter), 120 µm mesh (30 cm mouth diameter), 300 µm mesh (60 cm mouth diameter), and 500 µm mesh (60 cm mouth diameter).

At each station, one oblique haul was conducted from 200 m depth to the surface, or from approximately 10 m above the seabed to the surface at stations shallower than 200 m. A Hydro-Bios flowmeter was mounted inside each of the four nets to estimate the volume of filtered seawater. Samples were preserved in 4% buffered formaldehyde (sodium tetraborate, 0.5 g L^{-1}; Newell and Newell, 1977). During ABRACOS 1, the entire sample from each mesh size was used for taxonomic identification and quantification. During ABRACOS 2, samples from each net were split into two equal fractions, one dedicated to taxonomy and the other to stable isotope analyses described in a following section.

Sample processing by mesh size

Large microzooplankton samples from 64 µm mesh nets were split until a minimum of 200 individuals was reached. Organisms were identified under a stereomicroscope to the finest possible taxonomic level, primarily following Boltovskoy (1999) and counted. Abundances were standardised to numbers of individuals per cubic metre (ind m^{-3}) and reported as *Density* in the datafiles.

Samples from 120 µm mesh nets were analysed under a stereomicroscope (Zeiss Stemi 2000-C). For the ABRACOS 1 survey, organisms were identified by large taxonomic group. The samples were divided into subsamples by a factor ranging from 2 to 512 (field *Subpart*) to obtain at least 300 organisms per sample. For each individual zooplanktonic organism, the major and minor axis (fields *Major* and *Minor*) were measured in mm. Individual elliptical biovolume (field *EBV*) in mm^3 was calculated as $(4/3) \times \pi \times (Major/2) \times (Minor/2)^2$. Standardised empirical biovolume per m^3 (field *EBV_STD*) in $mm^3\ m^{-3}$ for the considered individual was computed as $(EBV \times Subpart)/Filtered\_Volume$, where *Filtered_Volume* is the total volume filtered for the considered net (Figueiredo et al., 2020). For the ABRACOS 2 survey, organisms were identified to the finest taxonomic level possible and counted; measurement of organisms and individual biovolume estimation were not performed. For each organism, abundance was standardised to number of individuals per m^3 (ind m^{-3}) and reported as *Density* in the data file. Users should note that taxonomic resolution differs between surveys for 120 µm samples, which may affect comparability.

The 300 µm and 500 µm samples were analysed using a ZooScan system. According to the concentration of organisms, the samples were split by a Motoda splitter into subsamples by a factor ranging from 2 to 512 (field *Subpart*) to obtain up to 2,000 objects in each scan. Subsamples were digitised using the ZooScan (Hydroptic model ZSCAN03) at a resolution of 2400 dpi, following the protocol established by (Grosjean et al., 2004; http://www.zooscan.obs-vlfr.fr/). Images were then processed using ZooProcess software (version 7.19) to isolate each object into a single vignette and generate a range of quantitative descriptors (size, grey level distribution, and shape parameters) for each. To classify the vignettes into pre-established taxonomic groups, a semi-automatic approach was initially used for ABRACOS 1 samples, using the Plankton Identifier software following Gorsky et al. (2010), while EcoTaxa software was used for ABRACOS 2. The ABRACOS 1 samples were subsequently re-classified using EcoTaxa to ensure methodological consistency with ABRACOS 2. After classification, all results were manually validated and identified to the smallest taxonomic level possible by multiple specialists.

The major and minor axes (fields *Major* and *Minor*) of each organism were measured in mm. The area of the organisms (field *Area*, mm^2) was estimated as $\pi \times (Major/2) \times (Minor/2)$, and their equivalent spherical diameter (field *ESD*, mm) was estimated as $\sqrt{(Minor \times Major)}$. Individual elliptical biovolume (field *EBV*, mm^3) was estimated as $(4/3) \times \pi \times (Major/2) \times (Minor/2)^2$. Spherical biovolume (field *SBV*) was also inferred as $(4/3) \times \pi \times (Area/\pi)^{(3/2)}$. Standardised biovolumes per organism per m^3 (fields *EBV_STD* and *SBV_STD*, $mm^3\ m^{-3}$) were calculated for both *EBV* and *SBV* using the formulas $EBV\_STD = ((EBV \times Subpart)/Filtered\_Volume) / Fraction$ and $SBV\_STD = ((SBV \times Subpart)/Filtered\_Volume) / Fraction$, where *Filtered_Volume* is the filtered volume (m^3) and *Fraction* is the proportion of this filtered volume used for taxonomy.

Dataset organisation

The general zooplankton dataset is organised into multiple CSV files, structured by survey and sampling gear: a sampling metadata file for each survey (*ZooPlankton_Sampling_Abracos1.csv*, *ZooPlankton_Sampling_Abracos2.csv*); a common taxonomic reference list for all gears and surveys (*Taxonomic_Reference_Zooplankton_Abracos.csv*); abundance data from WP2 net samples (*Zooplankton_WP2_Abracos1.csv*, *Zooplankton_WP2_Abracos2.csv*); abundance data from 64 µm bongo net samples (*Zooplankton_64_Abracos1.csv*, *Zooplankton_64_Abracos2.csv*); individual biovolume (ABRACOS 1) and abundance (ABRACOS 2) data from 120 µm bongo net samples (*Zooplankton_120_Abracos1.csv*, *Zooplankton_120_Abracos2.csv*); and individual biovolume data from 300 and 500 µm bongo net samples (*Zooplankton_300_500_Abracos1.csv*, *Zooplankton_300_500_Abracos2.csv*).

Data volume

During ABRACOS 1 and ABRACOS 2, respectively, 25 and 21 WP2 samples and 35 and 49 bongo samples were collected.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

990

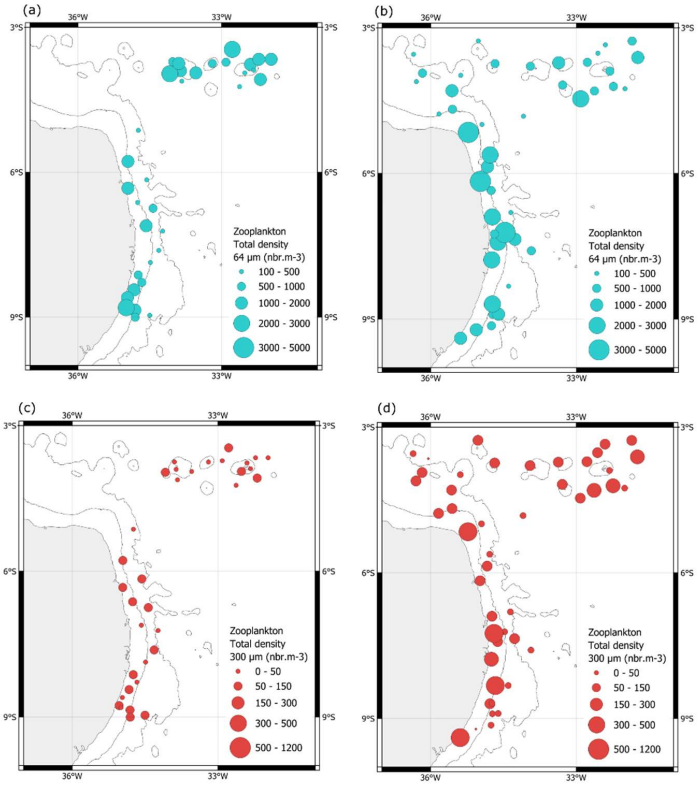
Data availability

The general zooplankton dataset, including all sampling metadata, the taxonomic reference file, abundance matrices, and biovolume estimates for both surveys and all mesh sizes, is publicly available through SEANOE:

- https://doi.org/10.17882/109464 (Melo et al., 2026)

995 The large microzooplankton abundance dataset derived from the 64 µm bongo samples is also publicly available through SEANOE:

- https://doi.org/10.17882/98869 (Tosetto et al., 2024a)



1000

Figure 11: Total zooplankton abundance (ind. m^{-3}) from bongo 64 µm samples (a): ABRACOS 1; (b): ABRACOS, and bongo 300 µm samples (c): ABRACOS 1; (d): ABRACOS 2.

Planktonic cnidarians from Bongo 300µm

1005

Planktonic cnidarian abundance data were derived from zooplankton samples collected with a 300 µm mesh bongo net during ABRACOS 1 and ABRACOS 2.

Sample processing

1010 In the laboratory, whole zooplankton samples were analysed under a stereomicroscope, and cnidarian specimens were identified (mainly following (Bouillon, 1999)) and counted. and counted. Abundances are expressed as the number of individuals per 100 m^3 for medusae and the number of colonies per 100 m^3 for siphonophores. For calycophorans, the number of anterior nectophores was used to estimate polygastric stage abundance, and the number of eudoxid bracts to estimate eudoxid stage abundance (e.g., Hosia and Båmstedt, 2007). For physonects and Hippopodidae, the number of colonies was estimated
1015 by dividing the total number of nectophores by 10 (Pugh, 1984).

Data volume

A total of 34 and 45 300 µm bongo samples were collected during ABRACOS 1 and ABRACOS 2, respectively.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Data availability

The planktonic cnidarian abundance dataset is publicly available through SEANOE:

- https://doi.org/10.17882/92011 (Giachini Tosetto et al., 2022)

2.6.5. Demersal and deep-pelagic macroalgae, invertebrates, and fishes

This dataset compiles records of macroalgae, invertebrates (sponges, cnidarians, siphonophores, molluscs, crustaceans, and tunicates), and fishes collected during the ABRACOS 1 and ABRACOS 2 surveys (Fig. 12). For most specimens, complete taxonomic identification, georeferenced coordinates, and sampling depth are provided. Morphometric measurements are available for several taxa.

Sampling gears and effort

Three types of trawl gear were employed: a bottom trawl (body mesh size 40 mm, cod-end mesh size 25 mm, entrance dimensions 28 × 10 m), a mesopelagic trawl (body mesh size 30 mm, cod-end mesh size 4 mm, net mouth 16.6 × 8.4 m), and a micronekton trawl (body mesh size 40 mm, cod-end mesh size 10 mm, net mouth 24 × 24 m). Bottom trawls were conducted at depths between 10 and 60 m, while mesopelagic and micronekton trawls targeted depths ranging from 10 to 1,100 m. All trawls were deployed during both daytime and nighttime operations. Trawl operation metadata for each survey are provided in Table 23.

Sample processing and data integration

After collection, samples were sorted by biological compartment (macroalgae, sponges, gelatinous organisms, molluscs, crustaceans, and fishes). Each compartment was analysed by specialised laboratories responsible for taxonomic identification and, when applicable, morphometric measurements.

A total of 691 taxa were identified at the lowest possible taxonomic level: species (75%), genus (18%), family (5%), and order (1%), totalling 99% of identified taxa. Taxonomic nomenclature was verified using Eschmeyer's Catalog of Fishes for fishes and the World Register of Marine Species (WoRMS) for all other taxa. Scientific names were standardised following WoRMS nomenclature (field: *Scientific_Name_Worms*), except for taxa with highly uncertain identification and recently described fish species not yet integrated into WoRMS. A general demersal and deep-pelagic taxonomic list was compiled (Table 24).

After identification and morphometric measurements, the resulting datasets were harmonised and compiled into a single integrated file representing the complete demersal and deep-pelagic community (Table 25). Because analyses were conducted by different laboratories and protocols varied among compartments, the level of taxonomic resolution and associated metadata may differ between groups. Selected fish specimens not used for biological or chemical analyses were deposited in the Fish Collection of the Institute of Biodiversity and Sustainability (NUPEM), at the Federal University of Rio de Janeiro (UFRJ), Macaé, Brazil. The NUPEM Fish Collection database is publicly accessible through two open-access repositories: speciesLink (https://specieslink.net) and SiBBr (https://www.sibbr.gov.br).

Data volume

In ABRACOS 1, a total of 48 trawl samples were collected (17 bottom, 27 mesopelagic, and 4 micronekton). In ABRACOS 2, 68 trawl samples were collected (19 bottom, 4 mesopelagic, and 45 micronekton). The general dataset includes 21,524 specimens, representing 16 classes, 86 orders, 218 families, 400 genera, and 512 species, compiled from the 691 identified taxa described above.

Data availability

The dataset of demersal and deep-pelagic macroalgae, invertebrates, and fishes identification is publicly available through SEANOE:

- https://doi.org/10.17882/107231 (Eduardo et al., 2025)

Table 23: Format of the trawl sampling description CSV file for the demersal and deep-pelagic dataset, including variable names, descriptions, and units.

Fields Name	Description	Modalities / Units
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Chronological order of points	"A1_N° of line in the logbook" "A2_N° of line in the logbook"
Station	Station Number for a given survey	1-> 54 for Abracos 1 1-> 60 for Abracos 2 + a/b/c for stations between 40 and 60 (e.g., 60a)
Id_Station	Survey code + Station Number	"A1_N° Station" or "A2_N° Station" – e.g., A1_01, "A2_49b
Operation	Type of Operation	"BotTrawl" / "MESO" / "MICRO"

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

Operation_Code	Operation Identification	Survey_Operation_Station – e.g., "A1_MICRO_01"
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Latitude	Latitude	DD
Longitude	Longitude	DD
Bottom_Depth	Bottom Depth	m
Dist_Shore	Shortest Distance from Continental Shoreline	m
Fishing_Depth_Upper	Upper limit of the fishing haul	m
Fishing_Depth_Lower	Lower limit of the fishing haul	m
Start_Latitude	Start Latitude of haul	DD
Start_Longitude	Start Longitude of haul	DD
End_Latitude	End Latitude of haul	DD
End_Longitude	End Longitude of haul	DD
Start_Time	Start Time of haul	dd/MM/yyyy hh:mm; UTC
End_Time	End Time of haul	dd/MM/yyyy hh:mm; UTC
Fishing_Duration	Fishing Duration of haul	s
Fishing_Distance	Fishing Distance of haul	m
Cable_Length	Cable Length of haul	m
Fishing_Speed	Fishing Speed of haul	knots
Horizontal_Opening	Horizontal Opening	m
Vertical_Opening	Vertical opening	m

Table 24: Format of the demersal and deep-pelagic taxonomic reference list CSV file, including variable names, descriptions, and unit.

Fields Name	**Description**	**Modalities / Units**
Species	Taxonomic identification	Unique taxonomic identifier including "sp.", "sp. 1", "sp. nov. 1", etc. – e.g., "Acanthostracion polygonium", "Abylopsis sp."
Code_Species	Species code	First four letters of Genus and first four letters of Species, except if ambiguous – eg. "Acan.poly", "Abyl.sp", "Acanthephyra.quad"
Compartment	Minimum taxonomic compartment	"CRUS" (crustaceans) / "FISH" / "GELATINOUS" / "MACROALGAE" / "MOLL" (molluscs) / "SPONGES"
AphiaID_Worms	Worms AphiaID	E.g., 1577312 / NaN if not in WorMs
Scientific_Name_Worms	Scientific name to search Worms	Similar to Species except sp, sp1, etc. – e.g., Acanthostracion polygonium, Abylopsis Can be used to check the taxonomy with Worms
Authority_Worms	Authority = Descriptor of the species	E.g., (Rüppell, 1844), Chun, 1888
Kingdom	Kingdom	Animalia / Chromista / Plantae / NaN
Phylum	Phylum	E.g., Chordata
Class	Class	E.g., Teleostei
Order	Order	E.g., Tetraodontiformes
Family	Family	E.g., Ostracidae
Genus	Genus	E.g., Acanthostracion
rank	Identification level	Species / Genus / Family / ….

Table 25: Format of the integrated demersal and deep-pelagic CSV data file, including variable names, descriptions, and units.

Fields Name	**Description**	**Modalities / Units**
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Chronological order of points	"A1_N° of line in the logbook" "A2_N° of line in the logbook"
Id_Station	Survey Code + Station Number	"A1_N° Station" or "A2_N° Station" – e.g., A1_01, "A2_49b
Operation	Type of Operation	"BotTrawl" / "MESO" / "MICRO"

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Operation_Code	Operation Identification	Survey_Operation_Station – e.g., "A1_MICRO_01"
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Latitude	Latitude	DD
Longitude	Longitude	DD
Bottom_Depth	Bottom Depth	m
Dist_Shore	Shortest Distance from Continental Shoreline	m
Fishing_Depth_Upper	Upper limit of the fishing haul	m
Fishing_Depth_Lower	Lower limit of the fishing haul	m
Species	Taxonomic identification	Unique taxonomic identifier including sp, sp1, etc. – e.g., Acanthostracion polygonium, Abylopsis sp
Code_Species	Species code	First four letters of Genus and first four letters of Species except if ambiguous – e.g., Acan.poly, Abyl.sp
Compartment	Minimum taxonomic compartment	CRUS / ECHI / FISH / GELATINOUS / MACROALGAE / MOLL / SPONGES
Reg	Register of each individual of each species in the sample	1, 2, 3…
Pres_Abs	Presence /Absence modality	NaN or 1
Nb_Individual	Count of individuals Used for GELATINOUS family Salpidae (sol)	
Nb_Colonies	Count of colonies Used for GELATINOUS family Salpidae (agg)	
Biovolume	Biovolume Used for GELATINOUS (bv)	
TL	Total Length Used for FISH/CRUS/MOLL	cm
FL	Fork Length Used for FISH	cm
SL	Standard Length Used for FISH/CRUS/MOLL	cm
ML	Mantle Length Used for MOLL-Cephalopods and GELATINOUS-Hydrozoa	cm
CL	Carapace Length Used for CRUS	cm
DL	Disc Length Used for rays (FISH/Dasyatidae & Rhinobatidae)	cm
TW	Total Weight	g
TWest	Total Weight estimated Used for individuals weighted in group	g
EW	Eviscerated Weight Used for FISH	g
GonW	Gonad Weight Used for FISH	g
StomachW	Stomach Weight Used for FISH	g
Fullness	Fullness index (indicative of the species feeding intensity) Used for FISH	"1" = Empty stomach; "2" = Partially empty; "3" = Partially full; "4" = Full stomach.
Collection	Rio museum collection number Used for FISH	NPM+4 digits – e.g., "NPM3162"
AphiaID_Worms	Worms AphiaID	E.g., 1577312
Scientific_Name_Worms	Scientific name checked with Worms	Similar to Species except sp, sp1, etc. – e.g., Acanthostracion polygonium, Abylopsis Can be use to check the taxonomy with Worms

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Authority_Worms	Authority = Descriptor of the species	E.g., Poey, 1876; Chun, 1888
Kingdom	Kingdom	Animalia / Chromista / Plantae / NaN
Phylum	Phylum	E.g., Chordata
Class	Class	E.g., Teleostei
Order	Order	E.g., Tetraodontiformes
Family	Family	E.g., Ostracidae
Genus	Genus	E.g., Acanthostracion
rank	Identification level	Species / Genus / Family / ….

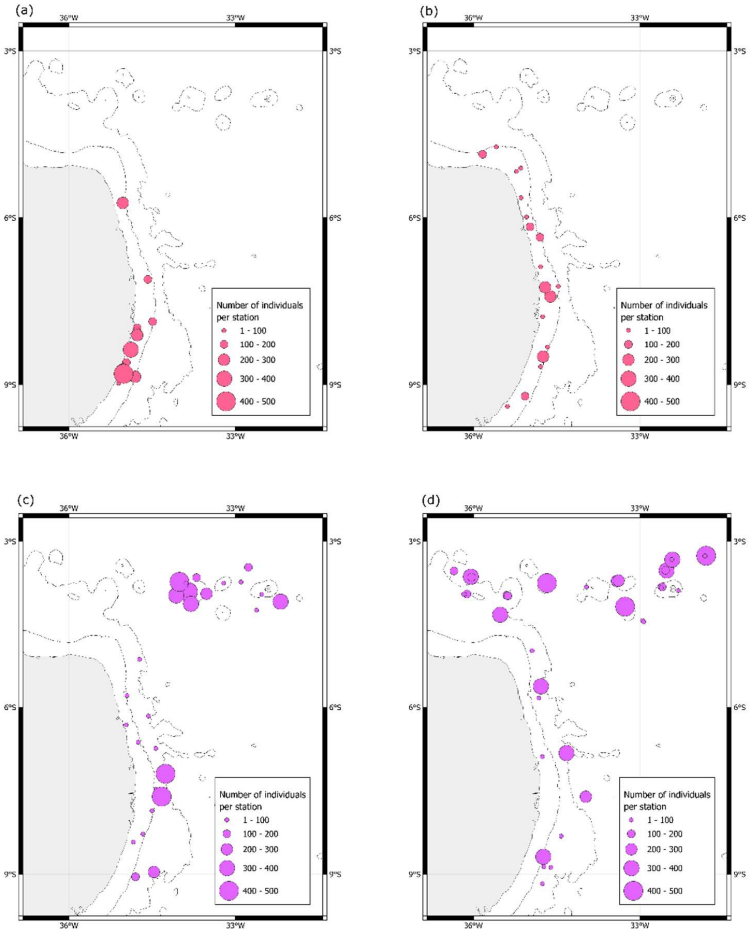


Figure 12: Total number of individuals collected per station using bottom and midwater trawls: bottom trawl during ABRACOS 1 (a) and ABRACOS 2 (b), mesopelagic trawl during ABRACOS 1 (c), and micronekton trawl during ABRACOS 2 (d).

2.6.6. Isotope data

This dataset compiles stable isotope measurements ($\delta^{13}C$ and $\delta^{15}N$) for multiple ecosystem components, providing a multi-compartment trophic baseline spanning demersal, epipelagic, and mesopelagic organisms in the western tropical Atlantic (Fig. 13). The dataset includes particulate organic matter (POM), zooplankton, and demersal and deep-pelagic fishes, crustaceans, cephalopods, and gelatinous organisms (siphonophores and salps) collected during the ABRACOS 1 and ABRACOS 2 surveys.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Sampling and sample processing

Particulate organic matter (POM) samples were collected at depths corresponding to the fluorescence maximum using a CTD rosette equipped with Niskin bottles (see above). For each sample, 8 L of seawater were filtered onto pre-combusted Whatman GF/F filters (47 mm diameter).

Zooplankton samples were collected using a bongo frame equipped with four nets (64 µm, 30 cm mouth; 120 µm, 30 cm; 300 µm, 60 cm; 500 µm, 60 cm), deployed simultaneously from 200 m depth to the surface (see above). Samples from all mesh sizes were pooled, sieved, and separated into size fractions. Five size fractions were defined during ABRACOS 1 (<200 µm; 200–500 µm; 500–1000 µm; 1000–2000 µm; >2000 µm) and six during ABRACOS 2 (<100 µm; 100–200 µm; 200–500 µm; 500–1000 µm; 1000–2000 µm; >2000 µm). Samples were packed in pre-combusted aluminium envelopes and stored frozen at −20 °C. In the laboratory, zooplankton samples were transferred to Eppendorf microtubes, freeze-dried for at least 24 h, homogenised, and weighed.

To obtain unbiased $\delta^{13}C$ values for POM and zooplankton samples, carbonate removal was performed on subsamples: POM filters were exposed to HCl vapour, whereas zooplankton fractions were treated with approximately 2 mL of 0.5 mol L^{-1} HCl. Acidification lasted 4 h, after which samples were dried at 40–60 °C for 24–36 h. The non-acidified subsamples were used for $\delta^{15}N$ measurements.

Demersal and deep-pelagic organisms were collected during both daytime and nighttime trawl operations (see above). White muscle tissue was extracted from fishes and crustaceans and rinsed with distilled water to remove external material (*e.g.*, carapaces, scales, bones). For fish larvae, whole individuals were analysed; for gelatinous organisms, entire specimens were used. The samples were dried at 60 °C for 48 h and ground to a fine powder prior to analysis.

Stable isotope analysis

Stable isotope ratios were measured using a Delta V+ Isotope Ratio Mass Spectrometer coupled to a ThermoScientific Flash 2000 elemental analyser via a ConFlo IV interface at the Pôle de Spectrométrie Océan (PSO, IUEM, Plouzané, France). Isotope values were expressed in delta notation relative to international standards**, namely Vienna Pee Dee Belemnite (VPDB) for $\delta^{13}C$ and atmospheric N_2 (AIR) for $\delta^{15}N$, according to:

$\delta^{13}C$ or $\delta^{15}N = ((R\text{sample} / R\text{standard}) - 1) \times 10^3$

where R represents the $^{13}C:^{12}C$ or $^{15}N:^{14}N$ ratio. Analytical accuracy was verified through repeated measurements of internal acetanilide standards**, with analytical precision better than 0.1‰ for both $\delta^{13}C$ and $\delta^{15}N$.

Data products

The results of POM samples for both ABRACOS 1 and ABRACOS 2 surveys are presented in a single tabular CSV file. Results from analyses performed with and without carbonate removal for a given sample are on the same row (Table 26). The final column (*C_N_ratio*) corresponds to the C/N ratio, calculated using the carbon value from the analysis without carbonate removal and the nitrogen value from the analysis with carbonate removal. For zooplankton samples, the results are organised in the same way; in addition, each row corresponds to an isotopic analysis on a size fraction from a given sample (Table 27). Users should note that size classes differ between the ABRACOS 1 and ABRACOS 2 surveys. For demersal and deep-pelagic organisms, each row of the result table corresponds to an isotopic analysis on a single organism, identified by a unique code (*Iso_code*) (Table 28). The global taxonomic list is given in Table 29.

Data volume

A total of 983 isotopic analyses were performed for ABRACOS 1 (152 for POM, 316 for zooplankton, and 515 for demersal and deep-pelagic organisms) and 1,638 isotopic analyses were performed for ABRACOS 2 (196 for POM, 528 for zooplankton, and 914 for demersal and deep-pelagic organisms). For POM and zooplankton, these totals include analyses performed both with and without carbonate removal.

Data availability

The isotope dataset is publicly available through SEANOE:

- https://doi.org/10.17882/108735 (Figueiredo et al., 2025a)

Table 26: Format of the POM stable isotope CSV data file, including variable names, descriptions, and units.

Fields Name	Description	Modalities / Units
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Survey Sequential record	"A1_N° of line" "A2_N° of line"
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since DD 00:00:00 UTC	s
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD
Bottom_Depth	Bottom Depth from Logbook_Abracos	m

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

Dist_Shore	Distance to Shore from Logbook Abracos	m
Id_Station	Survey Station number	"A1_N° Station" – e.g., A1_03
Operation	Type of Operation	"CTD" "Tap"
Operation_Code	Survey_Operation_Station	E.g., "A1_CTD_03"
Bottle	N° of bottle	2 to 12 – 0 for Tap
Id_Station_Bottle	Station + Bottle	E.g., "A1_03_8" for Station 3, Bottle 8
Id_CTDO	Station + Pressure	E.g., A1_03_122
Targeted_Depth	Targeted Depth	m
Pressure	CTD pressure at the sampling depth	dbar – e.g., 122
Depth_Exact	Exact depth	E.g., 121.29
Type_Fluo	Situation of the sample on the fluorescence max	Fbottom/Fmax/ SUP /Surface/Tap
Filtered_volume	Filtered volume	L
Num_analysis_Carb	N° of the isotope analysis with carbonates	5 digits
Identifier1_Carb	Identifier of sample for analysis with carbonates	E.g., “Fmax Decarbo.” / “AB2 - ST1 - Surf.”
Amount_mg_Carb	Amount of matter used for the analysis with carbonates	mg
d_15N_14N_Carb	Delta 15N/14N for analysis with carbonates	‰
d_13C_12C_Carb	Delta 13C/12C for analysis with carbonates	‰
Percent_N_Carb	Percentage N for analysis with carbonates	Ratio (between 0-1)
Percent_C_Carb	Percentage C for analysis with carbonates	Ratio (between 0-1)
C_N_Carb	C/N ratio for analysis with carbonates	Percent_C_Carb / Percent_N_Carb
Num_analysis_Decarb	N° of the isotope analysis without carbonates	5 digits
Identifier1_Decarb	Identifier of sample for analysis without carbonates	E.g., “Fmax Decarbo.” / “AB2 - ST1 - Surf. - Decarbo.”
Amount_mg_Decarb	Amount of matter used for the analysis without carbonates	mg
d_15N_14N_Decarb	Delta 15N/14N for analysis without carbonates	‰
d_13C_12C_Decarb	Delta 13C/12C for analysis without carbonates	‰
Percent_N_Decarb	Percentage N for analysis without carbonates	Ratio (between 0-1)
Percent_C_Decarb	Percentage C for analysis without carbonates	Ratio (between 0-1)
C_N_Decarb	C/N ratio for analysis without carbonates	Percent_C_Decarb / Percent_N_Decarb
C_N	C/N ratio using analysis without carbonates for C and analysis with carbonates for N	Percent_C_Decarb / Percent_N_Carb

1140

Table 27: Format of the zooplankton stable isotope CSV data file, including variable names, descriptions, and units.

Fields Name	**Description**	**Modalities / Units**
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Survey Sequential record	"A1_N° of line"
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Latitude	Coordinates (latitude)	DD
Longitude	Coordinates (longitude)	DD
Bottom_Depth	Bottom Depth	m
Dist_Shore	Distance to Shore	m
Lower_Haul_Depth	Depth of lower Haul	m

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Upper_Haul_Depth	Depth of upper Haul	m
Id_Station	Survey_Station number	"A1_N° Station" – e.g., A1_03
Operation	Type of Operation	"BONGO"
Operation_Code	Survey_Operation_Station	E.g., "A1_BONGO_03b"
Size_Type	Type of the size fraction from sample	Abracos 1: A, B, C, D, E + occasionally subfractions (1/2, 2/2 or 4/5...) Abracos 2: A, B, C, D, E, F
Size_Fraction	Description of the size fraction	Abracos 1: A: 200-500µm / B: 500-1000µm / C: 1000-2000µm / D: >2000µm / E: <200µm Abracos 2: A: <100µm / B: 100-200µm / C: 200-500µm / D: 500-1000µm / E: 1000-2000µm / F: >2000µm
Num_analysis_Carb	N° of the isotope analysis with carbonates	5 digits
Identifier1_Carb	Identifier of sample for analysis with carbonates	E.g., Ab. Zoopk 3A Carbo.
Date_analysis_Carb	Date of analysis for the sample with carbonates	dd/MM/yyyy
Amount_mg_Carb	Amount of matter used for the analysis with carbonates	mg
d_15N_14N_Carb	Delta 15N/14N for analysis with carbonates	‰
d_13C_12C_Carb	Delta 13C/12C for analysis with carbonates	‰
Percent_N_Carb	Percentage N for analysis with carbonates	Ratio between 0-1 – e.g., 0.028 for 2.8%
Percent_C_Carb	Percentage C for analysis with carbonates	Ratio between 0-1 – e.g., 0.182 for 18.2%
C_N_Carb	C/N ratio for analysis with carbonates	Percent_C_Carb / Percent_N_Carb – e.g., 6.6
Num_analysis_Decarb	N° of the isotope analysis without carbonates	5 digits
Identifier1_Decarb	Identifier of sample for analysis without carbonates	E.g., Ab. Zoopk 3A Decarbo.
Date_analysis_Decarb	Date of analysis for the sample without carbonates	dd/MM/yyyy
Amount_mg_Decarb	Amount of matter used for the analysis without carbonates	mg
d_15N_14N_Decarb	Delta 15N/14N for analysis without carbonates	‰
d_13C_12C_Decarb	Delta 13C/12C for analysis without carbonates	‰
Percent_N_Decarb	Percentage N for analysis without carbonates	Ratio between 0-1 – e.g., 0.028 for 2.8%
Percent_C_Decarb	Percentage C for analysis without carbonates	Ratio between 0-1 – e.g., 0.182 for 18.2%
C_N_Decarb	C/N ratio for analysis without carbonates	Percent_C_Decarb / Percent_N_Decarb – e.g., 6.6
C_N	C/N ratio using analysis without carbonates for C and analysis with carbonates for N	Percent_C_Decarb / Percent_N_Carb – e.g., 6.6
Obs	Observations	

Table 28: Format of the demersal and deep-pelagic stable isotope CSV data file, including variable names, descriptions, and units.

Fields Name	**Description**	**Modalities / Units**
Id_Survey	Survey Identification	"Abracos_1"; "Abracos_2"
Id_Survey_Pos	Survey Sequential record	"A1_N° of line" "A2_N° of line"
Date_Full_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Latitude	Latitude	DD
Longitude	Longitude	DD

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Bottom_Depth	Bottom Depth from Logbook_Abracos	m
Dist_Shore	Distance to shore from Logbook Abracos	m
Id_Station	Survey_Station number	"A1_N° Station" – e.g., A1_03
Operation	Type of Operation	"BotTrawl";"MESO";"MICRO" "Line"
Operation_Code	Operation Identification	Survey_Operation_Station – e.g., "A1_MICRO_01"
Fishing_Depth_Upper	Upper limit of the fishing haul	m
Fishing_Depth_Lower	Lower limit of the fishing haul	m
Species	Taxonomic identification	Unique taxonomic identifier including sp, sp1, etc. – e.g., Acanthostracion polygonium, Abylopsis sp
Code_Species	Species code	First four letters of Genus and first four letters of Species except if ambiguous – e.g., Acan.poly, Abyl.sp
Compartment	Minimum taxonomic compartment	CRUS / ECHI / FISH / GELATINOUS / MACROALGAE / MOLL / SPONGES / NaN
AphiaID_Worms	Worms aphia ID	E.g., 1577312
Scientific_Name_Worms	Scientific name to search Worms	Similar to Species except sp, sp1, etc. – e.g., Acanthostracion polygonium, Abylopsis Can be used to check the taxonomy with Worms
Authority_Worms	Authority = Descriptor of the species	E.g., Poey, 1876; Chun, 1888
Kingdom	Kingdom	Animalia / Chromista / Plantae / NaN
Phylum	Phylum	E.g., Chordata
Class	Class	E.g., Teleostei
Order	Order	E.g., Tetraodontiformes
Family	Family	E.g., Ostracidae
Genus	Genus	E.g., Acanthostracion
rank	Identification level	Species / genus / family / …
Reg	Register of each individual of each species in the sample	1, 2, 3…
TL	Total Length	cm
FL	Fork Length	cm
SL	Standard Length	cm
ML	Mantle Length (used for cephalopods)	cm
CL	Carapace Length (used for crustaceans)	cm
DL	Disc Length (used for rays)	cm
TW	Total Weigth	g
TWest	Total Weight estimated (for individuals weighted in group)	g
EW	Eviscerated Weigth	g
Sex	Sex	"M" = Male; "F" = Female; "I" = Indetermined
Matur	Stage of gonadal maturation	"A" = Immature; "B" = Maturing; "C" = Mature; "D" = spawned or resting
GonW	Gonad Weigth	g
StomachW	Stomach Weight	g
Fullness	Fullness index (indicative of the species feeding intensity)	"1" = Empty stomach; "2" = Partially empty; "3" = Partially full; "4" = Full stomach. – only FISH
Iso_code	Number of the isotope sample	From 1 to 2303 for Abracos 1&2
Amount_mg	Amount of matter used for the analysis	mg
Ampl_28	Ampl_28	
Ampl_44	Ampl_44	
d_15N_14N	Delta 15N/14N	‰
d_13C_12C	Delta 13C/12C	‰
Percent_N	%N	%
Percent_C	%C	%

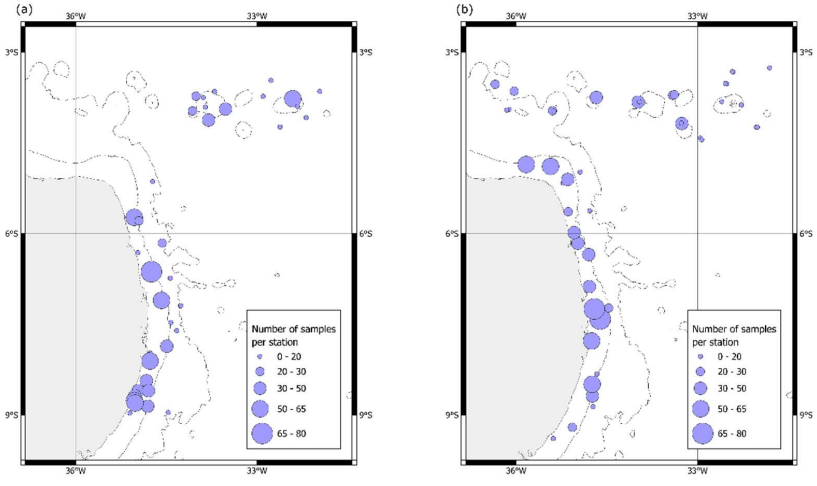
https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

C_N	C/N ratio	Percent_C/Percent_N
Obs	Comment	

1145

Table 29: Format of the taxonomic reference list CSV file associated with the demersal and deep-pelagic stable isotope dataset, including variable names, descriptions, and units.

Fields Name	**Description**	**Modalities / Units**
Species	Taxonomic identification	Unique taxonomic identifier including sp, sp1, etc. – e.g., Acanthostracion polygonium, Abylopsis sp
Code_Species	Species code	First four letters of Genus and first four letters of species names, except if ambiguous – e.g., Acan.poly, Abyl.sp
Compartment	Minimum taxonomic compartment	CRUS / ECHI / FISH / GELATINOUS / MACROALGAE / MOLL / SPONGES / NaN
AphiaID_Worms	Worms aphia ID	E.g., 1577312
Scientific_Name_Worms	Scientific name to search Worms	Similar to Species except sp, sp1, etc. – e.g., Acanthostracion polygonium, Abylopsis Can be used to check the taxonomy with Worms
Authority_Worms	Authority = Descriptor of the species	E.g., Poey, 1876; Chun, 1888
Kingdom	Kingdom	Animalia / Chromista / Plantae / NaN
Phylum	Phylum	E.g., Chordata
Class	Class	E.g., Teleostei
Order	Order	E.g., Tetraodontiformes
Family	Family	E.g., Ostracidae
Genus	Genus	E.g., Acanthostracion
rank	Identification level	Species / genus / family / ….



1150 Figure 13: Number of stable isotope samples per station from demersal and deep-pelagic organisms, for ABRACOS 1 (a) and ABRACOS 2 (b).

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

2.6.7 Contaminant data

Mercury

This dataset compiles total mercury concentration measurements performed on micronekton organisms collected during the ABRACOS 2 survey (Fig. 14).

Sample processing and data integration

Following collection, individual specimens were measured and prepared for mercury analysis. For each specimen, white muscle tissue was carefully excised and rinsed with distilled water to remove exogenous material such as scales, bones, or carapace fragments. For very small or gelatinous organisms, individuals of the same species were pooled when needed to obtain sufficient biomass for analysis. Samples were either oven-dried at 60 °C for 48 h or freeze-dried for 72 h, and then homogenised to a fine powder using a mortar and pestle. Total mercury concentrations were measured in approximately 50–100 mg of dried and homogenised tissue using thermal decomposition, gold amalgamation, and atomic absorption spectrophotometry with a DMA-80 analyser (Milestone, USA) at the Géosciences Environnement Toulouse laboratory (GET, Toulouse, France). Concentrations are reported on a dry weight basis in micrograms per gram (µg g^{-1} dw), equivalent to parts per million (ppm). The analytical detection limit was 0.005 µg g^{-1} dw. Analytical accuracy and precision were assessed using blanks and three certified reference materials: lobster hepatopancreas (TORT-3, certified THg: 0.29 ± 0.02 µg g^{-1} dw), mussel tissue (NIST-2976: 0.06 ± 0.01 µg g^{-1} dw), and freshwater sediment (PAC-2: 2.9 ± 0.3 µg g^{-1} dw). Recovery rates were consistent with certified values within their reported uncertainties.

Each record is associated with full taxonomic identification and, where available, station metadata. Taxonomic nomenclature follows the same WoRMS-based reference framework used throughout the dataset (see Section 2.3.5), with AphiaIDs assigned whenever available. All fields are described in Table 30.

Data volume

A total of 194 mercury analyses were performed on individual specimens during ABRACOS 2, covering 117 fishes, 41 crustaceans, 20 cephalopods, and 16 gelatinous organisms. The analysed specimens covered a broad body-size range, with mean taxon-level total lengths ranging from approximately 2 to 43 cm.

Data availability

Mercury concentration data are publicly available through SEANOE:

- https://doi.org/10.17882/118084 (Eduardo et al., 2026)

Table 30: Format of the mercury concentration CSV data file, including variable names, descriptions, and units.

Fields Name	Description	Modalities / Units
Id_Survey	Survey Identification	"Abracos_2"
Id_Survey_Pos	Survey Sequential record	"A2_N° of line" , NaN
Id_Station	Survey_Station number	"A2_N° Station" – e.g., A2_52
Operation	Type of Operation	MICRO"
Operation_Code	Operation Identification	Survey_Operation_Station – e.g., "A2_MICRO_52"
Latitude	Latitude	DD
Longitude	Longitude	DD
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
TimeStamp_mn	Number of seconds since 01/01/1970 00:00:00 UTC	s
Bottom_Depth	Bottom Depth from Logbook_Abracos	m
Dist_Shore	Distance to shore from Logbook Abracos	m
Kingdom	Kingdom	Animalia
Phylum	Phylum	E.g., Arthropoda
Class	Class	E.g., Malacostraca
Order	Order	E.g., Decapoda
Family	Family	E.g., Acanthephyridae
Genus	Genus	E.g., Acanthephyra

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Species	Species	E.g. Acanthephyra kingsleyi
Category	Layer of the water column	Deep-pelagic / Epipelagic
Compartment	Minimum taxonomic compartment	CRUST/ FISH / JELLY / CEPHA / MOLL
SL	Standard Length	mm
HG	Mercury concentration on a dry weight basis	ppm

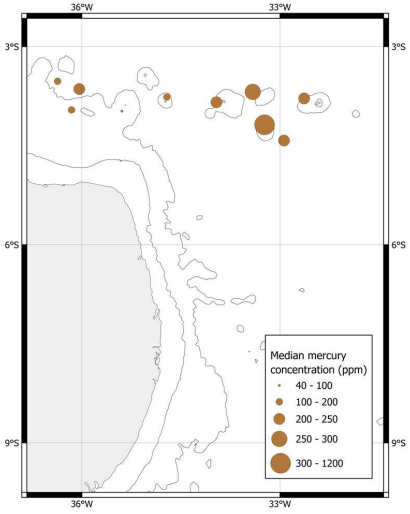


Figure 14. Median mercury concentration per station (ppm) during ABRACOS 2.

Microplastic

This dataset presents microplastic occurrence data from the digestive tracts of micronekton organisms collected during the ABRACOS 2 survey (Fig. 15). Specimens were obtained primarily from micronekton trawls, with the exception of three individuals collected during mesopelagic trawl operations.

Sample processing and data integration

Prior to microplastic analysis, morphometric measurements were recorded for each individual, including total length, standard length, jaw size, eye size, and lantern size, where applicable. All lengths are expressed in millimetres and weights in grams. Total wet weight and gastrointestinal tract wet weight were also recorded. Basic sampling metadata, including trawl start and end positions, trawl start and end times, sampling depth, temperature, dissolved oxygen, and salinity, are provided where available.

Because specific field-level precautions against airborne microplastic contamination were not implemented during the cruise, additional quality assurance and quality control (QA/QC) procedures were applied in the laboratory. These included the use of 100% cotton lab coats and disposable gloves in a dedicated, cleaned room with limited personnel flow throughout the analysis process. All solutions were filtered through 47 mm GF/F glass fibre filters (0.7 µm pore size, Whatman) using a vacuum pump system equipped with laboratory glassware. All procedures were conducted under a laminar flow cabinet to further reduce exposure to airborne contamination. Specimens were carefully rinsed with filtered distilled water to remove particles attached to external tissues. Gastrointestinal tracts, including the stomach and intestine, were removed and rinsed with filtered distilled water.

Prior to microplastic extraction, procedural blanks were conducted for each set of 5–10 samples. For each blank, a beaker was filled with 50 mL of sodium hydroxide (NaOH, 1 mol L^{-1}) solution, covered with a glass lid, and processed following the same protocol as the samples. Microplastics were extracted using alkaline digestion: each gastrointestinal tract was placed in a beaker and submerged in NaOH solution at a ratio of 1:100 (w/v), covered with a glass lid, and incubated at 60 °C for 24 h. Samples were homogenised during incubation and subsequently filtered through GF/F glass fibre filters (0.7 µm pore size) using a laboratory vacuum system. Filters containing digestion residues were placed in covered glass Petri dishes and oven-dried at 60 °C for 24 h.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Particles retained on the filters were visually inspected under a stereomicroscope (Zeiss Stemi 508) coupled to a camera system (Axiocam 105 Color, Zeiss). Suspected microplastic particles were counted, photographed, and measured along their longest axis using Zeiss ZEN software. The visual detection limit was 0.02 mm (20 µm). Particles up to 5 mm in size were classified as microplastics and categorised by shape (fibres, fragments, films, foams, and beads) and colour (black, blue, green, red, and white). Taxonomic nomenclature follows the same WoRMS-based reference framework used throughout the dataset (see Section 2.6.5), with AphiaIDs assigned whenever available. All variables are described in Table 31.

Data volume

The dataset includes 381 individuals, of which 268 contained at least one microplastic item and 113 showed no microplastic occurrence. A total of 661 microplastic items were recorded across all positive individuals.

Data availability

Microplastic occurrence data are publicly available through SEANOE:

- https://doi.org/10.17882/118089 (Ferreira et al., 2026)

Table 31: Format of the microplastic occurrence CSV data file, including variable names, descriptions, and units.

Fields Name	Description	Modalities / Units
Id_Survey	Survey Identification	"Abracos_2"
Id_Survey_Pos	Survey Sequential record	"A2_N° of line" , NaN
Id_Station	Survey_Station number	"A2_N° Station" – e.g., A2_52
Operation	Type of Operation	MICRO"
Operation_Code	Operation Identification	Survey_Operation_Station – e.g., "A2_MICRO_52"
Latitude	Latitude	DD
Longitude	Longitude	DD
Start_Latitude	Start trawl latitude	DD
Start_Longitude	Start trawl longitude	DD
End_Latitude	End trawl latitude	DD
End_Longitude	End trawl longitude	DD
Start_Date	Start date and time of the trawl	dd/MM/yyyy hh:mm; UTC
End_Date	End date and time of the trawl	dd/MM/yyyy hh:mm; UTC
DateFull_mn	Date and Time	dd/MM/yyyy hh:mm; UTC
Bottom_Depth	Bottom Depth from Logbook_Abracos	m
Dist_Shore	Distance to shore from Logbook Abracos	m
Strata	Layer in the water column	Epipelagic/Lower.Meso/Upper.Meso
Family	Family	E.g., Myctophidae
Species	Species	E.g., Bolinichthys distofax
Id_Individual	Identifier for each individual	integer
TL	Total length of the organism	mm
SL	Standard length of the organism	mm
Lantern	Size of the lantern organ	mm
Jaw	Size of the jaw	mm
Eye	Size of the eye	mm
TWG	Total wet weight of the organism	g
Git_WG	Wet weight of the gastrointestinal tract	g

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Open Access Earth System Science Data Discussions

MP_Occurence	Presence of microplastics in the organism	yes / no
MP_Shape	Shape of microplastic particle	E.g. fibre, fragment, foam, bead, ...
MP_Colour	Colour of the microplastic particle	E.g. white, blue, ...
MP_Size	Size of the microplastic particles	µm
Depth	Depth at which the sample was collected	m
Temp	Water temperature at sampling depth	°C
Oxy	Dissolved oxygen concentration	ml L^{-1}
Sal	Salinity of the water	PSU

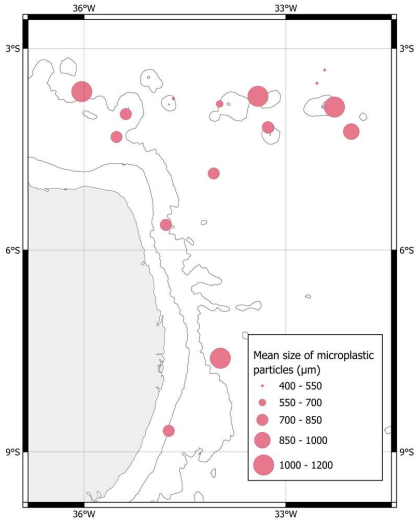


Figure 15: Mean microplastic size per station (µm) during ABRACOS 2.

Data synthesis and perspectives

The ABRACOS 1 and ABRACOS 2 datasets provide a vertically integrated description of the western tropical Atlantic ecosystem, encompassing coastal and continental shelf systems, the slope region, and the open ocean down to the deep pelagic zone. By combining physical, biogeochemical, and acoustic observations with biological sampling of planktonic, nektonic, and demersal communities, complemented by stable isotope and contaminant analyses, the dataset enables the joint analysis of biodiversity patterns, biomass distribution, trophic structure, and anthropogenic contamination across connected marine compartments. Conducted during two contrasting seasons, austral spring 2015 and austral autumn 2017, the surveys also provide a first window into seasonal variability in a region where repeated, multi-disciplinary observations remain scarce. Although each survey represents a synoptic snapshot rather than a continuous seasonal time series, independent assessments of the regional thermohaline structure and current dynamics indicate that conditions observed during ABRACOS 1 and ABRACOS 2 are representative of canonical spring and fall conditions, respectively, with no significant departure from typical interannual patterns for these periods (Assunção et al., 2020; Dossa et al., 2021). This supports the use of the dataset to investigate seasonal contrasts in ecosystem structure and functioning, despite the inherent limitations of a two-survey design. Over the past decade, these data have already underpinned more than 80 peer-reviewed publications spanning physical oceanography, plankton dynamics, trophic ecology, deep-pelagic biodiversity and taxonomy, functional ecology, anthropogenic contamination, fisheries, and ecosystem connectivity, demonstrating both the breadth and the scientific productivity of the programme.

A major strength of the ABRACOS programme lies in its explicit inclusion of the mesopelagic realm, sampled using dedicated trawl gears, multi-frequency acoustics, plankton nets, and isotopic analyses. The continuous multifrequency acoustic record, acquired day and night along the full survey track, provides spatially explicit descriptions of deep scattering layers and their diel vertical migrations, directly complemented by net and trawl sampling for taxonomic ground-truthing. This coordinated approach yields rare, multi-trophic documentation of mesopelagic communities in the western tropical Atlantic, supporting

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

investigations of vertical structuring, diel dynamics, and trophic linkages between epipelagic, mesopelagic, and deeper domains — questions of growing relevance in the context of the biological carbon pump and deep-ocean carbon sequestration. At the same time, extensive coverage of continental shelf and demersal systems ensures robust documentation of coastal–offshore gradients and benthic–pelagic coupling. Together, bottom trawl data, macroalgae and invertebrate records, morphometric measurements, and stable isotope signatures allow cross-system comparisons between demersal and pelagic compartments, and provide biodiversity baselines for a region still insufficiently represented in global marine databases. The inclusion of mercury concentrations and microplastic occurrence data for mesopelagic organisms further extends the scope of the dataset toward environmental contamination, enabling investigations of contaminant transfer across trophic levels and vertical gradients, a dimension rarely documented in open-ocean tropical ecosystems.

Through harmonised taxonomic validation against WoRMS and Eschmeyer's Catalog, standardised metadata, and systematic use of AphiaIDs, the ABRACOS dataset is fully interoperable with major open-access repositories including OBIS, GBIF, and EMODnet. This structure facilitates integration with complementary programmes in the tropical Atlantic and positions the dataset as a reference for regional ecosystem modelling efforts, including food-web models and contaminant transfer assessments.

Despite its breadth, the dataset has inherent limitations that users should consider. The two surveys provide only a snapshot of seasonal variability, and some methodological differences between campaigns — in taxonomic resolution, sample volumes, or size fractions — may affect direct cross-survey comparisons. Spatial coverage, while extensive, remains uneven between shelf and oceanic stations, and the deep-pelagic compartment below 1,000 m is only partially sampled. Contaminant analyses are furthermore restricted to ABRACOS 2 and to micronekton organisms, precluding direct temporal comparisons and limiting coverage of the full food web. These limitations point toward future directions, including repeated seasonal surveys, extension to greater depths, and expanded contaminant sampling across surveys and trophic levels.

Ultimately, the ABRACOS dataset constitutes a unique multi-parameter, multi-trophic, multi-compartment, and multi-contaminant baseline for the western tropical Atlantic, designed to support comparative analyses, ecosystem modelling, and synthesis efforts at regional to global scales. It is made freely available to encourage its use by the broad oceanographic community and to foster collaborative investigations of tropical marine ecosystem structure and functioning.

Acknowledgements and funding

We acknowledge the French Oceanographic Fleet for funding the ABRACOS surveys; GENAVIR officers and crew, Brazilian and French scientific teams of the R/V Antea for their contributions to the success of the operations. This work is a contribution of the IJL TAPIOCA (www. tapioca.ird.fr) and of the European Union's Horizon 2020 project TRIATLAS (Grant Agreement No. 817578). Claude AI (Sonnet 4.6) was used for final English Edition.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

References

Alory, G., Delcroix, T., Téchiné, P., Diverrès, D., Varillon, D., Cravatte, S., Gouriou, Y., Grelet, J., Jacquin, S., Kestenare, E., Maes, C., Morrow, R., Perrier, J., Reverdin, G., and Roubaud, F.: The French contribution to the voluntary observing ships network of sea surface salinity, Deep Sea Res. Part Oceanogr. Res. Pap., 105, 1–18, https://doi.org/10.1016/j.dsr.2015.08.005, 2015.

Aminot, A. and Kérouel, R.: Pasteurization as an alternative method for preservation of nitrate and nitrite in seawater samples, Mar. Chem., 61, 203–208, https://doi.org/10.1016/S0304-4203(98)00021-8, 1998.

Andrade, L. F., Alves-Júnior, F. A., Bertrand, A., and Senna, A. R.: A New Species of Cyphocaris Boeck, 1871 (Amphipoda: Lysianassoidea: Cyphocarididae): Found off the Rocas Atoll, Northeastern Brazil, Taxonomy, 1, 360–373, https://doi.org/10.3390/taxonomy1040027, 2021.

Angelini, R., Lima, M. A. L., Lira, A. S., Lucena-Frédou, F., Frédou, T., Bertrand, A., Giarrizzo, T., Steenbeek, J., Coll, M., and Keppeler, F. W.: The projected impacts of climate change and fishing pressure on a tropical marine food web, Mar. Environ. Res., 204, 106909, https://doi.org/10.1016/j.marenvres.2024.106909, 2025.

Aparecido, K. C., Frédou, T., Eduardo, L. N., Mincarone, M. M., Lima, R. S., Morais, M. F. D. S., and Mérigot, B.: Living in darkness: functional diversity of mesopelagic fishes in the western tropical Atlantic, Front. Mar. Sci., 10, 1117806, https://doi.org/10.3389/fmars.2023.1117806, 2023.

Ariza, A., Lebourges-Dhaussy, A., Nerini, D., Pauthenet, E., Roudaut, G., Assunção, R., Tosetto, E., and Bertrand, A.: Acoustic seascape partitioning through functional data analysis, J. Biogeogr., 50, 1546–1560, https://doi.org/10.1111/jbi.14534, 2023.

Assunção, R. V., Silva, A. C., Roy, A., Bourlès, B., Silva, C. H. S., Ternon, J.-F., Araujo, M., and Bertrand, A.: 3D characterisation of the thermohaline structure in the southwestern tropical Atlantic derived from functional data analysis of in situ profiles, Prog. Oceanogr., 187, 102399, https://doi.org/10.1016/j.pocean.2020.102399, 2020.

Auguet, Jean-Christophe, Carré, Claire, Costa Da Silva, Alex, Restrepo-Ortiz, Claudia Ximena, Simier, Monique, Ternon, Jean-François, and Bertrand, Arnaud: Data on marine microbiome diversity collected during the ABRACOS 1 expedition in the Tropical Western Atlantic Ocean along the Northeast Brazil continental shelf, slope and open ocean (1), https://doi.org/10.17882/109069, 2025.

Balech, E.: Los dinoflagelados del Atlántico sudoccidental, Ministerio de Agricultura, Pesca y Alimentación, Secretaría General Técnica, Madrid, 1988.

Barros, M. J. G. de, Eduardo, L. N., Bertrand, A., Lucena-Frédou, F., Frédou, T., Lira, A. S., and Ferreira, B. P.: Bottom trawling on a carbonate shelf: Do we get what we see?, Cont. Shelf Res., 213, 104314, https://doi.org/10.1016/j.csr.2020.104314, 2021.

Becker, S., Aoyama, M., Woodward, E. M. S., Bakker, K., Coverly, S., Mahaffey, C., and Tanhua, T.: GO-SHIP Repeat Hydrography Nutrient Manual: The Precise and Accurate Determination of Dissolved Inorganic Nutrients in Seawater, Using Continuous Flow Analysis Methods, Front. Mar. Sci., 7, 581790, https://doi.org/10.3389/fmars.2020.581790, 2020.

Bertrand, A.: ABRACOS cruise, Antea R/V, https://doi.org/10.17600/15005600, 2015.

Bertrand, A.: ABRACOS 2 cruise, Antea R/V, https://doi.org/10.17600/17004100, 2017.

Bertrand, A., Roudaut, G., Lebourges-Dhaussy, A., Vargas, G., and Roubaud, F.: ABRACOS 1 cruise. Acoustic data, https://doi.org/10.17882/77035, 2015.

Bertrand, A., Roudaut, G., Lebourges-Dhaussy, A., Vargas, G., and Grelet, J.: ABRACOS 2 cruise. Acoustic data, https://doi.org/10.17882/91135, 2017.

Bertrand, A., Costa Da Silva, Alex, Chaigneau, Alexis, Eldin, Gérard, Roubaut, Fabrice, Grelet, Jacques, Ternon, Jean-Francois, Roudaut, Gildas, Lebourges-Dhaussy, Anne, and Rousselot, Pierre: ABRACOS 1 cruise - Physical datasets, https://doi.org/10.17882/76696, 2024a.

Bertrand, A., Alory, G., Chaigneau, Alexis, Eldin, Gérard, Grelet, Jacques, Devesa, Jeremy, Bonnet, Delphine, Carre, Claire, Lira, Alex Souza, Garcia, Xiomara, Melo, Pedro, Nole, Leandro, Padovani, Beatrice, Roudaut, Gildas, Travassos, Paulo,

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Vargas, Gary, Souza Dos Santos, Arthur, and Rousselot, Pierre: ABRACOS 2 cruise - Physical datasets, https://doi.org/10.17882/76352, 2024b.

Blackwell, R., Harvey, R., Queste, B., and Fielding, S.: Aliased seabed detection in fisheries acoustic data, https://doi.org/10.48550/ARXIV.1904.10736, 2019.

Boltovskoy, D.: South Atlantic zooplankton, Backhuys, Leiden, 1999.

Bouillon, J.: Hydromedusae, in: South Atlantic zooplankton, 424–512, 1999.

Callahan, B. J., McMurdie, P. J., Rosen, M. J., Han, A. W., Johnson, A. J. A., and Holmes, S. P.: DADA2: High-resolution sample inference from Illumina amplicon data, Nat. Methods, 13, 581–583, https://doi.org/10.1038/nmeth.3869, 2016.

Carré, C. and Fabre, J.: A world phytoplanktonic organisms pictures database, https://doi.org/10.15148/C1CF4179-EF1B-4738-8FA7-AE053FDA4070, 2021.

Carré, C., Melo, Pedro Augusto Mendes De Castro, Cabanez, Léandro Ferreira, Cordeiro, Isis Amália, Jales, Marina Cavalcanti, Lacerda, Sírleis Rodrigues, Lira, Simone Maria De Albuquerque, Silva-Cunha, Maria Da Glória Gonçalves, Ternon, Jean-Francois, Simier, Monique, and Bertrand, Arnaud: Nano- and Microphytoplankton diversity data collected during the ABRACOS 1 and 2 surveys performed along the Northeast Brazil continental shelf, slope and open ocean, https://doi.org/10.17882/98867, 2024.

Chen, C.-T. and Millero, F. J.: Speed of sound in seawater at high pressures, J. Acoust. Soc. Am., 62, 1129–1135, https://doi.org/10.1121/1.381646, 1977.

Costa da Silva, A., Chaigneau, A., Dossa, A. N., Eldin, G., Araujo, M., and Bertrand, A.: Surface Circulation and Vertical Structure of Upper Ocean Variability Around Fernando de Noronha Archipelago and Rocas Atoll During Spring 2015 and Fall 2017, Front. Mar. Sci., 8, 598101, https://doi.org/10.3389/fmars.2021.598101, 2021.

Davis, N. M., Proctor, D. M., Holmes, S. P., Relman, D. A., and Callahan, B. J.: Simple statistical identification and removal of contaminant sequences in marker-gene and metagenomics data, Microbiome, 6, 226, https://doi.org/10.1186/s40168-018-0605-2, 2018.

De Robertis, A. and Higginbottom, I.: A post-processing technique to estimate the signal-to-noise ratio and remove echosounder background noise, ICES J. Mar. Sci., 64, 1282–1291, https://doi.org/10.1093/icesjms/fsm112, 2007.

Demer, D. A.; Berger, L.; Bernasconi, M.; Bethke, E.; Boswell, K.; Chu, D.; Domokos, R. Et Al.: Calibration of acoustic instruments, https://doi.org/10.17895/ICES.PUB.5494, 2015.

Dossa, A. N., Silva, A. C., Chaigneau, A., Eldin, G., Araujo, M., and Bertrand, A.: Near-surface western boundary circulation off Northeast Brazil, Prog. Oceanogr., 190, 102475, https://doi.org/10.1016/j.pocean.2020.102475, 2021.

Eduardo, L. N., Frédou, T., Lira, A. S., Ferreira, B. P., Bertrand, A., Ménard, F., and Frédou, F. L.: Identifying key habitat and spatial patterns of fish biodiversity in the tropical Brazilian continental shelf, Cont. Shelf Res., 166, 108–118, https://doi.org/10.1016/j.csr.2018.07.002, 2018.

Eduardo, L. N., Bertrand, A., Frédou, T., Lira, A. S., Lima, R. S., Ferreira, B. P., Menard, F., and Lucena-Frédou, F.: Biodiversity, ecology, fisheries, and use and trade of Tetraodontiformes fishes reveal their socio-ecological significance along the tropical Brazilian continental shelf, Aquat. Conserv. Mar. Freshw. Ecosyst., 30, 761–774, https://doi.org/10.1002/aqc.3278, 2020.

Eduardo, L. N., Bertrand, A., Lucena-Frédou, F., Villarins, B. T., Martins, J. R., Afonso, G. V. F., Pietsch, T. W., Frédou, T., Di Dario, F., and Mincarone, M. M.: Rich and underreported: First integrated assessment of the diversity of mesopelagic fishes in the Southwestern Tropical Atlantic, Front. Mar. Sci., 9, 937154, https://doi.org/10.3389/fmars.2022.937154, 2022.

Eduardo L. N., Coubard M., Laffont L., Lucena-Frédou F., Médieu A., Mincarone M. M., Point D., Santana J. L., Bertrand A.: Mercury concentration measurements performed on micronekton organisms collected during the ABRACOS 2 survey in the Tropical Western Atlantic (3°S–6°S), https://doi.org/10.17882/118084, 2026

Eduardo, L. N., Lucena-Frédou, F., Bertrand, S. L., Lira, A. S., Mincarone, M. M., Nunes, G. T., Frédou, T., Soares, A., Le Loc'h, F., Pelage, L., Schwamborn, R., Travassos, P., Martins, K., Albuquerque Lira, S. M., Figueiredo, G., Júnior, T. V., Ménard, F., and Bertrand, A.: From the light blue sky to the dark deep sea: Trophic and resource partitioning between

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

epipelagic and mesopelagic layers in a tropical oceanic ecosystem, Sci. Total Environ., 163098, https://doi.org/10.1016/j.scitotenv.2023.163098, 2023.

Eduardo, L. N., Mincarone, M. M., Sutton, T., and Bertrand, A.: Deep-Pelagic Fishes Are Anything But Similar: A Global Synthesis, Ecol. Lett., 27, e14510, https://doi.org/10.1111/ele.14510, 2024.

Eduardo, L. N., Mincarone, Michael Maia, Afonso, Gabriel Vinicius Felix, Cocentino Adilma De Lourdes, Montenegro, Frédou, Thierry, Garcia Diaz, Xiomara, Lima, Rayssa Siqueira, Lira, Alex Souza, Lucena-Frédou, Flávia, Martins, Júlia Rodrigues, Melo, Catarina, Pinheiro, Ulisses, Santana, Julianna De Lemos, Simier, Monique, Soares, Andrey, Souza Filho, Jesser Fidelis, Vaske-Jr., Teodoro, Villarins, Bárbara Teixeira, and Bertrand, Arnaud: Dataset of demersal and deep-pelagic macroalgae, invertebrates and fishes collected during the ABRACOS expeditions in the Tropical Western Atlantic (1), https://doi.org/10.17882/107231, 2025.

Eduardo, L. N., Médieu, A., Bertrand, A., Santana, J. L., Lucena-Frédou, F., Point, D., Ferreira, G. V. B., Lorrain, A., Justino, A. K. S., Le Loc'h, F., Munaron, J.-M., Laffont, L., and Mincarone, M. M.: Ocean productivity and trophic structure drive patterns of mercury accumulation in deep-pelagic fauna, Sci. Total Environ., 1022, 181583, https://doi.org/10.1016/j.scitotenv.2026.181583, 2026.

Farias, G. B., Ternon, J.-F., Hillion, S., Melo, P. A. M. D. C., Carré, C., Molinero, J.-C., Baurand, F., Grelet, J., Chaigneau, A., Costa Da Silva, A., Devasa, J., Roubaud, F., and Bertrand, A.: Nutrient data collected during the ABRACOS 1 and 2 surveys performed along the northeast Brazilian continental shelf, slope and open ocean, https://doi.org/10.17882/95172, 2015a.

Farias, G. B., Ternon, J.-F., Hillion, S., Melo, P. A. M. D. C., Carré, C., Molinero, J.-C., Baurand, F., Grelet, J., Chaigneau, A., Costa Da Silva, A., Devasa, J., Roubaud, F., and Bertrand, A.: Phytoplankton pigment data collected during the ABRACOS 1 and 2 surveys performed along the northeast Brazilian continental shelf, slope and open ocean, https://doi.org/10.17882/95171, 2015b.

Farias, G. B., Ternon, J.-F., Hillion, S., Melo, P. A. M. D. C., Carré, C., Molinero, J.-C., Baurand, F., Grelet, J., Chaigneau, A., Costa Da Silva, A., Devasa, J., Béc, B., Roubaud, F., and Bertrand, A.: Picoplankton and nanophytoplankton cytometry data collected during the ABRACOS 2 survey performed along the northeast Brazilian continental shelf, slope and open ocean, https://doi.org/10.17882/95241, 2017.

Farias, G. B., Molinero, J.-C., Carré, C., Bertrand, A., Bec, B., and Melo, P. A. M. de C.: Uncoupled changes in phytoplankton biomass and size structure in the western tropical Atlantic, J. Mar. Syst., 227, 103696, https://doi.org/10.1016/j.jmarsys.2021.103696, 2022.

Ferreira G., Justino A., Catunda A., Coubard M., Frédou T., Lucena-Frédou F., Mincarone M. M., Bertrand A.: Microplastics analysis performed on micronekton organisms collected during the ABRACOS 2 survey in the Tropical Western Atlantic (3°S–9°S), https://doi.org/10.17882/118089, 2026

Ferreira, G. V. B., Justino, A. K. S., Eduardo, L. N., Schmidt, N., Martins, J. R., Ménard, F., Fauvelle, V., Mincarone, M. M., and Lucena-Frédou, F.: Influencing factors for microplastic intake in abundant deep-sea lanternfishes (Myctophidae), Sci. Total Environ., 867, 161478, https://doi.org/10.1016/j.scitotenv.2023.161478, 2023.

Figueiredo, G. G. A. A., Eduardo, Leandro Nole, Frédou, Thierry, Gonzalez, Júlio Guazzelli, Le Loc'h, François, Lira, Alex Souza, Lucena-Frédou, Flávia, Martins, Júlia Rodrigues, Melo, Catarina, Mincarone, Michael Maia, Munaron, Jean-Marie, Pelage, Latifa, Santana, Julianna De Lemos, Schwamborn, Ralf, Simier, Monique, Soares, Andrey, Souza Filho, Jesser Fidelis, Villarins, Bárbara Teixeira, and Bertrand, Arnaud: Isotopic analyses realized on samples of Particular Organic Matter, Zooplankton, and demersal and deep-pelagic invertebrates and fishes collected during the ABRACOS expeditions in the Tropical Western Atlantic (1), https://doi.org/10.17882/108735, 2025a.

Figueiredo, G. G. A. A. D., Lira, S. M. D. A., Bertrand, A., Neumann-Leitão, S., and Schwamborn, R.: Zooplankton abundance and biovolume size-spectra in the western tropical Atlantic - From the shelf towards complex oceanic current systems, Mar. Environ. Res., 204, 106906, https://doi.org/10.1016/j.marenvres.2024.106906, 2025b.

Figueiredo, G. G. A. A. de, Schwamborn, R., Bertrand, A., Munaron, J.-M., and Le Loc'h, F.: Body size and stable isotope composition of zooplankton in the western tropical Atlantic, J. Mar. Syst., 212, 103449, https://doi.org/10.1016/j.jmarsys.2020.103449, 2020.

Fock, H. O., Andresen, H., Bertrand, A., Farias, G. B., Carré, C., Couret, M., Díaz-Pérez, J., Dudeck, T., Dugenne, M., Duncan, S., Figueiredo, G. G. A. A., Frédou, T., Lucena-Frédou, F., Díaz, X. F. G., Yemane, D., González-García, C., Kiko, R., Landeira, J. M., Lira, S. M. A., Lüskow, F., Marañón, E., De Castro Melo, P. A. M., Neumann-Leitao, S., Eduardo, L. N.,

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Stemmann, L., and Schwamborn, R.: Synthetic pelagic biomass size spectra of the tropical and subtropical Atlantic, Ecosphere, 17, e70608, https://doi.org/10.1002/ecs2.70608, 2026.

Fofonoff, N. P. and Millard, R. C.: Algorithms for computation of fundamental properties of seawater, UNESCO, Paris, 1983.

Foote, K. G.: Fish target strength for use in echo integrator surveys, J Acoust Soc Am, 82, 981–987, 1987.

Fukuda, R., Ogawa, H., Nagata, T., and Koike, I.: Direct Determination of Carbon and Nitrogen Contents of Natural Bacterial Assemblages in Marine Environments, Appl. Environ. Microbiol., 64, 3352–3358, https://doi.org/10.1128/AEM.64.9.3352-3358.1998, 1998.

Gaillard, F., Diverres, D., Jacquin, S., Gouriou, Y., Grelet, J., Le Menn, M., Tassel, J., and Reverdin, G.: Sea surface temperature and salinity from French research vessels, 2001–2013, Sci. Data, 2, 150054, https://doi.org/10.1038/sdata.2015.54, 2015.

Giachini Tosetto, E., Nogueira Junior, M., Neumann-Leitão, S., Costa Da Silva, A., and Bertrand, A.: Abundance data of planktonic cnidarians collected during the ABRACOS 1 and 2 surveys performed along the northeast Brazilian continental shelf, slope and open ocean, https://doi.org/10.17882/92011, 2022.

Gómez, F., Claustre, H., and Souissi, S.: Rarely reported dinoflagellates of the genera Ceratium, Gloeodinium, Histioneis, Oxytoxum and Prorocentrum (Dinophyceae) from the open southeast Pacific Ocean, Rev. Biol. Mar. Oceanogr., 43, https://doi.org/10.4067/S0718-19572008000100004, 2008.

Gorsky, G., Ohman, M. D., Picheral, M., Gasparini, S., Stemmann, L., Romagnan, J.-B., Cawood, A., Pesant, S., Garcia-Comas, C., and Prejger, F.: Digital zooplankton image analysis using the ZooScan integrated system, J. Plankton Res., 32, 285–303, https://doi.org/10.1093/plankt/fbp124, 2010.

Grosjean, P., Picheral, M., Warembourg, C., and Gorsky, G.: Enumeration, measurement, and identification of net zooplankton samples using the ZOOSCAN digital imaging system, ICES J. Mar. Sci., 61, 518–525, https://doi.org/10.1016/j.icesjms.2004.03.012, 2004.

Harrison, P. J., Zingone, A., Mickelson, M. J., Lehtinen, S., Ramaiah, N., Kraberg, A. C., Sun, J., McQuatters-Gollop, A., and Jakobsen, H. H.: Cell volumes of marine phytoplankton from globally distributed coastal data sets, Estuar. Coast. Shelf Sci., 162, 130–142, https://doi.org/10.1016/j.ecss.2015.05.026, 2015.

Hillebrand, H., Dürselen, C., Kirschtel, D., Pollingher, U., and Zohary, T.: BIOVOLUME CALCULATION FOR PELAGIC AND BENTHIC MICROALGAE, J. Phycol., 35, 403–424, https://doi.org/10.1046/j.1529-8817.1999.3520403.x, 1999.

Hooker, S. B., Claustre, H., Ras, J., Van Heukelem, L., Berthon, J.-F., Targa, C., van der Linde, D., Barlow, R., and Sessions, H.: The First SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-1), NASA Goddard Space Flight Center, Greenbelt, Maryland, 2000.

Hoppenrath, M.: Marine Phytoplankton: Selected microphytoplankton species from the North Sea around Helgoland and Sylt, Schweizerbart Textbooks, Stuttgart, 1 pp., 2020.

Hosia, A. and Båmstedt, U.: Seasonal changes in the gelatinous zooplankton community and hydromedusa abundances in Korsfjord and Fanafjord, western Norway, Mar. Ecol. Prog. Ser., 351, 113–127, https://doi.org/10.3354/meps07148, 2007.

ICES: SISP 4 - A metadata convention for processed acoustic data from active acoustic systems, https://doi.org/10.17895/ICES.PUB.7434, 2016.

Justino, A. K. S., Ferreira, G. V. B., Schmidt, N., Eduardo, L. N., Fauvelle, V., Lenoble, V., Sempéré, R., Panagiotopoulos, C., Mincarone, M. M., Frédou, T., and Lucena-Frédou, F.: The role of mesopelagic fishes as microplastics vectors across the deep-sea layers from the Southwestern Tropical Atlantic, Environ. Pollut., 300, 118988, https://doi.org/10.1016/j.envpol.2022.118988, 2022.

Licea, S.: Dinoflageladas del Golfo de California, 1. ed., Universidad Autónoma de Baja California Sur ; SEP : FOMES : PROMARCO, La Paz], [Mexico?, 1995.

Marcello, F., Wainer, I., De Mahiques, M. M., and Bícego, M. C.: Forced changes in Atlantic overturning are distinctly fingerprinted by South Atlantic western boundary transports, Commun. Earth Environ., 7, 184, https://doi.org/10.1038/s43247-026-03282-9, 2026.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Marie, D., Partensky, F., Jacquet, S., and Vaulot, D.: Enumeration and Cell Cycle Analysis of Natural Populations of Marine Picoplankton by Flow Cytometry Using the Nucleic Acid Stain SYBR Green I, Appl. Environ. Microbiol., 63, 186–193, https://doi.org/10.1128/aem.63.1.186-193.1997, 1997.

McMurdie, P. J. and Holmes, S.: phyloseq: An R Package for Reproducible Interactive Analysis and Graphics of Microbiome Census Data, PLoS ONE, 8, e61217, https://doi.org/10.1371/journal.pone.0061217, 2013.

Melo P. A. M. C., Carré C., Lira S. M. A., Figueiredo G. G. A. A., Diaz X. F. G., Guedes P. F. L., Lins-Silva N., Marcolin C. R., de Melo junior M., Neumann-Leitao S., Oliveira M., Schwamborn R., Simier M., Tosetto E. G., Bertrand A.: Abundance and biovolume of Zooplankton collected during the ABRACOS expeditions in the Tropical Western Atlantic, https://doi.org/10.17882/109464, 2026.

Menden-Deuer, S. and Lessard, . J.: Carbon to volume relationships for dinoflagellates, diatoms, and other protist plankton, Limnol. Oceanogr., 45, 569–579, 2000.

Mincarone, M. M., Martins, J. R., Di Dario, F., Eduardo, L. N., Frédou, T., Lucena-Frédou, F., and Bertrand, A.: Deep-sea smelts, pencil smelts, and barreleyes (Teleostei: Argentiniformes) from oceanic islands and seamounts off northeastern Brazil, Mar. Biol. Res., 16, 762–773, https://doi.org/10.1080/17451000.2021.1891806, 2020.

Newell, G. E. and Newell, R. C.: Marine plankton: a practical guide, [facsimile d. 5. ed.], reprint., Pisces Conservation Ltd, Lymington, 223 pp., 1977.

Parada, A. E., Needham, D. M., and Fuhrman, J. A.: Every base matters: assessing small subunit rRNA primers for marine microbiomes with mock communities, time series and global field samples, Environ. Microbiol., 18, 1403–1414, https://doi.org/10.1111/1462-2920.13023, 2016.

Pelage, L., Lucena-Frédou, F., Eduardo, L. N., Le Loc'h, F., Bertrand, A., Lira, A. S., and Frédou, T.: Competing with each other: Fish isotopic niche in two resource availability contexts, Front. Mar. Sci., 9, 975091, https://doi.org/10.3389/fmars.2022.975091, 2022.

Pelegrí, S., Dolan, J., and Rassoulzadegan, F.: Use of high temperature catalytic oxidation (HTCO) to measure carbon content of microorganisms, Aquat. Microb. Ecol., 16, 273–280, https://doi.org/10.3354/ame016273, 1999.

Perrot, Y., Brehmer, P., Habasque, J., Roudaut, G., Behagle, N., Sarré, A., and Lebourges-Dhaussy, A.: Matecho: An Open-Source Tool for Processing Fisheries Acoustics Data, Acoust. Aust., https://doi.org/10.1007/s40857-018-0135-x, 2018.

Pollard, R. and Read, J.: A Method for Calibrating Shipmounted Acoustic Doppler Profilers and the Limitations of Gyro Compasses, J. Atmospheric Ocean. Technol., 6, 859–865, https://doi.org/10.1175/1520-0426(1989)006%3C0859:AMFCSA%3E2.0.CO;2, 1989.

Pugh, P. R.: The diel migrations and distributions within a mesopelagic community in the North East Atlantic. 7. Siphonophores, Prog. Oceanogr., 13, 461–489, https://doi.org/10.1016/0079-6611(84)90016-8, 1984.

Reis-Júnior, J., Bertrand, A., Frédou, T., Vasconcelos-Filho, J., Aparecido, K. C., and Duarte-Neto, P. J.: Community-scale relationships between body shape and trophic ecology in tropical demersal marine fish of northeast Brazil, J. Fish Biol., 102, 1017–1028, https://doi.org/10.1111/jfb.15350, 2023.

Rodrigues, T. G. A., Alves-Júnior, F. A., and Cardoso, I. A.: A new species of Pasiphaea Savigny, 1816 (Crustacea, Decapoda, Pasiphaeidae) from the southwestern Atlantic, Zootaxa, 4418, https://doi.org/10.11646/zootaxa.4418.5.6, 2018.

Ryan, T. E., Downie, R. A., Kloser, R. J., and Keith, G.: Reducing bias due to noise and attenuation in open-ocean echo integration data, ICES J. Mar. Sci., 72, 2482–2493, https://doi.org/10.1093/icesjms/fsv121, 2015.

Salter, S. J., Cox, M. J., Turek, E. M., Calus, S. T., Cookson, W. O., Moffatt, M. F., Turner, P., Parkhill, J., Loman, N. J., and Walker, A. W.: Reagent and laboratory contamination can critically impact sequence-based microbiome analyses, BMC Biol., 12, 87, https://doi.org/10.1186/s12915-014-0087-z, 2014.

Santana, J. L., Eduardo, L. N., Souza-Filho, J. F., Aragão, C. E., Andrade, R. M., Figueiredo, G. G. A. A., Le Loc'h, F., and Bertrand, A.: Vertical migration, trophic structure, and ecological strategies of deep-pelagic crustaceans across contrasting systems in the western tropical Atlantic, Deep Sea Res. Part Oceanogr. Res. Pap., 229, 104680, https://doi.org/10.1016/j.dsr.2026.104680, 2026.

https://doi.org/10.5194/essd-2026-512
Preprint. Discussion started: 9 September 2026

Sun, J. and Liu, D.: Geometric models for calculating cell biovolume and surface area for phytoplankton, J. Plankton Res., 25, 1331–1346, https://doi.org/10.1093/plankt/fbg096, 2003.

Taylor, F. J. R.: Dinoflagellates from the International Indian Ocean Expedition: a report on material collected by the R.V. "Anton Bruun" 1963-1964, E. Schweizerbart, Stuttgart, 1976.

Tomas, C. R.: Identifying Marine Phytoplankton, Elsevier, https://doi.org/10.1016/B978-0-12-693018-4.X5000-9, 1997.

Tosetto, E., Neumann-Leitão, S., and Bertrand, A.: Abundance data of large microzooplankton collected during the ABRACOS 1 and 2 surveys performed along the northeast Brazilian continental shelf, slope and open ocean, https://doi.org/10.17882/98869, 2024a.

Tosetto, E. G., Neumann-Leitão, S., Farias, G. B., De Castro Melo, P. A. M., De Figueiredo Porto Neto, F., Carré, C., and Bertrand, A.: Potential bottom-up and top-down control of large microzooplankton in response to contrasting productive scenarios in the tropical southwestern Atlantic, J. Mar. Syst., 246, 104010, https://doi.org/10.1016/j.jmarsys.2024.104010, 2024b.

Utermöhl, H.: Zur Vervollkommnung der quantitativen Phytoplankton-Methodik: Mit 1 Tabelle und 15 abbildungen im Text und auf 1 Tafel, SIL Commun. 1953-1996, 9, 1–38, https://doi.org/10.1080/05384680.1958.11904091, 1958.

Villarins, B. T., Fischer, L. G., Prokofiev, A. M., and Mincarone, M. M.: Four new species of dragonfish genus *Eustomias* (Stomiiformes: Stomiidae: Melanostomiinae) from the western tropical Atlantic, with remarks on *Eustomias minimus* Clarke, 1999, Zool. J. Linn. Soc., 202, zlad163, https://doi.org/10.1093/zoolinnean/zlad163, 2024.

Zubkov, M. V., Sleigh, M. A., Burkill, P. H., and Leakey, R. J. G.: Picoplankton community structure on the Atlantic Meridional Transect: a comparison between seasons, Prog. Oceanogr., 45, 369–386, https://doi.org/10.1016/S0079-6611(00)00008-2, 2000.