



# ALL-ATLANTIC OCEAN RESEARCH ALLIANCE

Creating an Atlantic Ocean Community by Implementing  
the Galway and Belém Statements

## AA-BIOTECMAR Report: Current Trends in Marine Biotechnology Research Workshop



**BUILDING AN ALL ATLANTIC  
OCEAN COMMUNITY**  
Implementing the Belém Statement



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## JOINT PILOT ACTIONS

### ALL-ATLANTIC JOINT PILOT ACTIONS

Following a year-long collaborative process among more than 70 stakeholders at the Atlantic level, the All-Atlantic Ocean Research Alliance Multi-Stakeholder Platform, divided into 5 sub-multi-stakeholders platforms, identified more than 1000 initiatives towards strengthening marine research and innovation collaboration at the Atlantic level, 56 gaps and 79 needs/recommendations to achieve the All-Atlantic Ocean Research Alliance ambition, guided by a total of 20 Strategic Objectives, 20 Operational Objectives, and 10 Key Performance Indicators.

Based on these findings and on the idea of collaboration, alignment, and use of existing resources, they have developed six ambitious and long-term collaborative Joint Pilot Actions:

- [All-Atlantic Training Platform \(AA-TP\)](#)
- [All-Atlantic Aquaculture Technology and Innovation Platform \(AA-ATiP\)](#)
- [All-Atlantic Marine Biotechnology Initiative \(AA-BIOTECMAR\)](#)
- [All-Atlantic Data Enterprise 2030 \(AA-DATA2030\)](#)
- [All-Atlantic Blue Schools Network \(AA-BSN\)](#)
- [All-Atlantic Marine Research Infrastructure Network \(AA-MARINET\)](#)

This report is developed by the **All-Atlantic Marine Biotechnology Initiative (AA-BIOTECMAR)** Joint Pilot Action, that is a collective effort to support the development of new and emerging technologies intended to improve human health, encouraging the sustainable use of marine resources through marine biotechnology and advanced technologies in aquaculture, food production, fisheries management, and environmental monitoring. AA-BIOTECMAR is promoting collaboration among countries of the Belém and Galway statements through workshops and technical visits, identify best methodologies for technology transfer, promote outreach and engage ocean leaders to support the blue growth.

This report is a deliverable in scope of JPA AA-BIOTECMAR, Task 1. BIOTECMAR Workshop aiming to engage senior researchers, government officers and CEOs to later on develop a joint roadmap and action plan (Task 5) for networking and capacity building in the area of marine biotechnology. The workshop will also serve to discuss the state of the art and to find out the common interests to be further jointly developed.





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## SUMMARY

### 1. Summary

The AA-BIOTECMAR Workshop: Current Trends in Marine Biotechnology Research was a collaborative event for experts, researchers, and stakeholders in the marine biotechnology field. The workshop's primary goal was to promote knowledge sharing and collaboration, in line with the AANCHOR project's broader mission of fostering research partnerships across the Atlantic. The workshop covered a range of open topics, including coral reef systems and their significance as fishing grounds and biodiversity hotspots; The impact of pollutants on marine ecosystems and possible bioremediation strategies; The means to unlock the full potential of the Atlantic's endemic biodiversity for biotechnological applications; The use of microbiomes as biosensors to monitor climate variability and ecosystem changes; The potential use of metagenomes for ocean observation, mapping, forecasting, monitoring, and process modelling; and studies on Polar regions of the Atlantic.







## 2. Introduction

The Atlantic Ocean holds one of the Earth's largest collections of biodiversity and natural resources. Thus, it must be conserved, protected and explored in sustainable manners. In order to develop the knowledge and technology required for sustainably managing the Atlantic basin, all countries and territories bordering the Atlantic must come together and collaborate with the aim to close existing gaps. From this need of collaboration, the concept of an All-Atlantic Ocean Research Alliance was born: a coalition with the objective of connecting individuals, organisations and initiatives around the common goal of building an All-Atlantic Ocean Community.

One of the main objectives of the AANChOR Coordination and Support Action (CSA) is to support the All-Atlantic Ocean Research Community, by the implementation of the South Atlantic Research and Innovation Flagship initiative and the Belém Statement, which is an agreement that was signed by the European Union (EU), Brazil and South Africa in 2017, to upscale cooperation in research and innovation across and along the Atlantic Ocean, coast to coast and pole to pole. In order to achieve such an ambitious goal, AANChOR is providing the European Commission (EC) and the Belém Co-Chairs with a framework of concrete collaborative initiatives addressing activities leading to the stimulation of knowledge transfer, ocean innovation enhancement, common standards development, capacity building strengthening, citizen awareness and ocean literacy improvement, and research and innovation infrastructure initiatives alignment. In summary, AANChOR aims to raise its impact by bringing together numerous international stakeholder platforms with complementary expertise in different scientific areas, thus creating added value.

In order to foster international cooperation, one of the main purposes of the project is to bring together players in different scenarios such as governmental bodies, funding agencies, academia, industry, non-governmental organisations, and the civil society. In this sense, promoting greater awareness and enhancing ocean-engaged society and communities are seen as key elements for the AANChOR project. The path for achieving this goal involves an active promotion of initiatives; connecting partners from the Atlantic area, especially Brazil, South Africa, Argentina, Cabo Verde and the North Atlantic; incorporating the European Union, so as to build an All-Atlantic community and identity.

Such goal in the agenda will allow the project to strengthen ocean economy, and consequently to support economic growth, social inclusion, environmental sustainability, ocean ecosystems and the sustainable use of marine resources. Main activities and results of the project will be, thus, systematically communicated and disseminated.

Marine biodiversity is a major untapped resource, especially in countries with high endemic biodiversity. New technologies will be necessary to harness the full potential of marine biodiversity to deliver products and services, from the production of biofuels, food, feedstuffs to the discovery of new biomaterials, cosmetics, pharmaceuticals, among others. Marine biotechnology is the industrial, medical, or environmental application of biological resources from the sea.



This Joint Pilot Action, [AA-BIOTECMAR](#), is led by the Federal University of Rio de Janeiro, based in Brazil. The participants of this Joint Pilot Action are from countries from both sides of the Atlantic: Argentina, Belgium, Brazil, Cabo Verde, Denmark, Egypt, Germany, Ireland, Kenya, Morocco, Norway, Portugal, South Africa, Spain, United States of America.

AA-BIOTECMAR promoted efficient cooperation and maximised impact by bringing together organisations and projects having experience and an interest in the marine biotechnology area at the Atlantic Ocean level, including the All-Atlantic Ocean Research Alliance related projects. Researchers, entrepreneurs, the private sector, investors, legislators, governmental bodies (at the local, regional, national and international level), ministries and research foundations were all involved in the initiative.



### 3. Overview

The first AA-BIOTECMAR Workshop was a two-day international event organized by the Federal University of Rio de Janeiro (UFRJ) that was held on November 1st and 2nd, 2021. Due to the ongoing COVID-19 global pandemic, the workshop occurred online in a videoconference platform.

The main goal of the meeting was to share knowledge and look at possible avenues to enhance collaboration between marine field stakeholders, in line with AANChOR project's aims to foster research partnerships across all the Atlantic. As mentioned, AANChOR is a result of the Belém Statement that promotes initiatives for human resource formation and networking across the Atlantic. The two-day workshop was developed with the intent to bring experts together to share ideas, which would result in a start point for the establishment of a joint roadmap and action plan for networking-capacity building in marine biotechnology. During the event, each participant presented in around 10 minutes their ongoing research and/or project followed by a short Q&A open to any questions by the other participants. After the short presentations, a plenary session took place to find out common challenges, opportunities, and interests to be further jointly developed in the marine biotechnology field.

Around 40 experts, researchers and other stakeholders from all across the Atlantic were present in the workshop. The presenters shared their research projects regarding marine biotechnology, while at the same time trying to find means for further research cooperation. The two-day agenda included a total of 20 presenters, 8 of which in day one and the other 12 in day two. Table 1 shows the presenters, their country, a brief description of their research and a reference of their work.

Presenter	Country	Topic of research	Reference
Nils Asp (Federal University of Pará)	Brazil	The Mesophotic Reef System off the Amazon River mouth as a new frontier for biogeochemistry, genomics and biotechnology	[1]
Thulani Makhalanyane (University of Pretoria)	South Africa	Microbial processes, adaptations and applications; microbial ecology; microbiomics of geographically strategic marine environments	[2]
Margaret Rae (AORA-CSA)	United Kingdom	AORA Marine Microbiome Working Group and Marine Microbiome Forum	[3]
Lone Gram (Technical University of Denmark)	Denmark	Perspectives on marine bacterial biotechnology and its applications	[4]
Forest Rohwer (San Diego State University)	United States of America	Coral reef holobionts	[5]





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Ramy Aziz (Cairo University)	Egypt	Decoding genomes and microbiomes and the development and improvement of computational tools to overcome analysis bottlenecks	[6]
Rodrigo Costa (University of Lisbon)	Portugal	Multi-omics insights into the function and biotechnology potential of the marine sponge microbiome	[7]
Vitor Vasconcelos (University of Porto)	Portugal	Biotechnological applications of cyanobacteria and microalgae at CIIMAR	[8]
Ronaldo Francini-Filho (University of São Paulo)	Brazil	Biodiversity, monitoring and threats in the Abrolhos Bank in Brazil	[9]
Diogo Tschoeke (Federal University of Rio de Janeiro)	Brazil	Cyanobacteria microbiome plankton	[10]
Rosemary Dorrington (Rhodes University)	South Africa	Harnessing the chemical diversity of bioactive secondary metabolites from marine invertebrates and their associated microbiota to develop new pharmaceuticals	[11]
Ida Steen (University of Bergen)	Norway	Bioprospecting of arctic deep-sea hydrothermal vent microbiomes	[12]
Jeremie Vidal Dupiol (University of Perpignan Via Domitia)	France	Integrative analysis of the Pocillopora holobiont facing contrasted thermal regimes	[13]
Mishal Gudka (CORDIO East Africa)	Kenya	Coral reef ecosystems are vulnerable to critically endangered across a biogeographic province	[14]
Paula Gomes (Federal Rural University of Pernambuco)	Brazil	Research team in Anthozoa: ecology of benthic cnidarians and reef ecosystems	[15]
Hector Alvarez (Nacional University of Patagonia)	Argentina	Microbial lipids and marine biotechnology	[16]
Isabelle Ansoorge (University of Cape Town)	South Africa	South African Meridional Overturning Circulation (SAMOC): Establishing a long-term monitoring array south of Africa	[17]
Sonia Bejarano (Leibniz Centre for Tropical Marine Research - ZMT)	Germany	Four years of reef systems research	[18]
Olga Sato (University of São Paulo)	Brazil	The role of the South Atlantic in climate	[19]
Newton Gomes (University of Aveiro)	Portugal	From marine ecology to applied microbiology and entrepreneurship	[20]

**Table 1: Presenters of the AA-BIOTECMAR Workshop - Current Trends in Marine Biotechnology Research**



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## 4. Presentations and Discussion

The presentations served as a starting point for discussion on several topics of common interest among the stakeholders. The importance of valorising and better understanding microbiomes and coral reefs were topics very recurrent on the discussion. The antibiotic, antiviral and antitumoral molecules and the discovery of new gene clusters were also prominently discussed in some presentations. Lastly, the current panorama of funding for marine biotechnology research was also a subject of interest.

Coral reefs are responsible for 25% of life in the ocean so it is very important to find ways to maintain these systems healthy, while also identifying the possibilities regarding not only their applications but also the need of repopulating the oceans. The workshop showcased the strengths, possibilities and latest research developments in the marine field that could contribute to generate solutions for current global challenges. Among the discussions, it is worth highlighting the consensus on the fact that many projects focused on the isolation of microbes from coral reef ecosystems are currently being carried on, which translates to great potential for companies to grow in this direction. However, many companies that perform the assessment of marine environments in hopes of finding new bioactive compounds end up closing. There is a clear gap between the discovery and the valorisation of marine microbes, which hinders the process of bringing them to a final technology or product development.

Researchers and experts also pointed computational analysis as a major bottleneck in their projects. A lot of data is constantly being generated about organisms on the coral reef and it would take years to analyse it all, which makes Big Data analysis a common interest that should have more focus from the scientific community. Despite the common misconception that buying the fastest sequencer is enough to harness all the genomic data, progress in bioinformatics and computational analysis is still needed.

Going forward, it is key to brainstorm ideas for moving the diversity and discovery of new compounds towards the achievement of real molecules that can improve the quality of both our lives and the environment. Innovative research can uncover a whole world of possibilities regarding applications of biomolecules from marine sources. Considering Brazil as a case study, despite its great biodiversity, there are some difficulties in moving forward to utilize its full potential as the country still needs to develop long, sustained, and strategic investments in marine science and technology. Instead, researchers and institutions really suffer with waves of fluctuating financing, with promising times of great funding being suddenly followed by periods of less funding. Since adequate governmental funding structures are relevant drivers of research in Brazil, it is necessary to strengthen international collaboration and cooperation to find science-based solutions, as it could be the key to solve this problem. Sustainability of funding is very important for the success of projects as sometimes years and decades of research and progress can be lost due to funding crises.

It becomes crucial to ponder how to integrate transdisciplinary research & development in order to bring many of the discoveries and advances of the biotechnology field into proper use, making sure they are



contributing to a more sustainable world. The workshop offered an overview on the microbiomes and the possibilities for future unified South-South and North-South cooperation. It brought together researchers, entrepreneurs, conservationists, and other stakeholders who highlighted the importance of both the systems and biodiversity understanding and the valorisation of the marine environment. Together they found options for international research collaboration, development of projects and overall innovation. It promoted inclusive, embracing, and systemic cooperation and networking between all parties. A discussion was also held on the possibility of future opportunities for cooperation as a follow-up to this networking meeting.



## 5. Concluding Remarks

The workshop, which themes were strongly focused on microbiomes and reef, led to the conclusion that bioprospecting, i.e., the exploration of natural sources for new products of social and commercial value, is still a very crude field of action. To refine it, the AA-BIOTECMAR consortium will try to develop new pipelines that protect and develop these valuable resources. Several options for forthcoming research projects include: working together on a limited number of sites; examining integration of natural product discovery workflows; establishing a prototype protocol for better microbial biodiversity tools (including bioinformatics) from meta- to other -omics to be used at all sites; and participating in coral reef conservation actions, including coral farming. There is also a strong need for seeking new funding opportunities across the Atlantic.

According to two senior researchers that were present, the contributions of the workshop to the marine biotechnology field were of a very high level of importance, and could be the start of a new and fruitful network of collaboration between experts and researchers. The workshop clearly put many new opportunities of multi-lateral and bi-lateral cooperation on the table. The first step in pushing forward research and innovation in marine systems was given. Now, it will depend upon each individual to see possibilities of international cooperation and seek options for South-South and North-South cooperation.





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## 6. Workshop Agenda

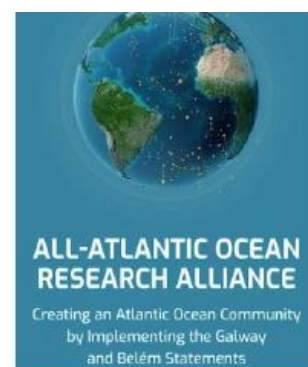
### AA-BIOTECMAR WORKSHOP

A Joint Marine Biotechnology Initiative for the Atlantic

**Meeting venue :** Online ( Link: <https://meet.google.com/hri-whtq-mfw> )

**Meeting host:** Universidade Federal do Rio de Janeiro

**Date, time:** 01 November 2021, 10:00 – 13:00 BRT  
02 November 2021, 10:00 – 13:00 BRT



#### MONDAY – 01 NOV 2021

##### 10:00 – 11:00: Presentations

Speakers: Nils Asp (BRA), Thulani Makhalanyane (ZAF), Margaret Rae (GBR), Forest Rohwer (USA), Lone Gram (DNK).

##### 11:00 – 12:00: Presentations

Speakers: Ramy Aziz (EGY), Rodrigo Costa (PRT), Diogo Tschoeke (BRA), Vitor Vasconcelos (PRT).

##### 12:00 – 12:10: Break

##### 12:10 – 13:00: Plenary Discussion

Coordination: Roberto Pinho (BRA), Fabiano Thompson (BRA), Patrizia Abdallah (BRA), Tracy Klarenbeek (ZAF), Claudia Magalhães (BRA).

#### TUESDAY – 02 NOV 2021

##### 10:00 – 11:00: Presentations

Speakers: Ronaldo Francini-Fo (BRA), David Obura (KEN), Rosemary Dorrington (ZAF), Ida Steen (NOR), Jeremie Vidal Dupiol (FRA), Gizele Garcia (BRA).

##### 11:00 – 12:00: Presentations

Speakers: Paula Gomes (BRA), Sonia Bejarano (GER), Hector Alvarez (ARG), Isabelle Ansorge (ZAF), Olga Sato (BRA), Newton Gomes (PRT).

##### 12:00 – 12:10: Break

##### 12:10 – 13:00: Plenary Discussion

Coordination: Roberto Pinho (BRA), Fabiano Thompson (BRA), Patrizia Abdallah (BRA), Tracy Klarenbeek (ZAF), Claudia Magalhães (BRA).



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