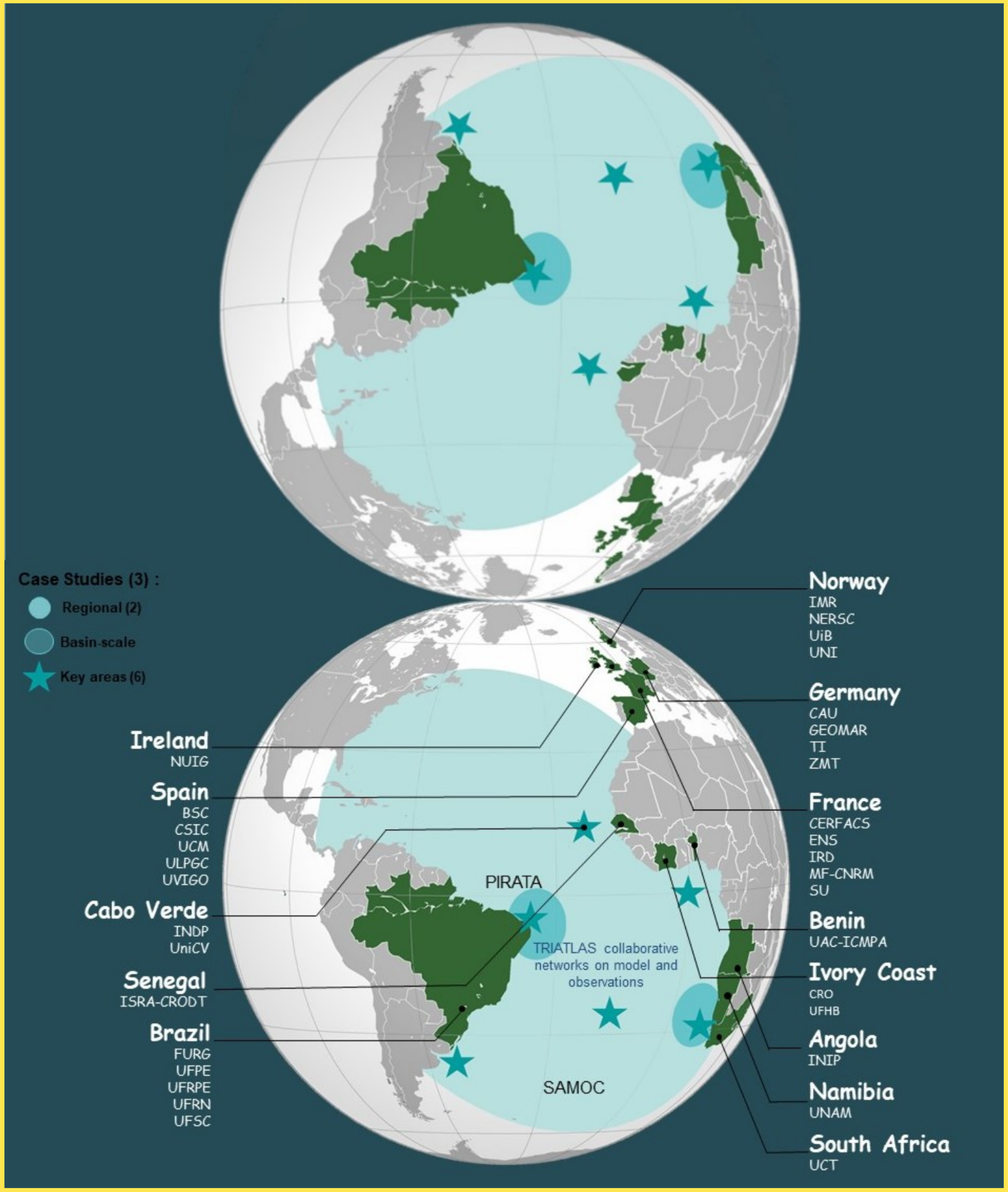
TRIATLAS

Newsletter November 2020



Project Management

Coordinator: Noel Keenlyside, Universitetet i Bergen
Co-coordinator: Heino Fock, Thünen-Institut

Project Coordination Office

University of Bergen, Geophysical Institute,
Bjerknes Centre for Climate Research,
Allégaten 70, N-5007 Bergen, Norway

TRIATLAS on Social Media

TRIATLAS.ProjectOffice@uib.no
www.triatlas.eu
@TRIATLASproject #TRIATLASproject
TRIATLAS on YouTube

This newsletter is compiled by the project manager, Nilgun Kulan (nilgun.kulan@uib.no), with contributions from the TRIATLAS consortium.

We look forward to hearing from you!

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817578

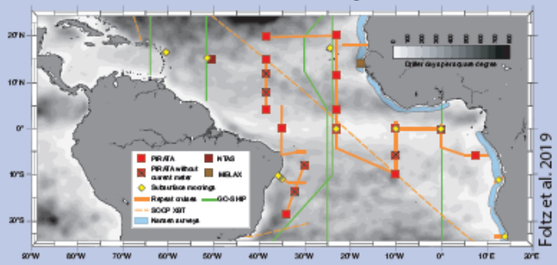
TRIATLAS

Tropical and South Atlantic climate-based marine ecosystem prediction for sustainable management

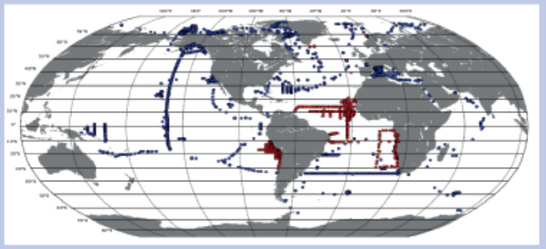
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817578

CT1 Current state of the marine ecosystems

TRIATLAS will focus on physical, ecological and social factors to understand the mean state and seasonal cycle.



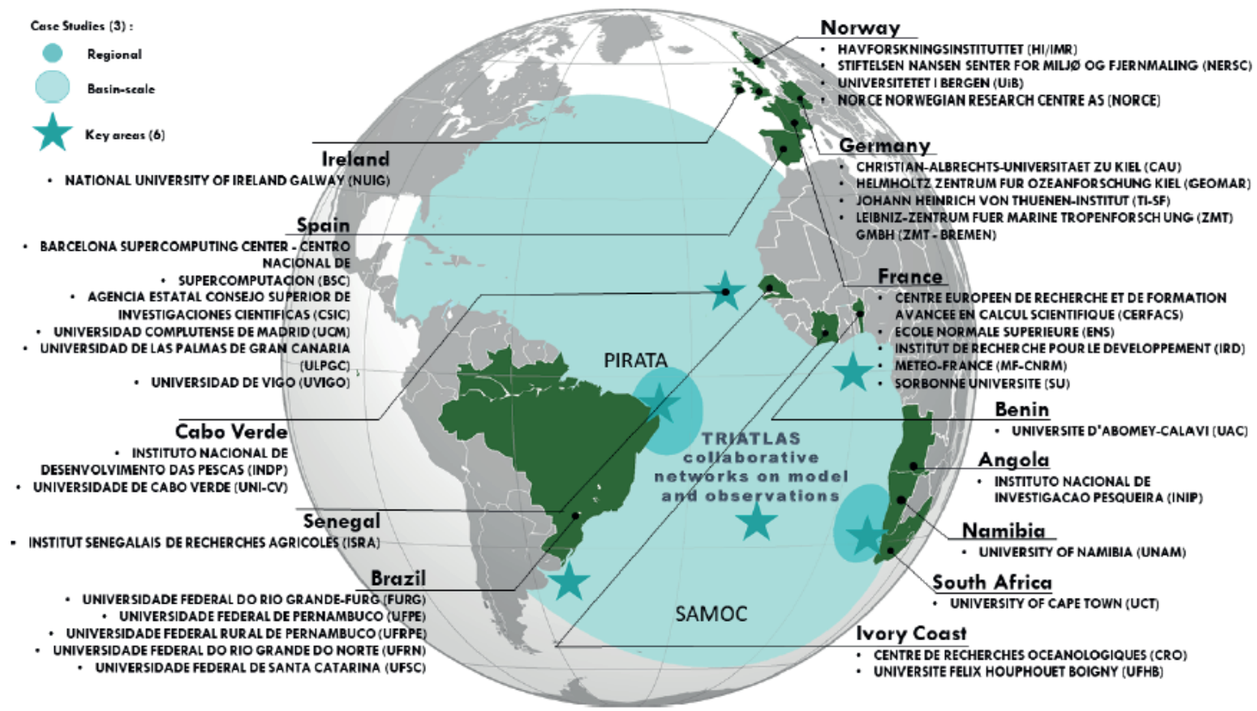
TRIATLAS is based on the existing sustained observing system and will contribute to maintain and extend the observing system by including additional moorings and sensors and contributing to seagoing experiments.



We will contribute to and make use of new observations of the ecosystem, such as the global data set of Underwater-Video-Profiler observations (red - source TRIATLAS partner GEOMAR) comprises information on POM and plankton distribution and size spectra. Source: GEOMAR

33 partners from across the Atlantic Ocean

Supporting the Belem Statement on Atlantic Research and Innovation Cooperation, part of the All Atlantic Ocean Community



Norway
- HAVFORSKNINGSINSTITUTTET (HI/IMR)
- STIFTELSEN NANSEN SENTER FOR MILJØ OG FJERNMALING (NERSC)
- UNIVERSITETET I BERGEN (UiB)
- NORCE NORWEGIAN RESEARCH CENTRE AS (NORCE)

Germany
- CHRISTIAN-ALBRECHTS-UNIVERSITAET ZU KIEL (CAU)
- HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL (GEOMAR)
- JOHANN HEINRICH VON THUENEN-INSTITUT (TI-SF)
- LEIBNIZ-ZENTRUM FUER MARINE TROPENFORSCH UNG (ZMT) GMBH (ZMT - BREMEN)

France
- CENTRE EUROPEEN DE RECHERCHE ET DE FORMATION AVANCEE EN CALCUL SCIENTIFIQUE (CERFACS)
- ECOLE NORMALE SUPERIEURE (ENS)
- INSTITUT DE RECHERCHE POUR LE DEVELOPPEMENT (IRD)
- METEO-FRANCE (MF-CNRM)
- SORBONNE UNIVERSITE (SU)

Ireland
- NATIONAL UNIVERSITY OF IRELAND GALWAY (NUIG)

Spain
- BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION (BSC)
- AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS (CSIC)
- UNIVERSIDAD COMPLUTENSE DE MADRID (UCM)
- UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA (ULPGC)
- UNIVERSIDAD DE VIGO (UVIGO)

Cabo Verde
- INSTITUTO NACIONAL DE DESENVOLVIMENTO DAS PESCAS (INDP)
- UNIVERSIDADE DE CABO VERDE (UNI-CV)

Senegal
- INSTITUT SENEGALAIS DE RECHERCHES AGRICOLES (ISRA)

Brazil
- UNIVERSIDADE FEDERAL DO RIO GRANDE-FURG (FURG)
- UNIVERSIDADE FEDERAL DE PERNAMBUCO (UFPE)
- UNIVERSIDADE FEDERAL RURAL DE PERNAMBUCO (UFRPE)
- UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE (UFRN)
- UNIVERSIDADE FEDERAL DE SANTA CATARINA (UFSC)

Benin
- UNIVERSITE D'ABOMEY-CALAVI (UAC)

Angola
- INSTITUTO NACIONAL DE INVESTIGACAO PESQUEIRA (INIP)

Namibia
- UNIVERSITY OF NAMIBIA (UNAM)

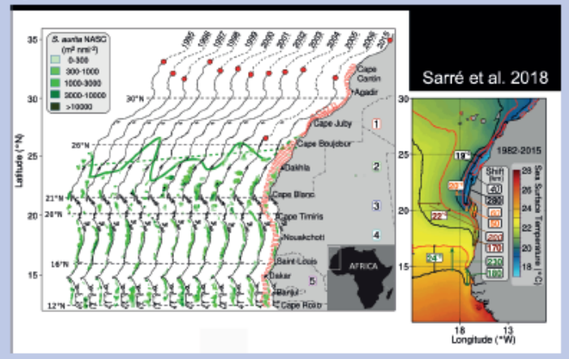
South Africa
- UNIVERSITY OF CAPE TOWN (UCT)

Ivory Coast
- CENTRE DE RECHERCHES OCEANOLOGIQUES (CRO)
- UNIVERSITE FELIX HOUPHOUET BOIGNY (UFHB)

CT2 Ecosystem changes

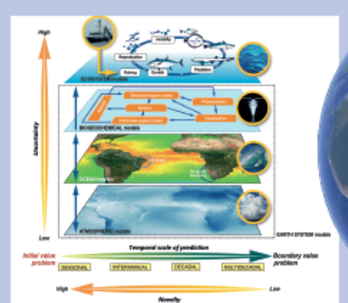
TRIATLAS will deliver an improved understanding of ecosystem changes focusing on key case study regions, considering environmental and anthropogenic factors, and investigating extremes on interannual and decadal timescales.

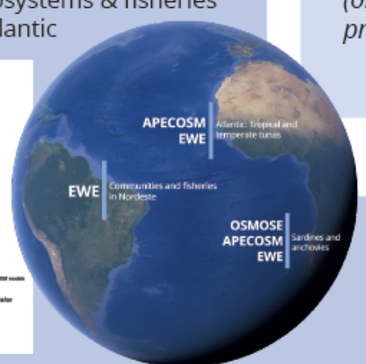
Annual shifts of biomass of Sardinella derived from hydroacoustic surveys.



CT3 Climate and marine-ecosystem prediction

TRIATLAS will provide an assessment of seasonal to decadal predictability and climate change scenarios simulations of ecosystems & fisheries in the South and Tropical Atlantic





We will develop end-to-end predictions based on three different earth system models (NorESM, EC-EARTH, CNRM) and three different ecosystem models (APECOSM, EWE, OSMOSE).

The TRIATLAS key challenge

To develop the understanding and the capacity (observational, modelling, and human) to best predict changes in the tropical Atlantic marine ecosystem and its societal impacts

Overall objective and plan

To assess the status of the South and Tropical Atlantic marine ecosystem and develop a framework for predicting its future changes, from months to decades, and thus to contribute to the sustainable management of human activities in the Atlantic Ocean as a whole.

This will be achieved by combining observations, climate-based ecosystem prediction and information on future socio-economic and ecosystem service changes.

References

Foltz, G. R., et al. (2019), The Tropical Atlantic Observing System, Frontiers in Marine Science, 6, 206

Sarre, A., et al. (2019), Early warning for food security in North-West Africa: spatial shift of small pelagic fish related to intense warming, in revision

Coordinator: Noel Keenlyside (noel.keenlyside@uib.no)
University of Bergen and Bjerknes Centre for Climate Research

Co-coordinator: Heino Fock (heino.fock@thuenen.de)
Thünen Institute

TRIATLAS.EU

Project manager: Nilgun Kulan (nilgun.kulan@uib.no)
Data Manager: Rocio Castana Primo (rocio.primo@uib.no)
Communications manager: Andreas H. Opsvik (andreas.opsvik@uib.no)

CT4 Knowledge exchange and societal impacts

Science to policy

TRIATLAS will engage stake holders from fisheries and other sectors through open forums, such as in the AWA and PREFACE projects.

tinyurl.com/prefacepolicybrief

Cross-Atlantic Network of Excellence in Marine Science (CANEMS)

TRIATLAS will train a new generation of researchers to work on the tropical Atlantic ocean, ecosystem, and climate prediction.

IPCC Shared Socioeconomic Pathways (SPPs)

To explore how societal choices and human activities will affect the marine ecosystems in the context of climate change, TRIATLAS will for the first time contextualize the SSPs with the focus on fisheries. We will use a transdisciplinary approach by engaging with stakeholders to co-develop policy-relevant scenarios and gather input for the construction of conceptual models.

...continued from previous page. **Figure Caption:** TRIATLAS Poster presented at the OceanObs'19 Conference (16-20 September, 2019) in Honolulu, Hawaii, by a group of TRIATLAS scientists including Patrice Brehmer (IRD), Jörn Schmidt (CAU), Jose Muelbert (FURG) among others.

◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆

Sustainable management of human activities affecting Atlantic marine ecosystems is critical to maintain its health and to support the blue economy of the bordering countries.

TRIATLAS will contribute to sustainable management of Atlantic marine ecosystems by assessing the information on their current state and future changes these ecosystems are facing. TRIATLAS will achieve this through a basin-wide approach that integrates research from the North and South. This approach will help to close critical knowledge gaps which exist in the Tropical and South Atlantic, and eventually, will improve our understanding of the entire Atlantic Ocean basin.

TRIATLAS Project brings together an interdisciplinary team of marine ecologists, physical oceanographers, climate researchers, and social scientists from 33 different institutions in Europe, Africa, and South America. TRIATLAS Researchers aim to enhance our knowledge of the marine ecosystems in key areas of the Atlantic using existing and pivotal new physical, biological, and societal observations.

Earth system, ecological, and socio-economic models and observations will be used to assess the cumulative impact of various pressures (climatic, pollution, and fishing) driving fluctuations in the marine ecosystem, and the potential for tipping point behaviour and regime shifts.

By combining state-of-the-art climate predictions and ecosystem models, first predictions of the marine-ecosystems for the next 40 years for the whole Atlantic will be developed. These marine ecosystem predictions will include Shared Socioeconomic Pathways (SSPs) and socio-economic vulnerability assessments through stakeholder engagement.

Furthermore, TRIATLAS aims to enhance capacity in marine ecosystems, oceanography, and climate research in countries bordering the South and Tropical Atlantic Ocean. There will also be close cooperation and alignment with relevant European Commission services such as the All Atlantic Research Alliance and other relevant initiatives. TRIATLAS will contribute to upscale cooperation around the Atlantic Ocean.

TRIATLAS Researchers have been busy doing fieldwork; attending meetings, workshops and conferences; publishing journal articles and book chapters; building stakeholder networks; and more...

In this newsletter, we present you a small collection of their diverse efforts. If you wish, you can contact us by email at:

TRIATLAS.ProjectOffice@uib.no

If TRIATLAS had a business card...

TRIATLAS
in a nutshell

Consortium:	33 Institutes from Europe, Africa, and Brazil
Coordinator:	Prof. Noel Keenlyside (University of Bergen, Norway)
Duration:	June 2019 – May 2023
Budget:	€11M
Website:	www.triatlas.eu

TRIATLAS project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817578.

TRIATLAS PARTNERS

33 INSTITUTES FROM AROUND THE ATLANTIC

TRIATLAS Project Kick-off Meeting (27-29 August, 2019) took place in Bergen, Norway, with the attendance of about 60 scientists from South Africa to Norway and Brazil to Cape Verde.

Below is a group picture taken during this important meeting which marked the beginning of a 4-year long, and perhaps longer, collaboration between marine ecologists, physical oceanographers, climate researchers, and social scientists from around the Atlantic Ocean.

***TRIATLAS** has a significant "Educational and Technological Capacity Strengthening" component. In fact, a whole Work Package (WP10) is edicated to it. One of the initiatives of WP10 is called **CANEMS - Cross-Atlantic Network of Excellence in Marine Science.** This network combines summer schools, student exchange programmes, sea-going training and academic teaching in a highly interdisciplinary and sustainable context.*

Visit our CANEMS Website: https://triatlas.w.uib.no/canems

◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆

***Our Early Career Researchers (ECR)**, scientists of tomorrow, are important to us. Here is what TRIATLAS Youth Ambassador (2019-2020), Leandro Nolé, has to tell us about his experience at the All-Atlantic Ocean Youth Ambassadors Summer School at the Marine Institute, Galway (23 - 27 August 2019) in **English** and in **Portuguese**!*

In the framework of the Galway and Belém Statements, the Youth Ambassadors are a group of young researchers – 23 in all – who were selected to participate in the first All-Atlantic Ocean Youth Ambassadors Summer School in Galway, Ireland, in August 2019. Youth Ambassadors have been nominated as dedicated individuals to promote sustainable development and stewardship of the Atlantic Ocean. Among others, Ambassadors were guided to develop campaigns and reach out to local communities, students, and civil society, engage decision-makers as well as work with local media to conserve and protect the Atlantic Ocean for future generations. In this context, Leandro Nole Eduardo, TRIATLAS's Ph.D. student in co-badging between University Federal Rural de Pernambuco (Brazil) and the U. of Montpellier (France), has been nominated as a Youth Ambassador.

In February 2020, at the first All-Atlantic Ocean Research Forum, these young professionals showed how they were able to reach more than 5000 people in a brief time, building a network that was able to be present in more than a 100 events and promoting ideals of ocean conservation and better management relevant to their communities. With a standing ovation from the audience, the Youth Ambassadors also showed a sense of community built amongst themselves, with such a diverse cultural background overcoming differences in languages, local realities, and areas of knowledge. From the impact assessment of human activities on the Atlantic Ocean to engaging communities in ocean-based culture, art, and celebration, all of the Ambassadors showed to be eager to keep bringing the Atlantic Ocean closer to citizens by engaging them and empowering them with 'Ocean Literacy'.

As Leandro Nolé described: "*the youth ambassador initiative has been a lifetime opportunity, where we are considering the diversity of our communities and translating science into wonder, mystery, and curiosity – a common language of all nations.*"

◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆

No contexto dos acordos de Galway e Belém, os embaixadores *All-Atlantic* são 23 jovens que foram selecionados para participar da primeira escola de verão em Galway, Irlanda, em agosto de 2019. Os jovens embaixadores foram nomeados como indivíduos dedicados a promover o desenvolvimento sustentável do Oceano Atlântico. Entre outros, os embaixadores foram orientados a desenvolver campanhas e alcançar comunidades locais, estudantes e sociedade civil. Além disso, aprenderam a envolver a mídia local e tomadores de decisão na conservação do Oceano Atlântico. Nessa ocasião, o aluno de doutorado Leandro Nolé Eduardo (Universidade Federal Rural de Pernambuco/Université de Montpellier), foi indicado como jovem embaixador *All-Atlantic* e representante do projeto TRIATLAS.

Em fevereiro de 2020, no primeiro *All-Atlantic Ocean Research Forum*, em Bruxelas, os jovens embaixadores mostraram como alcançaram mais de 5000 pessoas em um curto período. Entre outros, construíram uma rede de colaboradores que esteve presente em mais de 100 eventos ao redor do mundo, promovendo diversas iniciativas de conservação. Com um grande reconhecimento no evento, os jovens pesquisadores também mostraram um senso de comunidade construído entre si, superado diversas diferenças de idiomas, realidades locais e áreas de conhecimento. Desde a avaliação de impacto das atividades humanas no Oceano Atlântico até o envolvimento de comunidades na cultura, arte e celebração dos oceanos; todos os embaixadores mostraram-se ansiosos por continuar aproximando o Oceano Atlântico dos cidadãos, envolvendo-os e capacitando-os através da *cultura oceânica.*

Como Leandro Nolé descreveu: a iniciativa embaixadores da juventude *All-Atlantic Ocean* tem sido uma oportunidade única, onde aliamos a diversidade de nossas comunidades para traduzir ciência e conservação em entusiasmo, mistério e curiosidade - uma linguagem comum de todas as nações.

Learn more on:

Facebook & Instagram: @AllAtlanticYouth

Twitter: @AtlanticYouth

#AllAtlanticYouth

allatlanticocean.eu

Mais informações:

Facebook e Instagram: @AllAtlanticYouth @queridoatlantico

Twitter: @AtlanticYouth #AllAtlanticYouth

allatlanticocean.eu

TRIATLAS Youth Ambassador Leandro Nolé is giving a speech at the All-Atlantic Ocean Youth Ambassadors Summer School, Galway (23 - 27 August 2019)

Group picture of Summer School Organisers and Youth Ambassadors

Representing TRIATLAS at the All Atlantic Youth Ambassadors initiative was not Leandro's only contribution to TRIATLAS. He was the lead author of a scientific article published in ***Progress in Oceanography*** *titled* ***"Hatchetfishes (Stomiiformes: Sternoptychidae) biodiversity, trophic ecology, vertical niche partitioning and functional roles in the western Tropical Atlantic"*** *Eduardo, L. N., et al (2020)*

DOI : https://doi.org/10.1016/j.pocean.2020.102389

You can read the abstract of this publication below.

Species of the family Sternoptychidae (hatchetfishes) occur worldwide and play critical roles by sequestering carbon, recycling nutrients, and acting as a key trophic link between epipelagic primary consumers and higher trophic levels in marine ecosystems. Nevertheless, basic knowledge on their ecology is still lacking and their functional ecology remains understudied with respect to composition, organization, functions and environment interactions. Here we integrated comprehensive information collected in the western Tropical Atlantic on the diversity, abundance, distribution and trophic ecology of hatchetfishes, including physicochemical features of their habitats and extensive carbon and nitrogen stable isotope data on its main prey groups.

On this basis we defined five functional groups of hatchetfishes with different diet preference, isotopic composition, and vertical abundance peaks and reveal a possible high resource partitioning. Additionally, these species might have a different feeding tie chronology. Hence, hatchetfishes segregate in different ecological groups responding differently to environmental constraints including oxygen concentration and presenting diverse functional roles. As deep-sea species that migrate to epipelagic waters, hatchetfishes may play a key role in the transfer of sub-surface photoassimilated carbon to deeper waters, a pathway through which the effects of climate change at the surface are transferred to the deep ocean. Moreover, as consumers of gelatinous organisms, these species convert "gelatinous energy" into "fish energy" readily usable by higher trophic levels, including endangered and commercially important species. This is a crucial trophic relationship that has been historically underestimated due to methodology limitations (e.g., quickly digested gelatinous organisms were probably underestimated in previous studies, based solely on stomach contents). Considering that in ecosystem models this trophic relationship, as well as the functional organization of hatchetfishes, is important to properly answer key ecological questions including resource use, carbon transportation, and influence of mesopelagic community in climate change process.

During the first reporting period, TRIATLAS researchers have published over 40 articles in scientific journals —too many to mention or list here. But another article we would like to highlight is by ***Rebecca Hummels et al. (2020)*** *titled "****Surface cooling caused by rare but intense nearinertial wave induced mixing in the tropical Atlantic****" published in* ***Nature Communications****.*

You can read more about this paper on the next page *or on GEOMAR's own website:*

https://www.geomar.de/en/news/article/kurze-winddreher-mit-stark-kuehlender-wirkung

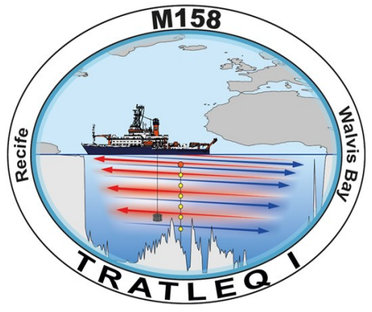
DOI *for the full article* https://doi.org/10.1038/s41467-020-17601-x

Short Wind Turns with Strong Cooling Effect

Why the ocean in the tropics is often colder than expected?

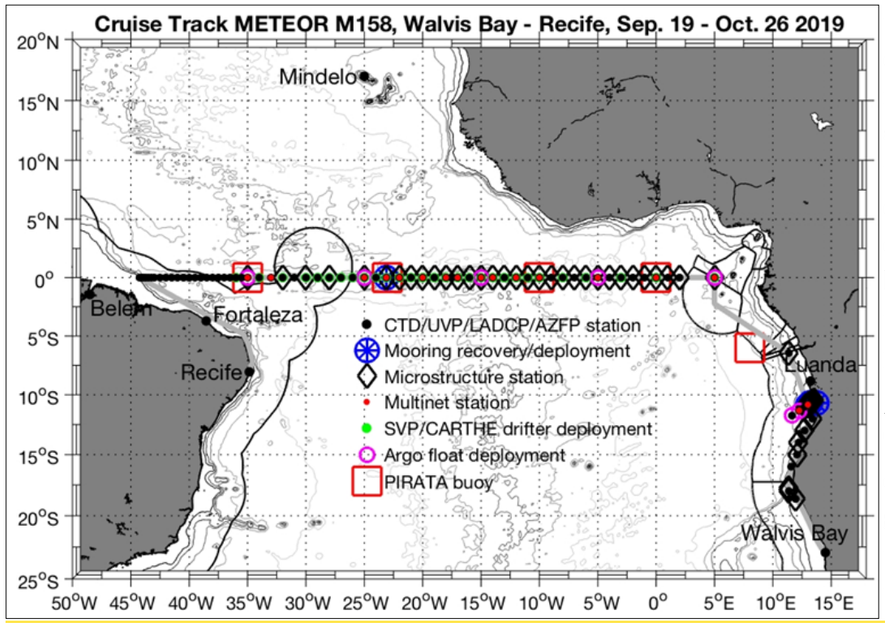
Why is the sea surface temperature of the northern tropics in the summer months often lower than expected? This question was investigated by a German-American team of scientists led by the GEOMAR Helmholtz Centre for Ocean Research Kiel. Their results, which have now been published in the international journal Nature Communications, show that a short-term, wind-driven wave phenomenon provides very efficient vertical mixing and cooling of the upper water layer.

Sea surface temperatures in the tropics have a major influence on the climate in the tropics and the adjacent continents. For example, they determine the position of the Intertropical Convergence Zone and the beginning and strength of the West African monsoon. Therefore, it is important to understand the variability of sea surface temperatures for climate predictions. Until now, the seasonal cycle of sea surface temperature in the tropical North Atlantic could not be sufficiently explained. "More precisely, the sea surface is colder than predicted by the combination of previous direct observations of solar radiation, currents and mixing, especially in the summer months from July to September", explains Dr. Rebecca Hummels from the GEOMAR Helmholtz Centre for Ocean Research Kiel and first author of a study now published in Nature Communications.



Ideas that led to the publication of the paper mentioned above were developed during ship-based observations on board the German research vessel Meteor in September 2015. More recently, the same research vessel carried a group of TRIATLAS researchers across the Tropical Atlantic allowing them to make physical, chemical, biogeochemical and biological measurements over a whole equatorial section from the eastern to the western boundary and from the surface to the bottom. Cruise No. M158, also known as Transatlantic Equatorial Cruise-I (TRATLEQ-I) was an interdisciplinary cruise focusing on upwelling in the tropical Atlantic, its physical forcing, its importance for biological production and plankton communities, associated chemical cycles, as well as on the current system setting the background conditions for the downward carbon export.

Another study topic of the TRATLEQ-I was the coastal upwelling off Angola to better understand the functioning of this tropical upwelling system.



Bathymetric map with cruise track of R/V Meteor cruise M158 (grey solid line) including locations of CTD/UVP/LADCP/AZFP stations, mooring recoveries and redeployments, microstructure and multinet stations and locations of drifter and float deployments. Territorial waters of different countries are marked with thin black solid lines.

*Another scientific cruise for the TRIATLAS Project was performed on board the French research vessel **Thalassa** in early 2020 just before the COVID-19 pandemic started. The **PIRATA FR 30 cruise** (the 30th French cruise for servicing the PIRATA moorings network in the eastern Tropical Atlantic) was planned to be carried out from February 16 to March 16, 2020. However, the field work was stopped on March 16 due to pandemic related restrictions. Instead of disembarking the ship at Mindelo, Cape Verde, as originally planned, the crew stayed onboard the R/V Thalassa until they reached Brest, France, on March 31, 2020.*

Description of work

by

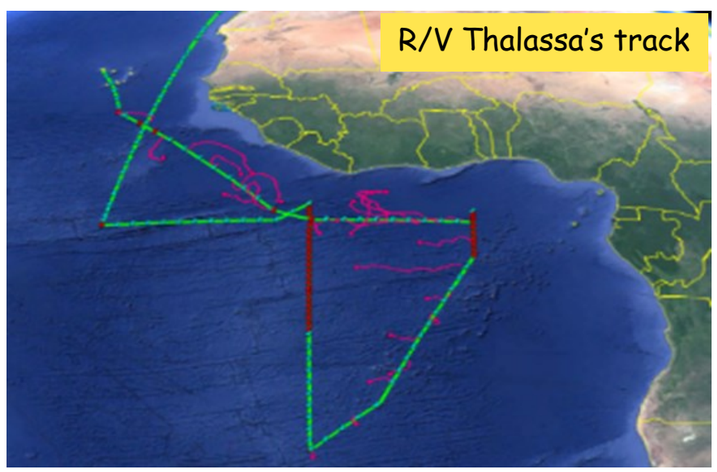
Bernard Bourles (IRD)

(*en français*)

R/V Thalassa and the crew

Lors de cette campagne, en plus des travaux classiques inhérents à ce type de campagne (profils CTD-O2/ LADCP, XBT, prélèvements de surface et bouteilles pour analyses…) et de travaux d'opportunité déjà effectués depuis quelques années (déploiements de 4 profileurs ARGO, au lieu des 5 prévus, et de 22 bouées dérivantes de surface de type SVP), plusieurs opérations supplémentaires étaient également programmées:

- Remplacement de 5 capteurs de turbulence sur 2 bouées équatoriales (23°W et 10°W) ;
- Remplacement de récepteurs acoustiques OTN sur toutes les bouées ;
- Acquisition de mesures acoustiques tout le long de la route du navire (pour la 5ème fois dans cette zone particulière, avec acquisition simultanée du courant avec les ADCP de coque).



R/V Thalassa's track

- Pour la 2nde fois et comme en 2019, mesures en continu du spectre de neutrons incidents pour ONERA (Toulouse) ;
- Aussi, des prélèvements spécifiques pour le Carbone 13 (C13) et l'Oxygène 18 (O18) sur demande de Gilles Reverdin (LOCEAN) ;
- Enfin, comme les années précédentes, prélèvements de Sargasses, d'anatifes sur les bouées, et demande supplémentaire de morceaux de thons (si péchés) pour analyser leur teneur en mercure.

D'autre part, pour la 1ère fois en Atlantique tropical, et sur proposition de la cellule de déploiement Argo-France (Noé Poffa, Romain Cancouët, Nathanaële Lebreton), une tentative de récupération d'un profileur Deep-Argo (profileur 3902132, déployé pendant FR28) a été menée avec succès le 22/02.

◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆

…And another piece of field work news reported by Abdoulaye Sarré (Crodt-ISRA)

A member of TRIATLAS community leading local scientists onboard the research vessel R/V Fridtjof Nansen to assess the Senegambian pelagic resources

"Supporting the application of Ecosystem Approach to Fisheries (EAF) to Fisheries management considering climate and pollution impacts" (GCP/GLO/690/NOR) aims to further strengthen the knowledge base and the overall institutional capacity for the implementation of the EAF in developing countries, with additional attention to the impact of climate variability and change, pollution and other anthropogenic stressors.

The programme, which started implementation in May 2017, builds on earlier phases, and is governed by an agreement between the Food and Agriculture Organization of the United Nations (FAO), the Institute of Marine Research (IMR), Norway and the Norwegian Agency for Development Cooperation (Norad). The three pillars of the new programme are: Science, Fisheries management, and Capacity development. A new state of the art research vessel, Dr Fridtjof Nansen is an integral part of the programme. A science plan, covering 11 research themes, guides the programme's scientific work.

The programme works in partnership with governments, regional organizations, other UN agencies as well as other partner projects and institutions.

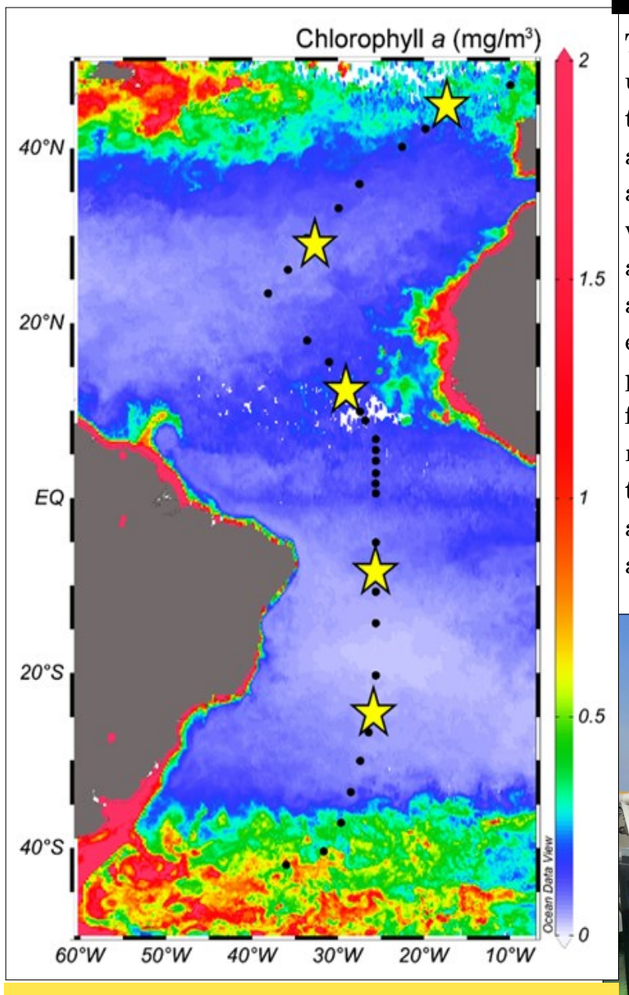
In this framework, a regional acoustic survey was performed in Senegal and Gambia from September 26 to October 7, 2019, using the vessel R/V Fridtjof Nansen, to assess the pelagic resources in Senegambian EEZ. 28 scientists from IMR (Norway), ISRA (Senegal), FRDU (The Gambia) IMROP (Mauritania) and CRO (Cote d'ivoire) participated in this survey. Abdoulaye Sarré, a member of the Triatlas Project, was the local cruise leader. The survey continued until December 16th to cover Mauritania and Morocco.

R/V Dr. Fridtjof Nansen and the crew during a regional acoustic survey off the coast of Senegal and Gambia.

...And a news article written by Cristina Fernández-González (UVIGO)

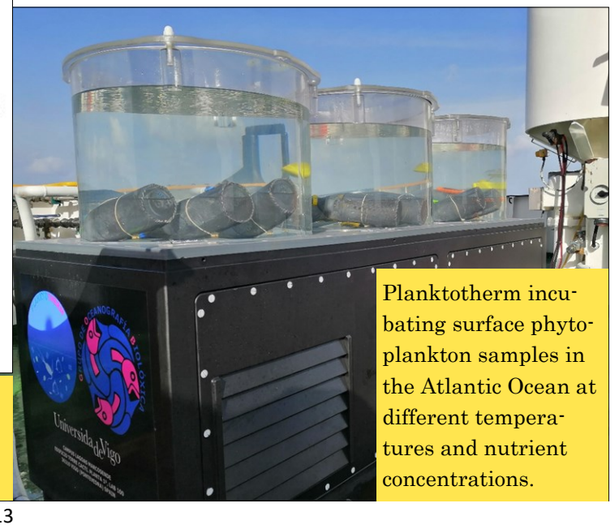
Temperature and nutrient availability are two of the main drivers that regulate biological communities in the ocean. But, their interaction can be more fascinating than their separate role. The Atlantic Meridional Transect (AMT) gives the opportunity to study different biogeographic regions in the ocean. While crossing the Atlantic from north (47ºN) to south (41ºS) we wanted to elucidate the response of different phytoplankton communities along the transect to changes in temperature and nutrient concentration. Our hypothesis is that the effect of temperature might be weaker or even suppressed by nutrient limitation.

RRS Discovery docked in Punta Arenas (Chile) at the end of the 29th Atlantic Meridional Transect.

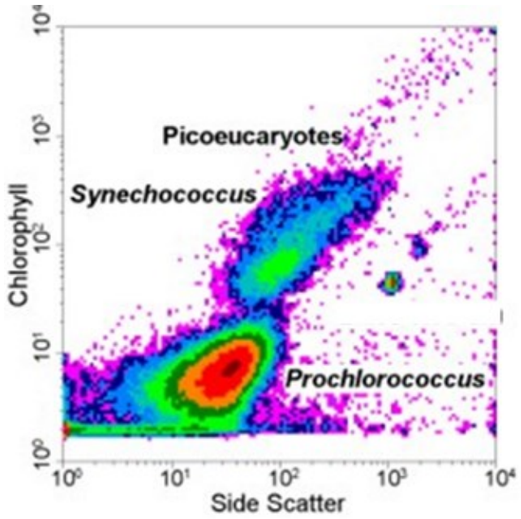


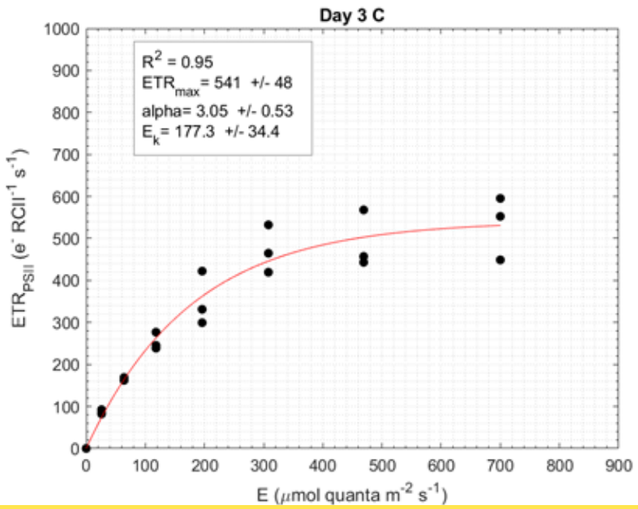
Location of sampled stations superimposed on a map of surface chlorophyll-a. Stars indicate the location of the temperature-nutrient experiments.

To test this, we performed several experiments using an incubator ("Planktotherm") that allows to maintain the microbial plankton communities at three different temperatures: *in situ* temperature (which is temperature of the surface seawater at the time we took the samples), 3°C above and 3°C below the *in situ* temperature. In addition, we established two conditions of nutrients, *in situ* and with additions of nitrogen and phosphorous, the two main limiting nutrients for phytoplankton in the Atlantic Ocean. We measured the response of the community in terms of photosynthetic activity (measured with a FRRF device) and cellular abundance of nano- and picophytoplankton and heterotrophic bacteria (measured with a flow cytometer).



Planktotherm incubating surface phytoplankton samples in the Atlantic Ocean at different temperatures and nutrient concentrations.





Example plot of picophytoplankton abundance measured by flow cytometry (credits to Daniel Vaulot, CNRS, Station Biologique de Roscoff, left panel) and plot of photosynthesis irradiance curve (here Electron Transport Rate versus light intensity, right panel).

Data are being processed at the moment so soon we will know if our hypothesis was on the right track!

◆ ◆ ◆ ◆ ◆ ◆ ◆ ◆

First TRIATLAS Summer School, a CANEMS activity, on **"Ocean, Climate and Marine Ecosystem"** was hosted by the **Nansen Tutu Centre, University of Cape Town** (14-21 January 2020). This Summer School brought together Early Career Researchers (Masters and PhD student, and Post-docs) from a wide background, geographically and professionally.

The **main objective** of the 1st TRIATLAS Summer School was to initiate new collaborations between oceanographers, climate science researchers, and marine ecosystem researchers since sustainable management of Atlantic marine ecosystems requires an integrated approach between these these fields.

The **format** of the Summer School was a blend of overview lectures to provide a common background on observations, theory, analysis, and modelling techniques; and practical group work exercises in interdisciplinary groups.

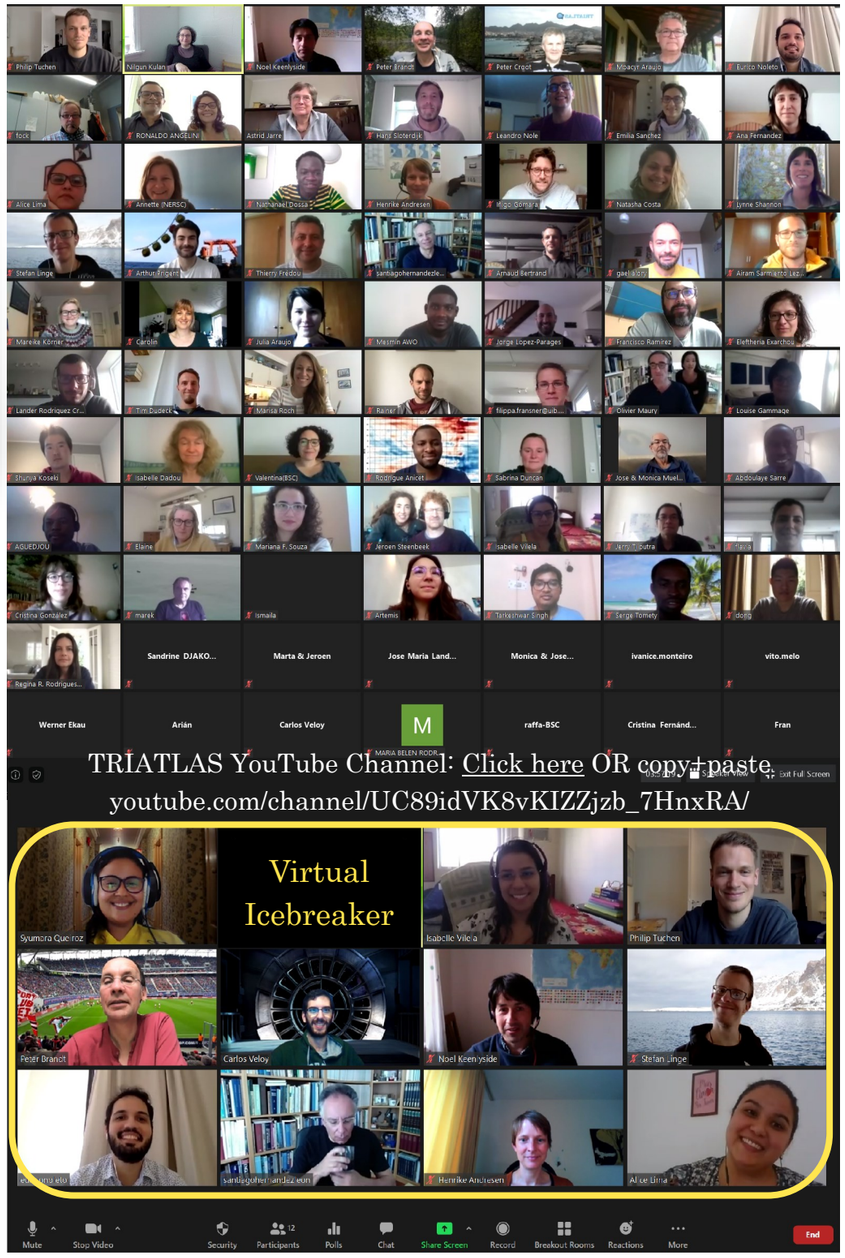
The Summer School was well attended by **16 lecturers, 12 post-docs, and 16 PhD and Master students**. Most of the attendees had the opportunity to stay at the UCT residences on campus, which created an atmosphere ripe for discussions, intellectual stimulation, collaboration, and for building long-term friendships and networks. A big thank-you goes to the head of local organising committee, Prof. Mathieu Rouault (NTC - UCT), for his tireless efforts to make this arrangement possible.

- For more information visit: https://www.nansentutusummerschool.com/
- The TRIATLAS - Nansen Tutu Center Summer School on "**Ocean, Climate, and Marine Ecosystem**" was a resounding success, with the participating Early Career Researchers asking for new interdisciplinary collaboration opportunities.
- Unfortunately, like many other activities which require mobility and gathering, the second TRIATLAS Summer school, which was planned to take place in early 2021 in Brazil has been **postponed** until the COVID-19 pandemic restrictions are lifted.
- Read **below** the testimonial from one of the ECRs, Hermann Luyt (UCT).

"*The TRIATLAS Summer School was a great learning experience where experts from an assortment of interrelated fields under the TRIATLAS umbrella were gathered to share their knowledge with each other and with young researchers. For me personally, it was a valuable experience to critically think through connectedness of social, climatic and physical issues, the latter of which I am more comfortable with. Even within my own field there was much to be learned, especially the impact of physical processes in the ocean on the livelihoods of vulnerable people. The summer school was also a time of building good friendships with others and opening the doors for future collaborations.*"

TRIATLAS General Assembly (12-14 May 2020)

TRIATLAS Project had a productive start with many activities such as meetings, scientific cruises, and its first Summer School taking place late 2019 and early 2020, before the COVID-19 pandemic turned our world upside-down. During the pandemic, we realised how adaptable and creative our scientists are at finding new ways to continue their research activities and collaborate. The medium might have changed but productive discussions and collaboration continued. Nothing shows our scientists dedication to advance science for the benefit of society better.



Soon after COVID-19 restrictions came into effect in most parts of the world, we realised that our much anticipated first General Assembly (GA) in Mindelo, Cabo Verde, would carry a big risk of spreading COVID-19 infection to this Island Nation.

The next step for the Scientific Steering and Executive Board (SSEB) was to look for another platform to hold our GA. In a year that lockdown, coronavirus, self-isolate, and social distancing made it to the list of the top ten words (Collins Dictionary), we also turned to virtual meeting platforms, like many others.

After two trial web-GA's, as we called them, we had a marathon of 60+ individual meetings spread over three days for the main web-GA. The number of meetings was high because we wanted to create an atmosphere of small group discussions around a particular poster, which naturally happens at an on-site meeting. To support this idea, our poster presenters prepared 2-min pre-recorded introductory videos (check them out on the TRIATLAS YouTube channel under "**playlists**" and "**videos**").

Planning for the web-GA was an intense time at the Project Office. Same was also true for the TRIATLAS web-GA Scientific Organising Committee. Luckily, the job of preparing the scientific program fell on to the shoulders of a group of volunteer Early

Career Scientists. Owing to their youthful enthusiasm and energy, the first TRIATLAS web-GA was a great success. Their support and cooperation during those turbulent times were well appreciated.

Scientific Organising Committee			
Airam N. Sarmiento-Lezcano	(ULPGC)	Jorge Lopez-Parages	(CERFACS/UCM)
Alex Souza Lira	(UFRPE)	Juliano Ramanantsoa	(UCT/NORCE)
Alina Nathanael Dossa	(UFPE)	Lander Crespo	(UiB)
Djoirka Minto Dimoune	(UFPE)	Leandro Nolé	(IRD/UFRPE)
Eurico M. Noleto Filho	(UFRN)	Louise Gammage	(UCT)
Faye Brinkman	(UNAM)	Marco J. Cabrerizo	(UVIGO)
Fernand Assene	(IRD/UFPE)	Maria Alice Leita Lima	(UFRN)
Franz Philip Tuchen	(GEOMAR)	Simone Lira	(UFPE)
Habib Micaël Aguedjou	(IRD/UAC)	Tim Dudeck	(ZMT)

...And an All-Atlantic Ocean Research Clustering Activity

TRIATLAS is one of the EU H2020 projects funded under the All Atlantic Ocean Research Alliance Flagship topic and one of the six so-called BG-08 sister projects (**iAtlantic, AquaVitae, TRIATLAS, ASTRAL, AtlantECO,** and **Mission Atlantic**). As such, TRIATLAS took part in the All Atlantic Ocean Research Forum organised by the European Commission in Brussels (6-7 February 2020).

The Forum represented a great opportunity for TRIATLAS to meet with other relevant EU H2020 project communities and key European and International Atlantic stakeholders. This as a first step in furthering exchanges and tight clustering with related initiatives. As the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, the UNESCO 2017 Global Ocean Science Report, and the IPBES Global Assessment on Biodiversity and Ecosystem Services all emphasize, more than ever today, it is crucial to define how to address unprecedented changes that the ocean and cryosphere are undergoing. More specifically, BG-08 projects all aim at understanding and sustainably managing the Atlantic Ocean as a whole. This requires a large-scale basin effort involving both the northern and the southern parts of this ocean and its interaction with the areas surrounding it. In order to achieve this, it is necessary to bring together scientists, stakeholders, data, knowledge, expertise, capacities, and resources.

A group of TRIATLAS members at the All Atlantic Ocean Research Forum (6-7 February 2020, Brussels).

ASTRAL

iAtlantic
INTEGRATED ASSESSMENT OF ATLANTIC MARINE ECOSYSTEMS IN SPACE AND TIME

TRIATLAS

BG-08 Sister Projects & Synergies

MISSION ATLANTIC
Towards the Sustainable Development of the Atlantic Ocean: Mapping and Assessing the present and future status of Atlantic marine ecosystems under the influence of climate change and exploitation

AtlantECO
Atlantic Ecosystems Assessment, Forecasting & Sustainability

AquaVitae

TRIATLAS *Northeast Brazil Group Meeting*

Many members of the IJL TAPIOCA are also involved in the EU H2020 project TRIATLAS. The objective of this meeting which brought together 25 participants from UFPE, UFRPE, UFRN, and IRD was to make a balance of current and planned activities of the "Northeast Brazil group" to improve coherency and stimulate interactions. Activities include research carried out specifically in the Northeast and also in other regions of the Atlantic Ocean by this group.

Main achievement of this meeting was the preparation of the Tables summarising the activities that will take place in each of the TRIATLAS work packages. Another significant output was the preparation of a synthesis of the activities developed in Northeast Brazil, which was presented during the first General Assembly (Oral Presentation).

CLOSE-UP

Gearing up for Atlantic marine ecosystem predictions using spatial-temporal food web models

by

Jeroen Steenbeek, Marta Coll, Lynne J. Shannon, Ronaldo Angelini, Kelly Ortega-Cisneros, Samantha Grusd, Maria Alice L. Lima

Institute of Marine Science (ICM-CSIC, Barcelona, Spain), Ecopath International Initiative (EII, Barcelona, Spain), University of Cape Town (UCT, Cape Town, South Africa), Universidade Federal do Rio Grande do Norte (UFRN, Natal, Brazil)

Here we provide a brief update about progress and next steps in WP9. At the end of the first year of TRIATLAS, spatial-temporal food web models based on Ecopath with Ecosim (EwE) and EcoOcean are getting ready for running marine ecosystems and fisheries predictions from seasons to decades, and from sub-regional to basin scales.

Southern Benguela

An updated EwE food web model for the **Southern Benguela marine ecosystem** was recently published (Shannon et al. 2020). This study captures recent advances in our understanding of local ecosystem dynamics and uses the latest available records of biomass and fishery catches to describe temporal dynamics from 1978 to 2015. Besides documenting the model structure and parameterization, the paper provides the rationale behind incorporating a newly available upwelling index and observed fishing effort as important drivers of ecosystem dynamics. This study shows promise for unraveling the observed dynamics of the Benguela upwelling ecosystem, and highlights the importance of exploring spatially disaggregated approaches - in particular, the foraging habitat capacity of the Ecospace approach - to improve our understanding of how processes such as variability in upwelling can drive the Southern Benguela ecosystem. Deeper understanding of environmental influences on the system complements the knowledge needed to manage fisheries and to protect marine biodiversity by means of ecosystem-based management in South Africa, and to prepare management for adaptation to future scenarios of climate change. In this regard, we have extracted temporal outputs of the GFDL-ESM2M model projections for the Southern Benguela area for two emission pathways (see EcoOcean below), and are refining species-environmental relationships in preparation for running spatial climate-fishery simulations using the revised Ecosim model. Further, and central to TRIATLAS activities, we have set up an Ecospace model of the Southern Benguela and are now carefully calibrating the spatial-temporal model of the area, with the aim to have the model ready for running initial TRIATLAS simulations by the end of 2020.

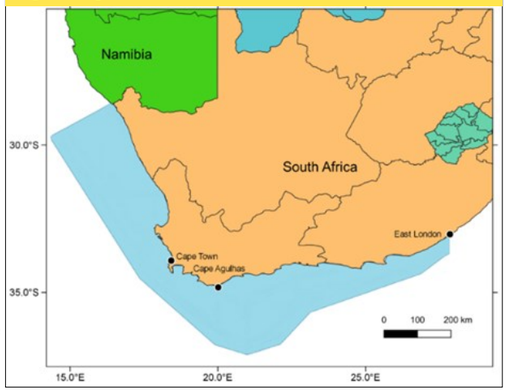


Figure 1 – Southern Benguela Modelled area (blue). Figure reproduced from Shannon et al. 2020.

Northeast Brazil

We are building the EwE food web model for Northeastern Brazil that encompasses 31,105 km2 off the NE Brazilian coast. The Northeast Coast has been under increasing environmental pressure combined with threats from climate variability and loss of important habitats for ecosystem services. The objective of our model is to better understand the role of several drivers such as fishing and climate change on individual species and the functioning of the entire ecosystem, with the aim to improve coastal management strategies. Functional groups were chosen according to: a) relative ecological importance; b) relevance in fishing landings; and c) charismatic species (turtles, dolphins, whales). Fish and invertebrates were sampled using bottom trawl nets in 2018-2017. Using updated data from functional groups, the most up-to-date fisheries statistics, and relative effort estimates for Brazil from the Sea Around Us project, greatly enhanced the ability of the model to reproduce observed past trends. We are currently finishing the calibration of the temporal model, and have started preparing the spatial-temporal model in parallel to focus on understanding the ecological processes in spatial perspective and on fishing in five states of Northeast region where local management has reported some successes. We will refine the relationship between environmental variables and species, such as temperature and depth. In the next steps, our activities will include different simulations for the most vulnerable species, such as varying effort, warming scenarios, and variations in important habitats. We will be ready to start running TRIATLAS simulations for Northeast Brazil in the spring of 2021.

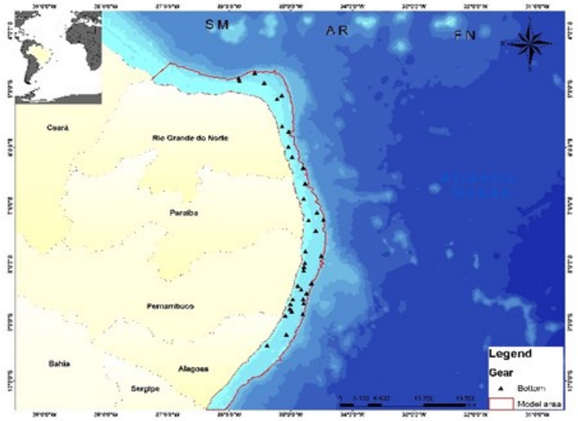


Figure 2 – Northeastern Brazil modelled area (light blue).

Global

An updated version of EcoOcean, version 2, was recently published (Coll et al. 2020). EcoOcean is a spatial-temporal ecosystem modelling complex that spans global food-web dynamics from primary producers to top predators. Innovations in version 2 include an enhanced ability to reproduce spatial-temporal ecosystem dynamics by linking species productivity, distributions, and trophic interactions to the impacts of climate change. The updated modelling platform has been used to simulate past and future scenarios of change, where we quantify the impacts of alternative configurations of the ecological model, responses to different climate-change scenarios, and the impacts of fishing effort reassessments. Climate-change scenarios were obtained from two Earth-System Models (ESMs, GFDL-ESM2M and IPSL-CMA5-LR) and two contrasting emission pathways (RCPs 2.6 and 8.5) for historical (1950-2005) and future (2006-2100) periods. Standardized ecological indicators and biomasses of selected species groups were used to compare simulations. Future developments and applications of EcoOcean v2 can contribute to the quantification of cumulative impact assessments of multiple stressors and of plausible ocean-based solutions to prevent, mitigate and adapt to global change; EcoOcean is ready for running TRIATLAS simulations.

The Team

Approach

The South African, Brazilian and Spanish EwE and EcoOcean teams meet online bi-weekly to discuss, advance and align modelling efforts. Current activities include the establishment of standardized spatial-temporal modelling procedures to contribute to tailored seasonal to multi-decadal forecasts and multi-decadal to centennial scenarios for key marine ecosystems and fisheries to be developed using different state-of-the-art integrated marine ecosystem models. Although we do not wish to standardize model structures to enable each model to most optimally capture local ecosystem characteristics, for comparative purposes we are currently defining a core set of standardized model outputs that each model will deliver. These outputs will cover summaries of catches, biomasses, and commonly accepted ecological indicators, which we hope that also other modelling groups in WP9 will adopt.

References

Coll, M., Steenbeek, J., Pennino, G.M., Buszowski, J., Kaschner, K., Lotze, H.K., Rousseau, Y., Tittensor, D., Walters, C., Watson, R.A. & Christensen, V. (2020) Advancing global ecological modelling capabilities to simulate future trajectories of change in marine ecosystems. Frontiers in Marine Science - Marine Fisheries, Aquaculture and Living Resources, 10.3389/fmars.2020.567877

Shannon, L.J., Ortega-Cisneros, K., Lamont, T., Winker, H., Crawford, R.J.M., Jarre, A. & Coll, M. (2020) Exploring temporal variability in the Southern Benguela ecosystem over the past four decades using a time-dynamic ecosystem model. Frontiers in Marine Science, section Marine Fisheries, Aquaculture and Living Resources, https://doi.org/10.3389/fmars.2020.00540