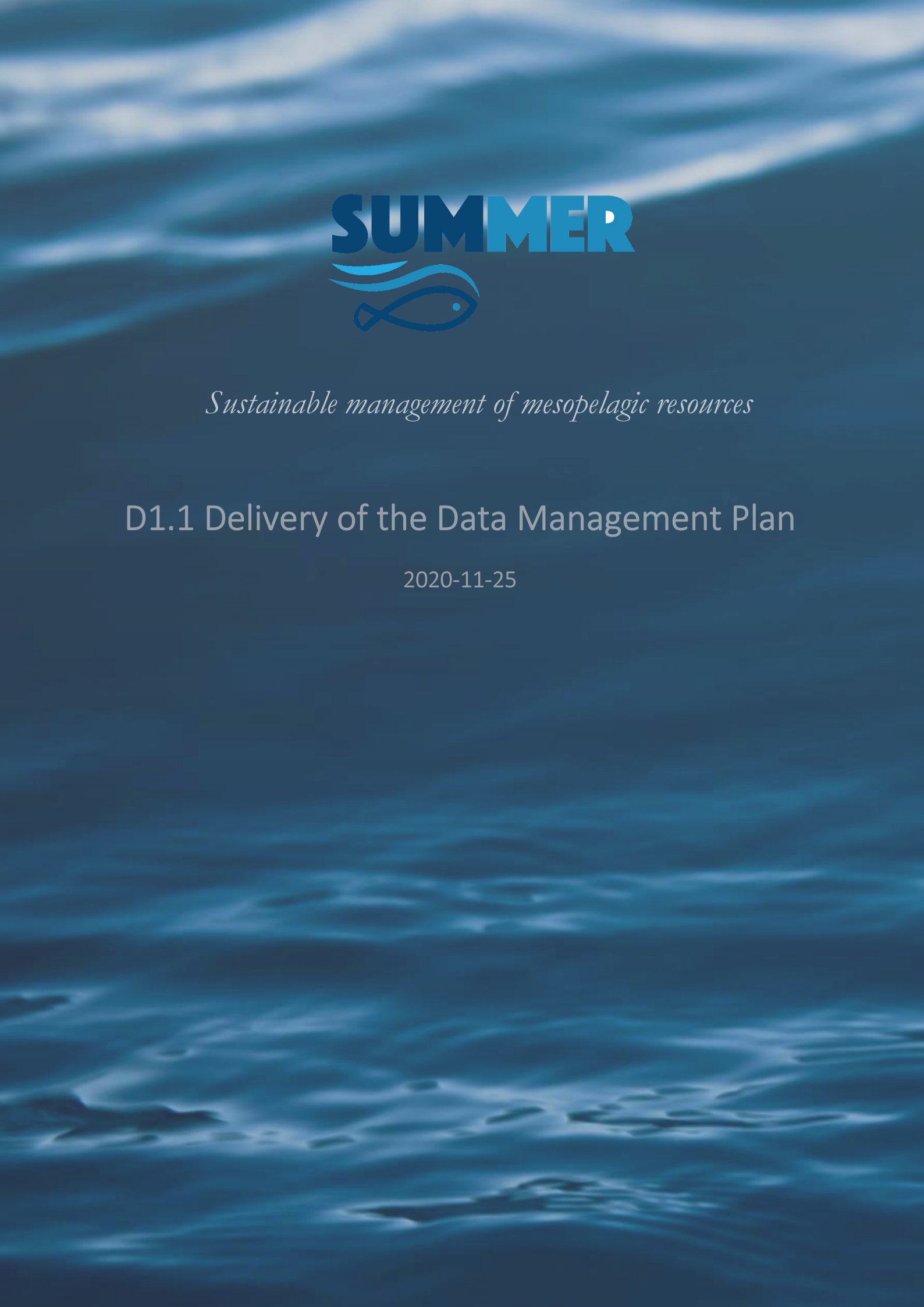

Sustainable management of mesopelagic resources

D1.1 Delivery of the Data Management Plan

2020-11-25

	Grant agreement No: 817806 Project duration: 48 months Start date: 01.09.2019 End date: 31.08.2023 Project coordinator: Xabier Irigoien, AZTI Web site: https://summerh2020.eu/

Deliverable ID: D1.1 – V.1.2	Due month: NA	Preparation date: 2020-11-25

Title:
Delivery of the Data Management Plan

Lead beneficiary:
University of Bremen, PANGAEA

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This project has received funding from the European Union´s Horizon 2020 Framework Programme for Research and Innovation under grant agreement no. 817806

Abstract
The SUMMER project will explore recent findings that suggest that the global ocean's mesopelagic zone contains 90 % of the planet's fish biomass. Even if this is correct by only a fraction of this value, the exploitation potential in fishmeal production, nutraceuticals and pharmaceuticals is enormous. However, as the role of mesopelagic fish in pelagic ecosystems is not well understood, it is necessary to first establish methods to accurately estimate their biomass, taxonomic/functional diversity, contribution to the global carbon cycle and potential as a sustainable fishery. Using state-of-the-art tools (e.g. eDNA, acoustics and gut analysis), SUMMER will also investigate environmental repercussions of such exploitation, and quantify the impact of commercial extraction on pelagic ecosystems. The Data Management Plan (DMP) summarizes the data that will be collected and generated during the project and lays out how, where and under which conditions the data will be disseminated. Preparing and updating the DMP is a requirement of the Open Research Data Pilot in which SUMMER participates. WP1 – Open Science ensures that the data are shared according to the FAIR (Findable, Accessible, Interoperable and Reusable) principles. This update defines persons responsible for cruise summary reports as well as embargo periods for data publication in open access. Expected data generated from each work package was updated due to COVID-19 issues where necessary.

Dissemination level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission services)	
CI	Classified information as referred to in Commission Decision 2001/844/EC	
Deliverable type		
R	Document, report	X
DEM	Demonstrator, pilot, prototype	
DEC	Web sites, patent fillings, videos, etc.	
OTHER	Software, technical diagram, etc.	

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Version history

Version number	Date	Description of changes
Version 1.0	2019-12-12	First draft
Version 1.1	2020-02-25	WP-leaders inputs added
Version 1.2	2020-11-25	Update due to COVID-19

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SUMMER H2020 consortium

SUMMER H2020 (817806) is an Innovation Action within Horizon 2020, the European Union's framework programme for research and innovation, H2020-BG-2018-2, Topic *Sustainable harvesting of marine biological resources,* LC-BG-03-2018, and is carried out by 22 partner organizations (Table 1).

Table 1: Information about the consortium members

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imar	**Instituto Do Mar (IMAR)** Rua Prof Dr Frederico Machado 4 Departman Horta, 9900 138 PORTUGAL	Mónica Silva monica.silva.imar@gmail.com +351 292200400
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GEOMAR Helmholtz Centre for Ocean Research Kiel	**Helmholtz Centre for Ocean Research Kiel (GEOMAR)** Am Kiel-Kanal 44 24106 Kiel GERMANY www.geomar.de	Deniz Tasdemir dtasdemir@geomar.de +494316004430
UiO : University of Oslo	**University of Oslo (UIO)** Problemveien 5-7 0313 Oslo NORWAY	Stein Kaartvedt stein.kaartvedt@ibv.uio.no +47 22854739

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1. SUMMER H2020 motivation and background

Recent studies estimate that the biomass of mesopelagic fish is 10,000 million tonnes, which has raised interest in the harvest and exploitation of fish in the mesopelagic zone as a new resource for fishmeal, pharmaceuticals and nutraceuticals. The objective of SUMMER H2020 is to establish a protocol to estimate mesopelagic fish biomass, quantify the ecosystem services provided by the mesopelagic community (food for aquaculture, for humans, for other wild fish, climate regulation and potential for bioactive compounds) and develop a decision-making support tool to quantitatively balance the trade-offs between the different services for any given exploitation scenario (Figure 1).

SUMMER will develop methods for accurate estimation of mesopelagic diversity and biomass. This will focus on determining the best combination of methods (including submersible broad-band acoustics), environmental DNA (eDNA) and scientific trawls. Furthermore, SUMMER will evaluate the role of mesopelagic species in the vertically integrated food web, its "services" as food for commercial fish species (e.g. tuna), deep sea species and emblematic species (e.g. cetaceans) and model the effects of different fishing scenarios on trophic stability. SUMMER also includes a climate perspective as it will determine the contribution of mesopelagic organisms to sequestration of atmospheric carbon dioxide via active vertical migration (the biological carbon pump). This will be done by estimating the carbon sequestration due to active migration relative to the gravitational flux and by modelling the effects of different fishing scenarios.

In terms of exploitation, SUMMER will explore the potential use of the mesopelagic by fishmeal and processed human food industries, and mesopelagic organisms as a source of bioactive compounds for pharmaceuticals and nutraceuticals.

SUMMER will develop a decision support tool to evaluate the trade-offs between different ecosystem services. It will provide a holistic assessment of the services provided by the mesopelagic ecosystem and seeks to establish trade-offs and tipping points between different services under different fish harvesting scenarios.

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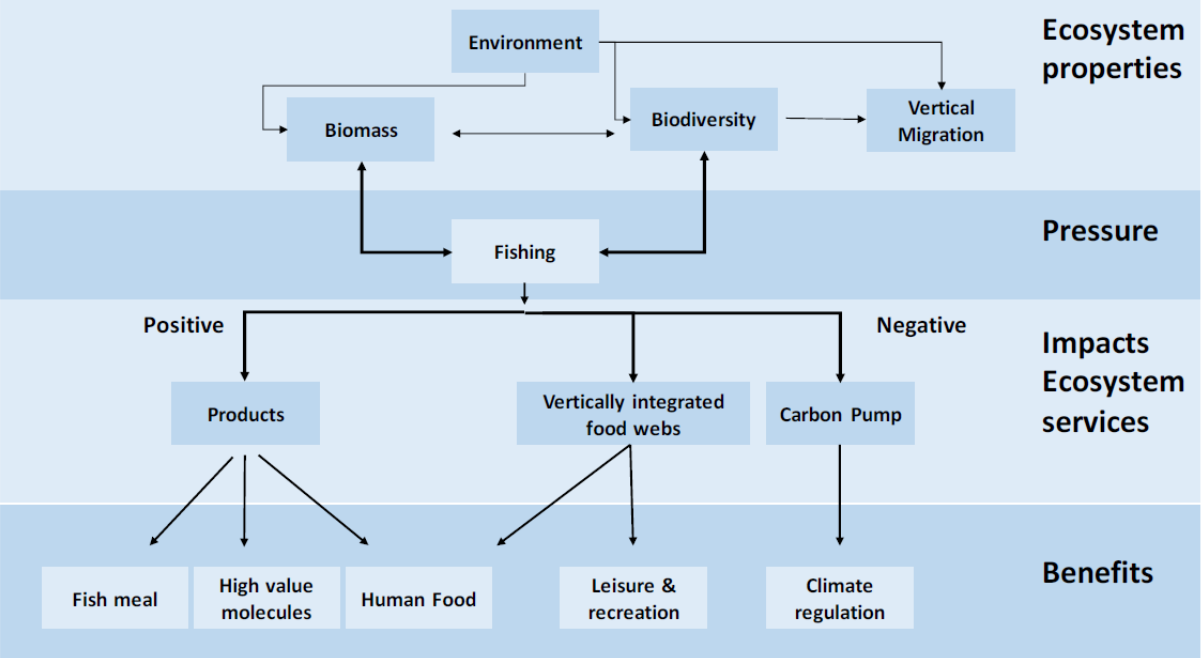

Figure 1: Schematic representation of the ecosystem properties, pressures, ecosystem services and benefits considered in SUMMER

1.1 Role of deliverable

The purpose of the Data Management Plan (DMP) is to provide an analysis of the expected data resources and a roadmap for the management of data collected and/or generated by the SUMMER project. The DMP is not a fixed document, but evolves during the lifespan of the project.

This DMP was partially produced using DMPonline.

1.2 Contributors to this deliverable

The following partners have contributed to this deliverable:

- UBREMEN
- USTAN
- GEOMAR
- AZTI
- NOC
- IMAR

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2. Data management obligations in accordance with the SUMMER grant agreement

The obligations of SUMMER partners to disseminate research data, and the conditions under which research data produced by the project SUMMER must be made available for third parties to access, mine, exploit, reproduce and disseminate, are ratified in the SUMMER Grant Agreement (817806) under Article 29.3:

Article 29.3 of the SUMMER grant agreement:

29.3 Open access to research data
*Regarding the digital research data generated in the action ('**data**'), the beneficiaries must:*
(a) *deposit in a research data repository and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate — free of charge for any user — the following:*

(i) the data, including associated metadata, needed to validate the results presented in scientific publications, as soon as possible;
(ii) not applicable;
(iii) other data, including associated metadata, as specified and within the deadlines laid down in the 'data management plan' (see Annex 1);

(b) *provide information — via the repository — about tools and instruments at the disposal of the beneficiaries and necessary for validating the results (and — where possible — provide the tools and instruments themselves).*

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

As an exception, the beneficiaries do not have to ensure open access to specific parts of their research data under Point (a)(i) and (iii), if the achievement of the action's main objective (as described in Annex 1) would be jeopardised by making those specific parts of the research data openly accessible. In this case, the data management plan must contain the reasons for not giving access.

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3. Data summary

Data collected during SUMMER will be used to 1.) estimate biomass and taxonomic and functional biodiversity of the mesopelagic community, 2.) quantify vertical migration and its influence on integrated trophic networks and its role as an ecosystem service i.e. its contribution to downward transport of carbon, and 3.) assess the potential for exploitation of high value products extracted from the mesopelagic zone. Relevant historical data will also be collated from open data resources and, along with data collected during the project, used to parameterise ecological models that generate predictions of mesopelagic production and quantify potential for exploitation.

3.1 Primary methods used for data collection in SUMMER

Data collection conducted during the SUMMER project will primarily consist of using *in situ* optics, acoustics and trawls combined with water samples (e.g. for eDNA-analysis). This also includes data generated from gut content analysis, molecular markers and stable isotope analysis, which will be used to study the vertically integrated trophic networks of commercially important and charismatic species. Data will be collected through a series of research cruises organized by national research fleets.

3.2 Research cruises contributing data to SUMMER – Cruise reports

Table 2 (last updated on 28.10.2020) provides information on planned SUMMER research cruises that will contribute data to SUMMER. More cruises will be added continuously. An updated list of research cruises is available to SUMMER partners in the SUMMER-SharePoint. For each cruise, the leading Principal Investigator for SUMMER (listed in Table 2) is responsible for submitting a cruise summary report to PANGAEA providing metadata about the cruise. These metadata shall include an overview of geo-referenced tracks and deployments as well as the corresponding data and samples collected. Cruise reports are expected within 3 months after the cruise has ended. Several cruises will be opportunistic, hence the data from them is not a deliverable for SUMMER.

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Table 2: Cruise list for project SUMMER per 28.10.2020

Year	Mo.	Vessel	Cruise report responsible	Objective	Acoustic data	Fish biomass data	Plankton & POM data	eDNA	ENVR-data (CTD)
2021	June	N/O Thalassa / dedicated	Anik Brindamour / Verena Trenkel	Abundance estimation/ trophic ecology/ diversity	yes	yes	yes	yes	yes
2020	Sep-Oct	Sarmiento de Gamboa / dedicated	M. Pilar Olivar	Abundance estimation/ trophic ecology/ diversity*	yes	yes	yes	yes	yes
2021	June	Mar de Portugal /. dedicated/ TBC	Mónica Silva	SUMMER	yes	yes	yes	yes	yes
2019-2021	May	E.Bardán & V.de Eza / opportunist.	María Santos	Abundance estimation/ ecosyst.	yes	yes	yes	yes	yes
2019-2021	Sep	E.Bardán & A.Alvariño / opportunist.	María Santos	Abundance estimation/ ecosyst.	yes	yes	yes	yes	yes
2021	TBD	Polarstern / opportunist.	Martina Blümel	Monitoring cruise each two years	yes	?	?	?	yes
2020-2021	July	Arni Fridriksson / opportunist.	Anna Olafsdottir	Ann.fish abundance & ecosyst. survey	yes	yes	yes	?	yes
2019-2021	Var.	Bilim-2/ opportunist.	Meltem Ok	Abundance est. and ecosystem	yes	yes	?	?	yes
2020	May	G.O. Sars/ opportunist.	Tor Knutsen	"Ecosystem survey"/ abundance est. and ecology	yes	?	yes	?	yes
2019-2021	Apr-Jun	Discovery or James Cook/ opportunist. / TBC	Adrian Martin	Turn around and calibrate a mooring	?	?	?	?	yes

*Biodiversity and biomass of mesopelagic species in zones with different productivity around the Iberian Peninsula zones (WP2). Investigations on vertical patterns through diel cycles (WP2 and WP3), and assessment of vertical migratory biomass for the estimation of active C flux (WP4). Collection of specimens for the study of trophic interactions, diet and species identification (WP3 and WP2). Deployment of sediment trap for the assessment of gravitational fluxes (WP4).

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3.3 Detailed description of expected data generated from each work package.

Metadata for data expected to be generated during the project was provided by work package leaders. This includes contact details and information on data type, size, format and the planned time of data submission to the repository.

3.3.1 WP1 - Background data

Mesopelagic background data from open repositories:

Scope of data: Collection of data resources from open data repositories made available to the SUMMER consortium, focus on measures of taxa-specific biomass and community composition including:

- Biomass estimates from multi-frequency and broadband echo sounder
- Catch and bycatch data
- Diet/trophic level data
- Daily feeding rates for key mesopelagic species
- Distribution, behaviour and vertical migrations of megafauna
- Predator abundance/biomass
- Biodiversity and eDNA resources
- Migration patterns and ranges of biomass
- High value products

Data types: Collation of data-sets consisting of links to data-sets available from their respective open repository
Data size: < 1 GB, data in itself will not be collected, but links to the relevant datasets in their hosting repositories will be collected and made available.
Data repository: PANGAEA.
Accessibility: The collation will be openly available
Planned time of data submission: February 2021
Data contact person for data: Astrid Wittmann (PANGAEA – UBREMEN, Germany)

3.3.2 WP2 - Biodiversity and biomass

Mesopelagic biomass estimates:

Scope of data: Estimates of taxa-specific mesopelagic biomass, including the proportion of biomass migrating and migration ranges
Data types: CSV files
Data size: < 1 GB
Data repository: PANGAEA
Accessibility: Embargo 1 year after project completion, then no restrictions
Planned time of data submission: 31 August 2023
Data contact person: Roland Proud (University of St. Andrews, UK)

Data from scientific echosounders:

Scope of data: Measures of calibrated raw acoustic backscattering intensity
Data types: Simrad proprietary format
Data size: ca. 5 TB
Data repository: PANGAEA
Accessibility: Embargo 1 year after project completion, then no restrictions
Planned time of data submission: Dependent on cruise date (Table 2)
Data contact person: Roland Proud (University of St. Andrews, UK)

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Egg production data:

Scope of data: Measures of egg abundances (*Maurolicus muelleri*) in the Bay of Biscay and adult parameters to apply the Daily egg production method
Data types: xls-files (abundances)
Data size: < 1 MB
Data repository: PANGAEA
Accessibility: No restrictions after first paper is accepted
Planned time of data submission: October 2021
Data contact person: María Santos Mokoroa (AZTI, Spain)

eDNA metabarcoding data:

Scope of data: Measures of mesopelagic organism abundance and taxonomic composition
Data types: Text-files in .fastq format
Data size: ~50 MB per sample
Data repository: ENA
Accessibility: No restrictions after first paper is accepted
Planned time of data submission: The data will be submitted as the papers come out
Data contact person: Naiara Rodriguez-Ezpeleta (AZTI, Spain)

Cruise-specific data (trawl and plankton net samples) to be continuously updated:

Data from commercial and scientific trawls:

Scope of data: Measures of organism (e.g. fish/squid/jelly) density, size and weight from Iceland basin 2018-2020
Data types: Appropriate data standard for specific trawl.
Data size: <1 GB
Data repository: PANGAEA
Accessibility: Embargo 1 year after project completion, then no restrictions
Planned time of data submission: October 2021
Data contact person: Anna Olafsdottir

Data from plankton nets:

Scope of data: Measures of plankton/egg/larval density, size and weight from Iceland basin 2018-2020
Data types: Appropriate data standard for specific plankton net
Data size: <1 GB
Data repository: PANGAEA
Accessibility: Embargo 1 year after project completion, then no restrictions
Planned time of data submission: October 2021
Data contact person: Anna Olafsdottir

Data from commercial and scientific trawls:

Scope of data: Measures of organism (e.g. fish/squid/jelly) density, size and weight from Sarmiento de Gamboa cruise October 2020
Data types: Appropriate data standard for specific trawl
Data size: <1 GB
Data repository: PANGAEA
Accessibility: Embargo 1 year after project completion, then no restrictions
Planned time of data submission: October 2021
Data contact person: M. Pilar Olivar (CSIC, Spain)

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Data from plankton nets:

Scope of data: Measures of plankton/egg/larval density, size and weight from Sarmiento de Gamboa cruise October 2020
Data types: Appropriate data standard for specific plankton net
Data size: <1 GB
Data repository: PANGAEA
Accessibility: Embargo 1 year after project completion, then no restrictions
Planned time of data submission: October 2021
Data contact person: M. Pilar Olivar (CSIC, Spain)

3.3.3 WP3 - Food-web structure and resilience

CSIC SUMMER cruise 2020 (https://doi.org/10.20351/29SG20200929):

Scope of data: CTD data, fish, crustaceans and decapod species diversity and abundance data from nets, acoustic data
Data types: To be clarified when analyses finished
Data size: No information yet (November 2020)
Data repository: PANGAEA or http://data.utm.csic.es/ (both open access)
Accessibility: Restricted, information relevant to all partners, but mostly to WP2 and WP3 partners
Planned time of data submission: Not clear yet, 2021, 2022 and 2023
Data contact person: M. Pilar Olivar (CSIC, Spain)

Gut/stomach content data:

Scope of data: Diet composition of mesopelagic organisms
Data types: Text-files
Data size: Few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: M. Pilar Olivar (CSIC, Spain)

Stomach content DNA metabarcoding data (cephalopods):

Scope of data: Diet composition of cephalopods
Data types: Text files in .fastq format
Data size: ~50 MB per sample
Data repository: ENA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: Roger Villanueva (CSIC, Spain)

Stable isotope data (food-web interactions):

Scope of data: Estimation of trophic level of mesopelagic organisms, assessment of food-web interactions
Data types: Text-files
Data size: Few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: M. Pilar Olivar (CSIC, Spain)

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Stable isotope data (food-web interactions – focus on Azores):

Scope of data: Estimation of trophic level of mesopelagic organisms and predators in the Azores, assessment of food-web interactions in the Azores
Data types: Text-files (2, one on mesopelagics, one on predators)
Data size: Few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: Mónica Silva (IMAR, Portugal)

Stable isotope data (food-web interactions – focus on Bay of Biscay):

Scope of data: Estimation of trophic level and feeding niches of meso- and bathypelagic organisms in the Bay of Biscay, assessment of food-web interactions in the Bay of Biscay
Data types: Text-files
Data size: Few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: Jérôme Spitz (CNRS - La Rochelle University, France)

Trace elements data:

Scope of data: Spatio-temporal variability in the nutritional quality of meso- and bathypelagic organisms
Data types: Text-files
Data size: Few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: Jérôme Spitz (CNRS - La Rochelle University, France)

Metal trace elements data:

Scope of data: Variability in the nutritional quality among meso- and bathypelagic organisms
Data types: Text-files
Data size: few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: Jérôme Spitz (CNRS - La Rochelle University, France)

Energy density data:

Scope of data: Variability in the nutritional quality among meso and bathypelagic organisms.
Data types: Text-files
Data size: Few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: Jérôme Spitz (CNRS - La Rochelle University, France)

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Fatty acid trophic markers (FATMs)-data:

Scope of data: Spatio-temporal variability in the nutritional quality of mesopelagic fishes and their prey
Data types: Text-files (2, one fish, one on zooplankton)
Data size: Few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2022
Data contact person: Sigrun Jonasdottir (DTU Aqua, Denmark)

Model outcome data of EwE-F for the Eastern Mediterranean:

Scope of data: Biogeochemical and biological data (biomasses and catches): Outputs from model simulations
Data types: NetCDF format
Data size: ~2 GB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2023
Data contact person: Ekin Akoglu (Middle East Technical University, Turkey)

Model outcome data of EwE for the Azores:

Scope of data: Biological data (biomasses and catches): Outputs from model simulations
Data types: Text-files
Data size: Few MB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2023
Data contact person: Telmo Morato (University of the Azores, Portugal)

Model outcome data of StrathE2E:

Scope of data: Biogeochemical and biological data (biomasses and catches): Outputs from model simulations
Data types: Text-files
Data size: Few GB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2023
Data contact person: Michael Heath (University of Strathclyde, UK)

Model outcome data of size-spectrum models:

Scope of data: Biological data (size-spectrum biomasses and catches): Outputs from model simulations
Data types: Text-files
Data size: Few GB
Data repository: PANGAEA
Accessibility: No restrictions
Planned time of data submission: 31 August 2023
Data contact person: Martin Lindegren (DTU Aqua, Denmark)

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3.3.4 WP4 - Carbon storage and climate regulation

Reuse of data collected in WP2 and collection of similar data in other locations:

Scope: Estimation of active flux
Data types: Excel files
Data size: <1 GB
Data repository: PANGAEA
Accessibility: One year after end of project
Planned time of data submission: One year after end of cruise, first submission September 2021
Data contact person: Santiago Hernández-León (University of Las Palmas de Gran Canaria, Spain), Andrew Brierley (University of St. Andrews, UK), Xabier Irigoien (AZTI, Spain)

Data from particle detection (200 - 10,000 µm) through imaging systems:

Scope of data: Estimation of gravitational particulate organic carbon flux
Data types: NetCDF
Data size: Up to 1 TB for raw data, size of processed currently uncertain
Data repository: PANGAEA and BODC (UK)
Accessibility: No restrictions one year after end of project
Planned time of data submission: One year after end of cruise, first submission September 2021
Data contact person: Sari Giering (NOC, UK)

Particulate organic carbon-data from marine snow collector:

Scope of data: Estimation of gravitational POC-fluxes
Data types: Excel files
Data size: ~10 MB
Data repository: PANGAEA and BODC
Accessibility: No restrictions one year after end of project
Planned time of data submission: One year after end of cruise, first submission September 2021
Data contact person: Sari Giering (NOC, UK)

Dissolved organic carbon-data from water samples:

Scope of data: Estimation of DOC-fluxes
Data types: Excel-files
Data size: <1 MB
Data repository: PANGAEA
Accessibility: No restrictions one year after end of project
Planned time of data submission: One year after end of cruise, first submission September 2021
Data contact person: Javier Arístegui (University of Las Palmas de Gran Canaria, Spain)

Gravitational, DOC and active flux estimates from models:

Scope of data: Fluxes at selected depths
Data types: NetCDF, Excel-files
Data size: ~10 MB for 1D model, ~100 GB for global model
Data repository: PANGAEA
Accessibility: No restrictions one year after end of project
Planned time of data submission: One year after end of cruise, first submission September 2021
Data contact person: Dag Aksnes (Bergen University Norway), Olivier Maury (IRD, France) and Tom Anderson (NOC, UK)

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3.3.5 WP5 - High value products

Protein, fat and ash content data from thermal extraction and enzymatic hydrolysis, molecular weight profile and bioactivity of the protein hydrolysates:

Scope of data: Assessment of mesopelagic macroorganisms for feed and nutraceutical applications
Data types: Excel file
Data size: 100 MB
Data repository: PANGAEA
Data accessibility: Restricted – protection of IPR
Planned time of data submission: 02/2022
Data contact person: Bruno Iñarra (AZTI, Spain)

Bioactivity and toxicity data from microbial extracts for cultured bacteria and fungi associated with the gut, gills and the skin of mesopelagic fish / organisms:

Scope of data: Assessment of culturable mesopelagic microorganisms for pharmaceutical applications
Data types: Excel sheets comprising readouts from microplate reader
Data size: Max 2 GB
Data repository: PANGAEA
Data accessibility: Embargo until two years after project ends
Planned time of data submission: 12/2021
Data contact person: Deniz Tasdemir and Martina Blümel (GEOMAR, Germany)

Sequence data from cultured bacteria and fungi associated with the gut, gills and the skin of mesopelagic fish / organisms:

Scope of data: Assessment of culturable mesopelagic microorganisms for pharmaceutical applications
Data types: Text files (fasta files)
Data size: <1 GB
Data repository: ENA
Data accessibility: Embargo until two years after project ends
Planned time of data submission: 10/2021
Data contact person: Deniz Tasdemir and Martina Blümel (GEOMAR, Germany)

Chemical data from microbial extracts, fractions and pure compounds from cultured bacteria and fungi associated with the gut, gills and the skin of mesopelagic fish / organisms:

Scope of data: Assessment of culturable mesopelagic microorganisms for pharmaceutical applications
Data types: Analytical chemistry data
Chromatograms: *.dat
UPLC-MS data: *.raw (MS-instrument specific raw data format)
processed data: *.mzxml format
HRESI-MS data: *.d format (instrument-specific format)
NMR data: *1r, 2rr format (NMR-instrument specific data format- submatrix format)
Data size: Chromatograms and MS data: 500 GB-1 TB, NMR data: 500 GB- 1 TB
Data repository: PANGAEA
Data accessibility: Embargo until two years after project ends
Planned time of data submission: 08/2023
Data contact person: Deniz Tasdemir and Martina Blümel (GEOMAR, Germany)

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Microbial metagenomic sequences related with the synthesis of omega-3 fatty acids, enzymes and/or secondary metabolites from mesopelagic waters of the Global Ocean:

Scope of data: Genes involved in the production of omega-3 fatty acids, enzymes and/or secondary metabolites from mesopelagic bacteria retrieved in metagenomic datasets from the Tara Oceans and Malaspina Circumnavigation Expeditions
Data types: Sequence data, fasta format
Data size: < 10 MB
Data repository: ENA (as Third party data) or Supplementary Information in Open Access publication
Data accessibility: Data will be deposited together with the first paper that makes use of it, and data will be publicly accessible as soon as the paper gets accepted
Planned time of data submission: 02/2023
Data contact person: Laura Alonso Sáez (AZTI, Spain)

Mesopelagic fish microbiome metabarcoding data:

Scope of data: Taxonomic composition of the microbiome associated with different species of mesopelagic fish
Data types: Text files in .fastq format
Data size: ~50 MB per sample
Data repository: ENA
Accessibility: Data will be deposited together with submission of the first paper that makes use of it, and data will be publicly accessible as soon as the paper gets accepted
Planned time of data submission: 02/2023
Data contact person: Anders Lanzen (AZTI, Spain)

3.3.6 WP6 - Ecosystem services and management evaluation

Data from economic evaluation of the ecosystem services:

Scope of data: Valuation of ecosystem services; prices, quantities and values, obtained from the literature or other SUMMER WPs
Data types: Excel files
Data size: <1 GB
Data repository: PANGAEA and SUMMER Web Page
Data accessibility: Open
Planned time of data submission: September 2021
Data contact person: Raúl Prellezo (AZTI, Spain)

3.3.7 WP7 - Communication, dissemination and exploitation and WP8 - Management

No data specified.

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4. Data management

4.1 FAIR data

Data management in SUMMER will implement the FAIR principles assuring that the data outcome is Findable, Accessible, Interoperable and Reuseable.

4.1.1 Making data findable, including provisions for metadata

The majority of data generated during SUMMER will be published by the data publisher PANGAEA, who is a project partner (UBREMEN) and responsible for the project's data management. All resource outputs from SUMMER will be made findable through internationally recognized open science repositories and infrastructures including, but not limited to:

1) Data Publisher for Earth and Environmental Science (PANGAEA) (http://www.pangaea.de)

2) The European Nucleotides Archive (ENA) (http://www.ebi.ac.uk/ena)

3) EU-funded open access digital repository (ZENODO) (https://zenodo.org),

4) H2020's research monitoring infrastructure (OpenAIRE) (https://www.openaire.eu)

5) The European Marine Observation and Data Network (EMODnet) (http://www.emodnet.eu)

Other data repositories may be used, if required by national authorities, for example in connection with national research cruises. In cases where repositories other than PANGAEA are used, SUMMER partners are requested to follow the FAIR principles and the guidelines described in the following sections of this DMP to assure interoperability of data.

An information specialist from PANGAEA will act as a project hub facilitator between SUMMER partners and existing open science repositories to assure curation, archiving and publication of SUMMERs data resources in accordance with international standards for data and metadata.

4.1.2 Making data openly accessible

SUMMER will make data resources accessible as soon as possible using open science repositories and infrastructures, in compliance with the open data pilot. Some data resources will have restricted access for an embargo period lasting until one year after the end of the project to safeguard findings prior to publication. Data from WP5, which specifically targets high value products for direct commercial use such as nutraceuticals and pharmaceuticals, will have highly restricted access to protect Intellectual Property Rights (IPR). For WP5, an embargo period lasting for two years after the end of the project was agreed upon. To assure the possibility for future patenting and allow for preclinical and clinical trials the embargo period may be prolonged.

At the end of the project, curated and published SUMMER research outputs (i.e. data and links to journal publications) will be harvested by EMODnet using the interoperability protocols specified by the different EMODnet thematic nodes (e.g. bathymetry, chemistry and biology). This will facilitate easy access to all SUMMERs resources through the EMODnet portal beyond the lifetime of the project.

An overview of expected open and restricted data resources is given in section 3.3.

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4.1.3 Making data interoperable

Archiving and publishing SUMMER's data resources through recognized open science data repositories and infrastructures will assure professional data curation in accordance with international standards for data and metadata in a machine-readable format. Furthermore, it will facilitate the assignment of persistent identifiers and assure consistent usage of standardized vocabularies. Altogether, this will facilitate high interoperability with other repositories and data-portals as well as software and analytical tools.

4.1.4 Increase data re-use (through clarifying licenses)

Data archived by SUMMER partners must be usable beyond the original purpose or scientific community by which it was collected. SUMMER-data made available through open access must have an appropriate open access license meeting accepted international standards. CC-BY 4.0 is recommended (https://creativecommons.org/licenses/by/4.0/).

4.2 Allocation of resources

SUMMER work package 1 (WP1) has resources (58.5 PM) dedicated to management of the data resources in SUMMER. This WP is led by the data publisher PANGAEA, in connection with the project partner BREMEN University (UBREMEN).

4.3 Data security

The partners in SUMMER are obligated to use certified repositories for long-term preservation and curation of data. For PANGAEA, which is the primary repository for SUMMER, long-term availability of its content is guaranteed through a commitment of the hosting institutions; the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) and the Centre for Marine Environmental Sciences, University of Bremen (MARUM). PANGAEA is member of the World Data System (WDS) of the International Science Council (ISC). It is further hosting the World Radiation Monitoring Center (WRMC) of the Baseline Surface Radiation Network (BSRN) and as such accredited as a "Data Collection and Processing Center" (DCPC) of the World Meteorological Organisation (WMO) Information System (WIS). PANGAEA is a CoreTrustSeal certified repository.

4.4 Ethical aspects

Ethical aspects regarding data management in the SUMMER project is covered in deliverable D9.2: POPD - Requirement No. 2, which revolves around:

- The implementation of the Data Minimization principle that states that data collected and processed should not be held or further used unless this is essential for reasons that were clearly stated in advance to support data privacy;
- The technical and organizational measures that will be implemented to safeguard the rights and freedoms of the data subjects/research participants;
- The security measures that will be implemented to prevent unauthorized access to personal data or the equipment used for processing.

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4.5 PANGAEA guidelines and responsibilities of SUMMER partners

4.5.1 Data submission

Research data shall be submitted to PANGAEA, which is the primary data repository for SUMMER, however, other recognized data repositories may be used. When using repositories other than PANGAEA, the metadata, which are published with the data, shall also be submitted to WP1, allowing PANGAEA to manage and compile the complete research data outcome from SUMMER.

Molecular data cannot be submitted to PANGAEA. European Nucleotide Archive (ENA) is recommended as data repository for molecular data from SUMMER. Complementary environmental data can be submitted to PANGAEA and linked to ENA datasets.

4.5.2 PANGAEA data submission guidelines

Guidelines for data submission through PANGAEA can be found on the following webpage: https://wiki.pangaea.de/wiki/Data_submission

and in the following video

https://youtu.be/5bJfSuAukTQ

For submission of SUMMER data to PANGAEA; the project **acronym "SUMMER_project" must be added** as label. This is also necessary for data that partners wish to make available for SUMMER, but which are not generated by SUMMER funds. In the latter case, "SUMMER_project" will be added as keyword, allowing the data to show up in searches for data related to SUMMER.

4.5.3 Persistent identifiers

To assure interoperability of the SUMMER data resources, the following vocabularies and persistent identifiers shall be applied to the data and metadata, whenever possible:

- **Authors:** OrcIDs; a persistent Identifier for all authors on the data set https://orcid.org/
- **Organizations:** ROR ID for organizations https://ror.org/search

4.5.4 Vocabularies

To assure interoperability, the following vocabularies shall be applied to the data and metadata, whenever possible. This is automatically achieved through data submission to PANGAEA

- **Species names:** use the vocabulary from World Register of Marine Species (WoRMS) http://www.marinespecies.org/
- **Devices (sampling and measurements):** use the BODC vocabularies L05 and L22 https://www.bodc.ac.uk/resources/vocabularies/vocabulary_search/L05/ https://www.bodc.ac.uk/resources/vocabularies/vocabulary_search/L22/

4.5.5 Specific metadata requirements

- **Acoustic data:** Metadata requirements for raw echosounder observations: calibration parameters must be included

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- **Plankton/Particulate organic matter:** From plankton-net measurement, from particle counter, from video; from optical devices: sensor, sensor type, software used including version number, depth range, sampling frequency
- **Bioassay data:** Instrument and protocol used (plus reference to standard official or published method), date of data acquisition
- **Sequence data:** Sequencing method, date of data acquisition
- **Chemical Data:** Instrument specifications (NMR type, MS type, HPLC type), date of acquisition, databases used for dereplication

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