



ATLAS Deliverable 7.3

ATLAS Trans-Atlantic Conference report

Project acronym:	ATLAS
Grant Agreement:	678760
Deliverable number:	7.3
Work Package:	WP7
Date of completion:	20 February 2019
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 678760 (ATLAS). This output reflects only the author's view and the European Union cannot be held responsible for any use that may be made of the information contained therein.

North Atlantic EBSAs, VMEs and MPAs in a changing ocean

A one-day symposium

Meeting report

Synopsis

In the North Atlantic, the Atlantic Meridional Overturning Circulation (AMOC) is central to the flow of energy and elements through the ocean. However, significant gaps in our understanding of the links between large-scale oceanographic processes and living marine resources hinder the development of predictive models to account for changes in ocean conditions due to climate change and increased human activity.

The ATLAS project (www.eu-atlas.org) is exploiting the vast *in situ* time series dataset provided by international oceanographic arrays to understand how climate and oceanic variability interact with human pressures to control ecosystem functioning, biodiversity, connectivity and goods and services. Twelve case studies located across the Atlantic are examining specific scenarios of 'Blue Growth' development to inform marine spatial planning approaches.

An integral part of this work is to consider implications of change on sensitive deep-water ecosystems that have been identified as significant and/or vulnerable and thus worthy of protection. The focus is on waters 200-2000m deep and on the implications of change for Vulnerable Marine Ecosystems (VMEs), Ecologically or Biologically Significant Areas (EBSAs) and High Seas Marine Protected Areas (MPAs).

This one-day symposium on 12 May 2018 was aimed at scientists, practitioners, policy makers and representatives of civil society with expertise and interest in the future of these area-based management tools (ABMTs) or situations that could support ABMTs in the North Atlantic, and took place in Montreal immediately before the 4th World Conference on Marine Biodiversity. Presentations highlighted emerging results from ATLAS, and the status of ABMTs informed by predicted shifts in ecosystem dynamics were reviewed. Discussions examined opportunities and processes for adaptive management, and formulated recommendations for future priorities and directions. A postscript explains how this discussion fed into subsequent policy fora and informed papers published in 2019.

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Overview

This one-day symposium took place at the Auberge du Vieux Port in the old port area of Montreal on Saturday 12 May 2018, organised by ATLAS partner Seascope Consultants Ltd. The purpose of this trans-Atlantic conference on North Atlantic VMEs and EBSAs was to facilitate engagement with US and Canadian partners to align ocean observation efforts, share information and explore the implications of changing interplay between the Atlantic and Arctic Oceans with specific reference to Atlantic VMEs and EBSAs that will help deliver on the Galway Statement.

Participation in the symposium was offered free of charge through an open registration process, but for logistical and budgetary reasons limited to a maximum of 50 attendees. A full list of attendees is given in Annex 2.

The morning session of the symposium featured presentations showcasing recent research efforts by ATLAS and other projects, a series of case studies and set the scene for the current state of play for VMEs and EBSAs in the North Atlantic. Following a short lunch break, participants were introduced to marine spatial planning activities being carried out within ATLAS, Blue Growth opportunities and policy priorities. Participants were then divided into four working groups in a carousel arrangement to consider policy opportunities in more detail; conclusions from these discussion groups were fed back via rapporteurs to the wider group for further discussion.

A copy of the symposium programme is provided in Annex 1.

Session 1: Introduction and overview

Symposium Chair and Session 1 moderator Prof. David Johnson (Seascope Consultants) opened the symposium with a welcome to all participants. He explained that the objectives of the day were to better relate science to policy for ABMTs in the North Atlantic and associate this with findings to inform maritime spatial planning and plan for Blue Growth activities. He explained that ABMTs are in integral part of the new legally binding instrument for biodiversity beyond national jurisdiction and that input from the Symposium would inform ATLAS efforts to engage with the UN sustainable development agenda.

ATLAS Coordinator Prof. Murray Roberts (University of Edinburgh) provided an overview of the ATLAS project and its high-level objectives, particularly placing it in the context of the economic crisis and the importance of the Atlantic and its resources for Blue Growth. He also highlighted the connections between the Atlantic and other sea basins, and the potential impacts that global-scale issues such as climate change and ocean acidification could have on Atlantic ecosystems, particularly if the Atlantic Meridional Overturning Circulation (AMOC) is affected. ATLAS links closely to social and policy dimensions, and results will be analysed in terms of their application to maritime spatial planning (MSP). To date, the project has led or participated in 19 offshore research expeditions, with 15 more planned for this year and next. These cruises are investigating 12 case studies in the Atlantic, each with a focus on deep-sea ecosystems and how these might be

impacted by changes in the AMOC. Prof. Roberts concluded with an overview of the peer-reviewed publications produced from the project to date and a look to the future in the context of the Belem Statement, which will extend pan-Atlantic collaborative ecosystem research to the South Atlantic.

Picking up on the theme of ecosystem vulnerability, Dr Telmo Morato (University of the Azores) presented recent work on developing a VME indicator tool based on data harvested from a literature review on ecosystems from the mid-Atlantic Ridge and supplemented by biological and biogeographic data from public databases. The VME indicator can be combined with an analysis of threats from different activities (such as fishing) to generate a VME Index, which combines how intrinsically vulnerable to human impacts the VME indicator is deemed to be, and how abundant the VME indicator is. This study demonstrates that despite the limited availability of data in the deep sea, existing data can still form the basis for policy-relevant scientific analysis, upon which effective marine governance strategies (such as ABMTs) can be developed, and opportunities for sustainable blue growth can be identified.

Dr Ellen Kenchington (DFO Canada) and Dr Lea-Anne Henry (University of Edinburgh) then presented, respectively, two examples of ATLAS case study areas: the Davis Strait and the Tropic Seamount. In the North Atlantic, the near-term impacts of climate change are expected to affect Davis Strait and Baffin Bay through increased temperatures, decreased salinity, pH and oxygen levels, and changes in nutrient transfer. In the Davis Strait study area, tracking and modeling of passive particles (to represent coral and sponge larvae dispersal), combined with temperature-salinity data, indicate that there is little spreading of particles outside the source water mass. The location of the spring bloom in Davis Strait does not coincide with the sponge distribution, suggesting that hydrodynamic transport controls the coupling of deep-water sponges with surface productivity.

Dr Henry then highlighted the ATLAS collaboration with the Marine E-Tech programme in carrying out detailed seafloor mapping of the Tropic Seamount off NW Africa in 2016. Survey data were used to develop habitat models and species distribution maps, revealing the presence of VMEs and indicating that the area may meet a number of the CBD's EBSA criteria.

To wrap up the first session of presentations, Dr Joana Xavier (University of Bergen) gave an overview of the EU H2020 SponGES project, illustrating the diversity and widespread distribution of sponge species across the global ocean, their ecological importance and the threats that they face. Despite evidence of their ecological importance and vulnerability, sponge grounds remain one of the most understudied deep-sea habitats, and are still largely under-represented in research and conservation agendas.

Discussions following these presentations touched on the following issues:

- It is important to understand how habitats are changing in order to manage resources effectively;
- Uncertainty remains one of the biggest challenges: given scientific uncertainties on what is a VME, what is serious harm, what is significant adverse impact, etc., how can scientists put their

results into the correct context for policymakers? Clear definitions of policy terminology are required;

- We need to think about having a framework to manage uncertainty. Management responses must be adapted as uncertainties are addressed. This is for management institutions to adapt to the evidence base as it evolves;
- Part of the issue with VMEs is that scientists put forward predictive information that suggests areas need to be closed - the system often suffers from a lack of 'ground-truthed' information. Regulators will demand a level of scientific certainty that can't always be delivered;
- How can we connect small-scale studies with basin-scale studies and large-scale change? We currently lack the capacity to observe ecosystems at the same degree of detail as oceanographic processes. We need to make detailed benthic observations with the same degree of diligence that the oceanographic moorings make - seafloor observatories must be key in this. We need this to move beyond the uncertainties;
- Models can go some way to address some of these uncertainties and scale issues. However, it remains challenging because there are many unknowns that would affect the outcomes of modelling exercises: for example, the modelling of larval dispersal is hampered by lack of information on longevity of larvae in the water column, dispersal depth, etc.

Session 2: Coverage of VMEs, EBSAs and MPAs: status and future prospects

The second session, moderated by Dr Anthony Grehan (National University of Ireland Galway), introduced Vulnerable Marine Ecosystems (VMEs), Ecologically or Biologically Significant Marine Areas (EBSAs) and High Seas Marine Protected Areas (MPAs) and their current status in the North Atlantic.

Dr Andrew Kenny (CEFAS/NAFO) presented an overview of VMEs and the role of Regional Fisheries Management Organizations in limiting fishing impacts on benthic ecosystems. UNGA resolution 61/105 (2007) and the subsequent FAO guidelines on the management of deep sea fisheries published in 2009 have resulted in step change in the performance of RFMOs over the past decade. Whilst many NGOs will argue there is much more to be done, there are now significant areas of VME closed to bottom fishing activities and each year it grows globally as a direct result of this resolution and set of guidelines. A series of examples of how VMEs have been used to manage fisheries in the North Atlantic were given, including how VMEs have been mapped, how they are used to assess significant adverse impacts, and what challenges still remain in order to make VMEs an effective tool in fisheries management in the face of global change.

This was followed by an introduction to EBSAs, presented by Dr Joseph Appiott from the Secretariat of the Convention on Biological Diversity. Having outlined the process and scientific criteria involved in describing EBSAs, Dr Appiott highlighted the EBSA process for the north-west

Atlantic Ocean, which described 7 EBSAs in the area beyond national jurisdiction. The presentation finished with a summary of lessons learned from the overall EBSA process, and a reflection on the challenges facing the EBSA process in the future, including how to maintain strengths of the EBSA process whilst strengthening its scientific credibility, and how to ensure that new knowledge can be incorporated while also maintaining political engagement and awareness.

The application of the EBSA criteria in a national context was demonstrated by Dr Nadine Wells (DFO Canada) who explained how Canada has taken EBSAs forward as a national process, resulting in the current designation of 111 EBSAs within the Canadian EEZ. The Canadian Department for Fisheries and Oceans (DFO) developed guidance for the identification of ecologically or biologically significant areas in 2004. These guidelines recognise three main criteria (uniqueness, aggregation, fitness consequences) plus two secondary criteria (resilience, naturalness) for identifying EBSAs, which loosely map onto the CBD's EBSA criteria. The Canadian EBSAs have undergone a rigorous re-evaluation in recent years to account for new information, and to inform the development of a bioregional network of MPAs. Going forward, DFO intends to use EBSAs in decision making for Marine Conservation Planning and a formal process is being established to recognise EBSAs during the environmental assessment process.

Prof. David Johnson (Seascope Consultants) drew on his experience in his former role as Executive Secretary of the OSPAR Commission to describe the challenges and benefits of establishing marine protected areas in the High Seas. Background to the OSPAR Convention and its Annexes can be found at <http://www.ospar.org/>. High Seas MPAs were established by consensus in 2010 and 2012 having established an agreed scientific case and negotiated jurisdictional concerns. Ecological coherence of the network was evaluated in 2013 based on biogeographic region coverage; MPA proximity using kernel density analysis; bathymetry data and other considerations. The OSPAR 2017 Interim Assessment confirmed:

- 7 MPAs in ABNJ within the OSPAR Maritime Area - chosen mostly for benthic features and habitats;
- 8.9% of OSPAR ABNJ currently protected (only binding on OSPAR Parties) but not ecologically coherent;
- a lack of MPA sites protecting seabirds and other highly mobile species; and
- OSPAR Recommendations requiring annual implementation reporting against agreed management measures but as yet no management plans in place.

On behalf of BirdLife International he then provided an update on the North Atlantic Current and Evlanov Seamount (NACES) High Seas MPA proposal. This draws on BirdLife's seabird tracking database (11 million positions, 116 species, 190 contributions) using tracking data for 105 colonies subject to robust statistical analysis. The area is an extensive (633,914 km²) foraging ground for 22 seabird species (an estimated 2.9 - 5million seabirds).

Prof. Johnson concluded with some points for consideration toward establishing an effective Atlantic High Seas MPA network emphasizing the importance of clarity concerning what is to be protected (i.e. MPA criteria) and from what (i.e. threats to biodiversity). This raises questions about

the extent and coverage of MPAs, buffer zones and whether it is appropriate to protect only the water column in some circumstances. As the High Seas is data poor thought must be given to predictive modeling, levels of precaution and efforts to improve data. Interim measures may be appropriate for locations in the NW Atlantic before the BBNJ Implementing Agreement comes into force.

Results of a recent ATLAS assessment of how effective VMEs, EBSAs and High Seas MPAs are likely to be in the context of climate change¹ was presented by Dr Ellen Kenchington (DFO Canada). In response to international treaties and agreements 47 areas have been identified in the high seas of the North Atlantic as EBSAs, VMEs and MPAs (collectively referred to as area-based management tools, ABMTs). Most of these areas protect species living on the seafloor, such as corals and sponges, living kilometers below the surface. The ATLAS study asked whether climate change would have an effect on these areas and, if so, over what time frames? Deep-sea species, including sponges and corals, have evolved in extremely stable environmental conditions and are ill equipped to deal with fast-changing environments. The potential impacts of climate change were reviewed over the next 20-50 years following a pressure-state-response framework applied to each of the 47 areas identified as EBSAs, VMEs or MPAs. The state of any one ABMT can be affected by a number of pressures: both endogenic (caused by on-site human activities) and exogenic (caused by external drivers, such as CC); such pressures can push the state of an ABMT out of balance, into a new, deteriorated state. The study aimed to identify potential management responses on adaptation of ABMTs in ABNJ to the effects of climate change, recognising that only the endogenic pressures are amenable to management. Certain ecological traits contribute to increase the resilience of systems to pressures, allowing them to absorb disturbance without fundamentally changing and those were considered in evaluating the responses. The study concluded that, with the exception of the hydrothermal vent EBSA on the Mid-Atlantic Ridge, all of the conservation targets in all of the current MPAs, EBSAs and areas closed to fishing to protect VMEs may be impacted by changes in at least one of the five climate change oceanographic variables before 2050, and may already be undergoing such effects.

The final presentation of this session was given by Mr Matt Gianni (Deep Sea Conservation Coalition), who presented an overview of how the legal framework regulating deep-sea fisheries in ABNJ has evolved over the past 20 years, and where lessons could be learned for the development of the new UN treaty to protect biodiversity in areas beyond national jurisdiction. Similar lessons could also be relevant for the International Seabed Authority in their current efforts to draft the exploitation regulations to govern the mining of minerals from the seafloor in ABNJ. Deep-sea mining activities are likely to have significant impact on the marine environment and biodiversity loss seems inevitable. At present there remain many questions about how much impact is deemed 'acceptable' by the international community, and how to assess whether it is justifiably compensated for by the benefits to be gained from mining.

¹ Johnson, D.J., Ferreira, M-A. & Kenchington, E. (2018) Climate change is likely to severely limit the effectiveness of ABMTs in the North Atlantic. *Marine Policy* 87: 111-122

Following the presentations, the floor was opened for general discussion, which touched on the following subjects:

- How much human activity is deemed to be acceptable? Thresholds will allow for some impact. What mitigation actions are acceptable? Should some degree of restoration be mandatory? Can ABMTs be made resilient in the face of climate change?
- How is EBSA information used (if at all) by industry bodies? The use of EBSA information is devolved to competent authorities, but in national EBSA-like processes there can be more direct engagement with the industry sector, for example in Australia's screening process. In Canada, DFO shares EBSA data with industry bodies and other authorities for use in environmental assessments.
- However, it was noted that EBSAs are often used as an information source but have no formal place in governance frameworks. Efforts to get sensitive areas recognised by industry in Canada were monumental and challenging. Getting governance frameworks in places to force this information to be taken into account is difficult.
- There is clearly some spatial relationship between different areas of designations. EBSAs can provide the context for the more site-specific measures used by various bodies. Perhaps EBSAs could play a bigger role in placing boundaries around ocean connectivity pathways.
- There is a need to work out how conservation measures can be included in developing regulations. Commercial interests are difficult to reconcile with environmental regulations.
- It was noted that in the ATLAS study of resilience of ABMTs to climate change scenarios presented by Ellen Kenchington, hydrothermal vents were the only habitat shown to be resilient to climate change impacts, but they are likely to be affected by deep-sea mining. The EBSA designation at some of these sites in the North Atlantic was mostly ignored by the ISA because it has no legal designation. Perhaps higher levels of thresholds and standards are required to avoid conflicts between different commercial activities.
- However, an opposing view was that EBSAs should be kept as a purely scientific recognition of natural value, and that it was important that they be kept separate from politics otherwise their designation becomes tainted.

Session 3: Blue Growth scenarios and implications for relevant area-based management tools

The afternoon session of the symposium focused on Blue Growth scenarios in the North Atlantic and what implications they might have for the implementation of area-based management measures. Dr Anthony Grehan presented some of the key principles of ecosystem-based management, the role that marine spatial planning has to play in effectively balancing human activities, blue growth and environmental stewardship, and how this is being taken forward in international policy development. Dr Grehan detailed the Blue Growth scenarios currently under consideration for a number of the ATLAS case study areas, and explained how the MESMA

framework is being used to develop spatially managed area (SMA) plans to test these scenarios against a backdrop of climate change.

The talk programme was rounded off by a summary of policy priorities for EBSAs, VMEs and MPAs in the Atlantic, presented by Prof. David Johnson. He identified four policy priorities as follows:

1. Predicting future change: ensuring that ABMTs are “future proofed” and relevant in the longer-term. Where ATLAS can advise Competent Authorities on the nature and extent of change;
2. Refining polygons: to better reflect biodiversity present, incorporating new scientific information. Where ATLAS can advise Competent Authorities on ecosystem composition;
3. Reacting to change: cumulative pressures requiring adaptation management and potential repositioning of ABMTs and/or making adjustments to enable Blue Economy opportunities. Where ATLAS can provide suggestions on effectiveness and specific trade offs; and
4. Creating an ecologically coherent High Seas network: recognising gaps, advocating a role for “Other Effective Conservation Measures” and making connections with EEZs. Where ATLAS can make suggestions for additional ABMTs.

To date a range of policy discussions have been informed by ATLAS on this basis at different scales (Global UN, Atlantic-wide, regional, sectoral, national) through presentations, input of data to enhance baselines (ICES, OBIS, EMODnet), peer reviewed publications and sharing information/outreach. Prof. Johnson then illustrated how VMEs are identified and mapped by ICES (with thanks to Eskild Kirkegaard), using the online ICES VME data portal and a VME weighting algorithm (multi-criteria assessment tool to relate likelihood of VME presence to a vulnerability score) with assigned confidence scores. He concluded that VMEs have much more potential for adaptative management than High Seas MPAs based on Guidance for Modifications as new information is required, set review dates and peer review.

Breakout groups

The symposium participants were divided into three discussion groups to consider the following topics: Blue Growth and policy opportunities, area-based management tools (ABMTs), and Vulnerable Marine Ecosystems. Participants spent approximately 30 minutes at each discussion station before rotating on to the next topic. The aim of the exercise was to capture reactions to the presentations and provide input to future discussions, policy briefs and negotiations on Blue Growth scenarios and the application of area-based management tools.

A summary of each discussion group topic is given below.

Topic 1: Blue Growth and policy opportunities

(Moderator: Murray Roberts; rapporteur: Anthony Grehan)

1. Should we identify Blue Growth (BG) areas?

- Yes - MSP supports zoning of BG activities

2. What are the limits to BG?

- Ability to sustain healthy ecosystems and oceans
 - In Europe, MSFD and the need to ensure GES (Good Environmental Status) may limit some BG activities
 - Reaching cumulative environmental impact thresholds (when these are defined) - GES
- The costs related to effective monitoring, addressing industry impacts and the implementation of conservation measures
- The lack of environmental baselines
- The need for lifecycle assessment of the BG activity
- The need to apply the precautionary principal

3. What are the tensions?

- Oil/gas vs fisheries/sensitive benthos/marine mammals (protected resources)
 - But oil/gas has higher value per unit area of footprint
- Intra-governmental management divisions (silo thinking) is prevalent
 - This can result in Government inter-departmental policy mismatches leading to unsustainable practices
- Loss of future options (bequest value)
- Equitability of benefit sharing - for example:
 - Fishing vs mining in NZ
 - Fishing vs oil/gas in Canada
- Historical (property) rights will come into play during any attempt to implement a new spatial plan
- "Valuing nature" is important but we need to be cognizant of different world views (cultural identity etc.)

4. Can we give examples of trade-offs?

- There is a lack of knowledge of true value of ecosystem goods and services
- The legitimacy of applying (habitat) offsetting in deep-sea needs to be established
- Scales of benefit versus damage need to be considered
 - Example of Namibian phosphate mining impacting hake spawning sites

- Destruction of habitat equates to loss of bequest value, i.e. potential to benefit future generations
- *It's hard to evaluate trade-offs with incomplete information*

5. How do we ensure more stringent environmental impact assessment (EIAS)

- EIAs have to be embedded in SEAs
- Regulators should have sufficient technical capacity to assess EIAs
 - Better oversight of the regulators by scientific experts
- Appropriate environmental indicators need to be selected
- Data should be lodged in an EIA repository to build the knowledge base over time
- Guidelines/thresholds for EIAs may need to be revised and redefined given advances in technology etc.

Topic 2: Area-based management tools

(Moderator: David Johnson; rapporteur: Lea-Anne Henry)

More flexible ABMTs (revisiting and assessing MPA management boundaries)

Principal discussion points were scoped by the first group of participants and reactions of subsequent groups were recorded as follows:

- How often do you re-visit these ABMTs? Depends on conservation objectives or case-by-case basis
- Policy drivers often dictate monitoring, but this should be more scientifically informed e.g. understand environmental drivers
- Sometimes risk-based assessments dictate monitoring frequency
- Always re-visit as 'certainty' changes
- Address institutional barriers: e.g. highly dependent on existing survey design including single species approaches

Reaction 1

- Research vessel technology is limited
- surveys down to restricted depths
- long-term science agendas need work
- what is pragmatic for industry could help inform
- shifting MPA boundaries may need to be more sector-specific
- being more risk-based including precautionary approach

Reaction 2

- How do you make/adjust MPAs in areas with multiple sectors
- Buffer zones could include some human activities
- Legislation (in some countries) to change ABMTs in place can be complex
- MPA definition needs to be changed - allowing non-static MPAs

Value of predictive models

- Uncertainty in models must be understood by policy-makers
- Multi-model assessments give more weight to certainty, beyond fisheries e.g. VME taxa
- Same point regarding institutional barriers

Reaction 1

- Ground truthing on-going
- Including ensemble models
- Issues of scale need to be worked through
- Standardise data collection methods

Reaction 2

- Validation of models need refining
- Baseline data should be used by all (standard)
- Great value to explore but also be precautionary

Heading for 30%?

- Need scientific rationale to support 30%
- Possible just by closing areas not already impacted
- Burden of proof could be shifted to 'how much does industry need'

Reaction 1

- 30% is part of the story, more of a political construct that Agencies can strive for
- need effective management, not %

Reaction 2

- % should reflect a more case-by-case basis
- should it be 30% of ocean or 30% of habitat extent?

Maps to regulation

- Need 2D and 3D
- Maps are effective tools if scaled correctly
- Need maps to be shown to 'local' authorities

Reaction 1

- Mapping companies need support, private data could be made open/shared
- Better stronger science - industry collaboration
- Knowledge transfer
- Limits to maps need to be understood by all
- 3D mapping technically possible - make policy aware

Reaction 2

- better ILK with map products
- zoning approaches
- maps that integrate with each other

Topic 3: Vulnerable Marine Ecosystems

(Moderator: Telmo Morato, rapporteur: Matt Gianni)

Standard approaches to applying the VME criteria

- Using VME indicator taxa is still considered a reasonable approach to follow. Many RFMOs have adopted lists of what they consider VME indicators in their specific regions. However, it was noted that some RFMOs have only agreed to a limited number of VME indicator species in regions where more species are likely to meet the criteria in the UN FAO International Guidelines for the Management of Deep Sea Fisheries in the High Seas (FAO Guidelines). It was suggested that all benthic epifaunal and at least some infaunal species may be vulnerable to some type of impact from bottom contact fishing although the extent and duration of the impacts will vary depending on the species and areas concerned, and the type of bottom gear and frequency of impact. It was noted that the list of VME indicators should move from very broad taxonomic categories (e.g. Sponges) to a finer level (Family, Genus or Species).
- The application of the VME criteria in the FAO Guidelines (para. 42) was considered to be case specific. However, it was noted that the lack of baselines prior to disturbance may be hampering the proper application of VME thresholds and the identification of VMEs. The set of criteria in the FAO Guidelines (paragraph 42) for defining what constitute a VME were considered valid:
- Structural Complexity:
 - The SponGES project is attempting to define when a sponge aggregation is considered a “sponge ground” based on patterns of abundance consistent with the criteria in the FAO Guidelines related to structural complexity (An ecosystem that is characterized by complex physical structures created by significant concentrations of biotic and abiotic features).
 - In the ATLAS/ICES approach, structural complexity is scored based on the perceived structural habitat created, frame-building, and presence of commensal or closely associated species.
- Fragility and Life History Characteristics:

- It was suggested that species, communities and habitats that are not capable of recovery within 5-20 years should be considered fragile as reflected in the criteria for VMEs in the FAO Guidelines - Fragility (An ecosystem that is highly susceptible to degradation by anthropogenic activities) and life history characteristics (Life-history of species which make recovery difficult). This is consistent with the criteria in the FAO Guidelines related to assessing significant adverse impacts.
- In the ATLAS/ICES approach fragility is scored according to the perceived fragility of the indicator against physical contact, the height and complexity of its structure, and the capacity for retraction, retention or re-growth or of being naturally protected from fisheries impacts in some way.
- Uniqueness and rareness:
 - Regarding the criteria in the FAO Guidelines of uniqueness or rareness (An area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by similar areas or ecosystems), it was suggested that the lack of knowledge is hampering the application of this criteria, but a biogeographical approach could be adopted.
 - In the ATLAS/ICES approach rarity is scored according to presence on IUCN red list, and if the indicator was known to be endemic, rare, threatened or declining.
- Functionality:
 - The breakout group did not discuss the criteria in the FAO Guidelines of Functionality at length. However, several participants noted that ecological functionality of VME species can be an important issue, for example, that sponges filter large volumes of water and the potential role or ecosystem service this supplies. Effort should be made to assess the functionality of key VME species to better determine the extent of the impacts on VMEs on the broader ecosystem.
 - In the ATLAS/ICES approach functionality is scored by evaluating if the indicators were known to create nursery areas for other species, or known for having higher level ecosystem role, such as nutrient cycling and water filtration.

What level of perturbation might be acceptable?

- There was considerable discussion over what level or degree of perturbation of VMEs or VME indicator species should constitute an excessive level or significant adverse impact. There were a range of views on this topic of measuring the extent of perturbation. Some suggested that most VMEs have already experienced far too much perturbation and that any further impacts on VMEs should be prevented.
- Others were of the view that a certain percentage of the areas where VMEs the range of distribution of VME indicator species are likely to occur should be closed to bottom fishing with suggestions ranging from 30-80%.
- It was recognized that the level of perturbation should be considered not only in terms of the direct impact of bottom fishing in the VME area but also in adjacent areas, since this perturbation may also affect VMEs (e.g. plumes generated by trawling on soft sediments; impacts on connectivity).

- It was recognized that not all VME indicator species form aggregations but may be widespread in a region (e.g. black corals in the northwest Atlantic) but that these should be protected through closed areas of significant size.

How to handle multiple stressors

- Following from the previous it is important to recognize that VMEs are likely to be impacted by multiple stressors including those related to climate change. Identifying the potential impacts related to climate change and other stressors on deep-sea ecosystems is an important part of the work of the ATLAS Project. It was recognized that assessing cumulative impacts was important and that this is reflected in the UNGA resolutions (e.g. UNGA 66/68) as well as the FAO Guidelines for the conduct of impact assessments (paragraph 47) but that there are major challenges to doing such assessments.
- It was recognized that the cumulative impacts on VMEs, including in particular past or historical bottom fishing in areas where VMEs are known or likely to occur, has probably already resulted in considerable impact on VMEs and that this should be taken into consideration when assessing and managing current bottom fisheries for their impacts on VMEs.
- A reference was made to the UN's First World Ocean Assessment and its conclusion that deep-water trawling has likely reduced the resilience seamount ecosystems to the impacts of multiple stressors.²

Other comments

- Protection of VMEs often hampered by lack of political will as opposed to insufficient scientific information. It was noted that the UN General Assembly (UNGA) resolutions regarding the management of deep-sea fisheries call on States and RFMOs to close areas where VMEs are known or likely to occur on a precautionary basis unless fishing can be managed in the area to prevent significant adverse impacts on VMEs. This objective is established in the regulations adopted by RFMOs in the North Atlantic and elsewhere. The UNGA resolutions also call on States and RFMOs to conduct prior environmental impact assessments of bottom fisheries consistent with the FAO Guidelines. The Guidelines in turn, recommend that EIAs include "mapping" areas where bottom fishing may be permitted to occur to determine whether VMEs are present in the area and whether and what management measures are required to protect them. However, this is often not done and in some cases bottom fishing is permitted to occur in areas where the best scientific information indicates that VMEs are likely to occur without a proper impact assessment.

² "Deep-sea ecosystems associated with seamounts, ridges, and other topographic features are now and will increasingly be subjected to multiple stressors from habitat disturbance, pollutants, climate change, acidification and deoxygenation. Studies to date on these impacts have been limited and considered in isolation. The scientific understanding of how these stressors may interact to affect marine ecosystems remains particularly poorly developed. For example, the widespread destruction of deep-water benthic communities due to trawling has presumably reduced their ecological and evolutionary resilience as a result of reduced reproductive potential and loss of genetic diversity and ecological connectivity. The synergistic influence of these factors is unknown at present." UN's 1st World Ocean Assessments, Chapter 51: Biological communities on seamounts and other submarine features potentially threatened by disturbance. Page 16

- It was also noted that the UN General Assembly in its most recent review and resolution, in 2016, on deep-water bottom fisheries encouraged States and RFMOs to make use of a variety of types of marine scientific research such as seabed mapping, mapping of vulnerable marine ecosystems based on information from the fishing fleet, on-site camera observations from remote vehicles, benthic ecosystem modelling, comparative benthic studies and predictive modelling to identify areas where vulnerable marine ecosystems are known or are likely to occur (UNGA resolution 71/123; paragraphs 181 & 182).

The symposium closed with Prof. Johnson thanking the participants for their time and input. A report of the day's events will be made available in due course.

Postscript on taking forward the Symposium conclusions

The outcome of the Symposium was shared at a series of 8 related meetings during the remainder of 2018. Brief details of these meetings and their particular interests are set out below:

1. GPS Azores (22-23 June, 2018): This regional project on 'Geographical and Political Scenarios in marine spatial planning for the Azores and North Atlantic' is a theoretical strategic approach to planning. One scenario, based on the Azores Marine Park is highly relevant to ABMT ideas shared during the Symposium. ATLAS will continue to be associated with this project.
2. Nausicaa High Seas Conference (27-28 June, 2018): this international conference celebrated a major new exhibition 'Journey in the High Seas' at Nausicaa, Centre National de la Mer, Bolougne France. ABMTs were a core part of the discussions and ATLAS Symposium results informed the debate.
3. CBD SBSTTA 22 (and IAG) (30 June - 7 July, 2018): An options paper (CBD/SBSTTA/22/7) for possible future refining of the EBSA portfolio was discussed at length during this meeting of the Subsidiary Body for Scientific, Technical and Technological Advice. Many of the points raised during the Symposium were relevant, especially modalities to incorporate and factor in new scientific data. The inaugural meeting of the Informal Advisory Group on EBSAs took place back to back with SBSTTA 22.
4. GEF-ABNJ (17-18 July, 2018): This project includes an analysis of ABMTs in the North- East Atlantic as one of four case studies from which lessons can be learned for future management and policy options. ATLAS will continue to be involved in this project through Seascope Consultants Ltd.
5. BBNJ ICG(1) (3-17 September, 2018): An ATLAS side event, sponsored by the French Sustainable Development Research Institute (IDDRI), considered High Seas marine spatial

planning. In particular, ATLAS work on ABMTs is relevant to the package of issues being negotiated by the Intergovernmental Conference and the ideas presented at the Symposium on adaptive management of VMEs were also presented here.

6. IUCN Paris (16-17 October, 2018): This global expert meeting focused on % targets for ABMTs as discussed by the Symposium Topic Group 2.
7. OSPAR ICG-MPA 2018 (30 October - 1 November, 2018): This expert group reviewed the OSPAR MPA network including the High Seas MPAs. An ATLAS presentation included the results of the Symposium. The expert group gave further consideration to the NACES MPA proposal and ICES advice received by OSPAR.
8. CBD COP14 (17- 28 November, 2018): Parties adopted Decision XIV/9 after intense discussion on the modalities for modifying the description of EBSAs, for describing new areas and for strengthening the scientific credibility and transparency of this process. Parts of the discussion were not concluded and ATLAS can continue to influence this process based on the results of the Symposium and future deliverables.

Two peer-reviewed publications produced in 2019 were informed by the results of the Symposium as follows:

Johnson D.E. & Kenchington, E.L. (2019) Should potential for climate change refugia be mainstreamed into the criteria for describing EBSAs? *Conservation Letters*, DOI 10.1111/conl.12634.

Johnson, D.E. et al. (2019) Rockall and Hatton: resolving a super wicked marine governance problem in the high seas of the northeast Atlantic Ocean. *Frontiers in Marine Science*, DOI 10.3389/fmars.2019.00069.

Annex I: Symposium programme

North Atlantic EBSAs, VMEs and MPAs in a changing ocean

Saturday 12 May 2018

Venue: Auberge du Vieux Port

97 De la Commune East, Montreal, H2Y 1J1

Session 1: Introduction and context Moderator: Prof. David Johnson, Seascope Consultants Ltd	
09.00	Welcome; aims and objectives of the symposium <i>Prof. David Johnson, Seascope Consultants Ltd / ATLAS lead on Policy Interaction</i>
09.15	ATLAS resume: Blue Growth in a dynamic deep-sea environment <i>Prof. Murray Roberts, University of Edinburgh / ATLAS Project Coordinator</i>
09.30	Progress on biodiversity and biogeography to advance science and add new information – key messages <i>Dr Telmo Morato, IMAR University of Azores</i>
09.45	Selected case study examples: the Tropic Seamount and the Davis Strait <i>Dr Lea-Anne Henry, University of Edinburgh</i> <i>Dr Ellen Kenchington, DFO</i>
10.00	Conserving deep-sea sponge biodiversity: The SponGES project <i>Dr Joana Xavier, University of Bergen</i>
10.15	Discussion
10.45	Coffee break
Session 2: Coverage of VMEs, EBSAs and MPAs: status and future prospects Moderator: Dr Anthony Grehan, National University of Ireland Galway	
11.15	VMEs: The role of Regional Fisheries Management Organizations <i>Dr Andrew Kenny, CEFAS / NAFO</i>
11.30	Ecologically or Biologically Significant Areas: the CBD process <i>Mr Joseph Appiott, Secretariat for the Convention on Biological Diversity</i>
11.45	Ecologically or Biologically Significant Areas: the Canadian national process in the Atlantic <i>Ms Nadine Wells, DFO</i>
12.00	High Seas MPAs: the OSPAR experience <i>Prof. David Johnson, Seascope Consultants Ltd / ATLAS lead on Policy Interaction</i>
12.15	Analysis of VMEs, EBSAs and High Seas MPAs in the context of climate change <i>Dr Ellen Kenchington, DFO</i>

12.30	The conservation of biodiversity in the marine environment: the regulation of deep-sea fisheries and mining <i>Mr Matt Gianni, Deep Sea Conservation Coalition</i>
12.45	Discussion
13.15	Lunch
Session 3: Blue growth scenarios and implications for relevant area-based management tools Moderator: Prof. Murray Roberts, University of Edinburgh	
14.30	Maritime Spatial Planning: Blue Growth opportunities for selected ATLAS case studies <i>Dr Anthony Grehan, National University of Ireland Galway / ATLAS lead on MSP</i>
14.45	Policy priorities for EBSAs, VMEs and MPAs in the Atlantic <i>Prof. David Johnson, Seascope Consultants Ltd / ATLAS lead on Policy Interaction</i>
15.00	Breakout group discussions to consider policy opportunities in detail (including working coffee break)
16.30	Feedback and conclusions Outputs from the symposium
17.00	Meeting close; informal networking reception

Annex 2: List of symposium participants

Last name	First name	Organisation
Appiott	Joe	S-CBD
Assad	Irawan	University of Auckland
Auscavitch	Steve	Temple University
Carr	Hannah	JNCC
Carreira Silva	Marina	IMAR
Carvalho	Francisca	DFO/UIB
Curtice	Corrie	Duke University
Day	Anastasia	Atlantic Canada Opportunities Agency
Edmondson	Elizabeth	DFO
Fajardo	Paola	McGill Uni
Favaro	Corinna	DFO
Fox	Alan	University of Edinburgh
Franklin	Christine	Pew Charitable Trusts
Gianni	Matt	Gianni Consultancy
Gjerde	Kristina	IUCN
Goodwin	Claire	Atlantic Reference Centre, Huntsman Marine Science Centre
Grehan	Anthony	NUIG
Guarin	Gustavo Adolfo	Université Laval
Gunn	Vikki	Seascope/ATLAS
Heaslip	Susan	DFO
Henry	Lea-Anne	U.Ed.
Hiltz	Crystal	Atlantic Reference Centre, Huntsman Marine Science Centre
Jesus	Ana	JNCC
Johnson	David	Seascope/ATLAS
Karan	Elizabeth	Pew Charitable Trusts
Kazanidis	Georgios	U.Edinburgh
Kenchington	Ellen	DFO
Kenny	Andrew	NAFO
Le Corre	Nicolas	Memorial University
LeBris	Nadine	Oceanological observatory of Banyuls
Lindstedt	Amber	DFO
Longtin	Caroline	DFO
Majiedt	Prideel	SANBI
Milne	Rebecca	Atlantic Reference Centre, Huntsman Marine Science

		Centre
Morato	Telmo	IMAR
Pierrejean	Marie	Université Laval
Roberts	Murray	U.Edinburgh
Robson	Laura	JNCC
Rowden	Ashley	NIWA
Saunders	Sarah	WWF Canada
Schaefer	Terry	NOAA
Settingington	Lisa	DFO
Soto Oyarzun	Eulogio	Universidad de Valparaíso
Speer	Elizabeth	NRDC
Wareham Hayes	Vonda	DFO
Wawrzyniak-Wydrowska	Brygida	University of Szczecin
Wells	Nadine	DFO
Xavier	Joana	U.Bergen / SPONGES

Appendix: Document Information

EU Project N°	678760	Acronym	ATLAS
Full Title	A trans-Atlantic assessment and deep-water ecosystem-based spatial management plan for Europe		
Project website	www.eu-atlas.org		

Deliverable	N°	7.3	Title	ATLAS Trans-Atlantic Conference Report
Work Package	N°	7	Title	Policy Integration to Inform Key Agreements

Date of delivery	Month 36
Dissemination level	Public

Authors (Partner)	Seascope Consultants Ltd			
Responsible Authors	Name	D. Johnson	Email	david.johnson@seascopeconsultants.co.uk

Version log			
Issue Date	Revision N°	Author	Change