WP3: Biodiversity and Biogeography

Leader: IMAR, Portugal

Co-Leader: IEO, Spain; HWU, UK

ATLAS Kick-off Meeting
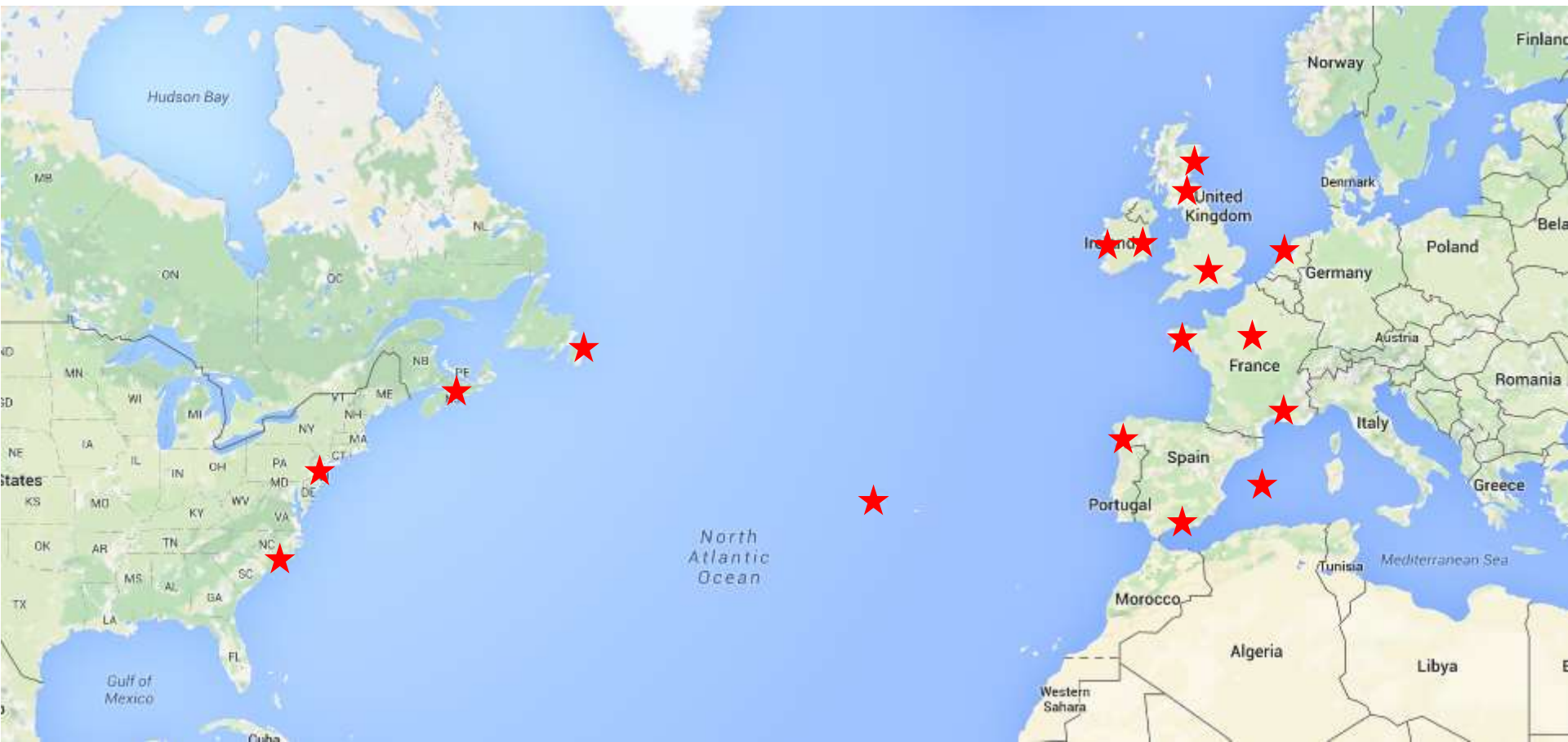
Edinburg, 13-15 June 2016

Partners involved

Partners: IMAR (PT), HWU (UK), IFREMER (France), IEO (Spain), MSS (UK), UCD (Ireland), NUIG (Ireland), Uox (UK), NIOZ (Netherlands), University of North Carolina Wilmington (UNC-W, USA)

Associate partners: Temple University (USA), Memorial University (Canada)

Third parties: DFO (Canada)

Partners involved

Vison

To bring together existing and new **biodiversity** data along with results from analysis of **North Atlantic circulation** (WP1) and **ecosystem functioning** (WP2)

to **deepen the understanding** of the biodiversity and biogeographic patterns in the deep North Atlantic **and forecast changes** under future scenarios of water mass structure and ocean currents

Impact

Improve the application of indicators of **Good Environmental Status** relevant to the deep-sea

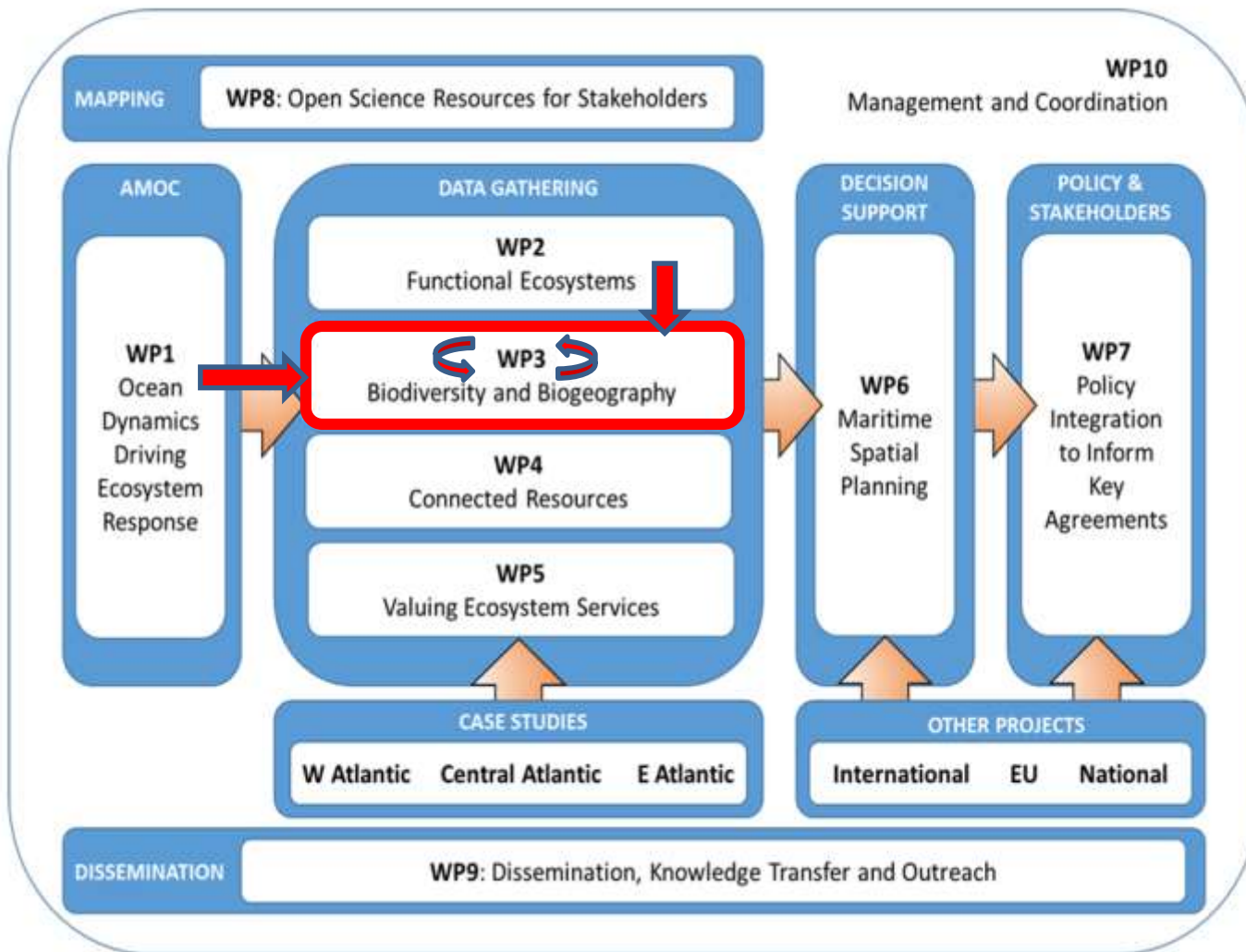Improve the Global Open Ocean and Deep Seabed (**GOODS**) biogeographic classification

Identify key locations that may constitute an **EBSA** in the CBD context

Reported results for assaying new **business opportunities** and commercial developments

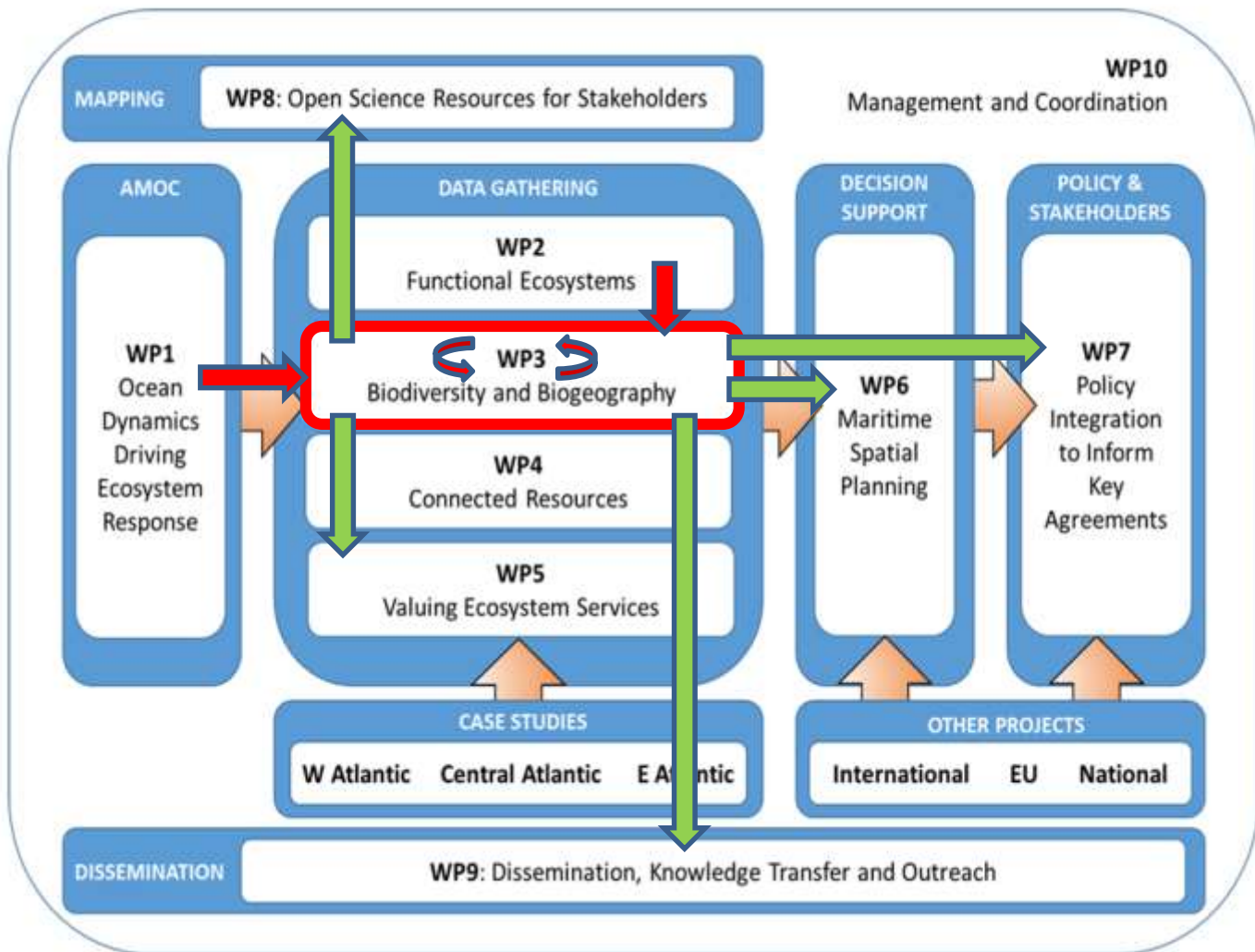# Work package links
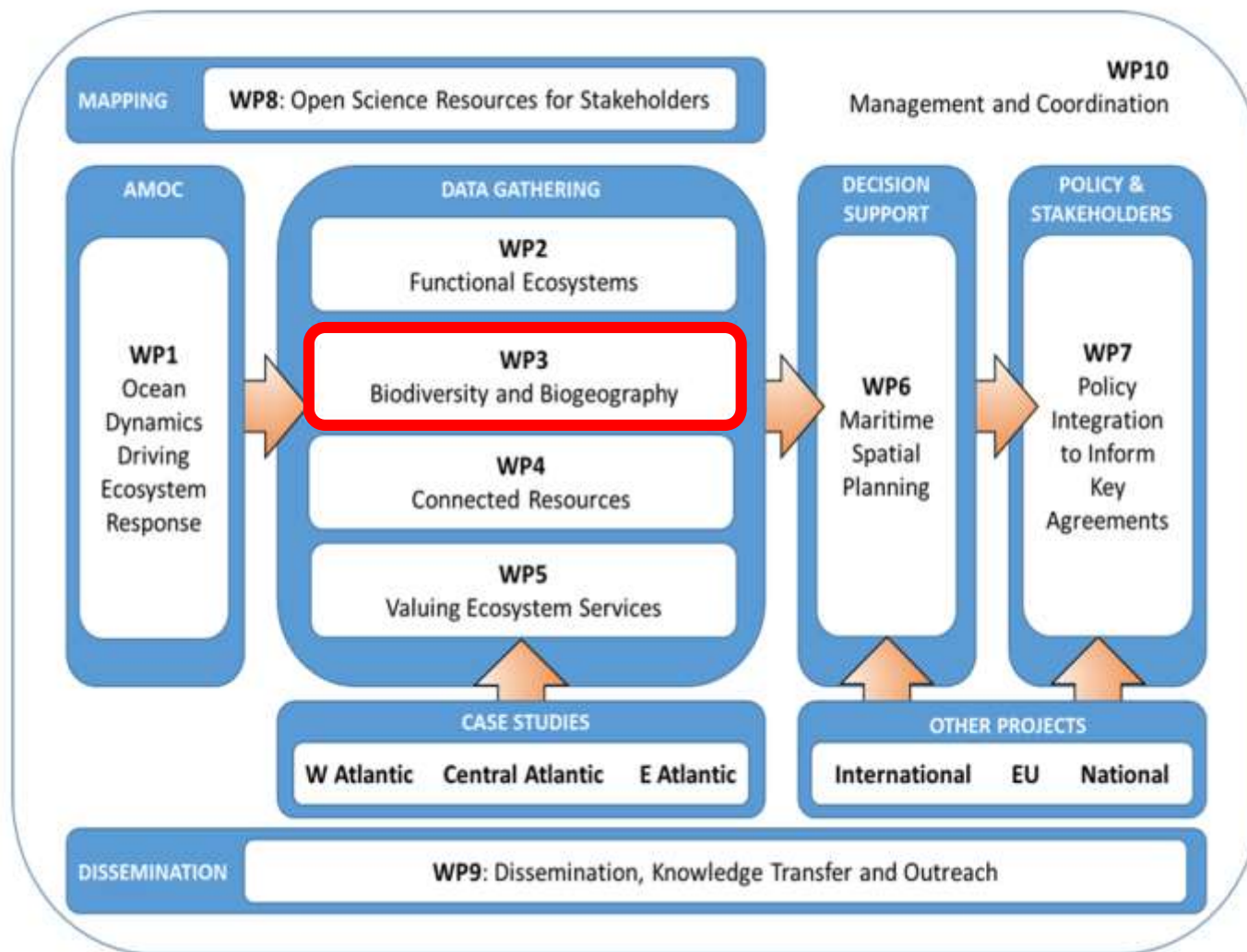
Work package links

Work package links

Objectives

1. **Quantify, model and map biodiversity** **and biogeography of VME indicator taxa, deep-sea fish and fish habitats across the deep N Atlantic**

2. **Evaluate eDNA as a means to assessing biodiversity and for quantitative PCR as means to detect and quantify biomass of VME indicator taxa and deep-sea fish species**

Objectives

3. **Conduct biodiversity assessments for MFSD to measure GES indicators of (D1)** biological diversity has been maintained**; (D3)** commercially exploited fish are within safe limits**; (D6)** seafloor integrity is at a level that safeguards ecosystem structure and functioning**.**

4. **Create maps from species and habitat distribution models (SDMs and HSMs) to predict changes in GOODS and GES according to IPCC 21st century scenarios**

Objectives

5. **Identify areas** in the Atlantic that may constitute an **EBSA** and assign appropriate portfolio conservation categories as a precursor to the future development of an Atlantic wide MPA network

Timeline

	Year										1														2														3														4			
	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
WP3	Biodiversity & biogeography																																																
T3.1	Understanding of biodiversity and biogeography																																															
T3.2	Validation of eDNA and qPCR																																															
T3.3	Biodiversity assessments and Good Environmental Status (GES)																																															
T3.4	Predict changes in GCCDS and GES																																															
	Deliverables																								D					D						D							D					
	Milestones									M		M												M					M																		

Case studies

Rockall bank – F. Neat, P. Duran-Muñoz, M. Sacau, A. Rogers, A. Grehan

Azores – M. Carreiro-Silva, T. Morato, C. Orejas

Reykjanes Ridge – J. Carlsson, P. Collins

Northern NW Atlantic (Southern Davis Strait, Western Greenland, Labrador Sea, Flemish Cap NAFO Regulatory Area) – E. Kenchington, A. Rogers, P. Snelgrove, P. Duran-Muñoz, M. Sacau

Southern NW Atlantic (Cape Hatteras area, mid-Atlantic canyons, Gulf of Mexico) – S. Ross, E. Cordes

Strait of Gibraltar (Alborán Sea, Strait of Gibraltar, Azores) – C. Orejas, J.L. Rueda, S. Arnaud-Haond, M. Carreiro-Silva

Bay of Biscay – L. Menot, S. Arnaud-Haond, P. Laffargue, M. Woillez, S. Rochette

Existing datasets

Partner	Datasets / Projects	Area
IMAR Uaz	CORALFISH, COLETA, SEEF, ARQDAÇO, MIDAS Data on demersal fisheries surveys and bycatch sampling. Benthic samples, underwater video transects, submersible video of macrofauna and habitats	Azores
IEO	Benthic samples and underwater images from the Gulf of Cádiz (TASYO, INDEMARES, ISUNEPCA, SUBVENT, CADHYS), Strait of Gibraltar (DEEPER, VIATAR) and Alborán Sea (DEEPER and MONTERA), Cooperative surveys; NE-ATLANTIC VME historical records; Spanish research vessel trawl survey data and Spanish NEREIDA data contributions from the Flemish Cap, NAFO Regulatory Area.	Gulf of Cádiz, Strait of Gibraltar and Alborán Sea, Flemish Cap (NAFO Regulatory Area), NW Atlantic, NE Atlantic
MSS	ICES VME database, Francis Neat demersal fisheries sampling campaign and bycatch sampling also be used 2011, 2012 Rockall surveys 1998-2013 Continental slope surveys 2014 Faroe-Shetland Channel and Rosemary bank survey	Rockall Bank, NE Atlantic
UCD Dublin	Jens Carlsson 2011 Irish Celtic Explorer and 2007 UK James Cook expeditions	Reykjanes Ridge, mid-N Atlantic, Whittard Canyon, Moytirra hydrothermal
DFO	Ellen Kenchington Canadian research vessel trawl survey data; benthic grab samples from selected locations associations; underwater photo transects from selected locations along the continental slope and shelf. Canadian NEREIDA data contributions	Southern Davis Strait/Western Greenland/Labrador Sea, northern NW Atlantic

Existing datasets

Partner	Datasets / Projects	Area
University of North Carolina - Wilmington	Steve W. Ross bottom multibeam sonar maps (2011-2012); submersible video surveys of macrofauna and habitats (1991-1992 and 2000-2002); bottom and mid-water (discrete depth) quantitative surveys of fish and invertebrates; neuston net surveys of surface communities; trophodynamics data (stable isotope and diets) for dominant species from surface to bottom; CTD casts for water column profiles. 2011-2013 data for Norfolk and Baltimore canyons duplicates the above	Western N. Atlantic, Cape Hatteras area, Norfolk and Baltimore canyons (available if needed)
IFREMER	CORALFISH. Video and photo transects from 19 canyons of the Bay of Biscay. Fish and invertebrate samples. High resolution bathymetry	Bay of Biscay
HWU	Lea-Anne Henry Megafaunal video from western Scotland (Hebrides Terrace Seamount, Rockall, Logachev Mounds and vicinity, Hatton Bank); boxcore samples from Hebrides Slope (replicating John Gage's 1970s samples to test for biogeographic/biodiversity differences relating to changes in oceanography), Logachev Mounds near Rockall; benthic Hydrozoa (in EtOH and frozen) from circum-equatorial seamounts (L Robinson's TROPICS cruise)	Western Scotland and equatorial N Atlantic seamounts
University of Oxford	Alex Rogers; macrofaunal communities in the NW Atlantic slopes sampled across a north to south temperature gradient	Flemish Cap and NAFO area of slope
National University of Ireland, Galway	Anthony Grehan	Porcupine Seabight, Rockall Bank
NIOZ	E and W Atlantic cold-water coral ecosystems, data from the deep NE Atlantic (Iberian margin)	

Planned surveys

Partner	Research cruises	Area
IMAR UAz	ARQDAÇO, MIDAS, BIOMOTORE; deep-sea biodiversity studies	Azores
IEO	Ship time submitted	Alborán, Gibraltar Strait, Gulf of Cadiz, Lusitanian Seamounts, Azores
MSS	MRV Scotia 'MOREDEEP' survey 2016	NE Atlantic
UCD Dublin	SEEPC cruises (2011-2015)	Gulf of Mexico and Atlantic seep ecosystems
DFO	AZOMP annual cruise in Labrador Sea; Targeted research cruises	Davis Strait; NW Atlantic
University of North Carolina - Wilmington	(unknown at this time)	
IFREMER	Evhoe cruises, yearly fish stock assessment cruises with an opportunity to carry out towed-camera video transects at night	Bay of Biscay
HWU		
University of Oxford	Influence of population connectivity on depth-dependent diversity of deep-sea marine benthic biota	NE Atlantic
National University of Ireland, Galway	Mapping the deep: the application of predictively modelled maps and monitoring of vulnerable marine ecosystems to European marine spatial planning (19 days on Celtic Explorer with Holland 1 ROV)	Porcupine Seabight and Rockall Bank
NIOZ	Video data (ROV drop camera)	

Tasks

Task 3.1 **Improve the understanding of biodiversity and biogeography in the deep N Atlantic (M1-M36)**

Existing partner and public data, and new ATLAS cruise data will be compiled for all mapping and modelling activities

Synthesise data on influence of AMOC, N Atlantic gyres, and water mass properties on deep-water biodiversity

Refine GOODS biogeographic classification scheme

Tasks

Task 3.1 **Improve the understanding of biodiversity and biogeography in the deep N Atlantic (M1-M36)**

MS3 Database on existing deep-sea biodiversity data in the N Atlantic completed (M10)

MS9 Sample and data collection from scientific cruises completed (M24)

D3.1 Biodiversity and biogeography in relation to water masses (M24)

D3.2 Refined GOODS biogeography using SDMs/HDMs (M30)

Tasks

Task 3.2 **Validate eDNA methods for monitoring and screening deep-sea biodiversity (M1-M36)**

Evaluate the performance of next-generation genomic tools (meta-barcoding of eDNA) for assessing biodiversity

Evaluate quantitative qPCR (plankton samples) as a sensitive tool to detect and quantify biomass of target species

Validate the accuracy and sensitivity of meta-barcoding and qPCR on samples assessed using classical taxonomy in selected Case Studies

Tasks

Task 3.2 **Validate eDNA methods for monitoring and screening deep-sea biodiversity (M1-M36)**

MS10 Protocols and genomic tools optimised, and sampling completed (M24)

D3.7 Potential and limits of meta-barcoding of eDNA and qPCR (M42 *or 36*)

Tasks

Task 3.3 **Conduct biodiversity assessments to measure GES in European Case Studies (M1-M36)**

Improve the definition of GES in the context of deep-sea, and define and agree on descriptor indicators and methodological standards at the first ATLAS General Assembly (needs continuous improvement)

Applications of the indicators to data compiled

Apply the Ecosystem Evaluation Framework to identify locations in the Atlantic that may constitute an EBSA and assign conservation categories as a precursor to the development of an Atlantic wide MPA network

Tasks

Task 3.3 **Conduct biodiversity assessments to measure GES in European Case Studies (M1-M36)**

MS16 Ecosystem Evaluation Framework adapted to the deep N Atlantic (M30)

D3.3 Good Environmental Status and Biodiversity Assessments (M30)
Report on baseline indicator values for GES descriptors (D1, D3, D6) and Biodiversity Assessments for EU case studies

D3.5 Conservation management issues in ATLAS (M30) *Report summarising identification of potential EBSAs and important fish habitat, designation of portfolio conservation categories and contribution of existing conservation initiatives to ensure GES, delineation of predicted VMEs and importance of fish habitat in each case study*

Tasks

Task 3.4 **Predict changes in GOODS and GES under IPCC 21st century scenarios (M24-M48)**
or under future scenarios of dynamics of N. Atlantic water masses

Test the hypothesis that ocean dynamics impact biodiversity and biogeography through three Case Studies

Conduct SDM and HSM under IPCC 21st scenarios (*or environmental data from WP1 and physiological responses from WP2*) and compare outputs with those created under current ocean conditions

Predict changes in GOODS biogeography under future scenarios of dynamics of the North Atlantic (*Predict changes in GES of VMEs under future scenarios of dynamics of the North Atlantic*)

Tasks

Task 3.4 Predict changes in GOODS and GES under IPCC 21st century scenarios (M24-M48)
or under future scenarios of dynamics of N. Atlantic water masses

MS17 Maps SDM and HSM under future scenarios produced (M30)

D3.4 Ocean/hydrographic controls on biodiversity and biogeography (M36)
In-depth analyses of the influence of water mass identity/properties and organic matter supply on biodiversity and biogeography from (1) the Alboran Sea to the Azores, (2) the UK continental shelf and slope, (3) the NAFO regulatory area, and (4) across Davis Strait, Rockall Bank and the Azores.

D3.6 Changes in biodiversity, GOODS and GES under IPCC scenarios (M36)

Acknowledgements

Special thanks to all WP3 members

 Marina Carreiro Silva

Covadonga Orejas

Lea-Anne Henry