atlas
UNDERSTANDING DEEP ATLANTIC ECOSYSTEMS

A trans-Atlantic assessment and deep-water ecosystem based spatial management plan for Europe

ISSUE 4| SEPTEMBER 2018

project news

Paragorgia sp. coral garden discovered during the Blue Azores Expedition 2018. © Ocean Azul Expedition, ROV Luso, EMEPC, IMAR-UAz

IN THIS ISSUE:

ATLAS is a four-year research and innovation project that aims to advance our understanding of the deep Atlantic Ocean ecosystems. **ATLAS** will provide essential new knowledge for effective ocean governance and adaptive management strategies that stimulate Blue Growth. It is the largest integrated study of deep Atlantic ecosystems ever undertaken. Funded under the European Union's Framework Programme for Research and Innovation, Horizon 2020, it has a total budget of €9.1 million. Led by the University of Edinburgh (Scotland, UK).

WELCOME FROM THE ATLAS COORDINATOR

Prof J Murray Roberts (The University of Edinburgh (UEDIN), ATLAS Coordinator)

We are now over halfway through our **ATLAS** voyage and what a lot we have to look back on already, and what a great foundation we've created for our work together over the next two years! I hope you enjoy the articles in this bumper issue of the **ATLAS** newsletter – the passion behind the **ATLAS** team's research is so clear and it's this passion that's driving our project forward and creating the collaborations and friendships that make being a marine scientist the best job in the world. Partnerships are at the heart of the **ATLAS** approach, and as I write this, Graham Tulloch (British Geological Survey) and Sabena Blackbird (University of Liverpool, UK) are at sea on the Canadian icebreaker *Amundsen* in one of our most ambitious partnership cruises so far. This cruise is a perfect example of the Galway Declaration's transatlantic alliance in action with ship time generously provided by the Canadian government, expertise and equipment from our partners University of North Carolina Wilmington USA, and research funds and people power from several European partners. While we look forward to the results from this partnership between Canada, the US and Europe it's great to see the discoveries from our other expeditions, notably the discovery of the *Luso* hydrothermal vent field and nearby coral gardens in the Azores (see p 8).

Our outputs continue to grow with 41 papers published and 53 more in preparation. Do check out the first **ATLAS** *Nature* paper (see p 4). We will continue to take our findings straight into policy discussions through our Science-Policy Panels (see p 4) and the **ATLAS** policy team are now busy limbering up for September's Intergovernmental Conference at the United Nations on the new legal instrument to manage marine biodiversity beyond national jurisdiction.

Do settle down with a coffee and enjoy this newsletter. I find all the stories inspirational and want to thank everyone across the project for all you're doing to make **ATLAS** what it is. Here's to our next two years!

Murray.Roberts@ed.ac.uk

SPRING – SUMMER 2018 HIGHLIGHTS

ATLAS 3rd General Assembly

The **ATLAS** Consortium gathered in Mallorca (Colonia Sant Jordi) for its 3rd General Assembly from 8 – 12 April 2018. The meeting brought together more than 70 participating scientists, policy makers and industry stakeholders to discuss the latest revelations from the project. The four days were filled with presentations, posters and breakout discussions on the many exciting scientific advances made by the consortium. If you missed anything, video recordings, slides, posters and summaries of all the presentations are now available on the **ATLAS** project website: **https://bit.ly/2BuMtN2**

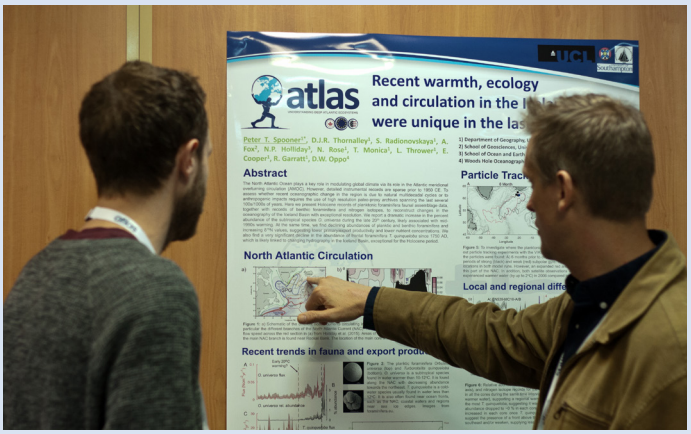
This year Dr Nicolas Le Corre and Marta Miatta joined the meeting with our Advisory Board member Dr Paul Snelgrove from the Canadian Healthy Oceans Network (CHONe). Nicolas, Marta and others have teamed up with Dr Laurence de Clippele (**ATLAS** Project Office, UEDIN) to create a new deep-sea early-career researcher's forum 'Deep CRC' to share experiences and support. If you want to get involved, seek advice or give top tips on surviving your PhD or postdoc, please contact Laurence **(Laurence.de.clippele@ed.ac.uk)**.

A massive thank you to the General Assembly organising committee: Julia Eighteen and Dr Laurence de Clippele, **ATLAS** Project Office, UEDIN.

Attendees at the 3rd **ATLAS** General Assembly © Dr Laurence de Clippele, UEDIN

REMINDER:
Don't forget to tweet your photos wearing the ATLAS beanie! Prizes for the best location: @eu_atlas

Dr Lea-Anne Henry (UEDIN) leading discussions on biogeographic classification



Dr Peter Spooner (UCL) and Prof J Murray Roberts (UEDIN) debating the repercussions of recent changes in ocean circulation

Jeanne Gallagher (UCD) and Dr Jake Rice (DFO) sharing insights on connected resources in the deep sea

Dr Ann Larsson (TMBL), Dr Dick van Oevelen (NIOZ), Vilhelm Fagerström (GU) and Dr Ingunn Nilssen (Equinor) gathering at the poster session

Dr Sophie Arnaoud-Haond (IFREMER) questioning why the next breakout session can't be outside!

Deep in thought... Dr Georgios Kazanidis (UEDIN), Carlos Dominguez-Carrió (IMAR) and Marta Miatta (CHONe)

Dr Marina Carreiro-Silva (IMAR-UAz) and Stephanie Liefmann (UEDIN) discussing the Mallorcan sun

*All pictures courtesy of Dr Laurence de Clippele, **ATLAS** Project Office, UEDIN.*

ATLAS research published in *Nature!*

On the final day of the 3rd **ATLAS** General Assembly, it was announced that research carried out within the framework of **ATLAS** had been published in Nature. The article reports on remarkable results from a study on Atlantic circulation conducted by **ATLAS** partners University College London (UCL) and the Department of Fisheries and Oceans (DFO), Canada. The research findings revealed a marked weakening in the Atlantic Meridional Overturning Circulation (AMOC) over the past 150 years and indicated that the trend is likely to continue.

To learn more about AMOC, please see 'AMOC for Smarties' by **ATLAS** researcher Dr Peter Spooner (UCL) on p 5.

To read the full article, please see: **Thornalley et al. 2018. 'Anomalously weak Labrador Sea convection and Atlantic overturning during the past 150 years'.**

2nd ATLAS Science – Policy Meeting

The **ATLAS** consortium, together with the Department of Fisheries and Oceans Canada (DFO), hosted a Science–Policy meeting in Ottawa, Canada. Illustrating the power of the 'Galway Declaration' to foster transatlantic cooperation between Europe, Canada and the USA, the conference proceedings paved the way for future collaborative initiatives and frameworks in ocean research. **ATLAS** policy lead Prof David Johnson (Seascape Consultants Ltd., UK) commented on the importance of these efforts:

*"Environmental change is forcing us to reconsider our approach to managing ocean areas. In Canada we have brought together experts to help identify research results from **ATLAS** which can be used to inform future governance."*

A full report on the 2nd **ATLAS** Science–Policy meeting is now available on the **ATLAS** project website.

ATLAS and DFO representatives at the Science–Policy meeting in Ottawa, Canada © Prof David Johnson, Seascape Consultants Ltd., UK

ATLAS NEWS AND STORIES

ATLAS Represented at International Forum for Marine Spatial Planning

By Prof David Johnson, ATLAS partner, Seascape Consultants Ltd. (UK)

Prof David Johnson (Seascape Consultants Ltd., UK) represented **ATLAS** at the kick-off event for the Joint IOC-UNESCO – EC DG-MARE International Forum for Marine/Maritime Spatial Planning (MSP) in Brussels from 22 – 25 May 2018. The Forum aims to develop international guidelines on cross-border and transboundary MSP, exchange good practices, and generally inspire the MSP community.

At the event, the EU Joint Communication on International Ocean Governance emphasised the potential of oceans for boosting growth, jobs and innovation, the ocean's key role in regulating the climate system, threats from over-exploitation, declining biodiversity and the need for accurate and timely information on the state of marine resources and ecosystems and other issues.

DEFINITIONS:

Cross-border region: two or more countries share a border

Transboundary region: multi-actors share borders and share borders with international water areas (outside exclusive economic zones)

The Forum also discussed MSP in the context of large transboundary Marine Ecosystems. The issues raised in the Forum resonate with several cross-border **ATLAS** case studies as well as the project as a whole, which is an example of a transboundary initiative in a sea basin that has MSP systems at different stages of development. **ATLAS** does not have the mandate to produce a sea basin MSP, but it is viewing Blue Growth (see p7) opportunities in the context of a changing ocean. In particular, two working groups of the **ATLAS** project, dealing with MSP and policy integration, have been considering how such activities should be undertaken in a manner that is efficient, safe and sustainable and which informs ocean governance.

continued on next page

ATLAS will consider these different MSP systems and the varying timelines along which they are evolving when considering a strategic environmental vision for the North Atlantic sea basin.
To learn more about the Joint IOC-UNESCO – EC DG-MARE International Forum for Marine/Maritime Spatial Planning, please see:

https://www.msp-platform.eu/events/kick-event-international-forum-maritime-spatial-planning

An extended version of this article is available on the ATLAS project website.

We are always eager to hear about your exciting research results and stories! Please send your news to: atlas@aquatt.ie

Cartoon drawing or 'graphic recording' of Marine Spatial Planning in action © Joint IOC-UNESCO – EC DG-MARE International Forum for Marine/Maritime Spatial Planning

AMOC for Smarties

By Peter Spooner, ATLAS partner, University College London (UCL, UK)

The **ATLAS** consortium was thrilled to learn of *Nature*'s decision to publish an **ATLAS** -funded study on anomalously weak Labrador Sea convection and Atlantic overturning during the past 150 years. To learn more about this important topic, the newsletter is proud to present a short explanation of AMOC by none other than Dr Peter Spooner (UCL, UK), the study's co-author and **ATLAS** partner.

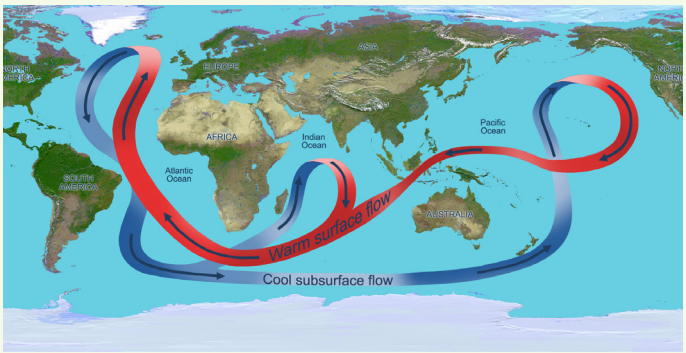


Fig. 1. The global ocean conveyor belt © NASA/JPL

The Atlantic Meridional Overturning Circulation (AMOC) is one of the most important climatic phenomena on Earth. Like many natural systems, the AMOC is so complex that in many respects it still defies our understanding. However, simplified models can be useful when thinking about its role in weather, climate, and ecosystems. Perhaps the most well-known of these models is the ocean conveyor belt (Fig. 1). This vastly simplified schematic of the global circulation shows us the most fundamental view of the Atlantic overturning circulation, with warm water near the surface travelling northwards, only to be cooled in the Labrador and Nordic Seas where it sinks due to an increase in density and flows back southwards. The difference in temperature between these northward and southward flows results in a strong northward heat transport, one of the most important climatic aspects of the AMOC. To better understand the AMOC, we need to think about the circulation in 3D, all the different components that comprise it, and what ultimately drives them.

Changes in temperature and salinity affect ocean density, and therefore the ability of water to sink at high latitudes. However, we also know now that the energy required to keep the flow going is actually supplied by winds and tides, and so we must consider the AMOC as both a mechanically- (wind/tide) and buoyancy-controlled system. Wind directly drives the ocean gyres, a major component of the AMOC which has different strengths at different latitudes. The links between overall AMOC strength (i.e. the volume of water flowing northwards in the upper Atlantic per unit time) and the dynamics of each of its different components are not straightforward. For example, an AMOC slowdown could be driven by changes in wind-forced gyre circulation (often on inter-annual timescales), or by buoyancy-driven changes (decadal or centennial timescales) in Labrador Sea convection, or by convection in the Nordic Seas, or all of the above. At other times, we might get counteracting changes in the deep-water formation regions, which involve very significant changes to local oceanography, but little overall change in AMOC strength. In the presence of a coherent forcing, such as warming and freshening at high latitudes driven by anthropogenic CO_2 emissions, we expect (and are starting to detect) the AMOC to get weaker. But we have yet to fully understand how this thermohaline weakening will interact with each part of the AMOC system, and therefore how it might affect heat transport, carbon cycling and ecosystems.

An extended version of this article is available on the ATLAS project website.

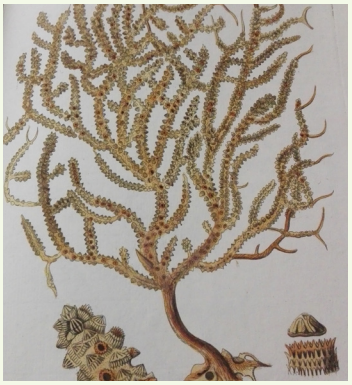
The Natural History of Atlantic Octocorals in the footsteps of Dr Manfred Grasshoff

By Íris Sampaio, ATLAS partner, Instituto do Mar-University of the Azores (IMAR-UAz, Portugal)

Global citizens are as diverse as the organisms I was looking for in the Natural History Museum – Senckenberg, in Frankfurt (Germany): Octocorals.

Similar to the first publication on octocorals by John Ellis in 1755, my interaction with octocorals started with a collection made in collaboration with fishermen on Faial island, Azores. Back in 2007 I wished to understand the impact of fishing on corals inhabiting the deep sea of the Azores.

From all the major coral groups, gorgonians (a group within octocorals) were the ones that caught my attention with their diversity, beauty and architectural sophistication. Octocorals are among nature's foremost engineers! In a union of soft tissue with calcareous structures, they stretch and compress in line with the oceanic currents – much like a musician plays an accordion to the pace of the music. Their polyps are hydrostatic systems, with eight mesenteries in the inner part of a hollow body, which hold the eight tentacles, giving support and shape to the body while providing control of its movements. Bridges among polyps are called coenenchyma and represent the main structural part of the octocoral body.



Hand-coloured octocoral prints by Johann Esper 1791

Layers of bricks, the sclerites, can be found inside or outside the coral body according to taxa. Sclerites control the order of the movements of the thin-walled body under the internal hydraulic pressure and the contraction of the muscles. Diverse shapes of sclerites are arranged to give structure to the octocoral in a major class of architecture.

All this amazement and knowledge was inexplicably caught only by a few people. The 20th century began with the main revisions on octocorals made in the NW Atlantic by Dr Elizabeth Deichmann and in the NE Atlantic Ocean by Prof John Arthur Thomson. A gap in taxonomic studies followed until the 1950s when Dr Frederick Bayer became the leading authority of octocorals and introduced the first published description of an octocoral species using scanning electron micrographs of their sclerites. Dr Stephen Cairns followed his steps by studying the gorgonians of the family *Primnoidae*. At the same time, in Europe, Dr Manfred Grasshoff revised the most common families of gorgonians of the NE Atlantic until the beginning of the 21st century, becoming the leading expert on this side of the basin. Despite some sporadic publications, no one followed in his footsteps and a void was left for the upcoming deep-sea exploration era.

It is incomprehensible to me that such diverse and beautiful animals are not attracting more scientists into the field of taxonomy. This gap in expertise begs the question: how can we understand and protect what we do not know? We should not be making conservation choices based on incomplete knowledge. With this in mind, I decided to follow their lead and continue the taxonomic work that has

Íris Sampaio (right) with Dr Manfred Grasshoff (left) at Senckenberg Museum, Frankfurt, Germany

major importance for all the biological sciences that follow. My PhD project investigates the biodiversity of gorgonians of the family *Plexauridae* in the NE Atlantic Ocean, following on from the work of Dr Manfred Grasshoff, who revised the previously named *Paramuriceidae* in 1977. For a decade I have read, identified samples, and constructed maps based on his papers. Thanks to a Network Senckenberg grant, I spent two weeks in June 2018 in Frankfurt which represented a historical moment for my career in taxonomy.

I finally met Dr Grasshoff and we spoke about the old times of the field, the octocoral species, the construction of animals, the evolution based in morphological characters and the techniques and tricks which enable a better performance in this research topic. In Frankfurt, I had access to a specimen of the species first described by Dr Grasshoff, and realised that the Azorean species, previously thought to be the same as the one described by Dr Grasshoff, is probably not it at all! Yet, most importantly, I discovered that half a century of age difference between us has no meaning when we look at octocorals in the same way.

Íris Sampaio is a PhD Candidate in Ocean Sciences, Marine Ecology at MARE & DOP, UAz and Senckenberg am Meer, Wilhelmshaven supervised by Dr Marina Carreiro-Silva, Prof Dr André Freiwald and Dr Gui Menezes. Funded by Forschungs-Alumni-Netzwerk Senckenberg (FANS), she travelled to Senckenberg Museum with the support of the Research Alumni Strategies-program of the Alexander von Humboldt Foundation.

An extended version of this article is available on the ATLAS project website.

Blue Growth: the mandate for ATLAS research

*By **ATLAS** partners Prof David Johnson (Seascape Consultants Ltd., UK) and Dr Anthony Grehan (NUI Galway, Ireland)*

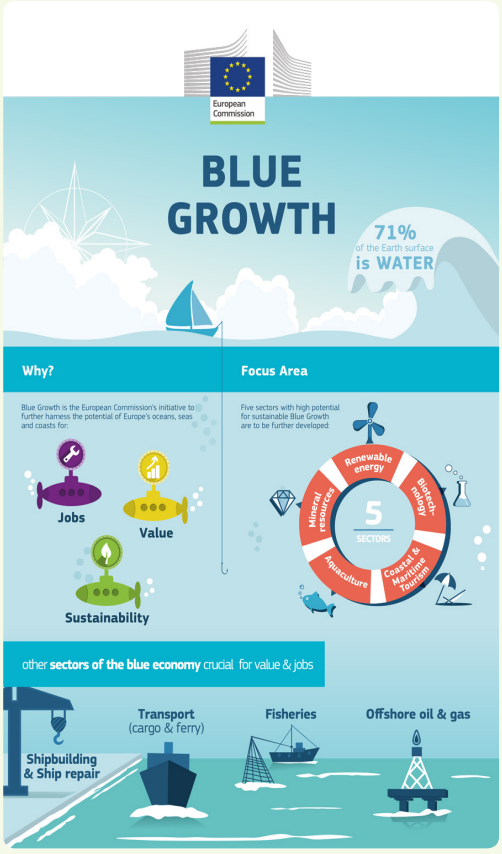
ATLAS is designed with an explicit connection to 'Blue Growth', but what exactly is Blue Growth? The 3rd **ATLAS** General Assembly explored various contending definitions and concluded that **ATLAS** should not be constrained by any single definition, but rather respond to a collection of nuanced definitions that frame its research agenda. Here, **ATLAS** policy lead Prof David Johnson (Seascape Consultants Ltd., UK), describes what Blue Growth really means and how **ATLAS** fits in.

Defining 'Blue Growth'

The concept of a 'blue economy' came out of the 2012 Rio+20 Conference and emphasises conservation and sustainable management, based on the premise that healthy ocean ecosystems are more productive and a must for sustainable ocean-based economies. Thus, according to the Organisation for Economic Co-operation and Development (OECD), 'Green [/Blue] growth' is the fostering of economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our wellbeing relies. 'Blue Growth' looks to further harness the potential of oceans, seas and coasts by promoting growth, improving conservation, building sustainable fisheries, fostering cooperation between countries and acting as a catalyst for policy development.

Blue Growth as seen by the EC

For the European Commission, 'Blue Growth' is the long-term strategy to support sustainable growth in the marine and maritime sectors as a whole. It is the maritime contribution to achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth from the oceans, seas and coasts as defined in the EU's third interim report '*Scenarios and drivers for sustainable growth from the oceans, seas and coasts*'. In the European Economic and Social Committee document 'Innovation in the Blue Economy: realising the potential of our seas and oceans for jobs and growth'; five sectors have been identified with a high potential for growth: aquaculture, coastal and maritime tourism (blue tourism), marine biotechnology (blue biotechnology), ocean energy (blue energy), and seabed mining. The maritime economy is perceived by the EC to consist of all sectoral and cross sectoral economic activities, direct and indirect, located anywhere, including landlocked countries. Maritime employment is all the employment resulting from the above activities related to the oceans, seas and coasts.



EC Blue Growth Infographic © European Union 2014

How will ATLAS contribute to 'Blue Growth'?

Within **ATLAS**, the FP7 Project MESMA (Monitoring and Evaluation of Spatially Managed Areas) generic MSP framework is being used to test future Blue Growth scenarios against a backdrop of potential climate change. **ATLAS** is extending this previous research by applying the framework in case study areas representing the full biogeographic, regulatory and jurisdictional situations occurring across the North Atlantic basin both to facilitate Blue Growth and to provide practical examples of area-based management that can aid the formulation of new regulations to protect biodiversity in areas beyond national jurisdiction. In doing this, **ATLAS** will support Blue Growth via MSP by providing examples of spatially managed areas that will seek to:

- reduce sectoral conflicts such as potential conflict between deep-sea mining and biotechnology resources
- improve the investment environment for infrastructure needed for operations such as open ocean aquaculture
- increase coordination between countries including in situations with extended continental shelf claims and unresolved jurisdictions
- balance development activities and environmental protection such as oil and gas prospecting with fisheries and conservation

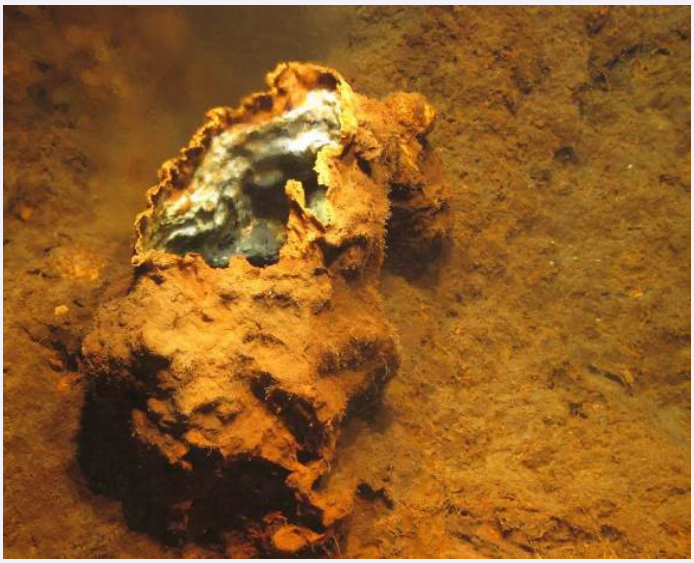
ATLAS CRUISE NEWS

Now in month 29, the ATLAS team has led or participated in 31 offshore expeditions. In the past six months alone, ATLAS has been involved in 13 surveys spanning the North Atlantic Ocean. In this issue, we feature two of these recent cruises.

Blue Azores Programme: Expedition 2018

This summer, **ATLAS** scientists Telmo Morato and researchers from the University of the Azores (IMAR–UAz) joined the "Blue Azores" Expedition 2018. The expedition surveyed the largely untouched seas of the Azores, an archipelago in the mid-Atlantic which harbours some of the most important deep-sea ecosystems in the Atlantic Ocean.

Using pioneering Remotely Operated Vehicle (ROV) technology and operations, they successfully mapped benthic communities inhabiting previously unexplored seamounts in the Gigante complex and Cachalote complex. This exercise identified areas that potentially meet the FAO's criteria for 'Vulnerable Marine Ecosystems' and examined distribution patterns of deep-sea benthic biodiversity in the Azores. Yet even more exciting than these successes were the two incredible discoveries made by the research team: an unexpected new hydrothermal field, and pristine coral gardens – two huge steps forward for deep-sea exploration and the better understanding of these largely untouched ecosystems.



A new hydrothermal vent field named *Luso* was discovered on 16 June 2018 © Oceano Azul Expedition ROV Luso EMEPC, IMAR-UAz

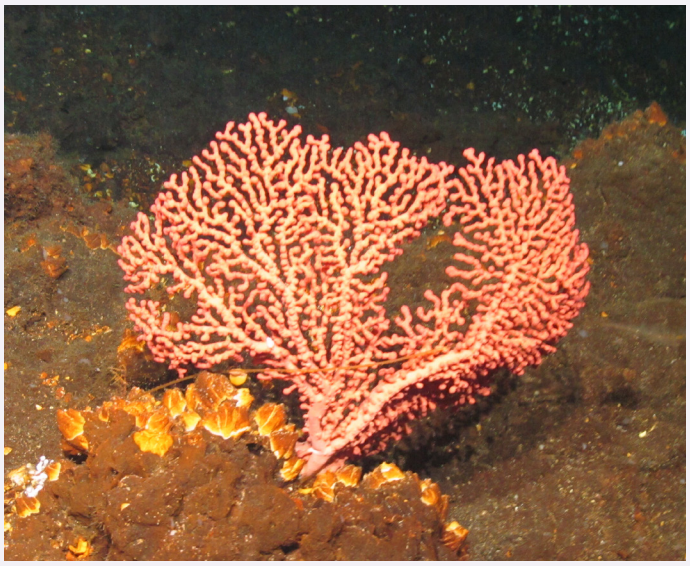
'*Luso*' – A new hydrothermal field discovered at 570 m depth on the slopes of Gigante seamount

The scientific and ROV teams on board were astonished as a new hydrothermal vent field – dubbed *'Luso'* – unexpectedly appeared on their screens.

This rare find, located on the Mid-Atlantic ridge half way between the Pico and Kurchatov fracture zones, is composed of multiple chimney-like structures of different sizes with orifices up to about 40 cm in diameter. Hydrothermal fluids, discharging from *Luso*, are transparent, warm and rich in CO_2 in comparison to the surrounding waters. Typical hydrothermal vent fauna were not observed, but white bacterial mats, bacteria-like filaments and a peculiar community of deep water reddish-yellowish *Cirripedia* (cf. Balanomorpha, a suborder of the barnacles) were reported.

Stunning new coral gardens

Approximately 13000 km west from the Portuguese coast, the team also revealed new coral gardens in the seas of the Azores between the archipelago's central and western islands. Spectacular 3D lacework structures of *Paragorgia* species (featured on the cover of this newsletter!) were found at 'Gigante' Seamount, close to the newly discovered shallow hydrothermal field. These enchanting octocorals, commonly known as bubblegum coral, grow slowly by building up fragile fan structures and are often brightly coloured white, pink, orange or red. Smaller solitary corals were also observed within the unusual assemblages, as were impressively large sponges.



Coral gardens discovered during the Blue Azores Expedition 2018 © Oceano Azul Expedition ROV Luso EMEPC, IMAR-UAz

The Blue Azores Expedition was organised by the Oceano Azul Foundation, in cooperation with the Waitt Foundation and National Geographic PRISTINE SEAS, and in partnership with the Regional Government of the Azores.

For more information, and to learn more about the expedition, please see: **https://www.oceanoazulfoundation.org/logbook/**, follow **@OceanoAzulF** on Twitter or **oceanoazulfoundation** on Instagram.

Chasing corals – A journalist's report on the ATLAS expedition to Rockall Bank

In April 2018, ATLAS partner Dick van Oevelen (NIOZ, the Netherlands) led a two-week expedition on board the research vessel *Pelagia*. Freelance journalist Edda Heinsman joined the expedition, and shares her experience.

Imagine a dark, cold ocean. It is so deep that it is pitch black. You probably wouldn't imagine much life there at the seafloor. But guess again. The slopes of the Rockall Bank, hundreds of meters below sea level, are home to one of the world's largest coral banks. How is it possible that corals live in such a harsh environment? Where do the organisms get their energy from? That is an important quest of the **ATLAS** project. A Dutch initiative, under the name NICO (National Initiative on Changing Oceans), allowed **ATLAS** researchers to visit Rockall Bank with the research vessel *Pelagia*.

"You're on the Atlantic, some of the most hostile seas in the world", warn the fishermen in Galway (Ireland) when asked for advice. We set sail from the peaceful harbour. Dolphins chase the ship, the sunset is magnificent, and the atmosphere on board is festive: we are off on a new adventure! Looking for cold water corals in the deep, dark, cool sea.

The schedule is tight, so chief scientist Dick van Oevelen has a strict plan: make measurements at seven locations and pick up the equipment he installed a year ago.

Preparing the CTD for sampling

Washing machine

As soon as we leave the relatively tranquil bay and reach the open sea, it turns out the fishermen knew what they were talking about. Wind force 8. The waves that hit the ship are so tall that the view from my cabin at the third deck resembles that of a washing machine. *Pelagia* looked like a huge ship before, but suddenly feels like a tiny dinghy. The weather not only causes sea sickness, it also slows down the ship, and the waves make it impossible to use some of the equipment.

Something strange

After some days the weather gets better. The motion sickness fades away and the mood improves. Sampling goes smoothly with the CTD, a device that measures '**C**onductivity, **T**emperature and **D**epth' and collects water. Suddenly the scientists notice something strange in the data. The phytoplankton (detected by a fluorescence sensor), usually found in the top layer of the water column, now appear to have mixed down to a few hundred metres deep. What is going on? Everyone is excited! You would expect the food that is produced in the near surface waters to slowly sink down, with only poor scraps making it to the bottom. So how do the corals live? The theory of the scientists on board is that the coral mounds create turbulence in the ocean that mixes relatively fresh food from the surface to the seafloor. Are the corals the real ecosystem engineers by influencing the currents?

Anna van de Kaaden and Evert de Froe (NIOZ) bend over the creatures that have been fished up on board the RV Pelagia

All hands on deck

The scientists are not sure yet. Van Oevelen asks the captain to sail back to the previous station to do some final measurements to help prove their theory. The captain agrees, but we have to hurry - there is a storm coming. In the last few hours of the expedition it's all hands on deck! Night or dayshift, everyone chips in to process the extra samples that are taken.

On the way back, I stand next to Van Oevelen on the deck of the ship. As much as I look forward to standing on solid ground, I realise that I feel a bit sad about going back, that the mission is over. Van Oevelen starts to laugh. "What do you mean, 'the mission is over', the mission is just beginning!". He explains that the most important part of his research, the analysis of the samples and data, is just as exciting as this trip. "The major part of the work, data analysis, the puzzling, is only about to begin."

By Edda Heinsman, NEMO Kennislink

Edda Heinsman is a (freelance) science journalist/writer for the Dutch popular science TV show FOCUS and the website NemoKennislink.nl. She studied physics and astrophysics at the University of Amsterdam. For NEMO Kennislink she reported frequently about the NICO-expedition, and was invited to join the mission in search for Cold Water Corals.

All images courtesy of Edda Heinsman, NEMO Kennislink

An extended version of this article is available on the ATLAS project website.

YOUNG SCIENTIST CORNER

In this issue, we meet three young Spanish researchers based in ATLAS partner institutes in Spain, Edinburgh and Portugal.

Name: Cristina Gutiérrez Zárate

From: Madrid, Spain

Education: BSc in Environmental Science at the Universidad Autónoma de Madrid, Spain; Erasmus scholarship at Umeå Universitet, Sweden; MSc in Marine Biology at Universidade da Coruña, Spain

Current role: Prospective PhD student, Instituto Español de Oceanografía, Spain

Name: Berta Ramiro Sánchez

From: Madrid, Spain

Education: BSc (Hons) Biology at the Universidad Autónoma de Madrid, Spain; MSc Applied Marine and Fisheries Ecology at the University of Aberdeen, Scotland, UK

Current role: PhD student, The University of Edinburgh, United Kingdom

Name: Yaiza Santana

From: Reus, Spain

Education: BSc in Biology at the University of Barcelona, BSC Mobility grant SICUE-SENECA at the University of Santiago de Compostela

Current role: Master student, Institute of Marine Research, Azores, Portugal

Welcome Cristina, Berta and Yazia. Tell us, how did you get involved in ATLAS?

My (Cristina) first experience with the **ATLAS** community was on board the research vessel (RV) *Sarmiento de Gamboa* (SdG) during the **ATLAS** oceanographic cruise MEDWAVES (MEDiterranean out flow WAter and Vulnerable EcosystemS), in October 2016. For me, MEDWAVES was not only an incredible opportunity to witness top quality offshore research on board of a state-of-the-art scientific vessel, but also a unique personal experience of meeting a wide variety of researchers from **ATLAS**, with whom I had the opportunity to talk about and gain insight into my possible scientific career. I plan to use ROV video footage from MEDWAVES for my PhD research and examine deep-benthic community assemblages and distribution patterns.

Fantastic! Yaiza, you were also involved in the MEDWAVES expedition - Please, tell us why you chose to study marine science and about your work in ATLAS.

I was born on the Mediterranean coast and I've been surrounded by the sea all my life. I've been working on boats for almost 10 years, sailing and diving all over the world, collaborating with NGOs and research teams to protect the oceans. My passion for the sea led me to study it in a more detailed and scientific way and I started a master's degree in September 2016 and became involved in MEDWAVES and **ATLAS**. I'm currently finishing my master's thesis working with video analysis from recordings taken during the MEDWAVES cruise around Azores. I'm focusing on the deep-sea communities in the Formigas seamount (Azores), investigating the composition of benthic fauna, distribution and relationship with the habitat, geological features and the track of the Mediterranean Outflow Waters.

Amazing! We like your multidisciplinary approach! Berta, you are also a deep-sea ecologist. What does your work in ATLAS focus on?

My work within the **ATLAS** project focuses on the biogeography and its drivers of vulnerable marine ecosystems (VMEs) in the high seas in the North Atlantic. In particular, I aim to revise the Global Open Oceans and Deep-Seabed (UNESCO, 2009) biogeographic classification system, a tool specifically developed to divide the deep-sea pelagic and benthic areas into distinct provinces that share some commonalities. The classification is, however, purely based on physical proxies rather than actual biogeographic species data and it doesn't account for climate change either. My work will consist of validating the GOODS tool for complex habitats formed by VME indicator taxa, and of testing the biogeography of VMEs under projected climate change scenarios in the North Atlantic.

That sounds like an exciting challenge! What would be the highlights from ATLAS so far and why is the project important to you?

During my time in **ATLAS** I (Berta) have already had the opportunity to participate in a deep-sea coral identification workshop, where I also met Cristina and Yaiza, and gained training in barcoding techniques and species distribution modelling, skills which will help develop my research career.

continued on next page

ATLAS tackles exciting research with partners from Europe, US and Canada and I find that being part of this research framework is unique as it opens the doors to collaborations, ideas and many more learning opportunities.

I (Cristina) hope my work will support this project by means of new tools and knowledge about Atlantic and Mediterranean deep-benthic ecosystems, from predictive habitat mapping to maritime spatial planning.

Thank you all very much for taking the time to tell us about your research within **ATLAS**!

An extended version of this interview is available on the ATLAS project website.

CASE STUDY – REYKJANES RIDGE

ATLAS is built around 12 case studies that monitor a variety of ecosystems spanning the North Atlantic Ocean from Norway to the Eastern Arctic. To learn more about **Reykjanes Ridge** and other **ATLAS** case studies, please see EU-ATLAS.

In January this year, the Marine and Freshwater Research Institute (MFRI), Iceland became a partner in the **ATLAS** consortium, overseeing work relating to **Case Study 9: the Reykjanes Ridge**. Dr Stefán Áki Ragnarsson and Dr Hrönn Egilsdóttir are marine ecologists at the MFRI, where they work, together with colleagues, towards a better understanding of the **Reykjanes Ridge** seafloor ecosystem. In this issue Dr Hrönn Egilsdóttir (MFRI) teaches us about **The Reykjanes Ridge** located off Iceland.

ATLAS Case Study 9. The Reykjanes Ridge

Iceland constitutes a portion of the mid-Atlantic ridge which lies above the ocean surface. The western and the eastern part of Iceland belongs to the North American and the Euroasian tectonic plates respectively. The **Reykjanes Ridge** represents the portion of the mid-Atlantic ridge that originates in SW-Iceland and lies down to approximately 2500 meters at around 56°N. Hydrothermal vent systems have been discovered on the northern part of the **Reykjanes Ridge**, called Steinahóll, roughly translated from Icelandic to English as "Rocky hill". The Steinahóll vent field area was discovered by fishermen when they noted on the echosounder a flow of bubbles rising to the surface from the seafloor. Based on seismic activity, a volcanic eruption likely occurred in the Steinahóll area in the late 80s and/or early 90s. The visible fauna on the Steinahóll appeared to be scarce, but some colonies of the stony coral *Lophelia pertusa* were found. Bacterial mats were observed at the effluent sites. In adjacent areas, the benthic life appeared much richer, including dense and diverse sponge grounds. It is likely that other hydrothermal vents will be discovered on the **Reykjanes Ridge** in the near future.

One of the objectives of the **ATLAS** project is to provide information about deep-sea ecosystems that are relevant to Marine Spatial Planning endeavours for the deep ocean and to Blue Growth (see p7) scenarios that vary depending on the different case studies. Fishing and marine shipping are the main human activities on the **Reykjanes Ridge** but sub-surface prospecting, deep-sea mining and carbon sequestration are also potential future activities in the region. Research on the **Reykjanes Ridge** carried out within the **ATLAS** framework produces information that informs marine spatial planning and policy makers and is thus of value for future decision makers regulating human activities in the area.

Steinahóll hydrothermal vent fauna © MFRI, Iceland

REMINDER:
Please send news and images from your case studies to the ATLAS project office: EU-Atlas@ed.ac.uk

ATLAS RECENT PUBLICATIONS

ATLAS partners have recently published six more exciting publications around their research results. Please find the full list of **ATLAS** publications **here.**

Crocket KC., Hill E., Abell RE., Johnson C., Gary SF., Brand T., Hathorne EC. (2018). **Rare Earth Element distribution in the NE Atlantic: Evidence for benthic sources, longevity of the seawater signal, and biogeochemical cycling.** Frontiers in Marine Science 5, 147.

Thornalley DJR., Oppo DW., Ortega P., Robson JI., Brierley CM., Davis R., Hall IR., Moffa-Sanchez P., Rose NL., Spooner PT., Yashayaev I., Keigwin LD. (2018). **Anomalously weak Labrador Sea convection and Atlantic overturning during the past 150 years.** Nature 556, 227-230.

Johnson D., Ferreira MA., Kenchington E. (2018). **Climate change is likely to severely limit the effectiveness of deep-sea ABMTs in the North Atlantic.** Marine Policy 87, 111-122.

Ramalho LV., López-Fé CM., Rueda JL. (2018). **Three species of *Reteporella* (Bryozoa: Cheilostomata) in a diapiric and mud volcano field of the Gulf of Cádiz, with the description of *Reteporella victori* n. sp.** Zootaxa 4375, 90–104.

Niner HJ., Ardron JA., Escobar EG., Gianni M., Jaeckel A., Jones DOB., Levin L., Smith CR., Thiele T., Turner PJ., Van Dover CL., Watling L., Gjerde KM. (2018). **Deep-sea mining with no net loss of biodiversity- an impossible aim.** Frontiers in Marine Science 5, 53.

Van Dover CL., Arnaud-Haond S., Gianni M., Helmreich., Huber JA, Jaeckel AL., Metaxas A., Pendleton LH., Petersen S., Ramirez-Llodra E., Steinberg PE., Tunnicliffe V., Yamamoto H. (2018). **Scientific rationale and international obligations for protection of active hydrothermal vent ecosystems from deep-sea mining.** Marine Policy 90, 20–28.

ATLAS CALENDAR 2019

Are you a budding photographer? Do you have spectacular scenes from your summer fieldwork? We want to showcase your amazing photographs in the **ATLAS 2019 calendar!** Please submit your high-resolution images with captions and credits to the **ATLAS** project office: **EU-Atlas@ed.ac.uk**

Deadline: 31st October 2018.

Coral in hand © Edda Heinsman, NEMO Kennislink

Newsletter designed and developed by AquaTT, with input from **ATLAS** partners

Contact us:
COMMUNICATION & PRESS:
atlas@aquatt.ie
COORDINATION & MANAGEMENT:
murray.roberts@ed.ac.uk
eu-atlas@ed.ac.uk

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.