Please check our wiki for help on navigating the form.

Horizon 2020

Call: H2020-BG-2018-2020

(Blue Growth)

SECOND STAGE

Topic: BG-08-2018-2019

Type of action: RIA

Proposal number: SEP-210522257

Proposal acronym: TRIATLAS

Deadline Id: H2020-BG-2018-2

Table of contents

How to fill in the forms

The administrative forms must be filled in for each proposal using the templates available in the submission system. Some data fields in the administrative forms are pre-filled based on the steps in the submission wizard.

1 - General information

Topic	BG-08-2018-2019	Type of Action	RIA
Call Identifier	H2020-BG-2018-2020	Deadline Id	H2020-BG-2018-2

Acronym   TRIATLAS

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

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &

Duration in months   *48*

Fixed keyword 1   Marine ecosystem management

Fixed keyword 2   Climatology and climate change

Free keywords   *Climate Prediction, Ecosystem Services, Sustainable development*

Abstract

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 this by delivering knowledge of the current state and future changes of the Atlantic marine ecosystems. We achieve this through a basin-wide approach that integrates research from the North and South, and that closes critical knowledge gaps in the Tropical and South Atlantic that impede an understanding of the entire basin. We bring together an interdisciplinary team of marine ecologists, physical oceanographers, climate researchers, and social scientists from 35 different institutions in Europe, Africa, and South America, together with industrial and regional stakeholders. We will enhance knowledge of the marine ecosystems in key areas of the Atlantic using existing and pivotal new (physical, biological, societal) observations. Earth system, ecological, and socio-economic models and observations will be used to assess the cumulative impacts of (climatic, pollution, and fishing) pressures driving fluctuations in the marine ecosystem, and the potential for tipping point behavior and regime shifts. We will develop the first predictions of the marine-ecosystem for the next 40 years for the whole Atlantic, by combining state-of-the-art climate prediction and ecosystem models, with Shared Socioeconomic Pathways, and by conducting socio-economic vulnerability assessments services, with stakeholder engagement. TRIATLAS will enhance capacity in marine ecosystems, oceanography, and climate research in countries bordering the South and Tropical Atlantic Ocean. There will be close cooperation and alignment with relevant European Commission services and the South-South Framework for Scientific and Technical Cooperation, as well as other relevant initiatives in the field. We will contribute to upscale cooperation around the Atlantic.

Remaining characters   47

Has this proposal (or a very similar one) been submitted in the past 2 years in response to a call for proposals under Horizon 2020 or any other EU programme(s)?	○ Yes ● No

Please give the proposal reference or contract number.	
XXXXXX-X	

Declarations

1) The coordinator declares to have the explicit consent of all applicants on their participation and on the content of this proposal.	☒
2) The information contained in this proposal is correct and complete.	☒
3) This proposal complies with ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct).	☒

4) The coordinator confirms:

- to have carried out the self-check of the financial capacity of the organisation on http://ec.europa.eu/research/participants/portal/desktop/en/organisations/lfv.html or to be covered by a financial viability check in an EU project for the last closed financial year. Where the result was "weak" or "insufficient", the coordinator confirms being aware of the measures that may be imposed in accordance with the H2020 Grants Manual (Chapter on Financial capacity check); or	○
- is exempt from the financial capacity check being a public body including international organisations, higher or secondary education establishment or a legal entity, whose viability is guaranteed by a Member State or associated country, as defined in the H2020 Grants Manual (Chapter on Financial capacity check); or	●
- as sole participant in the proposal is exempt from the financial capacity check.	○

5) The coordinator hereby declares that each applicant has confirmed:

- they are fully eligible in accordance with the criteria set out in the specific call for proposals; and	☒
- they have the financial and operational capacity to carry out the proposed action.	☒

The coordinator is only responsible for the correctness of the information relating to his/her own organisation. Each applicant remains responsible for the correctness of the information related to him and declared above. Where the proposal to be retained for EU funding, the coordinator and each beneficiary applicant will be required to present a formal declaration in this respect.

According to Article 131 of the Financial Regulation of 25 October 2012 on the financial rules applicable to the general budget of the Union (Official Journal L 298 of 26.10.2012, p. 1) and Article 145 of its Rules of Application (Official Journal L 362, 31.12.2012, p.1) applicants found guilty of misrepresentation may be subject to administrative and financial penalties under certain conditions.

Personal data protection

The assessment of your grant application will involve the collection and processing of personal data (such as your name, address and CV), which will be performed pursuant to Regulation (EC) No 45/2001 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data. Unless indicated otherwise, your replies to the questions in this form and any personal data requested are required to assess your grant application in accordance with the specifications of the call for proposals and will be processed solely for that purpose. Details concerning the purposes and means of the processing of your personal data as well as information on how to exercise your rights are available in the privacy statement. Applicants may lodge a complaint about the processing of their personal data with the European Data Protection Supervisor at any time.

Your personal data may be registered in the Early Detection and Exclusion system of the European Commission (EDES), the new system established by the Commission to reinforce the protection of the Union's financial interests and to ensure sound financial management, in accordance with the provisions of articles 105a and 108 of the revised EU Financial Regulation (FR) (Regulation (EU, EURATOM) 2015/1929 of the European Parliament and of the Council of 28 October 2015 amending Regulation (EU, EURATOM) No 966/2012) and articles 143 - 144 of the corresponding Rules of Application (RAP) (COMMISSION DELEGATED REGULATION (EU) 2015/2462 of 30 October 2015 amending Delegated Regulation (EU) No 1268/2012) for more information see the Privacy statement for the EDES Database.

Proposal ID **SEP-210522257**	Acronym **TRIATLAS**

2 - Participants & contacts

#	Participant Legal Name	Country	Action
1	UNIVERSITETET I BERGEN	Norway	
2	HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL	DE	
3	STIFTELSEN NANSEN SENTER FOR MILJOOG FJERNMALING	NO	
4	HAVFORSKNINGSINSTITUTTET	NO	
5	JOHANN HEINRICH VON THUENEN-INSTITUT, BUNDESFORSCHUNGSINSTITUT FUER LAENDLICHE RAEUME, WALD UND FISCHEREI	Germany	
6	LEIBNIZ-ZENTRUM FUER MARINE TROPENFORSCHUNG (ZMT) GMBH	DE	
7	CHRISTIAN-ALBRECHTS-UNIVERSITAET ZU KIEL	DE	
8	METEO-FRANCE	FR	
9	CENTRE EUROPEEN DE RECHERCHE ET DE FORMATION AVANCEE EN CALCUL SCIENTIFIQUE	FR	
10	INSTITUT DE RECHERCHE POUR LE DEVELOPPEMENT	FR	
11	BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION	ES	
12	UNIVERSIDAD COMPLUTENSE DE MADRID	ES	
13	UNIVERSITY OF CAPE TOWN	ZA	
14	INSTITUTO NACIONAL DE DESENVOLVIMENTO DAS PESCAS	CV	
15	INSTITUTO NACIONAL DE INVESTIGACAO PESQUEIRA	AO	
16	UNIVERSIDAD DE VIGO	ES	
17	UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	ES	
18	UNIVERSITE FELIX HOUPHOUET BOIGNY	Cote d'Ivoire	
19	CENTRE DE RECHERCHES OCEANOLOGIQUES	CI	
20	UNITED KINGDOM RESEARCH AND INNOVATION	UK	
21	UNIVERSITE D'ABOMEY-CALAVI	BJ	

22	UNIVERSIDADE FEDERAL DO RIO GRANDE-FURG	BR	
23	UNIVERSIDADE FEDERAL DE PERNAMBUCO	BR	
24	UNIVERSIDADE FEDERAL DE SANTA CATARINA.	BR	
25	UNIVERSIDADE FEDERAL RURAL DE PERNAMBUCO	BR	
26	NATIONAL UNIVERSITY OF IRELAND GALWAY	IE	
27	UNI RESEARCH AS	NO	
28	INSTITUT SENEGALAIS DE RECHERCHES AGRICOLES	SN	
29	AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS	ES	
30	ECOLE NORMALE SUPERIEURE	FR	
31	UNIVERSIDADE DE CABO VERDE	CV	
32	UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE	BR	
33	Department of Agriculture, Forestry and Fisheries	ZA	
34	SORBONNE UNIVERSITE	FR	
35	UNIVERSITY OF NAMIBIA	NA	

2 - Administrative data of participating organisations

PIC

999974456

Legal name

UNIVERSITETET I BERGEN

Short name: UiB

Address of the organisation

Street   MUSEPLASSEN 1

Town   BERGEN

Postcode   5020

Country   Norway

Webpage   www.uib.no

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....no

Legal person ....yes

Industry (private for profit)..................no

Enterprise Data

SME self-declared status...23/05/2016 - no

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Geophysical Institute | ☐ not applicable

☐ Same as proposing organisation's address

Street | PO Box 7803 |

Town | Bergen |

Postcode | NO-5020 |

Country | Norway |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.

Sex ● Male ○ Female

First name **Noel**   Last name **KEENLYSIDE**

E-Mail **noel.keenlyside@gfi.uib.no**

Position in org. Professor

Department Geophysical Institute   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street PO Box 7803

Town Bergen   Post code NO-5020

Country Norway

Website http://www.uib.no/personer/Noel.Keenlyside

Phone +4755582032   Phone 2 *+xxx xxxxxxxxx*   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Liv-Grethe	Gudmundsen	post@fa.uib.no	*+4755584965*
Mahaut	de Vareilles	mahaut.vareilles@uib.no	*+4755583708*
Fabiana	Werthein	fabiana.werthein@uib.no	*+xxx xxxxxxxxx*
Friederike	HOFFMANN	Friederike.Hoffmann@gfi.uib.no	*+xxx xxxxxxxxx*
Line	Garnes Steffensen	line.steffensen@uib.no	*+xxx xxxxxxxxx*

PIC
986090458

Legal name
HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL

Short name: GEOMAR

Address of the organisation

Street   WISCHHOFSTRASSE 1-3

Town   KIEL

Postcode   24148

Country   Germany

Webpage   www.geomar.de

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no

Research organisation ....yes

Legal person ....yes

Industry (private for profit)..................no

Enterprise Data

SME self-declared status...01/01/2012 - no

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Department(s) carrying out the proposed work

Department 1

Department name | Ocean Circulation and Climate Dynamics | ☐ not applicable

☐ Same as proposing organisation's address

Street | Düsternbrooker Weg 20

Town | Kiel

Postcode | 24105

Country | Germany

Department 2

Department name | Marine Ecology | ☐ not applicable

☐ Same as proposing organisation's address

Street | Düsternbrooker Weg 20

Town | Kiel

Postcode | 24105

Country | Germany

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal ID **SEP-210522257**	*Acronym* **TRIATLAS**	*Short name* **GEOMAR**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.

Sex ● Male ○ Female

First name **Peter** Last name **Brandt**

E-Mail **pbrandt@geomar.de**

Position in org. Professor Experimental Oceanography

Department Ocean Circulation and Climate Dynamics / Physical Oceanography ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Düsternbrooker Weg 20

Town Kiel Post code 24105

Country Germany

Website https://www.geomar.de/en/research/

Phone +494316004105 Phone 2 *+xxx xxxxxxxxx* Fax +494316004102

Other contact persons

First Name	Last Name	E-mail	Phone
Alexandra	Drossou-Berendes	adrossou-berendes@geomar.de	*+494316002808*
Rainer	Kiko	rkiko@geomar.de	*+494316004524*
Johannes	Karstensen	jkarstensen@geomar.de	*+xxx xxxxxxxxx*
Marcus	Dengler	mdengler@geomar.de	*+xxx xxxxxxxxx*
Helena	Hauss	hhauss@geomar.de	*+xxx xxxxxxxxx*
Rebecca	Hummels	rhummels@geomar.de	*+xxx xxxxxxxxx*

PIC   *Legal name*
999477913   STIFTELSEN NANSEN SENTER FOR MILJOOG FJERNMALING

Short name: NERSC

Address of the organisation

            Street   THORMOHLENSGATE 47

            Town   BERGEN

       Postcode   5006

        Country   Norway

       Webpage   www.nersc.no

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....no   Legal person ....yes

Non-profit ....yes

International organisation ....unknown

International organisation of European interest ....unknown
                                                                            Industry (private for profit).................no
Secondary or Higher education establishment ....no

Research organisation ....yes

Enterprise Data

 SME self-declared status...23/02/2009 - yes

 SME self-assessment .... unknown

 SME validation sme..23/02/2009 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Climate dynamics and prediction   ☐ not applicable

☐ Same as proposing organisation's address

Street | Thormøhlensgt 47

Town | Bergen

Postcode | 5006

Country | Norway

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ◉ Male ○ Female

First name **Francois**   Last name **Counillon**

E-Mail **francois.counillon@nersc.no**

Position in org. Researcher II

Department Climate dynamics and prediction   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Thormøhlensgt 47

Town Bergen   Post code 5006

Country Norway

Website http://www.nersc.no

Phone +4745288557   Phone 2 +4755205801   Fax _+xxx xxxxxxxxx_

Other contact persons

First Name	Last Name	E-mail	Phone
Sebastian	Mernild	sebastian.mernild@nersc.no	_+4791004721_
Knut	Holba	knut.holba@nersc.no	_+4790734815_
Annette	Samuelsen	annette.samuelsen@nersc.no	_+4793238202_

Proposal Submission Forms

PIC	Legal name
999548432	*HAVFORSKNINGSINSTITUTTET*

Short name: HI

Address of the organisation

Street NORDNESGATEN 50

Town BERGEN

Postcode 5817

Country Norway

Webpage www.hi.no

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no

Research organisation ....yes

Legal person ....yes

Industry (private for profit)..................no

Enterprise Data

SME self-declared status..01/09/1900 - no

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name   Havforskningsinstituttet   ☐ not applicable

☐ Same as proposing organisation's address

Street   NORDNESGATEN 50

Town   BERGEN

Postcode   5817

Country   Norway

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title | Dr. | Sex   ⦿ Male ◯ Female

First name **Marek**   Last name **Ostrowski**

E-Mail **mareko@imr.no**

Position in org. | Scientist in charge |

Department | Havforskningsinstituttet | ☐ Same as organisation name

☒ Same as proposing organisation's address

Street | NORDNESGATEN 50 |

Town | BERGEN | Post code | 5817 |

Country | Norway |

Website | http://www.imr.no/ |

Phone | +xxx xxxxxxxx | Phone 2 | +xxx xxxxxxxx | Fax | +xxx xxxxxxxx |

Proposal Submission Forms

Proposal ID **SEP-210522257**	Acronym **TRIATLAS**	Short name **THUENEN-INSTITUTE**	

PIC
998427888

Legal name
JOHANN HEINRICH VON THUENEN-INSTITUT, BUNDESFORSCHUNGSINSTITUT FUER LAENDLICHE RAEUME, WALD UN

Short name: THUENEN-INSTITUTE

Address of the organisation

Street   BUNDESALLEE 50

Town   BRAUNSCHWEIG

Postcode   38116

Country   Germany

Webpage   www.thuenen.de

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....unknown

International organisation of European interest ....unknown

Secondary or Higher education establishment ....unknown

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status...01/01/2008 - no

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Institute of Sea Fisheries | ☐ not applicable

☐ Same as proposing organisation's address

Street | Herwigstr 31 |

Town | Bremerhaven |

Postcode | 27572 |

Country | Germany |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ⦿ Male ○ Female

First name **Heino**   Last name **Fock**

E-Mail **heino.fock@thuenen.de**

Position in org. Research group coordinator

Department Marine Ecosystems Research Group   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Herwigstr 31

Town Bremerhaven   Post code 25572

Country Germany

Website www.thuenen.de

Phone +4947194460366   Phone 2 *+xxx xxxxxxxxx*   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Nicole	Hielscher	nicole.hielscher@thuenen.de	*+4947194460142*
Hilke	Heeren	drittmittel-administration@thuenen.de	*+495315961201*
Philipp	Seban	philipp.seban@thuenen.de	*+495315961213*

Proposal Submission Forms

PIC	*Legal name*
986128094	*LEIBNIZ-ZENTRUM FUER MARINE TROPENFORSCHUNG (ZMT) GMBH*

Short name: ZMT BREMEN

Address of the organisation

Street   FAHRENHEITSTRASSE 6

Town   BREMEN

Postcode   28359

Country   Germany

Webpage   www.leibniz-zmt.de

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....no

Non-profit ....no

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no

Research organisation ....no

Legal person ....yes

Industry (private for profit).................yes

Enterprise Data

SME self-declared status..12/08/2009 - no

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name   ZMT Bremen   ☐ not applicable

☐ Same as proposing organisation's address

Street   FAHRENHEITSTRASSE 6

Town   BREMEN

Postcode   28359

Country   Germany

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Mr.

Sex   ⦿ Male ◯ Female

First name **Werner**   Last name **Ekau**

E-Mail **werner.ekau@leibniz-zmt.de**

Position in org. Scientist in charge

Department ZMT Bremen   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street FAHRENHEITSTRASSE 6

Town BREMEN   Post code 28359

Country Germany

Website

Phone +xxx xxxxxxxx   Phone 2 +xxx xxxxxxxx   Fax +xxx xxxxxxxx

Proposal Submission Forms

PIC
999839529

Legal name
CHRISTIAN-ALBRECHTS-UNIVERSITAET ZU KIEL

Short name: CAU

Address of the organisation

Street   OLSHAUSENSTRASSE 40

Town   KIEL

Postcode   24118

Country   Germany

Webpage   http://www.uni-kiel.de

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes   Legal person ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no
                                                                          Industry (private for profit).................no
Secondary or Higher education establishment ....yes

Research organisation ....yes

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | CAU | ☐ not applicable

☐ Same as proposing organisation's address

Street | OLSHAUSENSTRASSE 40 |

Town | KIEL |

Postcode | 24118 |

Country | Germany |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Mr. Sex ⦿ Male ◯ Female

First name **Joern** Last name **Schmidt**

E-Mail **jschmidt@economics.uni-kiel.de**

Position in org. Scientist in charge

Department CAU ☐ Same as organisation name

☒ Same as proposing organisation's address

Street OLSHAUSENSTRASSE 40

Town KIEL Post code 24118

Country Germany

Website

Phone +xxx xxxxxxxx Phone 2 +xxx xxxxxxxx Fax +xxx xxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Linda	Pialek	euoffice@uv.uni-kiel.de	+xxx xxxxxxxx

PIC	*Legal name*
999578890	*METEO-FRANCE*

Short name: METEO-FRANCE

Address of the organisation

Street	AVENUE DE PARIS 73
Town	SAINT MANDE CEDEX
Postcode	94165
Country	France
Webpage	www.meteo.fr

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status...18/06/1993 - no

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name   METEO-FRANCE   ☐ not applicable

☐ Same as proposing organisation's address

Street   AVENUE DE PARIS 73

Town   SAINT MANDE CEDEX

Postcode   94165

Country   France

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title   Mr.   Sex   ◉ Male ○ Female

First name   **Roland**   Last name   **Seferian**

E-Mail   **roland.seferian@meteo.fr**

Position in org.   Scientist in charge

Department   METEO-FRANCE   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street   AVENUE DE PARIS 73

Town   SAINT MANDE CEDEX   Post code   94165

Country   France

Website

Phone   +xxx xxxxxxxx   Phone 2   +xxx xxxxxxxx   Fax   +xxx xxxxxxxx

PIC   *Legal name*
999940118   *CENTRE EUROPEEN DE RECHERCHE ET DE FORMATION AVANCEE EN CALCUL SCIENTIFIQU*

Short name: CERFACS

Address of the organisation

Street   Avenue Gaspard Coriolis 42

Town   TOULOUSE

Postcode   31057

Country   France

Webpage   www.cerfacs.fr

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....no   Legal person ....yes

Non-profit ....no

International organisation ....unknown

International organisation of European interest ....unknown
                                                                              Industry (private for profit).................yes
Secondary or Higher education establishment ....no

Research organisation ....no

Enterprise Data

SME self-declared status...19/05/2016 - no

SME self-assessment .... unknown

SME validation sme..22/09/2008 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Department(s) carrying out the proposed work

Department 1

Department name | CERFACS | ☐ not applicable

☐ Same as proposing organisation's address

Street | Avenue Gaspard Coriolis 42 |

Town | TOULOUSE |

Postcode | 31057 |

Country | France |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ◯ Male ⦿ Female

First name **Emilia**   Last name **Sanchez-Gomez**

E-Mail **sanchez@cerfacs.fr**

Position in org. Scientist in charge

Department CERFACS   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street Avenue Gaspard Coriolis 42

Town TOULOUSE   Post code 31057

Country France

Website

Phone +xxx xxxxxxxx   Phone 2 +xxx xxxxxxxx   Fax +xxx xxxxxxxx

PIC
999513803

Legal name
INSTITUT DE RECHERCHE POUR LE DEVELOPPEMENT

Short name: IRD

Address of the organisation

Street   BOULEVARD DE DUNKERQUE 44 CS 90009

Town   MARSEILLE

Postcode   13572

Country   France

Webpage   www.ird.fr

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no

Research organisation ....yes

Legal person ....yes

Industry (private for profit)..................no

Enterprise Data

SME self-declared status..21/11/2008 - no

SME self-assessment .... unknown

SME validation sme...21/11/2008 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | LEGOS UMR6655 | ☐ not applicable

☐ Same as proposing organisation's address

Street | 14. Av. Edouard Belin |

Town | Toulouse |

Postcode | 31400 |

Country | France |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex ⦿ Male ◯ Female

First name **Bernard**   Last name **Bourles**

E-Mail **bernard.bourles@ird.fr**

Position in org. Senior Scientist, coordinator of PIRATA

Department LEGOS, IRD délégation régionale Ouest   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Technopole Pointe du Diable, BP70

Town Plouzane   Post code 29280

Country France

Website http://www.ird.fr/

Phone +33298224511   Phone 2 +33676268496   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Francois	Tremege	francois.tremege@ird.fr	*+33491999373*
François	Trémège	europe@ird.fr	*+xxx xxxxxxxxx*

PIC
999655520

Legal name
BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION

Short name: BSC

Address of the organisation

Street   Calle Jordi Girona 31

Town   BARCELONA

Postcode   08034

Country   Spain

Webpage   www.bsc.es

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status..01/03/2005 - no

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Department(s) carrying out the proposed work

Department 1

Department name   Earth Science Department   ☐ not applicable

☐ Same as proposing organisation's address

Street   NEXUS II building, Jordi Girona 29

Town   Barcelona

Postcode   08034

Country   Spain

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title | Dr.   Sex   ⦿ Male ◯ Female

First name **Pablo**   Last name **Ortega**

E-Mail **portega@bsc.es**

Position in org. | Research Scientist

Department | Earth Science Department   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street | NEXUS II Building, Jordi Girona 29

Town | Barcelona   Post code | 08034

Country | Spain

Website | https://www.bsc.es/

Phone | +34934137679   Phone 2 | *+xxx xxxxxxxxx*   Fax | *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Eleftheria	Exarchou	eleftheria.exarchou@bsc.es	*+xxx xxxxxxxxx*
Mar	Rodriguez Rodrigo	mar.rodriguez@bsc.es	*+xxx xxxxxxxxx*
Dorota	Chmielewska	dorota.chmielewska@bsc.es	*+34934134082*

PIC
999874546

Legal name
UNIVERSIDAD COMPLUTENSE DE MADRID

Short name: UCM

Address of the organisation

Street   AVENIDA DE SENECA 2

Town   MADRID

Postcode   28040

Country   Spain

Webpage   http://www.ucm.es

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status..01/01/1900 - no

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Departemento de Fisica de la Tierra, Astronomia y Astrofisica | ☐ not applicable

☐ Same as proposing organisation's address

Street | Placa de Ciencias, 1. Ciudad Univ.

Town | Madrid

Postcode | 28040

Country | Spain

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title `Prof.`   Sex   ◯ Male ⦿ Female

First name **Elsa**   Last name **Mohino**

E-Mail **emohino@fis.ucm.es**

Position in org. `Professor`

Department `Departemento de Fisica de la Tierra, Astronomia y Astrofisica`   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street `Place de Ciencias, 1. Ciudad Universitaria`

Town `Madrid`   Post code `28040`

Country `Spain`

Website `http://www.ucm.es/`

Phone `+34913944390`   Phone 2 `+xxx xxxxxxxx`   Fax `+xxx xxxxxxxx`

Other contact persons

First Name	Last Name	E-mail	Phone
Belen Rodriguez	Fonseca	brfonsec@fis.ucm.es	+xxx xxxxxxxx
Ignacio	Gomez Cuesta	ignacio.gomez@rect.ucm.es	+xxx xxxxxxxx
Jose Luis	Lopez de Ayala Hidalgo	ljayala@ucm.es	+xxx xxxxxxxx
Leticia	Riaza Gambero	l.riaza@ucm.es	+xxx xxxxxxxx

Proposal ID **SEP-210522257**	Acronym **TRIATLAS**	Short name **UCT**

PIC	Legal name
999849229	*UNIVERSITY OF CAPE TOWN*

Short name: UCT

Address of the organisation

Street	PRIVATE BAG X3
Town	RONDEBOSCH
Postcode	7701
Country	South Africa
Webpage	www.uct.ac.za

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit)..................no

Enterprise Data

SME self-declared status..19/12/1997 - no

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Department(s) carrying out the proposed work

Department 1

Department name | Department of Biological Sciences | ☐ not applicable

☐ Same as proposing organisation's address

Street | John Day Building, Upper Campus

Town | Rondebosch

Postcode | 7701

Country | South Africa

Dependencies with other proposal participants

Character of dependence	Participant	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.

Sex ○ Male ⦿ Female

First name **Astrid**   Last name **Jarre**

E-Mail **astrid.jarre@uct.ac.za**

Position in org. SA Research Chair in Marine Ecology and Fisheries

Department Biological Sciences   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street John Day Building, University Avenue, Upper Campus

Town Rondebosch, Cape Town   Post code 7700

Country South Africa

Website http://www.uct.ac.za

Phone +27216505454   Phone 2 *+xxx xxxxxxxx*   Fax *+xxx xxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Lynne	Shannon	lynne.shannon@uct.ac.za	*+xxx xxxxxxxx*
Isabelle	Ansorge	isabelle.ansorge@uct.ac.za	*+27216503277*
Cashifa	Karriem	cashifa.karriem@uct.ac.za	*+27216503277*
Farhana	Moodley	farhana.moodley@uct.ac.az	*+27216502545*
Mathieu	Rouault	mathieu.rouault@uct.ac.za	*+27216503607*

PIC	*Legal name*
999528256	*INSTITUTO NACIONAL DE DESENVOLVIMENTO DAS PESCAS*

Short name: INDP

Address of the organisation

Street   Cova de inglesa

Town   MINDELO - SAN VICENTE

Postcode   -

Country   Cape Verde

Webpage

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....unknown

International organisation of European interest ....unknown

Secondary or Higher education establishment ....unknown

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | INDP | ☐ not applicable

☐ Same as proposing organisation's address

Street | Cova de inglesa |

Town | MINDELO - SAN VICENTE |

Postcode | - |

Country | Cape Verde |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title | Dr.

Sex   ○ Male   ⦿ Female

First name **Ivanice**   Last name **Monteiro**

E-Mail **ivanice.monteiro@indp.gov.cv**

Position in org. | Scientist in charge

Department | INDP   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street | Cova de inglesa

Town | MINDELO - SAN VICENTE   Post code | -

Country | Cape Verde

Website | http://www.indp.gov.cv

Phone | *+xxx xxxxxxxx*   Phone 2 | *+xxx xxxxxxxx*   Fax | *+xxx xxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Vito	Ramos	vito.melo@indp.gov.cv	*+xxx xxxxxxxx*

PIC	*Legal name*
950976264	*INSTITUTO NACIONAL DE INVESTIGACAO PESQUEIRA*

Short name: INIP

Address of the organisation

Street   RUA MORTALA MOHAMED

Town   LUANDA

Postcode

Country   Angola

Webpage

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status..08/02/2013 - no

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Department of Biology and Conservation of Marine Resources   ☐ not applicable

☐ Same as proposing organisation's address

Street | Street Mortala Mohammed, Ilha de Luanda

Town | Luanda

Postcode | C.P. 2601

Country | Angola

Department 2

Department name | Fisheries Research Center   ☐ not applicable

☐ Same as proposing organisation's address

Street | Avenue of Independence, Restinga, Lobito

Town | Benguela

Postcode | C.P. 677

Country | Angola

Department 3

Department name | Fisheries Research Center   ☐ not applicable

☐ Same as proposing organisation's address

Street | Valódia, Plato, Namibe

Town | Mocamedes

Postcode | C.P. 2601

Country | Angola

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex ○Male ⦿Female

First name **Filomena**   Last name **Vaz Velho**

E-Mail **menavelho@gmail.com**

Position in org. General Director

Department National Institute of Fisheries Research   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Mortala Mohammed, Ilha de Luanda

Town Luanda   Post code C.P. 2601

Country Angola

Website www.minpescas.gov.ao

Phone +244940130320   Phone 2 *+xxx xxxxxxxx*   Fax *+xxx xxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Sonia	Silva	sonia_antoniela@hotmail.com	*+xxx xxxxxxxx*
António	Barradas	barradantonio@hotmail.com	*+xxx xxxxxxxx*
Pedro	Tchipalanga	pemtchipa@gmail.com	*+xxx xxxxxxxx*
Claudete	Sousa	claudethsousa@gmail.com	*+244923409117*
Joao	Pereira da Gama	joaopyk@hotmail.com	*+244923588987*

PIC	*Legal name*
999630494	*UNIVERSIDAD DE VIGO*

Short name: UVIGO

Address of the organisation

Street   LG CAMPUS LAGOAS MARCOSENDE

Town   VIGO PONTEVEDRA

Postcode   36310

Country   Spain

Webpage   www.uvigo.es

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes   Legal person ....yes

Non-profit ....yes

International organisation ....unknown

International organisation of European interest ....unknown
                                                                                                  Industry (private for profit).................no
Secondary or Higher education establishment ....yes

Research organisation ....yes

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Ecologia y Biologia Animal | ☐ not applicable

☐ Same as proposing organisation's address

Street | Campus Universario

Town | Vigo

Postcode | 36310

Country | Spain

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ◉ Male ○ Female

First name **Emilio**   Last name **Maranon**

E-Mail **em@uvigo.es**

Position in org. Professor

Department Ecologia y Biologia Animal   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Campus Universario

Town Vigo   Post code 36310

Country Spain

Website

Phone +xxx xxxxxxxx   Phone 2 +xxx xxxxxxxx   Fax +xxx xxxxxxxx

PIC	Legal name
999929739	UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA

Short name: ULPGC

Address of the organisation

Street   C/ Juan de Quesada 30

Town   LAS PALMAS DE GRAN CANARIA

Postcode   35001

Country   Spain

Webpage   http://www.ulpgc.es

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes   Legal person ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Industry (private for profit).................no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Enterprise Data

SME self-declared status..10/03/2003 - no

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Instituto de Oceanografia y Cambio Global (IOCAG) | ☐ not applicable

☐ Same as proposing organisation's address

Street | Campus de Taliarte

Town | Telde

Postcode | 35214

Country | Spain

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.

Sex ⦿ Male ◯ Female

First name **Santiago**   Last name **Hernández Leon**

E-Mail **shernandezleon@ulpgc.es**

Position in org. Professor

Department Instituto de Oceanografia y Cambio Global   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Campus de Taliarte

Town Telde   Post code 35214

Country Spain

Website www.ulpgc.es

Phone +34928452907   Phone 2 +34609552755   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Almudena	Suárez	almudena.suarez@ulpgc.es	*+34928452907*
Javier	Aristegui	javier.aristegui@ulpgc.es	*+34928459916*

Proposal Submission Forms

PIC	*Legal name*
922160571	*UNIVERSITE FELIX HOUPHOUET BOIGNY*

Short name: UFHB

Address of the organisation

Street   BOULEVARD DE L'UNIVERSITE

Town   ABIDJAN

Postcode   00225

Country   Cote d'Ivoire

Webpage   www.univ-fhb.edu.ci

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status.. unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | UFHB | ☐ not applicable

☐ Same as proposing organisation's address

Street | BOULEVARD DE L'UNIVERSITE |

Town | ABIDJAN |

Postcode | 00225 |

Country | Cote d'Ivoire |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ○ Male ◉ Female

First name **Sandrine**   Last name **Djakoure**

E-Mail **dask_kousso@yahoo.fr**

Position in org. Scientist in charge

Department UFHB   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street BOULEVARD DE L'UNIVERSITE

Town ABIDJAN   Post code 00225

Country Cote d'Ivoire

Website http://www.univ-fhb.edu.ci/

Phone *+XXX XXXXXXXX*   Phone 2 *+XXX XXXXXXXX*   Fax *+XXX XXXXXXXX*

PIC
950968019

Legal name
CENTRE DE RECHERCHES OCEANOLOGIQUES

Short name: CRO

Address of the organisation

Street   RUE DES PECHEURS 29

Town   ABIDJAN

Postcode   225

Country   Cote d'Ivoire

Webpage   www.nodc-cotedivoire.org

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes   Legal person ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no
                                                                              Industry (private for profit).................no
Secondary or Higher education establishment ....no

Research organisation ....yes

Enterprise Data

SME self-declared status..12/02/2013 - no

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Department of Environment | ☐ not applicable

☐ Same as proposing organisation's address

Street | 29, Rue des Pêcheurs |

Town | Abidjan |

Postcode | BPV 18 |

Country | Cote d'Ivoire |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title | Dr.

Sex ◉ Male ○ Female

First name **Vamara**   Last name **Kone**

E-Mail **kvamara@hotmail.com**

Position in org. | Researcher

Department | Department of Environment   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street | 29, Rue des Pêcherus

Town | Abidjan   Post code | BPV 18

Country | Cote d'Ivoire

Website |

Phone | +xxx xxxxxxxx   Phone 2 | +xxx xxxxxxxx   Fax | +xxx xxxxxxxx

Other contact persons

First Name	Last Name	E-mail	Phone
Bamba Siaka	Barthemely	bambasb@hotmail.com	+xxx xxxxxxxx

PIC
906446474

Legal name
UNITED KINGDOM RESEARCH AND INNOVATION

Short name: UKRI

Address of the organisation

Street   POLARIS HOUSE NORTH STAR AVENUE

Town   SWINDON

Postcode   SN2 1FL

Country   United Kingdom

Webpage   https://www.ukri.org/

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes   Legal person ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no   Industry (private for profit)..................no

Research organisation ....no

Enterprise Data

SME self-declared status.. unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name   National Oceanography Centre   ☐ not applicable

☐ Same as proposing organisation's address

Street   European Way

Town   Southampton

Postcode   SO14 3ZH

Country   United Kingdom

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ○ Male ● Female

First name **Elaine**   Last name **McDonagh**

E-Mail **e.mcdonagh@noc.ac.uk**

Position in org. Senior Scientist

Department National Geography Centre   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street European Way

Town Southampton   Post code SO14 3ZH

Country United Kingdom

Website http://www.noc.ac.uk/

Phone +442380597741   Phone 2 *+xxx xxxxxxxx*   Fax *+xxx xxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Stephanie	Walsh	stls@noc.ac.uk	*+441517954846*
Adrian	Brown	adrian.brown@noc.ac.uk	*+xxx xxxxxxxx*
Philip	Worrall	pgwo@noc.ac.uk	*+xxx xxxxxxxx*

PIC
999845058

Legal name
UNIVERSITE D'ABOMEY-CALAVI

Short name: UAC

Address of the organisation

Street   CAMPUS UNIVERSITAIRES D ABOMEY

Town   ABOMEY CALAVI

Postcode   01

Country   Benin

Webpage   www.uac.bj

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit)..................no

Enterprise Data

SME self-declared status..01/01/2001 - no

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | International Chair in Mathematical Physics and Applications | ☐ not applicable

☐ Same as proposing organisation's address

Street | CAMPUS UNIVERSITAIRES D ABOMEY

Town | ABOMEY CALAVI

Postcode | 01

Country | Benin

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.   Sex   ◉ Male ◯ Female

First name **Mahouton Norbert**   Last name **Hounkonnou**

E-Mail **hounkonnou@yahoo.fr**

Position in org. Head. President

Department ICMPA-UNESCO CHAIR   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street CAMPUS UNIVERSITAIRES D ABOMEY

Town ABOMEY CALAVI   Post code 01

Country Benin

Website

Phone +22995062689   Phone 2 *+xxx xxxxxxxxx*   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Ezinvi	Baloitcha	ezbalo@yahoo.fr	*+22966482772*
Yelognisse Casimir	Da-Allada	daallada@yahoo.fr	*+22961671939*

PIC   **Legal name**
998369009   *UNIVERSIDADE FEDERAL DO RIO GRANDE-FURG*

Short name: FURG

Address of the organisation

Street   AVENIDA ITALIA KM 8 CAMPUS CARREIROS

Town   RIO GRANDE

Postcode   96201 900

Country   Brazil

Webpage   www.furg.br

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status..21/08/1969 - no

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Institute of Oceanography | ☐ not applicable

☐ Same as proposing organisation's address

Street | Av. Itália, km 8 |

Town | Rio Grande, RS |

Postcode | 96203-900 |

Country | Brazil |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal ID **SEP-210522257**	*Acronym* **TRIATLAS** *Short name* **FURG**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.

Sex ⦿ Male ◯ Female

First name **Jose H.**   Last name **Muelbert**

E-Mail **docjhm@furg.br**

Position in org. Professor

Department Institute of Oceanography   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Av. Italia, km 8

Town Rio Grande, RS   Post code 96203-900

Country Brazil

Website http://www.furg.br/

Phone +555332336513   Phone 2 *+xxx xxxxxxxxx*   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Eduardo	Resende Secchi	propesp.proreitor@furg.br	*+555332336769*
Mozart	Tavares Martins Filho	prpmozar@furg.br	*+555332336721*
Marcelo	Goncalves Montes D'Oc	dipesq.direcao@furg.br	*+555332336818*

Proposal Submission Forms

PIC
964550444

Legal name
UNIVERSIDADE FEDERAL DE PERNAMBUCO

Short name: UFPE

Address of the organisation

Street   AVENIDA PROFESSOR MORAES REGO - CID

Town   RECIFE

Postcode   50670 901

Country   Brazil

Webpage   www.ufpe.br

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status.. unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Department(s) carrying out the proposed work

Department 1

Department name | Departamento de Oceanografia - DOCEAN | ☐ not applicable

☐ Same as proposing organisation's address

Street | Av. Arquitetura, s/n Cidade Universitári

Town | Recife-PE

Postcode | 50740-550

Country | Brazil

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.

Sex ● Male ○ Female

First name **Moacyr**   Last name **Araujo**

E-Mail **moa.ufpe@gmail.com**

Position in org. Professor

Department Department of Oceanografia - DOCEAN   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Av. Arquiteria s/n Cidade Universitária

Town Recife-PE   Post code 50740-550

Country Brazil

Website https://www.ufpe.br/

Phone +558121267112   Phone 2 *+xxx xxxxxxxxx*   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Ralf	Schwamborn	rs@ufpe.br	*+xxx xxxxxxxxx*
Ernani	Calvalho	proreitor.propesq@ufpe.br	*+558121267055*
Jose	Souto Rosa Filho	souto.rosa@ufpe.br	*+558121268225*

Proposal Submission Forms

PIC	Legal name
999871733	UNIVERSIDADE FEDERAL DE SANTA CATARINA.

Short name: UFSC

Address of the organisation

Street	Trindade - Florianopolis
Town	SANTA CATARINA
Postcode	88040-900
Country	Brazil
Webpage	www.ufsc.br

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....unknown

International organisation of European interest ....unknown

Secondary or Higher education establishment ....yes

Research organisation ....unknown

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Department(s) carrying out the proposed work

Department 1

Department name | Coordenadoria Especial de Oceanografia | ☐ not applicable

☐ Same as proposing organisation's address

Street | Caixa Postal 476, Campus Trindade

Town | Florianopolis, SC

Postcode | 88040-970

Country | Brazil

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title `Prof.`   Sex ○ Male ● Female

First name **Regina**   Last name **Rodrigues**

E-Mail **regina.rodrigues@ufsc.br**

Position in org. `Associate Professor`

Department `Coordenadoria Especial de Oceanografia - Centro de Ciencias Fisicas e Mat`   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street `Caixa Postal 476, Campus Trindade`

Town `Florianopolis, SC`   Post code `88040-970`

Country `Brazil`

Website `http://ufsc.br/`

Phone `+554837213530`   Phone 2 `+xxx xxxxxxxxx`   Fax `+xxx xxxxxxxxx`

Other contact persons

First Name	Last Name	E-mail	Phone
Valdir Rosa	Correia	valdir.rosa.correia@ufsc.br	*+554837216851*

PIC	*Legal name*
998816179	*UNIVERSIDADE FEDERAL RURAL DE PERNAMBUCO*

Short name: UFRPE

Address of the organisation

Street   RUA DOM MANOEL DE MEDEIROS S/N

Town   RECIFE

Postcode   52171900

Country   Brazil

Webpage   www.ufrpe.br

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status...11/06/2008 - no

SME self-assessment .... unknown

SME validation sme...11/06/2008 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Departemento de Pesca e Aqüicultura | ☐ not applicable

☐ Same as proposing organisation's address

Street | Rua Dom Manoel de Medeiros, s/n

Town | Recife-PE

Postcode | 52171-900

Country | Brazil

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title **Prof.**   Sex ◉ Male ○ Female

First name **Fabio**   Last name **Hazin**

E-Mail **fhvhazin@terra.com.br**

Position in org. Professor

Department Departemento de Pesca e Aqüicultura   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Rua Dom Manoel de Medeiros, s/n

Town Recife-PE   Post code 52171-900

Country Brazil

Website http://www.ufrpe.br

Phone +558133206052   Phone 2 *+xxx xxxxxxxx*   Fax *+xxx xxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Maria Madalena	Pessoa Guerra	proreitor.prppg@ufrpe.br	*+558133206050*
William	Severi	cppg.prppg@ufrpe.br	*+558133206052*

PIC	*Legal name*
999978045	*NATIONAL UNIVERSITY OF IRELAND GALWAY*

Short name: NUI GALWAY

Address of the organisation

Street   UNIVERSITY ROAD

Town   GALWAY

Postcode

Country   Ireland

Webpage   www.nuigalway.ie

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....unknown

International organisation of European interest ....unknown

Secondary or Higher education establishment ....yes

Research organisation ....unknown

Legal person ....yes

Industry (private for profit)..................no

Enterprise Data

SME self-declared status..19/05/2016 - no

SME self-assessment ....19/05/2016 - no

SME validation sme...02/12/2008 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Department(s) carrying out the proposed work

Department 1

Department name | Earth and Ocean Sciences, School of Natural Sciences | ☐ not applicable

☐ Same as proposing organisation's address

Street | University Road

Town | Galway

Postcode | H91 TK33

Country | Ireland

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Prof.

Sex   ◉ Male ○ Female

First name **Peter**   Last name **Croot**

E-Mail **peter.croot@nuigalway.ie**

Position in org. Professor

Department Earth and Ocean Sciences   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street University Road

Town Galway   Post code H91 TK33

Country Ireland

Website www.nuigalway.ie

Phone +35301492194   Phone 2 *+xxx xxxxxxxx*   Fax *+xxx xxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Ian	Knight	ian.knight@nuigalway.ie	*+35391492860*
Silvio	Maretto	silvia.maretto@nuigalway.ie	*+xxx xxxxxxxx*

Proposal Submission Forms

PIC   **Legal name**
999419616   *UNI RESEARCH AS*

Short name: UNI RESEARCH AS

Address of the organisation

Street   NYGARDSGATEN 112

Town   BERGEN

Postcode   5008

Country   Norway

Webpage   www.uni.no

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....no   Legal person ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no   Industry (private for profit).................no

Research organisation ....yes

Enterprise Data

SME self-declared status..17/06/2003 - no

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Proposal ID **SEP-210522257**	*Acronym* **TRIATLAS**	*Short name* **UNI RESEARCH AS**	

Department(s) carrying out the proposed work

Department 1

Department name | Uni Research Climate | ☐ not applicable

☐ Same as proposing organisation's address

Street | NYGARDSGATEN 112

Town | BERGEN

Postcode | 5008

Country | Norway

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ⦿ Male   ◯ Female

First name **Jerry**   Last name **Tjiputra**

E-Mail **jerry.tjiputra@uni.no**

Position in org. Researcher

Department Uni Research Climate   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Jahnebakken 5

Town Bergen   Post code 5007

Country Norway

Website https://www.uni.no/nb/staff/directory/jerry-tjiputra/

Phone +4755588679   Phone 2 *+xxx xxxxxxxxx*   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Erik	Sandquist	erik.sandquist@uni.no	*+4755589807*

Proposal Submission Forms

Proposal ID **SEP-210522257**		Acronym	**TRIATLAS**	Short name	**ISRA**

PIC	*Legal name*
999791805	INSTITUT SENEGALAIS DE RECHERCHES AGRICOLES

Short name: ISRA

Address of the organisation

Street   Route des Hydrocarbures

Town   DAKAR

Postcode   3120

Country   Senegal

Webpage   www.isra.sn

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes   Legal person ....yes

Non-profit ....yes

International organisation ....unknown

International organisation of European interest ....unknown

Secondary or Higher education establishment ....unknown   Industry (private for profit).................no

Research organisation ....yes

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Centre de Recherces Océanographiques de Dakar-Thiaroye (CRODT) | ☐ not applicable

☐ Same as proposing organisation's address

Street | Pole de Recherches de Hann

Town | Dakar

Postcode | BP 2241

Country | Senegal

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.

Sex ⦿ Male ◯ Female

First name **Abdoulaye**   Last name **Sarre**

E-Mail **ablaysarrey@yahoo.fr**

Position in org. Responsible of Pelagic Resources Assessment

Department Gestion durable des écosystèmes et des ressources (GEDER)

☐ Same as organisation name

☐ Same as proposing organisation's address

Street Pole de Recherches de Hann

Town Dakar   Post code BP 2241

Country Senegal

Website http://www.isra.sn

Phone +221776320532   Phone 2 *+xxx xxxxxxxxx*   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Fatou	Fofana	fatou.fofana@isra.sn	*+221338591729*
Ndeye	Diouf Drame	amine.diouf2002@yahoo.fr	*+221775152293*
Seynabou	Ndiaye	zeinobe@yahoo.fr	*+221774031998*

PIC
999991722

Legal name
AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS

Short name: CSIC

Address of the organisation

Street   CALLE SERRANO 117

Town   MADRID

Postcode   28006

Country   Spain

Webpage   http://www.csic.es

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....no

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status..10/05/2016 - no

SME self-assessment .... unknown

SME validation sme...21/12/2007 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | CSIC | ☐ not applicable

☐ Same as proposing organisation's address

Street | CALLE SERRANO 117 |

Town | MADRID |

Postcode | 28006 |

Country | Spain |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ◯ Male ⦿ Female

First name **Marta**   Last name **Coll**

E-Mail **mcoll@icm.csic.es**

Position in org. Scientist in charge

Department CSIC   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street CALLE SERRANO 117

Town MADRID   Post code 28006

Country Spain

Website

Phone +XXX XXXXXXXX   Phone 2 +XXX XXXXXXXX   Fax +XXX XXXXXXXX

PIC
999854758

Legal name
ECOLE NORMALE SUPERIEURE

Short name: ENS

Address of the organisation

Street   45, RUE D'ULM

Town   PARIS CEDEX 05

Postcode   75230

Country   France

Webpage

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Department of Geosciences   ☐ not applicable

☐ Same as proposing organisation's address

Street | 24 rue Lhomond

Town | Paris

Postcode | 75231

Country | France

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title | Prof.   Sex   ◯ Male ⦿ Female

First name **Sabrina**   Last name **Speich**

E-Mail **sabrina.speich@ens.fr**

Position in org. | Professor

Department | Department of Geosciences   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street | 24 rue Lhomond

Town | Paris   Post code | 75231

Country | France

Website | www.ens.fr

Phone | +33144322248   Phone 2 | *+xxx xxxxxxxxx*   Fax | *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Marc	Mézard	secretariat.direction@ens.fr	*+33144323001*
Marine	Germain	contrat-recherche@ens.fr	*+33144322615*
Gaëlle	Bruant	gaelle.bruant@lmd.polytechnique.fr	*+33169335195*
Laurent	Bopp	laurent.bopp@lmd.ens.fr	*+xxx xxxxxxxxx*

PIC
941875045

Legal name
UNIVERSIDADE DE CABO VERDE

Short name: UNI-CV

Address of the organisation

Street   PRACA ANTONIO LERENO

Town   PRAIA

Postcode

Country   Cape Verde

Webpage   www.unicv.edu.cv

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status..20/11/2006 - no

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Faculty of Engineering and Marine Sciences | ☐ not applicable

☐ Same as proposing organisation's address

Street | Ribeira de Juliao, km 6

Town | São Vicente

Postcode | 163

Country | Cape Verde

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex   ○ Male ● Female

First name **Corrine**   Last name **Almeida**

E-Mail **corrine.almeida@docente.unicv.edu.cv**

Position in org. Professor

Department Faculty of Engineering and Marine Sciences   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Ribeira de Julião, km 6

Town São Vicente   Post code 163

Country Cape Verde

Website www.unicv.edu.cv

Phone +2382321113   Phone 2 +2389963153   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Astrigilda	Silveira	astrigilda.silveira@docente.unicv.edu	*+2382612660*
Carmen	Paris	carmen.paris@adm.unicv.edu.cv	*+2383340203*
Salvador	Moniz	salvador.moniz@adm.unicv.edu.cv	*+2383340207*

PIC
968572355

Legal name
UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE

Short name: UFRN

Address of the organisation

Street AV SENADOR SALGADO FILHO 3000

Town Natal

Postcode 59078-970

Country Brazil

Webpage http://www.ufrn.br

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Civil Department | ☐ not applicable

☐ Same as proposing organisation's address

Street | Campus Universitário Lagoa Nova |

Town | Natal |

Postcode | CEP 59078 |

Country | Brazil |

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title Dr.   Sex ◉ Male ○ Female

First name **Ronaldo**   Last name **Angelini**

E-Mail **ronangelini@gmail.com**

Position in org. Professor

Department Civil department   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Campus Universitário Lagoa Nova

Town Natal   Post code CEP 59078

Country Brazil

Website http://www.ufrn.br

Phone +558432153724   Phone 2 *+xxx xxxxxxxxx*   Fax *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Angela Maria	Paiva Cruz	reitoria@ufrn.br	*+558433422317*
Marcio Venicio	Barbosa	sri@sri.ufrn.br	*+558432155584*

Proposal ID **SEP-210522257**	*Acronym* **TRIATLAS**	*Short name* **DAFF**

PIC	*Legal name*
908818124	*Department of Agriculture, Forestry and Fisheries*

Short name: DAFF

Address of the organisation

Street Foretrust Building, Martin Hammerschlag Way,

Town Cape Town

Postcode 8018

Country South Africa

Webpage

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....unknown

Non-profit ....unknown

International organisation ....unknown

International organisation of European interest ....unknown

Secondary or Higher education establishment ....unknown

Research organisation ....unknown

Legal person ....no

Industry (private for profit).................unknown

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name   Chief Directorate: Research and Development   ☐ not applicable

☒ Same as proposing organisation's address

Street   Foretrust Building, Martin Hammerschlag

Town   Cape Town

Postcode   8018

Country   South Africa

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title | Dr.   Sex   ◉ Male ○ Female

First name **Carl**   Last name   **van der Lingen**

E-Mail **carl.vanderlingen@gmail.com**

Position in org. | Specialist Scientist

Department | DAFF   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street | Foretrust Building, Martin Hammerschlag Way, Foreshore

Town | Cape Town   Post code | 8018

Country | South Africa

Website | www.daff.gov.za

Phone | +27 21 402 3168   Phone 2 | +27 73 1457 285   Fax | +27 21 402 3694

Proposal Submission Forms

PIC
909875521

Legal name
SORBONNE UNIVERSITE

Short name: SU

Address of the organisation

Street 21 RUE DE L'ECOLE DE MEDECINE

Town PARIS

Postcode 75006

Country France

Webpage

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....no

International organisation of European interest ....no

Secondary or Higher education establishment ....yes

Research organisation ....yes

Legal person ....yes

Industry (private for profit)..................no

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Department(s) carrying out the proposed work

Department 1

Department name | Laboratoire d'Oceanographie de Villefranche (LOV) | ☐ not applicable

☐ Same as proposing organisation's address

Street Port de la Darse - BP48

Town Villefrance-sur-mer

Postcode 06230

Country France

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title   Prof.   Sex   ◉ Male   ○ Female

First name **Lars**   Last name **Stemmann**

E-Mail **stemmann@obs-vlfr.fr**

Position in org.   Deputy Director

Department   Laboratoire d'Oeanographie de Villefranche (LOV)   ☐ Same as organisation name

☐ Same as proposing organisation's address

Street   Port de la Darse - BP 48

Town   Villefrance-sur-mer   Post code   06230

Country   France

Website   http://www.lanouvelleuniversite.fr/fr/index.html

Phone   +33493763811   Phone 2   *+xxx xxxxxxxx*   Fax   *+xxx xxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Mélanie	Pellen	melanie.pellen@upmc.fr	*+33144276351*
Anaïs	DESCLOS	anais.desclos@sorbonne-universite.fr	*+xxx xxxxxxxx*

PIC	*Legal name*
998753420	*UNIVERSITY OF NAMIBIA*

Short name: UNAM

Address of the organisation

Street   MANDUME NDEMUFAYO AVENUE 340

Town   WINDHOEK

Postcode   9000

Country   Namibia

Webpage   www.unam.na

Legal Status of your organisation

Research and Innovation legal statuses

Public body ....yes

Non-profit ....yes

International organisation ....unknown

International organisation of European interest ....unknown

Secondary or Higher education establishment ....unknown

Research organisation ....unknown

Legal person ....yes

Industry (private for profit).................no

Enterprise Data

SME self-declared status... unknown

SME self-assessment .... unknown

SME validation sme.. unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

Proposal Submission Forms

Department(s) carrying out the proposed work

Department 1

Department name | UNAM   ☐ not applicable

☐ Same as proposing organisation's address

Street | MANDUME NDEMUFAYO AVENUE 340

Town | WINDHOEK

Postcode | 9000

Country | Namibia

Dependencies with other proposal participants

Character of dependence	*Participant*	

Proposal Submission Forms

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title   Dr.   Sex   ◯ Male ⦿ Female

First name   **Margit**   Last name   **Wilhelm**

E-Mail   **mwilhelm@unam.na**

Position in org.   Scientist in charge

Department   UNAM   ☐ Same as organisation name

☒ Same as proposing organisation's address

Street   MANDUME NDEMUFAYO AVENUE 340

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Country   Namibia

Website   http://www.unam.na/

Phone   *+xxx xxxxxxxx*   Phone 2   *+xxx xxxxxxxx*   Fax   *+xxx xxxxxxxx*

Proposal ID **SEP-210522257**   *Acronym* **TRIATLAS**

3 - Budget

No	Participant	Country	(A) Direct personnel costs/€	(B) Other direct costs/€	(C) Direct costs of sub-contracting/€	(D) Direct costs of providing financial support to third parties/€	(E) Costs of inkind contributions not used on the beneficiary's premises/€	(F) Indirect Costs / € (=0.25(A+B-E))	(G) Special unit costs covering direct & indirect costs / €	(H) Total estimated eligible costs / € (=A+B+C+D+F+G)	(I) Reimburse-ment rate (%)	(J) Max.EU Contribution / € (=H*I)	(K) Requested EU Contribution/ €
1	Universitetet I Bergen	NO	1038171	265829	0	0	0	326000,00	0	1630000,00	100	1630000,00	1630000,00
2	Helmholtz Zentrum Fur Ozeanforschu	DE	395400	155000	0	0	0	137600,00	0	688000,00	100	688000,00	688000,00
3	Stiftelsen Nansen Senter For	NO	168800	8000	0	0	0	44200,00	0	221000,00	100	221000,00	221000,00
4	Havforskningsinstituttet	NO	73333	36267	0	0	0	27400,00	0	137000,00	100	137000,00	137000,00
5	Johann Heinrich Von Thuenen-	DE	307500	24500	0	0	0	83000,00	0	415000,00	100	415000,00	415000,00
6	Leibniz-zentrum Fuer Marine	DE	201400	15400	0	0	0	54200,00	0	271000,00	100	271000,00	271000,00
7	Christian-albrechts-universitaet	DE	267400	103000	0	0	0	92600,00	0	463000,00	100	463000,00	463000,00
8	Meteo-france	FR	242268	12132	0	0	0	63600,00	0	318000,00	100	318000,00	318000,00
9	Centre Europeen De Recherche Et	FR	229455	17745	0	0	0	61800,00	0	309000,00	100	309000,00	309000,00
10	Institut De Recherche Pour Le	FR	765200	172000	0	0	0	234300,00	0	1171500,00	100	1171500,00	1171500,00

Proposal Submission Forms

Proposal ID **SEP-210522257**   *Acronym* **TRIATLAS**

11	Barcelona Supercomputing Center -	ES	189000	17400	0	0	0	51600,00	0	258000,00	100	258000,00	258000,00
12	Universidad Complutense De Madrid	ES	193590	12810	0	0	0	51600,00	0	258000,00	100	258000,00	258000,00
13	University Of Cape Town	ZA	429440	39600	0	0	0	117260,00	0	586300,00	100	586300,00	586300,00
14	Instituto Nacional De Desenvolvime	CV	37499	20901	0	0	0	14600,00	0	73000,00	100	73000,00	73000,00
15	Instituto Nacional De Investigacao	AO	73184	38395	3527	0	0	27894,75	0	143000,75	100	143000,75	143000,00
16	Universidad De Vigo	ES	171996	82404	0	0	0	63600,00	0	318000,00	100	318000,00	318000,00
17	Universidad De Las Palmas De	ES	144000	58000	0	0	0	50500,00	0	252500,00	100	252500,00	252500,00
18	Universite Felix Houphouet	CI	13900	8500	0	0	0	5600,00	0	28000,00	100	28000,00	28000,00
19	Centre De Recherches Oceanologiqu	CI	13400	9000	0	0	0	5600,00	0	28000,00	100	28000,00	28000,00
20	United Kingdom Research And	UK	405223	192377	0	0	0	149400,00	0	747000,00	100	747000,00	747000,00
21	Universite D'abomey-calavi	BJ	12300	10100	0	0	0	5600,00	0	28000,00	100	28000,00	28000,00
22	Universidade Federal Do Rio Grande-	BR	165030	95130	0	0	0	65040,00	0	325200,00	100	325200,00	325200,00
23	Universidade Federal De Pernambuco	BR	96240	129760	0	0	0	56500,00	0	282500,00	100	282500,00	282500,00
24	Universidade Federal De Santa	BR	91200	15200	0	0	0	26600,00	0	133000,00	100	133000,00	133000,00
25	Universidade Federal Rural De	BR	181600	60800	0	0	0	60600,00	0	303000,00	100	303000,00	303000,00

Proposal ID **SEP-210522257**   *Acronym* **TRIATLAS**

26	National University Of Ireland Galway	IE	48300	32500	0	0	0	20200,00	0	101000,00	100	101000,00	101000,00
27	Uni Research As	NO	90760	3000	0	0	0	23440,00	0	117200,00	100	117200,00	117200,00
28	Institut Senegalais De Recherches	SN	40000	10400	0	0	0	12600,00	0	63000,00	100	63000,00	63000,00
29	Agencia Estatal Consejo	ES	147300	38300	25000	0	0	46400,00	0	257000,00	100	257000,00	257000,00
30	Ecole Normale Superieure	FR	259680	186960	0	0	0	111660,00	0	558300,00	100	558300,00	558300,00
31	Universidade De Cabo Verde	CV	28950	29450	0	0	0	14600,00	0	73000,00	100	73000,00	73000,00
32	Universidade Federal Do Rio Grande	BR	134400	29600	0	0	0	41000,00	0	205000,00	100	205000,00	205000,00
33	Department Of Agriculture, Forestry And	ZA	0	12800	6500	0	0	3200,00	0	22500,00	100	22500,00	22500,00
34	Sorbonne Universite	FR	72000	39200	0	0	0	27800,00	0	139000,00	100	139000,00	139000,00
35	University Of Namibia	NA	48800	12800	0	0	0	15400,00	0	77000,00	100	77000,00	77000,00
	Total		6776719	1995260	35027	0	0	2192994,75	0	11000000,75		11000000,75	11000000,00

4 - Ethics

1. HUMAN EMBRYOS/FOETUSES		Page
Does your research involve Human Embryonic Stem Cells (hESCs)?	○ Yes ◉ No	
Does your research involve the use of human embryos?	○ Yes ◉ No	
Does your research involve the use of human foetal tissues / cells?	○ Yes ◉ No	
2. HUMANS		Page
Does your research involve human participants?	◉ Yes ○ No	79
Are they volunteers for social or human sciences research?	◉ Yes ○ No	79
Are they persons unable to give informed consent?	○ Yes ◉ No	
Are they vulnerable individuals or groups?	○ Yes ◉ No	
Are they children/minors?	○ Yes ◉ No	
Are they patients?	○ Yes ◉ No	
Are they healthy volunteers for medical studies?	○ Yes ◉ No	
Does your research involve physical interventions on the study participants?	○ Yes ◉ No	
3. HUMAN CELLS / TISSUES		Page
Does your research involve human cells or tissues (other than from Human Embryos/ Foetuses, i.e. section 1)?	○ Yes ◉ No	
4. PERSONAL DATA		Page
Does your research involve personal data collection and/or processing?	○ Yes ◉ No	
Does your research involve further processing of previously collected personal data (secondary use)?	○ Yes ◉ No	
5. ANIMALS		Page
Does your research involve animals?	◉ Yes ○ No	79
Are they vertebrates?	◉ Yes ○ No	79
Are they non-human primates?	○ Yes ◉ No	
Are they genetically modified?	○ Yes ◉ No	

Are they cloned farm animals?	○ Yes ◉ No	
Are they endangered species?	○ Yes ◉ No	

Seabirds as representatives of marine ecosystem top predators. Main target species: boobies (Sula sula, S. dactylatra, and S. leucogaster). Optionnal (depending on animal availability/accessibility and our capacity to get adequate loggers)
- tropicbird (Phaeton lepturus and Phaethon aethereus),
- fregatebird (Fregata magnificens and Fregata minor)
- terns (Sterna fuscata and Gygis alba)
- noodies (Anous stolidus and Anous minutus)

6. THIRD COUNTRIES		Page
In case non-EU countries are involved, do the research related activities undertaken in these countries raise potential ethics issues?	○ Yes ◉ No	
Do you plan to use local resources (e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.)?	○ Yes ◉ No	
Do you plan to import any material - including personal data - from non-EU countries into the EU?	○ Yes ◉ No	
Do you plan to export any material - including personal data - from the EU to non-EU countries?	○ Yes ◉ No	
In case your research involves low and/or lower middle income countries, are any benefits-sharing actions planned?	○ Yes ◉ No	
Could the situation in the country put the individuals taking part in the research at risk?	○ Yes ◉ No	
7. ENVIRONMENT & HEALTH and SAFETY		Page
Does your research involve the use of elements that may cause harm to the environment, to animals or plants?	○ Yes ◉ No	
Does your research deal with endangered fauna and/or flora and/or protected areas?	○ Yes ◉ No	
Does your research involve the use of elements that may cause harm to humans, including research staff?	○ Yes ◉ No	
8. DUAL USE		Page
Does your research involve dual-use items in the sense of Regulation 428/2009, or other items for which an authorisation is required?	○ Yes ◉ No	
9. EXCLUSIVE FOCUS ON CIVIL APPLICATIONS		Page
Could your research raise concerns regarding the exclusive focus on civil applications?	○ Yes ◉ No	
10. MISUSE		Page

Does your research have the potential for misuse of research results?	○ Yes ⦿ No	
11. OTHER ETHICS ISSUES		**Page**
Are there any other ethics issues that should be taken into consideration? Please specify	○ Yes ⦿ No	

I confirm that I have taken into account all ethics issues described above and that, if any ethics issues apply, I will complete the ethics self-assessment and attach the required documents.   ☒

How to Complete your Ethics Self-Assessment

5 - Call specific questions

Declarations on stage-2 changes

The full stage-2 proposal must be consistent with the short outline proposal submitted to the stage-1- in particular with respect to the proposal characteristics addressing the concepts of excellence and impact.

Are there substantial differences compared to the stage-1 proposal?	○Yes	◉ No

Extended Open Research Data Pilot in Horizon 2020

If selected, applicants will by default participate in the Pilot on Open Research Data in Horizon 2020[1] , which aims to improve and maximise access to and re-use of research data generated by actions.

However, participation in the Pilot is flexible in the sense that it does not mean that all research data needs to be open. After the action has started, participants will formulate a Data Management Plan (DMP), which should address the relevant aspects of making data FAIR – findable, accessible, interoperable and re-usable, including what data the project will generate, whether and how it will be made accessible for verification and re-use, and how it will be curated and preserved. Through this DMP projects can define certain datasets to remain closed according to the principle "as open as possible, as closed as necessary". A Data Management Plan does not have to be submitted at the proposal stage.

Furthermore, applicants also have the possibility to opt out of this Pilot completely at any stage (before or after the grant signature). In this case, applicants must indicate a reason for this choice (see options below).

Please note that participation in this Pilot does not constitute part of the evaluation process. Proposals will not be penalised for opting out.

We wish to opt out of the Pilot on Open Research Data in Horizon 2020.	○Yes	◉ No

Further guidance on open access and research data management is available on the participant portal:
http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-dissemination_en.htm and in general annex L of the Work Programme.

[1] *According to article 43.2 of Regulation (EU) No 1290/2013 of the European Parliament and of the Council, of 11 December 2013, laying down the rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)" and repealing Regulation (EC) No 1906/2006.*

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

Call: Blue Growth

Topic: BG-08-2018-2019: All Atlantic Ocean Research Alliance Flagship

Sub-Topic: 2018-2019- Assessing the status of Atlantic marine ecosystems

Table of Contents

List of Participants

#	Participant organisation name	Country
1	Universitetet i Bergen - **UiB**	Norway
2	Helmholtz Zentrum fuer Ozeanforschung Kiel - **GEOMAR**	Germany
3	Stiftelsen Nansen Senter for Miljo og Fjernmaling - **NERSC**	Norway
4	Havforskningsinstituttet - **IMR**	Norway
5	Johann Heinrich von Thuenen-Institut, Bundesforschungsinstitut fuer Laendliche Raeume, Wald Und Fischerei - **TI**	Germany
6	Leibniz-Zentrum fuer Marine Tropenforschung - **ZMT**	Germany
7	Christian-Albrechts-Universitaet zu Kiel - **CAU**	Germany
8	Météo-France - **MF-CNRM**	France
9	Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique - **CERFACS**	France
10	Institut de Recherche pour le Developpement - **IRD**	France
11	Centro Nacional de Supercomputacion - **BSC**	Spain
12	Universidad Complutense de Madrid - **UCM**	Spain
13	University of Cape Town - **UCT**	South Africa
14	Instituto Nacional de Desenvolvimento das Pescas - **INDP**	Cabo Verde
15	Instituto Nacional de Investigacao Pesqueira - **INIP**	Angola
16	Universidad de Vigo - **UVIGO**	Spain
17	Universidad de Las Palmas de Gran Canaria - **ULPGC**	Spain
18	Universite Felix Houphouet Boigny - **UFHB**	Ivory Coast
19	Centre de Recherches Océanologiques - **CRO**	Ivory Coast
20	UK Research and Innovation - **UKRI**	United Kingdom
21	Université D'Abomey-Calavi - **UAC-ICMPA**	Benin
22	Universidade Federal do Rio Grande - **FURG**	Brazil
23	Universidade Federal de Pernambuco - **UFPE**	Brazil
24	Universidade Federal de Santa Catarina - **UFSC**	Brazil
25	Universidade Federal Rural de Pernambuco - **UFRPE**	Brazil
26	National University of Ireland Galway - **NUIG**	Ireland
27	Uni Research As/NORCE - **UNI**	Norway
28	Institut Senegalais de Recherches Agricoles - **ISRA-CRODT**	Senegal
29	Agencia Estatal Consejo Superior de Investigaciones Científicas - **CSIC**	Spain
30	Ecole Normale Superieure - **ENS**	France
31	Universidade de Cabo Verde - **UniCV**	Cabo Verde
32	Universidade Federal do Rio Grande do Norte - **UFRN**	Brazil
33	Department of Agriculture, Forestry and Fisheries - **DAFF**	South Africa
34	Sorbonne Universite - **SU**	France
35	University of Namibia - **UNAM**	Namibia

1. Excellence

1.1 Objectives

Gaps in our understanding of marine ecosystems and their future changes pose a major challenge for the sustainable management of human activities affecting them. Our knowledge of the status of the South and Tropical Atlantic marine ecosystems and their future evolution is poor, especially in comparison to the North Atlantic, and impedes the understanding of the whole Atlantic. At the same time, many of the countries bordering the South and Tropical Atlantic depend heavily on marine ecosystems for providing relevant services such as food, genetic resources, recreation and climate regulation. Thus there is an urgent need to provide reliable information on their current state and how they may change over the next few months to decades, which are the time scales of greatest and immediate interest to most stakeholders and economic actors. Research is now needed on understanding and modelling climatic and human activity impacts on marine ecosystems in the South and Tropical Atlantic, to be able to understand, predict and adapt to ecosystem changes across the entire Atlantic. A systemic approach, leading to climate-based ecosystem prediction and information on future socio-economic and ecosystem service changes, will enable policy makers to tackle socio-economic challenges and contribute to the sustainable development of the Atlantic Ocean.

Main Objective: Enable sustainable management of human activities in the Atlantic Ocean as a whole, by closing knowledge gaps on the status of the South and Tropical Atlantic marine ecosystem and developing a framework for predicting its future changes, from months to decades.

We will achieve this through a basin-wide cooperation that combines ecosystem observations, climate-based ecosystem prediction and information on future socio-economic and ecosystem service changes, as well as close networking with relevant stakeholders and related projects and programs. We have the following specific objectives (SO):

SO1 - To enhance knowledge of the present state and seasonal dynamics of the Atlantic marine ecosystem across several trophic levels, by scientifically integrating and extending the physical and biological observing system in key areas of the South and Tropical Atlantic (Core Theme 1; CT1).

SO2 - To quantify the drivers at interannual to decadal time scale in the Atlantic marine ecosystem, and the potential for tipping point behavior and regime shifts, by using observations and numerical (earth system, ocean, and marine ecosystem) model simulations to examine the interactions between different stressors (including climate variability, extremes, and change, as well as fisheries and pollution) and the role of cumulative impacts on ecosystem functioning and associated ecosystem services (CT2).

SO3 - To combine state-of-the-art climate prediction and ecosystem models to improve forecasting capabilities of physical stressors, tipping points, recovery and changes in ecosystem state of the Atlantic from months to decades (CT3).

SO4 - To contribute to improving the sustainable exploitation of Atlantic marine resources by developing scenarios combining climate-based ecosystem predictions with Shared Socioeconomic Pathways (SSP), by conducting socio-economic vulnerability assessments services, with stakeholder engagement and by analysing new value chains (CT4).

SO5 - To enhance capacity in marine ecosystem, oceanographic, and climate research in countries bordering the South and Tropical Atlantic Ocean, so as to increase the region's ability for managing human activities and sustainable development in the Atlantic Ocean (CT4).

SO6 - To ensure that activities are carried out both: 1) in close cooperation and alignment with relevant European Commission services (DG R&I) and the South-South Framework for Scientific and Technical Cooperation in the South and Tropical Atlantic and Southern Oceans; and 2) in coordination with other relevant projects and programmes in the field. This is to ensure coherence with related policy initiatives and to contribute to upscale cooperation along and across the Atlantic Ocean as a whole (CT1 to CT4).

1.2 Relation to the work programme

TRIATLAS relates to the BG-08-2018: All Atlantic Research Alliance Flagship, <u>Part [B] 2018-2019- Assessing the status of Atlantic marine ecosystems</u> and responds to all mandatory scopes and challenges of this topic: TRIATLAS will close *considerable gaps in our knowledge and understanding of processes related to this ocean and the potential for the sustainable exploitation of its natural resources*. It will *enhance the knowledge on the status and dynamics of Atlantic Marine Ecosystems* within CT1 "Current state of the marine ecosystems including environmental processes and human activities" (WP1.1-1.5) and at longer timescales in CT2 (WP2.1-2.2). CT1 will contribute to enhance South and Tropical Atlantic observing system improving process understanding and relevant

time series. *Main drivers of short and long-term change, interactions between different stressors including climate change, and the role of cumulative impacts on ecosystem functioning and associated services* will be explored in CT2 (WP2.2). CT2 will also test for *tipping points and regime shifts (WP2.2)*. This will lead to *extended climate-based predictions* and *more advanced assessments of ecosystem stability* (CT3), leading to *improve the sustainability of the exploitation of marine resources* (CT4, WP4.2). The project will also *develop new technologies within climate and ecosystem prediction* (CT3, WP3.1-3.2), and mobile data collection tool for small-scale fisheries (WP4.1). The *industrial and regional stakeholders* related to the fisheries sector are involved in defining ecosystem-requirements and will benefit from impact assessments (WP1.4, WP2.2, WP4.2). *Data collected in this project* will *be managed and processed* according to the FAIR principle, which includes making them *open access by the end of the project* (CT4 WP4.3); use of international open-access archives for storing TRIATLAS data and *clustering with other projects* like the CSA ANNCHOR ensures *cost-effective approaches to management and processing of the large quantities of data, better coordinated data sharing and operability (WP4.3, WP4.4, ch. 2.2a)*. WP4.1 is dedicated to educational and technological *capacity strengthening and training in and with countries bordering the South and Tropical Atlantic Ocean*. With a thematic focus on the South and Tropical Atlantic, *enhanced cooperation with countries bordering the South Atlantic* (partners from *Brazil, South Africa* and also *Angola, Benin, Cabo Verde, Ivory Coast, Namibia, Senegal*) and through close collaboration with projects focusing on the North Atlantic – see Section 1.3a. and 2.2a – TRIATLAS will enable *understanding and sustainably managing the Atlantic Ocean as a whole, initiating a large-scale basin effort involving both southern and northern parts of this ocean and its interlinks with adjacent areas*.

1.3   Concept and methodology

(1.3.a) Concept
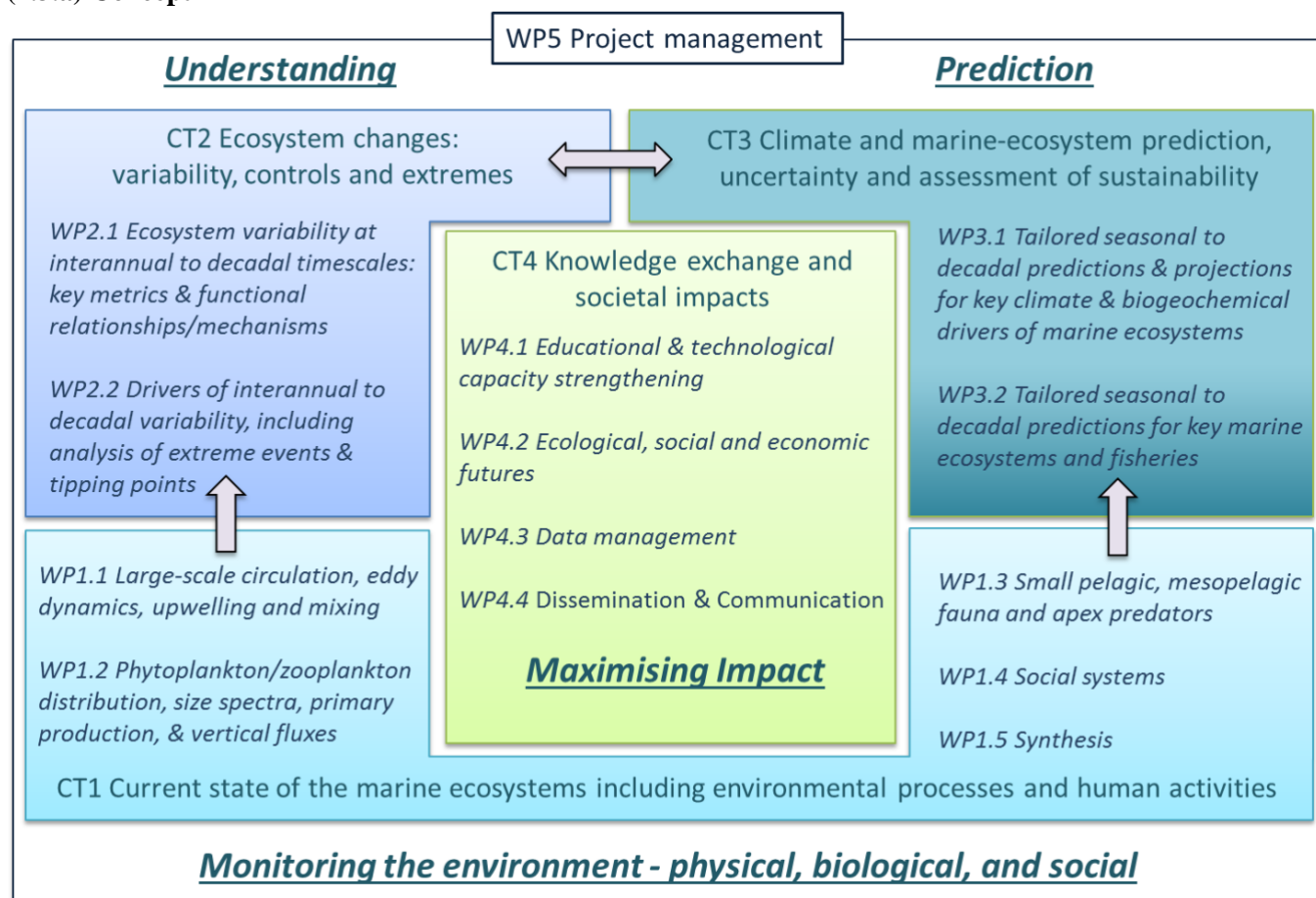
Figure 1.1: *TRIATLAS combines ecosystem observations, climate-based ecosystem prediction and information on future socio-economic and ecosystem service changes to develop a framework for predicting future marine ecosystem evolution in the Atlantic Ocean; and thereby to contribute to improving the sustainable exploitation of Atlantic marine resources. This will be achieved through four research Core Themes (CTs), 13 work packages and one work package for management and dissemination. Common aspects linking CTs and information flow are indicated.*

TRIATLAS brings together an interdisciplinary team of marine ecologists, physical oceanographers, climate researchers, and social scientists from 35 different institutions in Europe, Africa, and South America. It has four interrelated Core Themes (CTs) within a DPSIR (drivers-pressures-state-impact-response) framework (Fig. 1.1). CT1 will deliver a description of the present state of the social-ecological system by means of new observations and existing data series (SO1). CT1 will further analyse local to regional social impacts as prerequisite for modelling developments along SSP trajectories (SO4). Extending on this, CT2 will assess past and present changes in the ecosystem, deliver improved understanding of the (climatic and human) drivers and pressures, and assess the performance of state-of-the-art Earth System Models (ESM) and marine ecological models (SO2). CT3 will focus on the future state with a focus on fisheries impacts while supplying the first multi-model climate-based ecosystem and fisheries predictions for the entire Atlantic Basin, with a particular focus on the Benguela upwelling off Southern Africa and the northeast of Brazil, from seasonal, decadal and multi-decadal timescales, by combining ESMs and ecological models with improved understanding from CT1 and CT2. Taking the assessments and predictions from CT1-3, CT4 will furnish outlooks for the development of ecosystem components in key areas during the next 40 years and beyond, under different SSP and assess future societal implications and impacts, in close dialogue with local stakeholders (SO4). Industrial and regional stakeholders will be consulted at an early-stage and through-out to best understand future socio-economic developments, complementing interview series collected during FP7-PREFACE in Cabo Verde, Senegal and Nigeria for cross-Atlantic comparisons. CT4 also has wide ranging capacity development activities (SO5). A highly experienced team will manage the project (WP5), coordinate dissemination, exploitation, and communication activities, and implement an open, optimal, and integrating data management plan, promoting networking activities with appropriate EC Services and relevant projects and programmes (SO6).

A specific focus of TRIATLAS is on the Tropical and South Atlantic down to 34.5°S. Following the Large Marine Ecosystem approach and the concept of biogeographic provinces (Longhurst, 1998), six key areas are identified because of their importance for providing ecosystem services for coastal communities and economies in order to address SO1 and SO2: (1) Cabo Verde archipelago and tropical North Atlantic, (2) the equatorial upwelling and Gulf of Guinea, (3) the subtropical South Atlantic, (4) the tropical Northeast Brazil, (5) the confluence region in Southern Brazil, and (6) the Benguela-Angola upwelling system.

In order to address SO2, SO3, and SO4, three case studies will focus on detailed integrative analysis of state, variability and change, as well as systems modelling: (i) the basin-scale Atlantic case study focusing on tuna encompassing key areas 1-3 due to the highly migratory behaviour of key tuna species; (ii) Northeastern Brazil as part of key area 4 with a focus on high-value demersal fish and tuna (seasonally), and (iii) the Southern Benguela as part of key area 6 with a focus on small pelagics (Jarre et al. 2015). SO4 also refers to an analysis of ecological/economic hotspots in key area 5.

TRIATLAS will use the existing observational network and extend it in key areas and hitherto undersampled ecosystem components, recognizing that the South Atlantic has received far less observational effort during the last decades than the North Atlantic for all ecosystem components. We will make new observations from ships, moorings, autonomous floats and profiling instruments. The observations are chosen to fill gaps that will be crucial for the delivery of TRIATLAS while benefiting from considerable added value of existing networks and projects.

TRIATLAS will utilise a hierarchy of state-of-the-art models to provide predictions and scenarios of climate and the ecosystem across the Atlantic (SO2-SO4). We will use three Earth System Models (ESMs) to perform global climate predictions and scenarios (Table 3.1d): NorESM (Counillon et al. 2016), CNRM-ESM (Séférian et al., 2016), and EC-EARTH (Prodhomme et al. 2016). We will perform ecosystem predictions for the three case studies. ESM predictions and scenarios will feed three marine-ecosystem models (Table 3.1d): APECOSM (Maury 2010), OSMOSE (Shin and Cury, 2004) and EwE suite of models (e.g., Christensen and Walters, 2004). Based on stakeholder participation, we will develop conceptual models based on the DPSIR approach (Smith et al. 2016) at case study level using output from the ecosystem predictions and accounting for human pressures (Oppenheimer et al. 2014).

Position of the project in terms of technology development

In terms of technology development, TRIATLAS will contribute to the development and improvement of numerical models for ecosystem and climate prediction. Ecosystem models are now at TRL 2, technology concept formulated, and will reach TRL 5 during the project, technology validated in relevant environment, which means validated for scientific use. Climate prediction models are now at TRL 5, and will be improved to TRL 6-7, demonstration in operational environment (i.e., ready to be applied and used by climate services). In terms of observations, next generation in-situ tools for particle and zooplankton recording will enable rapid automated assessments of ecosystem components, raising TRL from 4 to 6. Data collection tools will be developed tailor-made for the purposes of small-scale fisheries in tropical ecosystems with many different landing sites taking

benefit of mobile IT rather than applying formal and cumbersome hard-copy protocols, which did were ineffective in the past, raising TRL from 2 to application in test mode (TRL 6). See also Section 2.1.

National or international research and innovation activities which will be linked to the project

(1) TRIATLAS will build on on-going EU-funded projects (PREFACE, ATLANTOS, CRESCENDO, PRIMAVERA) covering the entire Atlantic and cluster with other projects funded under BG-08-2018/19 or related calls (**CT4, WP4.4**). Project activities will also be carried out in close collaboration with **relevant EC services**. **(2)** TRIATLAS will also build on current existing international observation programs in the region (PIRATA, SAMOC/SAMBA, Argo) and link to networks in the North Atlantic (RAPID), and will benefit by participating in joint research cruises. For example, from the project TRAFFIC and BANINO funded by German Federal Ministry of Education and Research in the frame of Science&Technology Cooperation with Southern Africa starting in 2018. Some of the new TRIATLAS observations will be made in collaboration with **Argentinian** colleague Alberto Piola (Departamento Oceanografia, Servicio de Hidrografia Naval) with an in-kind contribution of ship time. **(3)** TRIATLAS will also be linked to various national activities. For example, we benefit from modelling developments carried out under the Norwegian Research Council funded 'Arven etter Nansen' program for Atlantic-Arctic Sector, the project CIGOEF funded by the French National Research Agency (grant n°ANR-17-CE32-0008) that aims at advancing oceanic ecosystem modelling and the development of scenarios, and research projects funded under the FONA3 (Research for Sustainable Development) programme by the German Ministry of Research in the Canary and Benguela Currents. TRIATLAS contributes to the goals of the South African Research Infrastructure Roadmap (DST 2016) understanding how climate and global change will alter coastal environments and influence coastal livelihoods as well as it supports Namibia's current National Programme on Research, Science, Technology and Innovation (NPRSTI) by promoting geo-scientific knowledge and enhancing the understanding of the Earth system. It will also connect to local programs of excellence like the Brazilian National Institutes for Science and Technology for the Seas (INCT). In Cabo Verde, TRIATLAS will bring support to the WASCAL program (West African Science Service Centre on Climate Change and Adapted Land Use) newly established in 2017 at UniCV for the marine sector and the Ocean Science Centre Mindelo established in cooperation between GEOMAR and INDP. **(4)** TRIATLAS will be linked to the Belmont Forum network SEAVIEW aiming at improving ecological-economic models, methods and tools in fisheries management currently being established inter alia in Brazil and South Africa with UCT and CAU as partners. The human dimensions work in CT2 will network with the Belmont Forum Global Climate Change consortium GULLS. **(5)** TRIATLAS partners are already part of EMODNet (IMR, UKRI). We will use data available via EMODNet, and aim to make TRIATLAS collected/compiled data available via EMODNet. **(6)** TRIATLAS research will be tightly connected with the sub-committee of ecosystems of the International Commission for the Conservation of Atlantic Tunas (ICCAT), and benefit from ICCAT fishing data of last 50 years that have become recently available through the Tuna Atlas VRE (http://www.bluebridge-vres.eu/news/_tuna-atlas-vre) provided by the H2020 BlueBRIDGE project. More details about measures for clustering with related projects and programs are given in Section 2.2a.

(1.3.b) Methodology

CT1 Current state of the marine ecosystems including environmental processes and human activities (5 work packages (WP)) will focus on physical, ecological and social factors to understand the **mean state and seasonal cycle** of the Atlantic marine ecosystems in all 6 key areas defined by taking into account existing ecosystem assessments for the North and South Atlantic (Section 1.3). CT1 is based on state-of-the-art measurements and field experiments complemented by data of the global observing system including satellite remote sensing, Argo floats, moorings, PIRATA buoys, reanalysis data, and fisheries statistics, and will analyse climate and environmental conditions, ecosystem size structure, trophic structure, spatio-temporal coherence for migrating populations, and derived parameters across ecosystem components as key metrics to understand the ecosystem response to physical drivers and human activities and to assess models applied in CT2.

WP1.1 *Large-scale circulation, eddy dynamics, upwelling and mixing* [GEOMAR, UFPE, UCT, INIP, IRD, ENS, FURG, UKRI, UFHB, CRO, UAC-ICMPA, INDP, UniCV, SU]. We will study the physical drivers of the ecosystems of the South and Tropical Atlantic. Different physical processes, which dominate the climate and environmental impact on the ecosystem in the different regions, will be studied based on moored, shipboard, float/glider, and satellite observations including circulation, mixing, upwelling, mesoscale eddies, and flow-topography interaction.

WP1.2 *Phytoplankton and zooplankton distribution, size spectra, primary production, and vertical fluxes* [ULPGC, UVIGO, GEOMAR, NUIG, UFPE, FURG, INIP, SU]. We will study the daily to seasonal and spatial variability in distribution, abundance and biomass of phytoplankton, zooplankton, and sinking particles and construct size

spectra. A unique ensemble of in-situ optical and acoustic instrumentation will be deployed to investigate diel vertical migration of zooplankton and nekton, i.e., Underwater Vision Profiler (UVP) and zooplankton hydroacoustic profiler. Multifactorial laboratory and cruise experiments will be used to assess the interactive effects of different climate change-related stressors upon phytoplankton productivity.

WP1.3 *Small pelagics, mesopelagic fauna and apex predators* [ZMT, TI, IRD, FURG, UFRPE, UFPE, ISRA-CRODT, UniCV, INIP, UNAM, DAFF]. We will study the abundance, diversity and vertical and horizontal distribution of small pelagic and mesopelagic fauna including their relevance for fisheries by means of historical trawling and fisheries data, shallow and open-ocean hydroacoustic data as well as shelf and deep-sea trawling down to 1000 m. Biomass size spectra and export to apex predators will be investigated, referring to migratory species such as tuna, marine mammals and avifauna, for the latter obtained by biologging experiments. Isotope composition and trait-based community analysis will reveal food web structure.

WP1.4 *Social systems* [UFRPE, CAU, INDP, DAFF]. We will map and assess the human activities affecting and being affected by marine ecosystems in all case study areas and identify relevant stakeholders for scenario development in WP4.2 and contextualizing the Shared Socioeconomic Pathways (SSP). We will quantitatively assess the current status of main activities with regards to climate change, fisheries and aquaculture and cumulative impacts thereof. A qualitative assessment of other activities including shipping, land-based pollution and energy production will be based on available literature and expert solicitation.

WP1.5 *Synthesis* [TI, GEOMAR, ZMT, UFPE, INDP, UniCV, UVIGO, UFRPE, DAFF, UNAM, SU, UCM]. The synthesis will provide an assessment of the current state of the Atlantic Ocean ecosystem while focusing on the 6 main area of study and combining the results of WPs 1.1 to 1.4. The data background will further be applied to evaluate to-date assessments of the North and South Atlantic. In terms of data provision, the synthesis will be focused on the requirements of model simulations and development (CTs 2&3) and socio-economic vulnerability assessments (CT4).

CT2 Ecosystem changes: variability, controls and extremes (2 WP) will characterise and determine the drivers of interannual to decadal variability in the TRIATLAS case study regional ecosystems through analysis of time-series observations and outputs from ecosystem models and ESMs. Key findings will feed predictability assessments in CT3, and risk modelling/scenario analyses in CT4.

WP2.1 *Characterising ecosystem variability at interannual to decadal timescales: key metrics and functional relationships/mechanisms* [UKRI, IRD, UiB, IMR, GEOMAR, CERFACS, CSIC, UCM, UFRPE, UFPE, UCT, CRO, ENS]. We will use new and existing observations (CT1) and state-of-the-art model (ESM, forced ocean and marine ecosystem) simulations to characterise interannual to decadal physical and ecological variability in the case study regions. We will improve understanding of relations between physical and biological variability with a focus on the three case study regions, and determine the key metrics and functional relationships on interannual to decadal timescales.

WP2.2 *Defining the drivers of interannual to decadal variability including analysis of extreme and tipping points* [UCM, UFRPE, UKRI, CSIC, UFSC, UFRN, UCT, UiB, ENS, UNAM]. We will determine the large-scale physical and human social drivers that cause the key metrics from WP 2.1 to vary on interannual and decadal time scales, and assess their relative importance. We will analyse new and existing observations and model simulations to generate new knowledge about drivers across the TRIATLAS region, focusing on the case study regions. Physical drivers considered will include regional to large-scale ocean circulation, and large-scale climate modes (e.g., ENSO, Atlantic Niño and Atlantic Meridional Mode). We will include an additional focused study of the extreme events associated with marine heatwaves. The complex connections between drivers and impacts in the human social dimensions will be brought to the fore and analysed using time series of social indicators. We will study historic tipping points in ecosystem state and evaluate the impact of alternative fishing strategies on these regime shifts.

CT3 Climate and marine-ecosystem prediction, uncertainty and assessment of sustainability (2WPs) provides seasonal to decadal predictions and scenario simulations over the entire Atlantic for relevant climate, marine-ecosystems and fisheries using state-of-the-art ESMs and End-to-End ecosystem models (E2E). ESMs will be improved to produce reliable predictions for key physical-biogeochemical variables driving marine ecosystems and fisheries (CT1-2), and used to force E2E ecosystem models. We will focus on assessing predictability, climate change and related uncertainties of marine ecosystems and fisheries for three case studies. Finally, we will deliver climate-to-fisheries predictions and scenarios to CT4.

WP3.1 *Tailored seasonal to multi-decadal forecasts and multi-decadal to centennial scenarios for key climate and biogeochemical drivers of marine ecosystems* [MF-CNRM, UiB, NERSC, CERFACS, ENS, BSC, UNI, UCM]. We will **i)** assess the seasonal to decadal predictability and climate change (limits and uncertainties) of key climate

and biogeochemical drivers for marine ecosystems (such as water temperature or net primary production) using three seasonal or decadal forecast systems based on the new generation of ESMs prepared for CMIP6 in other EU-funded projects (CRESCENDO, PRIMAVERA, PREFACE); and **ii)** deliver multi-model predictions and scenarios from seasonal to multi-decadal timescales and associated uncertainties for key climate and biogeochemical drivers to relevant stakeholders.

WP3.2 *Tailored seasonal to multi-decadal forecasts and multi-decadal to centennial scenarios for key marine ecosystems and fisheries* [IRD, UFRN, DAFF, UCT, CSIC, UFRPE]. We will develop an ecosystem forecast system based on different ecosystem models of various complexity and using the outcomes of WP3.1 to assess the predictability of relevant marine ecosystems and fisheries and provide predictions from seasonal to multi-decadal timescales. Three E2E ecosystem models (Section 1.3a) will be implemented for the three case studies. We will drive these models with climate and biogeochemical data provided by WP3.1 to produce multi-model marine ecosystems and fisheries predictions and scenarios from seasons to decades, and from sub-regional to basin scales, that will be delivered to CT4.

CT4 Knowledge exchange and societal impacts (4 WPs) will focus on academic, technological and economic capacity strengthening as well as modelling of perceived socio-economic vulnerability and the presence of biodiversity hotspots that are of interest for conservation, and the development of ex ante protocols to investigate new fisheries, and include data management, dissemination and communication.

WP4.1 *Educational and technological capacity strengthening* [FURG, UNAM, ZMT, UFPE, INDP, IRD, UniCV, TI, CSIC] is intended to initiate and facilitate human capital and technological capacity development (S05) by proposing concrete collaborative initiatives between South American and African countries and EU in the field of marine research (natural and social sciences), including education and training activities (joint PhD courses, student exchanges, visiting scholarships, technical training, curricula support) and helping initiate a Cross-Atlantic Network of Excellence in Marine Science (CANEMS) as a cross-cutting activity hosted by FURG. Further, by enhancing technological capacity development for fisheries data collection and management purposes based on mobile IT solutions.

WP4.2 *Ecological, social and economic futures* [CAU, FURG] will develop the quantification of the contextualized SSPs for the fisheries in the case study areas as input for the ecosystem models in CT3 by using the draft narratives from WP1.4 and further consult with relevant stakeholders and experts (including scientists and policy makers). We will also identify possible future pathways for other activities to be used in conceptual modelling to explore possible future development of stressors other than fisheries and climate change. To prioritize and visualize areas of specific concern, we will identify ecological hotspots as well as areas of high maritime activities based on input from WP1.4, WP1.5 and WP2.2. We will develop an ex-ante protocol to investigate the potential to switch from a reduction fishery towards a fishery for human consumption, i.e. *Engraulis anchoita*.

WP4.3 *Data Management* [UiB], professional staff from the Bjerknes Climate Data Centre will ensure an efficient use of resources and will steward all generated data and ensure its integration with all Atlantic observing and modelling activities. A data management plan will ensure curation, preservation and sustainability and open access to all data and results generated following the Open Research Data Pilot and the FAIR data management principles. All results will be open access by the end of the project; intellectual property rights may cause a short delay.

TRIATLAS will utilize a professional web-based collaboration suite with additional components for intermediate data storage and cataloguing as a virtual research environment from the developing research data management. A flexible data sharing portal will provide easy access to historical and all project data, which will be long-term archived in national (e.g. Norway's National Infrastructure for Research Data, NODC) and international (e.g., OBIS and PANGAEA for observational data; GitHUB for computer code) data archives, making cost-effective use of existing infrastructure. We will develop cost-effective technology to manage and process the large quantities of mobile-phone-collected fisheries data (WP4.1). Public TRIATLAS collected/compiled data and software will be made available to external data portals (e.g., EMODnet, OBIS).

WP4.4 *Dissemination and Communication* [UiB], professional staff (Bjerknes Centre) will ensure a streamlined coordination of all dissemination and communication activities, with particular focus on achieving SO6. Clustering with other projects funded under BG-08-2018/19 and other relevant calls will insure the integration of TRIATLAS activities with other relevant projects and programmes in the field (Section 1.3a). In dialogue with regional stakeholders and relevant European Commission (EC) services (DG R&I) (for example, through our Project Officer and UiB's office in Brussels), we will prepare fact sheets and align TRIATLAS so as to contribute to the implementation of EU Integrated Maritime Policy and its related Atlantic Strategy and Action Plan and the South-South Framework for Scientific and Technical Cooperation. Thus, we will contribute to upscale cooperation along and across the Atlantic Ocean as a whole.

Gender dimension: Acknowledging that gender balance contributes to both scientific quality and societal relevance of produced knowledge, the TRIATLAS consortium ensured a gender-balanced contribution to decisions on its research agenda. Questions such as: 'Whose interests and needs are served with TRIATLAS?' 'Who will be the users of the knowledge that is to be produced?' and 'Who can benefit and in which way from the research?' will be of particular relevance for WP1.4, WP2.2 and CT4, e.g., for having a gender perspective when identifying stakeholders. Further, TRIATLAS will promote equal opportunities during the process of recruiting workforce required for the project activities, and strive to have gender represented evenly in capacity development activities, to counteract stereotypical beliefs about women's and men's 'natural' abilities in science, allowing for everyone to engage with science in all its aspects without constraints set by ungrounded preconceptions.

1.4 Ambition

Assessing current status of the ecosystem (CT1)

A better understanding of ocean climate and ecosystems, as well as human impacts and vulnerabilities, requires the implementation and coordination of a continuous and long-term system of ocean observations. Existing observation frameworks for physical oceanography and marine ecosystems reveal significantly higher observation effort in the North Atlantic than in the Tropical and South Atlantic. Understanding of the status of the Atlantic ecosystem thus requires additional discipline specific and dedicated observational efforts in some regions. In this context, TRIATLAS **CT1** will enhance the implementation and coordination of ocean observations in the South and Tropical Atlantic critical for three major goals: climate, operational services, and marine ecosystem health. These goals correspond to the Belém agreement on Atlantic Research and Innovation Cooperation to contribute to a coordinated and partnership-based approach to tackle the scientific and societal challenges of the Atlantic Ocean based on the principles of shared responsibility and mutual benefit in ocean observation, technology innovation, forecasting and monitoring processes and systems to assess climate variability and develop ecosystem approaches devoted to ensure food security, fisheries and biodiversity managements. The TRIATLAS observational enhancement is essential to address the three given goals.

Within TRIATLAS, **CT1** systematically brings together physicists, biologists, ecologists and socio-economists to address observation gaps and elucidate context specific societal drivers and impacts. It is the close interdisciplinary and multidisciplinary cooperation across North, Tropical and South Atlantic countries during the coordination and realization of research cruises and dedicated field experiments that will allow to robustly link the physical state of the ocean and its seasonal variations to South and Tropical Atlantic ecosystems. This will allow, for example, to intercompare the different climatic regimes of the Tropical and South Atlantic and relate them to the larger context of the entire Atlantic Ocean. This will be possible through the expansion of the actual observing systems in the South and Tropical Atlantic. In particular, TRIATLAS will enhance significantly the South Atlantic Meridional Overturning Circulation (SAMOC) network of moorings, robotic instruments, and ship-based observations to address the border-to-border South Atlantic Ocean state and variability and their links with the Indian, Southern and North Atlantic oceans, in terms of both, dynamics and ecosystems, as well as their role in predictability. The tropical Atlantic observing system will be similarly enhanced addressing the requirements of specific multidisciplinary ecosystem studies. Through the work conducted in **CT1** regarding size spectra analysis and in **CT3** for ecosystem modelling, TRIATLAS will be the first project to conduct a size structured approach across several trophic levels (organic particles, phyto-, zooplankton, nekton) at basin scale, for different time periods, both with observations and models combined. The deployment of next generation UVPs on automated systems (Argo floats and possibly gliders) and zooplankton profilers will significantly complement shipborne measurements with regards to the understanding of the effect of small scale hydrographic structures on plankton communities. The synthesis in CT1 will provide a harmonized assessment of the present state of the Atlantic Ocean while reviewing assessment methodologies, summarizing existing work for the North Atlantic, evaluating assessments of the South Atlantic and complementing these based on the new data inventory of **CT1**.

Understanding past ecosystem variability (CT2)

The work in **CT2** encompasses a systems perspective, analysing and synthesising physical, ecological and human social variability and change into a coherent whole for three case studies where we believe the database is sufficiently strong. **CT2** will examine ecosystem variability in response to large scale circulation variability and its impacts, including contributions to oceanic stratification and oceanic heat and freshwater transports, quantities that we expect to vary under climate change. This is a novel use of the trans-Atlantic circulation observations (such as SAMOC at 34.5S and RAPID at 26.5N) which will give us the ability to validate this response and variability in our models for the first time. The explicit inclusion of human social drivers in a marine social-ecological approach is beyond state-of-the-art in the southern hemisphere and in many regions in the northern hemisphere as well. While ecosystem regime shifts are beginning to be understood, the potentially vast ramifications for management

of human activities in the ocean are far less researched, both from a human social and natural science perspective. We will contribute novel approaches to management advice accounting for potential regime shift in the different case studies. We will develop a model intercomparison exercise using available ecosystem models to examine past changes in regional systems, using the standardized protocol of the Fisheries and Marine Ecosystem Model intercomparison project (FishMIP). A series of suitable indicators will be analysed to compare among model types, and among case studies drawing from both observational and model results. This methodology is very much at the forefront of science globally, and the outcome will be beyond state-of-art.

The Atlantic hosts a wide range of climate phenomena, including the Atlantic Niño, Benguela Niño, Atlantic Meridional Mode, Atlantic Multi-decadal Oscillation, and it is impacted by remote atmospheric forcing from the Pacific and oceanic forcing from North and South Atlantic (AMOC/SAMOC). **CT2** will advance our understanding of the links between such large-scale climate variability and ecosystem shifts in the South and Tropical Atlantic, an aspect that has hardly been investigated. Event-based research still lags behind trend-based work and the understanding of the relative importance of natural and anthropogenic drivers of tipping points and ecosystem regime shifts remains to be carried through to the management of human activities in the ocean. To this end, CT2 will deliver the first comprehensive characterization of extreme ocean temperature events (marine heatwaves and cold spells), identifying causes and impacts on marine ecosystems, and their role on tipping points of marine ecosystems in the South and Tropical Atlantic.

How will the ecosystem evolve over the next months to decades? (CT3)

The work in **CT3** will develop state-of-the-art climate-to-fish approaches to provide ecosystem predictions and scenarios in the whole Atlantic, with particular focus on the three case study regions. Indeed, there is an increasing societal and economic demand for integrated predictions of living marine resources from seasonal to decadal timescales in order to develop a precautionary and adaptive management, rationalize investments in the fisheries sector (Tommasi et al. 2017), and explore necessary adaptation and mitigation options (FAO, 2018). This is particularly true in the South and Tropical Atlantic, regions with economic and societally important fisheries, lacking resources for anticipating and establishing adaptation strategies. In general, climate variations have been incorporated as a forcing for ecosystem models ("climate-to-fish approaches") for running RCP-driven centennial ecosystem scenarios up to 2100 (e.g. Lefort et al., 2015; Dueri et al., 2014). So far, a few of pioneering studies have highlighted the potential interest of using climate-based forecasts for predicting living marine resources using ESMs (e.g. Séférian et al. 2014) at seasonal or decadal timescales. Very few studies focusing over the regions (i.e., Australia and USA) have shown the potential interest of using seasonal climate forecasts for providing marine ecosystem predictions at timescales that are relevant for fishery management and industry decisions (Hobday et al. 2016, Kaplan et al. 2016; Siedlecki et al. 2016). Moreover, decadal predictions have not been used in marine ecosystem applications, though their potential interest for marine environment has been highlighted (Salinger et al. 2016). Centennial scenarios are typically driven by the level of greenhouse gases concentration in the atmosphere. They can be classified as "boundary condition problems" (Meehl et al. 2014). On the contrary, climate predictions (seasonal to decadal) are "initial condition problems" that critically depend on our ability to characterise the initial state and to initialize simulations (Fig. 1.2).

CT3 will go beyond the present state-of-the-art by bringing together climate and marine ecosystem modellers who will join their efforts to integrate several ESMs, ecosystem and fisheries models into a multi-model climate-to-fish prediction framework over the whole Atlantic Ocean (Fig. 1.2). For this, **CT3** will benefit from the observational network and products from CT1 and from the understanding of the ecosystem-climate links studied in **CT2**. For the first time, physical (atmosphere and ocean), biogeochemical, ecosystem and fisheries predictions from seasonal to decadal timescales will be implemented to deliver tailored information of future marine ecosystem evolution and its associated uncertainty. In complement to these novel short to mid-term predictions, long-term scenarios simulations driven by RCPs and the SSP-based fishing effort scenarios developed (with stakeholder input) in **CT4** will also be realized. Both predictions and scenarios will be made available to scientists, stakeholders and the wider public in South Africa, Brazil, and other countries bordering the Atlantic Ocean and interested in the evolution of marine ecosystems and fishery resources.
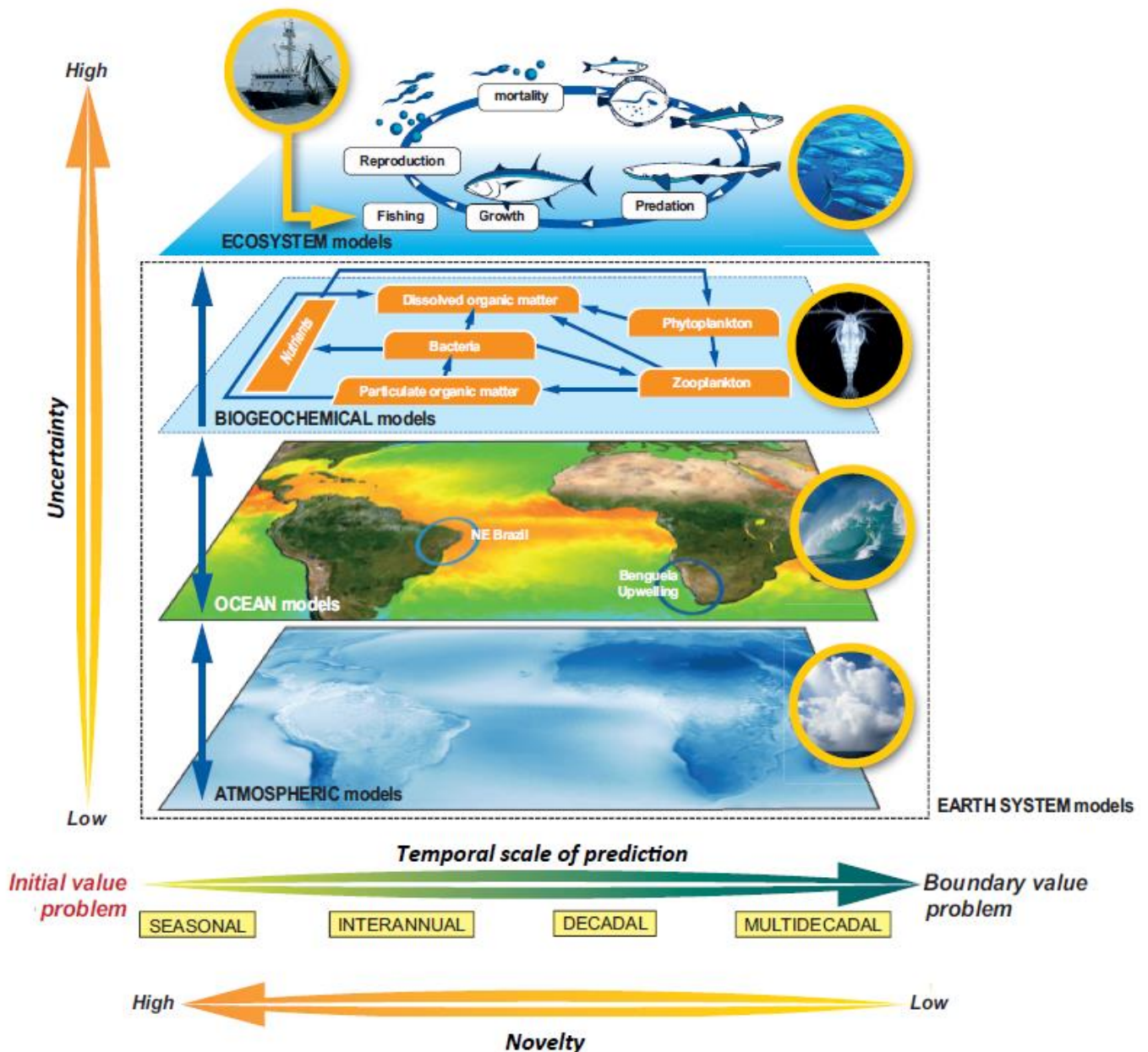
Figure 1.2: *General methodological approach followed in CT3. A climate-to-fish prediction system (atmospheric, ocean, biogeochemical and marine ecosystem models) will be developed and used to run both predictions (seasonal to decadal scales) and scenarios (multi-decadal to centennial) of climate, marine ecosystems and fisheries in the entire Atlantic (tuna fisheries); as well as in the NE Brazil region (artisanal and industrial Brazilian fisheries) and the Benguela upwelling region (artisanal and industrial south-African fisheries). This approach is especially novel at short time scales. In particular, the level of uncertainty, which increases when we consider living compartments in the system, will be assessed and the predictability horizons estimated.*

Combining forecasts and stakeholder knowledge to provide targeted regional information (CT4)

Future fishing opportunities are not only determined by the change in production and distribution of fish stocks through climate change, but also by changes in technology and changes in the demand for fish, mainly driven by population growth and changes in income (Quaas et al. 2016). As fish is a highly traded food commodity, this is not only affected by local, but also global changes. The SSP used by the IPCC are used to develop global scenarios. To understand local effects and changes, TRIATLAS will contextualize the SSPs for the first time for the case study areas and marine activities, mainly fishing (**CT4**). TRIATLAS will go beyond an interdisciplinary approach by engaging with stakeholders to co-produce the scenarios and gather input for the conceptual models. This will also ensure a dialogue for better uptake of project results by practitioners and decision makers. With the output from ecosystem models and the collection of social and economic data on a community level, impact assessments

will be performed and the output used to inform policy makers in the case study regions. The increasing demand of fish for human consumption will likely require changes in the use of some species, which are currently used to produce fish meal and oil for feed. A change from a reduction fishery towards a human consumption fishery will have profound effects on the value chain. TRIATLAS will advance the understanding of necessary changes and their effect in the value chain.

Increasing educational and technological capacity (CT4)

The *Cross-Atlantic Network of Excellence in Marine Science* (CANEMS) will combine summer schools, student exchange programs, sea-going training and academic teaching in a highly interdisciplinary and sustained, i.e. lasting context. CANEMS is intended to support young researchers not only during one certain period but to serve as network with a multi-year perspective so that several steps of their careers can be accomplished within the CANEMS community. This makes the CANEMS concept different to other interdisciplinary approaches which often have a stronger short-term component (e.g. POGO). It is new as a South-South-North enterprise and may therefore establish the foundation for a longer lasting science cooperation which has been established in parts of the North Atlantic (ICES) and Pacific (PICES) **(WP 4.1)**. (For *technological capacity development* see *Innovation potential*.)

Innovation potential: Advances in numerical modelling and prediction (ESM, ecological, fisheries) is a significant innovative step for management of marine resources in the Atlantic, also opening a new sector in climate services for the marine sector (**CT3**). Development of next generation in-situ tools for particle and zooplankton recording is an innovative tool for ecosystem assessment (**WP1.2**). The development of mobile IT devices for data management (**WP4.1**) will provide spacious island communities and economies with predominant small-scale fisheries tailor-made facilities for data collection, as prerequisite for effective resource management with test applications carried out in Cabo Verde and Northern Brazil. The application of the World Bank Group Survey Designer is envisaged that also provides space for initial data storage for partner institutions. The development of data collection tools will be tailor-made for regional purposes based on regional expertise, which is new and contributes to the citizen science concept and the UNEP science-and-data-for-people concept to support Sustainable Development Goals (here # 14). Surveys to monitor stakeholder attitudes and measures to enhance willingness to contribute go hand-in-hand with the development and implementation of this approach **(WP 4.1)**. In **WP4.2**, the investigation on the potential of a new fisheries in advance of its establishment will for the first time allow for an ex-ante assessment of economic and ecological impacts of a subtropical fisheries. (See also Section 1.3a Position of the project in terms of technology development)

2   Impact

2.1   Expected impacts

(2.1.a) Impacts mentioned in the work programme

<u>**In the short term**</u>

1. **Contribute to the implementation of the EU-Brazil-South Africa Belém Statement on Atlantic Ocean Research and Innovation cooperation.** TRIATLAS will *deepen scientific cooperation in the South and Tropical Atlantic* by gathering expertise from Europe, Brazil, South Africa and other countries bordering the South and Tropical Atlantic, to work on the following *key common areas of interest*: *climate variability and ecosystem approaches*, *ocean observation*, *fisheries management and biodiversity*, and *effects of emerging pollutants* such as plastic (WP1.4, WP2.2), in order to achieve *better monitoring and forecasting capacities* (CT1-CT3) and *the sustainable use of marine resources* (WP1.4-5, CT2-CT4*)*. Improved numerical models (CT2-CT3) can be used as a *technology to service societal needs,* as well as the development of mobile IT devices for data management in view of resource management (WP4.4). WP1.4-5 and particularly, WP4.1 & 4.4 will contribute to achieving *ocean-engaged citizens though enhanced ocean literacy activities and promote human capital development* and to *encourage new models for cooperation.* Finally, WP5 and WP4.4 ensure achieving SO6, in line with the mission of the Belém Statement. **Key Performance Indicator (KPI)1:** participation in at least 3 Belém All Atlantic Research Forum or other related implementation meetings, starting from Year 1 of TRIALTAS, to present key actions and findings contributing to the implementation of the Belém Statement and to enhance cooperation and align research goals with the community.

2. **Contribute to create the right conditions for the development of better and accurate monitoring, modelling, planning, management and prediction capacities in the whole Atlantic.** By means of output from CT1, TRIATLAS will establish a significant baseline for national monitoring programs for countries bordering the South and Tropical Atlantic in terms of physical oceanography, small scale and regional hydro-acoustics and fisheries data, size spectra data, avifauna and marine mammals. The TRIATLAS SAMOC array observations at 34.5S, will enhance the capability of that multinational (US, Brazil, Argentina, South Africa, France) observing program and add-value to the TRIATLAS investment and, through collaboration, improve science outputs. The new data collection facilities developed under CT4 will enhance the national capacities to properly monitor small-scale fisheries in remote landing sites at national scale to improve national landings statistics. Understanding of the drivers of ecosystem variability (CT2) and improved climate based ecosystem predictions (CT3) will allow better management of human activities in Atlantic marine ecosystem. Use of stakeholder knowledge will lead to more relevant regional scenarios and assessments (CT4). Better climate predictions will also have wider socio-economic benefits. Together this will *lead to a systematic approach* to *tackle climate-food-ocean challenges*. Enhancing these capabilities in the South and Tropical Atlantic and integrating these with existing advanced capabilities in the North (WP4.3, 4.4), will contribute to better monitoring, modelling, management, planning and prediction capabilities across the entire Atlantic. **KPI2:** recommendations from TRIATLAS for better monitoring, modelling and management discussed in relevant fora (e.g. Atlantic Observing Ocean BluePrint, policy meetings of local or regional environmental and fishery management commissions,…) during project life-time and taken-up by higher decision bodies within 1-5 years after the project; measured by number of policies adopted in result of project findings and agreements signed between competent authorities for joint Atlantic monitoring and management (see also KPI1, 3-6 and 9).

3. **Develop ecosystem assessments and forecasts as well as a deeper understanding of vulnerabilities and risk including those relating to the global climate system and the impacts of climate change (in accordance with the aims of EU Maritime Policies).** The unique set of comprehensive observations and model results identifying drivers, trends and tipping points produced by CT1 and CT2 will enable to assess ecosystem state in a quantitative way (Fock & Kraus, 2016). This approach is complemented by socioeconomic vulnerability assessments based on the perception of economic risks (CT4), and by utilising key metrics from ecosystem predictions to indicate changes at stock or ecosystem component level, based on ESMs that simulate the global climate system and climate change, (CT3). This combined approach allows understanding ecosystems as social-ecological systems, and will provide the means for bordering countries to carry out assessments in line with the DPSIR framework (driver-pressure-state-impact-response) according to their national policies (e.g. Fock et al. 2011). As such, the scope of TRIATLAS can be seen in concordance with the aims of the EU Marine Strategy Framework Directive (MSFD) in that it will provide means to assess the good environmental status of Atlantic ecosystems not only in a European context but consistently in North and South Atlantic. It will further contribute to sustainable use of natural resources in particular for tropical

and subtropical Atlantic ecosystems. However, the TRIATLAS ecosystem approach is different to the MSFD methodology for assessment, the latter with primarily national assessments followed by accessory regional standardisation as far as the N2000 Biogeographical Process and its tools are concerned. **KPI3:** Ecosystem assessments and forecasts as described above delivered by TRIATLAS (Deliverables 1.5.2, 2.2.2, 3.2.2, 4.2.2, 4.2.3, 4.2.4 due in months 36-48), and used to carry out assessments by at least 2 bordering countries 0-24 months after the end of the project. Success measured by numbers of assessments in line with the DPSIR framework carried out.

4. **Increase the competitiveness of the EU's blue economy by developing new technologies to service societal needs and establish new value chains**. TRIATLAS will provide a suite of climate-based ecosystem prediction models at significant TRL for the region (CT3) that will allow better management of the marine ecosystem, increasing the competitiveness of the EU's blue economy. Solutions for data collection designed specifically for use in small-scale fisheries in CT4 (WP4.1, Section 1.3.a) may prove to be useful also in other regions adjacent to EU countries with persisting data collections problems. In turn, improved fisheries data are essential as input to the calibration of prediction models (CT3, CT4). Regarding establishing new value chains, the opportunity to conduct an ex-ante assessment and hotspot analysis on the anchoita fisheries and its conversion to a consumption fisheries is in support of EU's long term strategy to support sustainable management (WP4.2). **KPI4:** Climate-based ecosystem prediction models provided for the three case study regions (D3.2.2, months 48) adopted by at least one operational centre 1-3 years after the project. Number of artisanal fisheries self-reporting system (D4.1.3, month 46) in use 1-year after the end of the project and in other regions; target 50% more than during the project and at least in 5 other regions. Impact of anchoita fisheries assessment (D4.2.4, month 36) in regional fishery management by 1 year after end of the project; measured by number of policies changed.

5. **Contribute to the sustainable management and protection of marine and coastal ecosystems to avoid significant adverse impacts, e.g., by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans (UN SDG 14).** A critical component of the conservation and sustainable use of the oceans is the deepening of the scientific cooperation in the South and Tropical Atlantic following the vision of the Belém statement, which is addressed here by an integration of activities from South American, African, and European partners in line with SDG goal 14.A by means *of increasing scientific knowledge, developing research capacity and transferring marine technology*. The Belém vision is further reflected in the selection of case study sites, for which vulnerability studies will be performed according to SSP scenarios (WP4.2). Case study analyses will enable management strategy evaluation to support local and regional policies. Further, the ex-ante approach to assess a new fisheries in CT4 on the background of an extended ecosystem status assessment in CT1 is in line with SDG 14 aim to *conserve and sustainably use the oceans, seas and marine resources for sustainable development*. With regards to Cape Verde and Northeast Brazil, TRIATLAS will contribute to SDG goal 14.7 improving *the economic benefits to small island developing states and least developed countries from the sustainable use of marine resources by 2030* through better understanding of regional ecosystems and its future changes (CT1-3), and better monitoring tools (WP4.1). **KPI5:** Strengthened scientific cooperation and knowledge will be documented by at least 30 joint publications by the end of the project including European, South American and African researchers. Impact of vulnerability assessments on regional marine conservation and management policies, expected to occur 1-2 years after the end of the project, through communication to local stakeholders (Table 2.2), measured by number of policies changed because of project results. Improved economic benefit, expected 1-2 years after the project end, measured by number of regional stakeholders using the mobile devices and using forecast data.

In the medium term

6. **Contribute to the development of ecosystem services to ensure the long-term sustainable management of marine resources (UN SDG 14).** The analysis of current state, the understanding of change of ecosystem state with regards to historical data in coastal and oceanic habitats of the Atlantic and anthropogenic drivers, and the understanding of ecosystems as social-ecological systems enables to evaluate and assess ecosystem services with regards to provisioning services (food, commodities), regulating services (climate control), cultural services (heritage of small-scale fisheries in coastal communities), and supporting services (biodiversity, primary production). **CT3** climate and ecosystem prediction and **CT2** analysis will enable to investigate trade-offs between ecosystem services, also maintained in the SSP approach (**CT4**), in accordance with **SO2**. **KPI6:** Operational prediction centres have significantly improved their ecosystem services after taking TRIATLAS results into use, 6-18 months after end of project.

7. **Increase EU leadership in ocean technology developments**. The deployment of next generation UVPs, plankton profilers and other devices mounted onto floats and gliders will bring significant enhancement to these technologies; tested and deployed under different practical conditions (WP1.2-1.3). Automation of data transfer and data analysis via machine learning techniques (WP1.2) will be another important aspect of technology development, enabling the almost real-time assimilation of plankton data in ecosystem modelling approaches. **KPI7**: D1.2.1 (month 30) and D1.2.2. (month 42) will summarize advances and results of novel plankton devices. Automation of data transfer and machine learning will be performed and standardized during the lifetime of the project. At least 2 high-level publications will describe these technology improvements in detail, their impact on EU leadership in ocean technology development will be measured by numbers of citations of these articles and how many research groups and institutes have adopted and further developed these technologies 6-18 months after the end of the project.

8. **Improve the professional skills and competences of those working and being trained to work within the blue economy.** The support for academic programs with the establishment of a CANEMS (Cross Atlantic Network of Excellence in Marine Sciences) will mean a sustained progress in that field. In particular the CANEMS will persist as strong networking component. Summer schools in the region and on-board research vessel training for scientists from countries in the South and Tropical Atlantic will further increase competences; as will the use of new data collection technologies by local fisherman who will also gain awareness and access to climate and ecosystem predictions. (See WP4.1). **KPI8:** D4.1.1. (month 36) and D4.1.2 (month 48) will summarize success of and results from CANEMS. Improvement of professional skills and competences of previous CANEMS students will be measured by the success of their career ways, with the goal of at least 90% of the CANEMS attendees being in relevant positions within the Blue Economy or marine research 1-3 years after the end of the project.

9. **Contribute to policy-making in research, innovation and technology.** We will deliver policy relevant information by means of development of ecosystem assessments (CT1, CT2) and the capacity to forecast (CT3), as well as to analyse different scenarios as a prerequisite to conduct management and environmental policy (CT4), in tight consultation with the stakeholder group and services at the Commission (WP4.4). Thus, TRIATLAS contributes to the capacities of the bordering states to further develop their own marine ecosystem management programmes/policies in accordance to the HLG recommendation to elucidate on social, ecological, and economic trade-off implications while framing 'food-from-the-ocean' policies (HLG SO 3/17). **KPI9**: Success measured in numbers of policies directly quoting TRIATLAS project results, 0-3 years after the end of the project.

(2.1.b) Substantial impacts not mentioned in the work programme

10. **New interdisciplinary and transdisciplinary methods**. The TRIATLAS researcher agenda encompassing physical, biological, and social sciences, and including stakeholder involvement will stimulate new interdisciplinary and transdisciplinary methods, and contribute to train a new type of researchers. Specific examples include the joint physical oceanographic cruises and ecosystem surveys (CT1), interdisciplinary summer schools (WP4.1), combining of climate and ecosystem models (CT3), and the development of regional SSP using stakeholder knowledge (WP1.4, 4.1). These new approaches can lead to new areas of research.

11. **Improved ocean and climate models and predictions.** Analysis of climate model simulations and the development and testing of new model configurations in a framework that includes new verification metrics (from biogeochemistry and ecosystem systems) and new observational data will lead to improved ocean and climate models and predictions (CT1-3).

12. **Development of climate services for the Tropical and South Atlantic.** Tropical and South Atlantic region have received relatively little attention in terms of the development of climate services. TRIATLAS research that will contribute to improved modelling and prediction capabilities (CT3) and better understanding of stakeholder needs (WP1.4, 4.2) will strengthen the basis for development of climate services in this region.

13. **Contributions to Intergovernmental Panel on Climate Change (IPCC) assessments.** The IPCC is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. TRIATLAS Earth System Models contribute simulations for these reports, thus improved modelling capabilities contributes directly to these assessments. The development of regional SSP will contribute to the impact and vulnerability assessments. Researchers in TRIATLAS are also contributing authors to these reports.

14. **Contributions to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).** The mission of IPBES is to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human wellbeing and sustainable development. IPBES supports using carefully developed scenarios and models for agenda setting, policy design and policy implementation relating to the achievement of biodiversity targets across a range of scales (IPBES 2016). Development of linked climate-ocean models, as well as the model intercomparisons carried out in TRIATLAS (CT3) will be a key contribution to the *marine* toolkit of IPBES. Improving our understanding of human-social drivers of long-term change (CT2) and working with stakeholders and scenarios (CT1, CT4) will contribute towards the IPBES dimensions of long-term human well-being and sustainable development of interactions with the oceans, which can enhance future regional and global assessments. Two members of the TRIATLAS consortium are lead-authors in the current IPBES global assessment, in Section 2, "Status and trends; indirect and direct drivers of change", and Section 3, "Progress towards meeting major international objectives related to biodiversity and ecosystem services", respectively, and will promote the use of TRIATLAS results in this key global forum.

15. **Improving activities of relevant Developmental Cooperation Agencies.** Improved understanding (CT2) of expected future changes (CT3) affecting living conditions and response of the society (CT4) in developing countries can lead to better mitigation and adaptation strategies, supporting these agencies.

(2.1.c) Barriers, obstacles, and framework conditions

- Reluctance of stakeholder groups to uptake project results: Even though the reaction of stakeholders is beyond the project's control, the project will take any possible measure to gain and keep the stakeholder's attention, and to deliver results that fit stakeholders' needs. See more details in Section 2.2a and CT4.
- Limitations in technical local infrastructure in some partner countries: Project collaboration with partner countries in West Africa may be impeded by limitations in local technical infrastructure, such as a slow internet connection or irregular power supply. The coordinator is aware and has experience working around these barriers from previous project collaboration (e.g., EU-PREFACE).
- Political instability: In some of the partner countries this could hamper the activity of the involved research institutes: we are aware of this obstacle and have taken this into account with allowing flexibility for contributions from these partners, and setting realistic milestones and deliverable dates.
- Language: Communication in English can be a barrier, as it can be a challenge for some of the non-European partners. We addressed this in the Risk Assessment, Table 3.2b.

2.2   Measures to maximise impact

(2.2.a) Dissemination and exploitation of results

The draft of the "Plan for exploitation and dissemination of TRIATLAS results" (PEDR) is given below. Early in the project this draft will be used as the basis to develop the full Plan for Exploitation and Dissemination of Results (PEDR) (D5.2, month 3). The TRIATLAS data management and implementation plan is addressed in "Management of IPR and research data" below and it will be fully formulated early in the project (D4.3.1, month 3). Within these updated plans more details will be given about target audiences, specific needs, methods, deadlines and performance indicators. Once updated, the plans will be used as the working document to ensure effective management of these activities and their integration in the project as a whole.

Plan for exploitation and dissemination of TRIATLAS results (PEDR)

TRIATLAS will ensure that project results are easily accessible and exploitable, also for non-expert stakeholders. This will be achieved through one-way dissemination measures where exploitable project results are presented to relevant stakeholders, and through two-way communication interactions where existing stakeholder knowledge and expertise will be used to adapt the project activities. This interaction will shape TRIATLAS research output to maximize societal and policy impact. The dissemination and exploitation measures to achieve expected impacts are summarised in Table 2.2 and explained in further detail below. These measures complement the communication activities (Section 2.2b). Stakeholder interactions occurs in several WPs (WP1.4, 2.2, 4.1, 4.2, Table 2.2), and are supervised and coordinated by WP4.4 Dissemination and Communication in collaboration with CT4 leads.

Scientific community:

The oceanographic, ecosystem, and climate researchers working on understanding, modelling and predicting Atlantic environmental and ecosystem changes will greatly benefit from the expected outcomes of the project, mainly from new targeted observations and advances in numerical modelling and prediction, which will open a

new sector in marine-related climate services, see also Section 1.4 Ambition. Ecosystem researchers will also benefit from the next generation of in-situ tools for particle and zooplankton measurements, which will at the same time increase EU leadership in ocean technology. Many project partners are central players in these research communities and will channel project results through their scientific networks, through publication in relevant journals (e.g., J. of Mar. Systems, CoSUST, Fish & Fisheries, Global Environ. Change, Clim. Dynamics, J. Phy. Oceanography) and presentation at relevant conferences (e.g., EGU, AGU/ASLO/TOS, Ocean Sciences Meeting, ICES ASC, IMBER). Results will also be disseminated through interdisciplinary training (CANEMS, WP4.1). Clustering activities with related projects as outlined below will also contribute to scientific dissemination and exploitation of the project results.

Decision and policy makers:

Managers of marine ecosystems both on the local, European and global level will benefit from advanced climate-based ecosystem predictions, which will be developed in CT3. They will also be interested in the ex-ante assessment and hotspot analysis of anchovy fishery that will be performed in WP4.2. These will lead to improved management of marine ecosystems, improved ecosystem services, sustainable resource management, and competitiveness of EU's Blue Economy. The following relevant ecosystem managers will be invited to project events targeting their specific interests. Based on these meetings we will prepare tailored fact sheets following for wider distribution.

- *Regional/local marine ecosystem managers* will be invited to **special sessions at project meetings taking place in Brazil, Cabo Verde and South Africa.** These stakeholders will be identified through existing stakeholder collaboration in the respective work packages and an environment analysis at the beginning of the project, see below. Others will be identified through interaction between the project management office with the WP1.4, 2.2, 4.1, and 4.2 leads and the regional PR contacts as identified in WP 4.4. The content of the respective events will be targeted towards the needs of the invited stakeholders. For each specific meeting we will consider which media outreach is most relevant according to the presented results, local knowledge of stakeholders, and current local debate.
- *Marine ecosystem managers on the European level* will be approached through interaction with the relevant EC services (see below).
- *Global marine ecosystem managers* will be directly approached through **targeted side event at major international events** such as COP 26, IOC-LME fora, UN High Level Political Forum on Sustainable Development, and indirectly through interaction with the relevant EC services and programs (see below).
- Presentations given at All Atlantic Research Forum-meetings and during an afternoon briefing in Brussels will establish an extra interface to policy makers.

The government of bordering countries will benefit from the socio-economic vulnerability assessments as performed in WP4.2. It will enable the countries to carry out assessments in line with DPSIR framework, and to strengthen their own ecosystem management policies. These stakeholders will also be invited to the respective local stakeholders sessions as described above.

Developmental cooperation agencies supporting countries bordering the Atlantic will benefit from improved understanding of potential future changes in Atlantic Ocean, marine ecosystem, climate, and fishing communities delivered by TRIATLAS, as it can help to improve the effectiveness of funding leading to better co-developed mitigation and adaptation strategies. Relevant results will be communicated to contact points within the agencies, through fact sheets and personal contact, and organization of side events at international meetings (WP4.4).

Local communities and users:

Members of *coastal fishing communities in Brazil, Cape Verde, and South Africa* will actively participate in research activities of WP1.4, WP2.2, and WP4.1. The knowledge of these stakeholders will be used for research co-design. Regular meetings are planned from month 6 in WP1.4 and WP2.2, in addition to frequent interactions within WP2.2 activities. These stakeholders will benefit from a greater understanding of human-social systems and social-ecological interdependencies, as well from greater understanding of the ecosystem and its potential changes.

Spacious island communities and economies in tropical ecosystems will benefit from the mobile data collection tools tailor-made for small-scale fisheries to be developed in WP 4.1. Test application in Cape Verde and Northern Brazil during the project will include users, and community members will also be invited to the local stakeholder sessions at project meetings as described above. This tool will enable improved fishery management in island communities with many landing sites, and will in general increase Ocean Technology Development.

A series of factsheets will be prepared throughout the course of the project and distributed to stakeholder contacts (and more widely); these will deliver key project findings that are most relevant to the various stakeholder groups

(WP4.4). This result and the knowledge increase through the interaction will lead to increased ocean literacy and adaptive capacity in coastal fishing communities in *Brazil, Cape Verde, and South Africa.*

Scientists and local fisherfolk from Tropical and South Atlantic will be targeted by capacity strengthening measures in WP4.1. Scientists will benefit from the establishment of the CANEMS, which will enable North-South and South-South "standardisation" of oceanographic, ecosystem, climate, and related impacts research. Dedicated project training activities towards this group include supervision of PhD and Masters students, 2 summer schools and concrete training on research vessels. Local fisherfolk will benefit from training to use the mobile data-collection tool. Together this will lead to improved professional skills of those working within Blue Economy. The development of the mobile data-collection tool will at the same time increase EU leadership in ocean technology.

Clustering with related research projects:

TRIATLAS includes a task (WP4.4) to cluster related research projects. This includes European funded research projects covering the North Atlantic and Southern Oceans such as ATLANTOS, SPONGES, ATLAS, CLIMEFISH, CERES, PANDORA, as well as other projects that will be financed under topic BG-08-2018-19 or by the Belmont Forum. In particular, TRIATLAS will become a stakeholder of the BG-08 CSA ANNCHOR and be involved in a number of its platforms (i.e., Capacity Development; Common Standards for Data and Information Sharing; Ocean Citizen Awareness and Literacy; Convergence and Alignment of R&I Infrastructure Initiatives). Tight clustering of these projects will make it possible to create an **All Atlantic Research Alliance**, which is the overarching aim of the topic BG-08. This alliance will generate status assessments of the entire Atlantic marine ecosystem, and create the knowledge base for improved management of the entire Atlantic Ocean. Relevant research activities and results will be continuously shared with these projects, leading to synergistic cooperation that will maximise the impact of the projects involved, increasing the funding effectiveness and societal benefit. Clustering will be achieved by participation in the Atlantic Ocean Research and Belém All-Atlantic Research Forums; by participation of relevant project PIs in TRIATLAS project meetings and stakeholder events, and vice versa; and by co-organize sessions at international conferences. We plan for at least two joint activities during the project. A current list of project contact points will be maintained (WP4.4).

TRIATLAS will also contribute to other international research programs such as EMODnet and CLIVAR, by making project data and results available through these platforms. This will benefit coordination of international research, observation activities, and use of infrastructure. TRIATLAS partners are already part of both programs.

Alignment with relevant policies and programs:

TRIATLAS will align itself with relevant policies and programs from European Commission, research funding agencies in Africa and Brazil, and respective national governments. These will benefit from TRIATLAS research results, increased awareness of key research questions for the region achieved through dialogue with related projects, local institutes and stakeholders. This will contribute to better management of entire Atlantic Ocean; increase the EU's Blue Economy competitiveness; improve North-South research cooperation; and better enable nations to meet the SDG, through increased understanding of the link between climate, human activities and marine ecosystems. It will also contribute to the implementation of international agreements such as the Galway (AORA) and the Belém statements. Contact points within these institutions will be identified at the beginning of the project. Regular communication and dialogue with these contact points will ensure TRIATLAS research can be of most use to these institutions. In addition, we will organise a science-policy event in Brussels and side events at international conferences (e.g., UN Ocean, Our Ocean), and contribute to international assessments (IPCC, IPBES).

Table 2.2: TRIATLAS results to be disseminated to and exploited by the different stakeholders and users, dissemination channels and expected impact; numbers in the right column refer to expected impacts (Section 2.1)

Stakeholder/user group	Expected project result(s) of interest	Involvement of user in project	Mode of interaction with user	Expected impact, sustainability after project
Scientific community				
Ecosystem, oceanographic, and climate researchers and operational prediction centres	Enhanced capabilities to monitor Atlantic Ocean circulation and ecosystem (WP1.1); next generation of in-situ tools for particle and zooplankton (WP1.2)	Include partners taking observations, or being marine information or operational prediction centres or with links to these centres	Scientific dissemination (conference talks and sessions, publications), capacity strengthening (research cruises, workshops)	Improved monitoring, understanding, and prediction of ecosystem, ocean, and climate; observation technology development; **(1-7,10-14)**
Earth system modelling (ocean, climate, biogeochemistry) and prediction communities	Increased understanding of ocean, climate, and biogeochemical variability (CT1, CT2); Advances in numerical modelling and forecasting (CT3)	Many partners are part of the Earth system modelling and prediction communities	Scientific dissemination (conference talks and sessions, publications), contributing to international working groups (CMIP6), active exchange with EU and other projects in the field	New approaches into the next generation of ESM and prediction models, leading to reduced model uncertainties and bias, and improved predictions **(1-6,9,11-15)**
Ecosystem modelling and forecasting community	Increased understanding of processes controlling marine ecosystem; Advances in numerical modelling and forecasting (CT3)	Many partners are part of the ecosystem modelling community	Scientific dissemination (conference talks and sessions, publications, contributing to international working groups (FISHMIP), active exchange with EU and other projects in the field	New development of ecosystem models, improve representations of processes and parameterization, reduce model uncertainties and bias **(1-6,9,13-15)**
Climate and marine ecosystem services providers	Improved ability to monitor (CT1) and predict climate and marine ecosystem (CT2, CT3), and better knowledge of social and socio-economic factors in the region (CT2, CT4)	Partners are national fisheries institutes and climate services providers in Africa, Brazil, and Europe	Stakeholder sessions organized at annual meetings in South Africa, Brazil, and Cabo Verde	Open a new and demand driven sector in climate and marine ecosystem services, especially in the Tropical and South Atlantic **(1-6,9,11-15)**
Decision and policy makers				
European and regional fisheries management (EU	Better understanding of changes in tropical ecosystem affecting	Partners are advice giving and management	Presentations at relevant meetings of the respective	Improving the knowledge base for developing the

Stakeholder/user group	Expected project result(s) of interest	Involvement of user in project	Mode of interaction with user	Expected impact, sustainability after project
Commission, Sub-Regional Fisheries Commission, South East Atlantic Fisheries Organisation, International Commission for the Conservation of Atlantic Tunas)	commercial fish stocks (CT2, CT3); Ex-ante assessment and hotspot analysis of anchovy fishery (WP4.2); Mobile data collection tools tailor-made for small-scale fisheries (WP4.1)	organizations (e.g., International Council for the Exploration of the Sea, Sub-Regional Fisheries Commission, Benguela Current Commission)	management organisations, and engagement with scientific working groups of these organisations (WP4.4); interactions with stakeholders in Brazil, Cabo Verde, Cape Town (WP 1.4, 2.2, 4.2)	external dimension of the Common Fisheries Policy (CFP), improving the basis for regional fisheries management; Increased EU leadership in ocean technology (**1-7,9,14**)
Governance structures responsible for marine spatial planning (national ministries, regional programmes like the Benguela Current Commission, Canary Current Large Marine Ecosystem Programme)	Enhanced monitoring of ocean and ecosystem (CT1); advanced climate-based ecosystem predictions (CT3); better understanding of climate induced ecosystem changes interacting with maritime activities (CT2); Socio-economic vulnerability assessments (WP4.2)	Communication and dialogue with contact points of relevant governance structures	Inform stakeholders of the project aims and relevant project results through fact sheets, organize side events at international meetings (e.g. UN Ocean conference, Our Ocean conference, COP 26, UN HLPF - WP4.4); interaction with stakeholders in Brazil, Cabo Verde, Cape Town (WP2.2, WP4.2, 4.4)	Better ecosystem services and sustainable resource management; Contributing to the EU's Blue Growth strategy, the Belém statement, and competitiveness of EU's Blue Economy (**1-6,9,15**)
Developmental Cooperation Agencies (e.g., The Norwegian Agency for Development Cooperation, German Federal Ministry for Economic Cooperation and Development, French Development Agency)	Improved understanding of biodiversity, fisheries and conservation, and of climate impacts on marine ecosystems, the interactions with human activities, and community well-being (CT2, CT3, CT4)	Communication and dialogue with contact points within the agencies, many projects partners already have established contacts; IRD has the mission to support development activities	Information of project aims and key results to agencies through fact sheets and personal contact; organization of side events at international meetings (WP4.4)	Better co-developed mitigation and adaptation strategies in developing countries, through better knowledge in these agencies of expected changes affecting living conditions (**1,5,6,15**)
Local communities and users				

Stakeholder/user group	Expected project result(s) of interest	Involvement of user in project	Mode of interaction with user	Expected impact, sustainability after project
Coastal fishing communities in Cabo Verde, Brazil and South Africa	Comparative overview of (CV/SA/BR) project results concerning human-social systems and social-ecological interdependencies (WP1.4, 2.2, 4.2)	Participation in research by coastal fishing community members (WP1.4, 2.2), and co-design of SSP (WP4.2)	Fact sheets on the mapping of human activities and results of impact studies (WP4.4); Meetings and regular dialogue with fishing community members (WP1.4, 2.2, 4.2)	Increased ocean literacy and understanding of adaptive capacity in coastal communities in Cabo Verde, Brazil, and South Africa (1,5,8)
Coastal communities in Cabo Verde, Brazil and South Africa (related to fishing)	Mobile data collection tools tailor-made for small-scale fisheries (WP4.1)	Test application in Cabo Verde and Northern Brazil during project with users	Meetings with regional stakeholders in Brazil, Cabo Verde, South Africa (WP1.4, 4.2, 4.4); Measures for capacity development in WP4.1	Improved coastal community fishery management; Increased EU leadership in ocean technology (1,4-8)
Scientists from Tropical and South Atlantic, Local Fisherfolk	Capacity strengthening; Cross-Atlantic Network of Excellence in Marine Science (WP4.1); North-South "standardization" of ecosystem research	Participation in dedicated project training activities for user group	Summer school, training on research vessels, training of fisherfolk to use data tools (WP4.1)	Increased ocean, climate, ecosystem, and social science research ability; better skills of those working within the fisheries sector of the Blue Economy (1-3,5,8,10,12)
Clustering with related research projects and initiatives				
Research projects funded under the BG-08; relevant H2020 projects or funded under other program (e.g., Belmont Forum, JPI); projects targeting the North Atlantic and Southern Oceans	All relevant on-going research activities, results relevant for respective projects	Communication and dialogue with contact points	PI participation in meetings of other relevant projects; Participation and organizing side-events at the Belém All-Atlantic Research Forum; organizing scientific conferences and stakeholder events (WP4.4)	Contribute to All Atlantic Ocean Research Alliance; The synergistic enhancement of clustering project's impacts, increased effectiveness of EU and other funding; (1-15)
Other relevant international programs such as EMODnet; CLIVAR	Project results relevant for respective projects and programs	Communication and dialogue with contact points	Collected/compiled TRIATLAS data available via external portals; Contributing and organising events with other programs (WP4.4)	Improved coordination of international research, observation activities, and use of infrastructure (1-15)

Stakeholder/user group	Expected project result(s) of interest	Involvement of user in project	Mode of interaction with user	Expected impact, sustainability after project
Alignment with relevant policies and programs				
Relevant European Commission services (Directorate General for Research and Innovation)	Results from project research and from interaction with other relevant projects	Communication and dialogue with contact points	Regular communication with PO, at least one dialogue event in Brussels (WP4.4 and 5)	Policy/program coherence improving management of entire Atlantic Ocean, the EU's Blue Economy competitiveness, and North-South research co-operation **(1-15)**
Research administrators and funding agencies in Africa and Brazil; Programmes related to the Galway (AORA) and the Belém statement	Project results from North-South research activities; dialogue with local institutes and stakeholders; key results relevant for local funding agencies	Partners are research institutes advised and working with these agencies, commissions and associations	Invitation to annual meetings or briefing meetings; attendance of meetings related to the Galway and the Belém statement; Side events at international conferences (UN Ocean, Our Ocean) (WP 4.4 and 5)	Increased North-South dialogue on research agenda; mutual benefit and cohesive management of marine ecosystems **(1-15)**
National Governments	Implications of anthropogenic and climate effects on marine ecosystems relevant to the development of strategies to implement the Sustainable Development Goals (SDGs)	Partners are involved in international initiative: IPCC, IPBES, The World Ocean Assessment, and the UN Ocean and Our Ocean conferences	Communication through direct contacts within relevant ministries and factsheets (WP4.4)	Increased understanding of the link between climate, human activities and marine ecosystems in relation to the implementation of the SDGs **(1-15)**

Management of IPR and research data

The *consortium agreement* will regulate all issues on Intellectual Property Rights and their protection including the use of previous knowledge to be exploited by TRIATLAS. We will explicitly encourage the use of open access journals for publications in order to make all material including figures easily usable and exploitable by others. The data management and implementation plan (D4.3.1, month 3) will address what data will be generated, what best practises will be followed and applied, how data will be curated, shared and accessed within the consortium, what measures are taking into account to protect Intellectual Property Rights (IPR) and when, how and where data will be long-term preserved and published. An *IPR panel* will oversee the handling of IPR in the project and will contribute to solving potential cases of conflict before they become an issue.

WP4.3 *Data management* will ensure a proper handling of all TRIATLAS data and their metadata ensuring that the Intellectual Property Rights of scientists are protected, that all TRIATLAS related data are easily accessible and fit for purpose following international standards and best practices, that relevant data policies are fulfilled in order to maximise the impact and exploitation of observational as well as model output data. See description of WP4.3 for detailed operative tasks. The networking among the scientific and database partners will be realised according to

international standards and protocols. A professional data management plan (DMP, D4.3.1) will formalize what data will be generated within TRIATLAS, how those will be shared within and outside the consortium in respect to protect Intellectual Property Rights, and how and when those data will be made public.

All project metadata and resulting data (observations, model results and codes) will be made publicly available meeting the requirements of the *H2020 FAIR policy and Open Research Data Pilot*.

(2.2.b) Communication activities

TRIATLAS will communicate the project activities, its progress, results and achievements efficiently to the different target audiences. A **strategic communication plan** is outlined below. Communication goes hand in hand with and complements dissemination and exploitation activities, which were outlined in Section 2.2a. The project's strategic communication plan will therefore be formulated in detail as part of the Plan for Exploitation and Dissemination of TRIATLAS Results (PEDR) early in the project (D5.2, month 3). The strategic communication plan will specify in more detail the different target audiences for communication and will provide more detail about specific requirements, deadlines, methods, procedures and evaluation measures. The strategic communication plan will then be used as a working document in TRIATLAS to ensure effective management of these activities and their integration into the project as a whole.

TRIATLAS communication strategy will evolve, as the project goes through different phases: during the first 9 -12 months it will focus on general promotion of the project, creating expectation among stakeholders and target groups, and initiating the dialogue with them; in an intermediate phase there will be a balance between general and specific promotion with increasing efforts set in releasing formal outputs and getting feedback to shape the further progress of the project; and in the final 6 months the project results will be capitalized to leave a mark and fully meet the overarching outreach goal.

All communication activities will be coordinated by the TRIATLAS project office, namely by the communication officer supported by the scientific project manager.

The purpose of the project communication plan is to communicate relevant information about the project to the different target audiences, with the aim to achieve the expected impacts. This communication is preferably both ways in form of a regular dialogue but can also be a one-way transfer of information. For successful communication it is essential to identify the respective target audiences, which project activities will be of interest for this target group, which impact we aim to achieve by the communication, and which measures and time lines we plan for communication. Concrete actions and responsibilities for the different communication measures are given in Section 3.1, WP4.4 description. TRIATLAS activities of interest to be communicated to and discussed with the different target audiences, communication channels and measures, timeline and expected impacts are now summarised.

Communication with stakeholders:

The various stakeholder groups and communication means are described in Section 2.2a. In addition, the interaction with regional stakeholders in WP1.4, WP2.2, and WP4.2 will be used to co-design the research. We will identify relevant stakeholders for the project as a whole with the help of local partners and specifically for consultation on mapping maritime activities in WP1.4 and WP2.2, and for scenario development and contextualizing the Shared Socioeconomic Pathways (SSP) in WP4.2. The consultation will also be used to refine the conceptual diagrams and maps and to inform the stakeholders about the basis for the modelling work in CT3. We will also seek expert solicitation where necessary. In WP2.2, working with members of coastal fishing communities, we will analyse the complex connections between drivers and impacts in the human social dimensions, with particular attention to long-term variability and regime shifts in the social-ecological systems. In WP4.2, we will send out questionnaires to selected representatives of local communities to gather the general perception of current and possible future impact of different maritime sectors on marine ecosystems. Based on these, we will prioritize a set of contrasting future scenarios to be used in climate-ecosystem based predictions (CT3). The interaction with these stakeholders will follow the principles of participant-lead research, and it will begin at month 6 and be maintained to the end of the project. Dialogue with stakeholders will also be used to tailor fact sheets for wider distribution.

To ensure coherence of project activities with relevant policy initiatives, a close dialogue with the European Commission is essential. The main contact for this dialogue will be the TRIATLAS project officer at the DG for Research and Innovation. S/he will establish contact with other relevant DGs such as for example the DG Climate Action, the DG Environment, the DG Mare and the DG Health and Food Safety, with relevant members of the European Parliament, etc. Current activities and relevant results from TRIATLAS as well as conclusions resulting from interactions with relevant projects (see above) will be discussed. The feedback from the commission services

will be used to modify and shape project activities if necessary. The Brussels office of the coordinator UiB will play an active role in this interaction by informing the TRIATLAS project office with current relevant policy documents and initiatives, and organizing dialogue meetings in Brussels. Through these actions, TRIATLAS will contribute to improved management of the entire Atlantic Ocean, improved competitiveness of EU's Blue Economy Growth Strategy, and increased North-South dialogue on research agendas.

The clustering with related research projects and alignment with other relevant policies and programs also requires dialogue with relevant institutions. This will be also used to identify the research results most relevant to the various institutions, and could also lead to some joint research activities. To ensure the integration with the trans-Atlantic research cooperation, a close dialogue will be established with the Atlantic Ocean Research Alliance (AORA) supporting the Galway and the Belém statement. TRIATLAS will support activities related to identifying and develop further research priorities related to climate effects on marine ecosystem and the impact on and from human activities on marine ecosystems. TRIATLAS will also support the national governments by providing knowledge relevant for the implementation of the Sustainable Development Goals. Contact points will be addressed at least once per year by email, fact sheets will be sent as relevant, and TRIATLAS PIs will attend and organise events at the AORA/Belém research forums.

<u>Wider audience:</u>

Interesting and relevant project activities and results will be communicated to a *wider international audience interested in climate research and climate change*. Whenever a relevant activity happens or a relevant result becomes available, the project office at UiB will create targeted news releases such as a written news stories, picture-based stories or short videos. Those news items will be channelled through existing social media channels already established at UiB and partner institutions with large groups of followers within the target audience: for example, the project office will establish the hashtag #triatlas, use Facebook announcements to raise awareness for TRIATLAS events, etc. The success of the social media strategy will be quantified and modified if necessary. Details for these tasks are given in WP4.4. These targeted news stories will always refer to the project website where background information about the project and more detailed information about the released news stories will be presented. The website will be created by the project office in month 3, see milestone 1, and will be continuously updated.

To reach a wider audience in each partner country, local PR contacts at each partner institution will become active. A list of these PR contacts will be collected within WP4.4 at the beginning of the project (D4.4.1). These local PR contacts will translate the news releases provided by the project office (see above) into the local language and channel them to the relevant target audiences in the partner countries. The local PR contacts will also assist the project office in identifying relevant regional stakeholders and media contacts for the specialised stakeholder sessions at project meetings that will take place in Brazil, Cabo Verde and Cape Town (see WP4.4 and Section 2.2b).

3 Implementation

3.1 Work plan — Work packages, deliverables

The TRIATLAS concept and scientific methodology is outlined in Section 1.3. The details of the work plan to achieve TRIATLAS's ambitious objectives are elaborated here.

TRIATLAS is a four-year project that consists of 14 work packages (WP, Table 3.1a) that are grouped into four core themes (CT):

- CT1 Current state of the marine ecosystems including environmental processes and human activities (WP1.1 – WP1.5),
- CT2 Ecosystem changes: variability, controls and extremes (WP2.1, WP2.2),
- CT3 Climate and marine-ecosystem prediction, uncertainty and assessment of sustainability (WP3.1-3.2),
- CT4 Knowledge exchange and societal impacts (WP4.1-WP4.4),

with an additional WP for project management (WP5). The CT and WPs logically partition the work to efficiently reach the project objectives. Table 3.1b details the individual WPs. The main interaction among the CTs is schematized in the concept figure 1.1. The Gantt chart below indicates the timing of the WP tasks and major deliverables (Table 3.1c). Project milestones (MS) are used to track progress (Table 3.2a).

The work in the 4 CTs is performed in parallel with most tasks starting at month 1. CT1 focuses on data collection and delivering a process-based understanding of the mean and seasonal cycle of the Atlantic marine ecosystem. Most work in CT1 is performed during the first 3 years of the project. Scientific findings from analysis of the new observational data are used by other CTs to inform their analysis and model development. The definition of data (MS8, month 12) and its provision (MS14, month 24) to the project are key milestones. Stakeholder interaction also begins in CT1 (WP1.4), and feeds into CT (WP2.2) and CT4 (WP4.2); the result of this interaction is the provision of fisheries scenarios for use in CT3 (MS24, month 36). CT1 also provides a list of stakeholders to be used for dissemination and exploitation of project results (D1.4.2, month 12) in WP4.4.

CT2 provides an understanding of past and present ecosystem variability using mostly existing data, including extremes such as marine heatwaves and long-term, ecosystem-scale regime shifts. Results of CT2 feed into CT3 in terms of providing key metrics and diagnostics to assess the prediction systems (MS15, month 24). CT3 focuses on the development and assessment of climate-ecosystem predictions. Initial work in CT3 is on the development of new systems and innovative methods. In second stage, CT3 will deliver ecosystem predictions for the case study regions to be used for impact assessments in CT4 (WP4.2) and uses results from CT2 to deepen understanding of ecosystem predictability. The initial provision of data for testing interoperability (MS16, month 24) and the subsequent of actual predictions with the new systems (MS25, month 42) are key milestones. There will be a close interaction between CT4 (WP4.2) and CT3 during the second half of the project. This will ensure that impact assessment models will be ready for data from CT3 at month 42 and can produce findings by the end of the project.

CT4 focuses on achieving project impacts. Beyond the impact assessment, it has strong component on capacity strengthening and technological development (WP4.1), determining ecological, social and economic futures (WP4.2), efficient data management (WP4.3) and project dissemination and communication (WP4.4). These activities run the course of the project.

Gantt Chart

01.05.2019 - 30.04.2023			Year 1				Year 2				Year 3				Year 4			
WP No.	Task No.	Period	3	6	9	12	15	18	21	24	26	30	33	36	42	46	47	48
WP1.1		1M-42M																
	1.1.1	1M-26M									1.1.1							
	1.1.2	1M-42M													1.1.2			
	1.1.3	1M-36M												1.1.3				
WP1.2		1M-42M																
	1.2.1	1M-30M										1.2.1						
	1.2.2	1M-42M													1.2.2			
	1.2.3	1M-36M												1.2.3				
WP1.3		1M-42M																
	1.3.1	1M-42M													1.3.1			
	1.3.2-1.3.3	1M-36M												1.3.2				
WP1.4		1M-18M																
	1.4.1	1M-6M		1.4.1														
	1.4.2	1M-12M				1.4.2												
	1.4.3	1M-18M						1.4.3										
WP1.5		11M-48M																
	1.5.1-1.5.4	11M-48M								1.5.1								1.5.2
WP2.1		1M-42M																
	2.1.1-2.1.2	1M-30M										2.1.1						
	2.1.3	24M-42M													2.1.2			
WP2.2		1M-47M																
	2.2.1	1M-30M										2.2.1						
	2.2.2	1M-36M																
	2.2.3	12M-47M															2.2.2	
WP3.1		1M-48M																
	3.1.1	1M-24M								3.1.1								
	3.1.2-3.1.3	1M-48M																3.1.2
WP3.2		1M-48M																
	3.2.1	1M-24M								3.2.1								
	3.2.2 -3.2.3	24M-48M																3.2.2
WP4.1		1M-48M																
	4.1.1	1M-36M												4.1.1				
	4.1.2	1M-48M																4.1.2
	4.1.3	1M-46M														4.1.3		
WP4.2		1M-48M																
	4.2.1	1M-24M								4.2.1								
	4.2.2	1M-36M																
	4.2.3	1M-46M																4..2.2
	4.2.4	1M-42M													4.2.3			
	4.2.5	1M-36M												4.2.4				
WP4.3		1M-48M																
	4.3.1-4.3.3	1M-48M																4.3.1-4.3.4
WP4.4		1M-48M																
	4.4.1-4.4.5	1M-48M																4.4.1-4.4.3
WP5		1M-48M																
	5.1	1M-3M	5.1															
	5.2-5.5	1M-48M																5.2

Table 3.1a: List of work packages

Work package No	Work Package Title	Lead and Co-Lead Participant No	Lead and Co-Lead Participant Short Name	Person-Months	Start Month	End month
1.1	Large-scale circulation, eddy dynamics, upwelling and mixing	2, 23	GEOMAR, UFPE	383,69	1	42
1.2	Phytoplankton and zooplankton distribution, size spectra, primary production, and vertical fluxes	16, 17	UVIGO, ULPGC	197,40	1	42
1.3	Small pelagics, mesopelagic fauna and apex predators	6, 22	ZMT, FURG	304,50	1	42
1.4	Social systems	7	CAU	63,00	1	18
1.5	Synthesis	5, 23	TI, UFPE	101,45	11	48
2.1	Characterising ecosystem variability at interannual to decadal timescales: key metrics and functional relationships/mechanisms	20, 10	UKRI, IRD	183,83	1	42
2.2	Defining the drivers of interannual to decadal variability, including analysis of extreme events and tipping points	12, 13	UCM, UCT	237,80	1	47
3.1	Tailored seasonal to multi-decadal forecasts and multi-decadal to centennial scenarios for key climate and biogeochemical drivers of marine ecosystems	8, 9	MF-CNRM, CERFACS	212,10	1	48
3.2	Tailored seasonal to multi-decadal forecasts and multi-decadal to centennial scenarios for key marine ecosystems and fisheries	10, 32	IRD, UFRN	201,03	1	48
4.1	Educational and technological capacity strengthening	22,10	FURG, IRD	55,50	1	48
4.2	Ecological, social and economic futures	7, 22	CAU, FURG	72,00	1	48
4.3	Data Management	1	UiB	12,00	1	48
4.4	Dissemination and Communication	1	UiB	16,00	1	48
5	Project Management	1	UiB	48,00	1	48
	Total Person Month			**2088,30**		

Table 3.1b: Work package description

Work package number	WP1.1				Start and end date		1 - 42
Work package title	Large-scale circulation, eddy dynamics, upwelling and mixing						
Participant number	2	23	13	15	10	30	22
Short name of participant	GEOMAR	UFPE	UCT	INIP	IRD	ENS	FURG
Person/months	34	35	61.05	50	42	12	24

Participant number	20	31	34	18	19	21	14
Short name of participant	UKRI	UniCV	SU	UFHB	CRO	UAC-ICMPA	INDP
Person/months	18.64	5	4	20	26	29	23

Objectives

WP1.1 will study the physical drivers of the ecosystems of the South and Tropical Atlantic. Different physical processes, which impact the ecosystem in the different regions, will be studied based on moored, shipboard, float/glider, and satellite observations, on ocean modelling and ocean reanalysis. Among the processes to be studied are mean and seasonal circulation, upwelling and mixing, mesoscale eddies, and flow-topography interaction. New data will be acquired during interdisciplinary research cruises and experiments allowing to directly address physical-biogeochemical-biological interactions. Due to the broad range of different ecosystems under study, a comparison of the relevance and importance of different physical drivers in the different regions will be performed allowing a classification of the ecosystems with regard to their vulnerability to the different climate-change stressors such as warming, deoxygenation, and acidification. Specific objectives are (i) to understand the interaction of circulation and mesoscale eddies with topography in the vicinity of seamounts, island and shelf-breaks and to study communalities and differences with respect to a possible ecosystem response; (ii) to identify and understand the physical processes impacting the highly productive tropical upwelling systems from preconditioning and onset of upwelling to its decay and export flux; (iii) to analyse the role of large-scale circulation, mesoscale eddies and associated local processes on the connectivity in the ocean in view of possible climate change impacts on different ecosystems.

Description of work

Task1.1.1: *Flow-topography interactions* (**UFPE**, GEOMAR, IRD, INDP, UniCV): Seamounts, islands and continental shelf breaks are open ocean hot spots of marine biodiversity (Morato et al. 2010), which is in many cases under serious threat by overexploitation associated with lack in ecosystem management (Pitcher et al. 2010). The existence of such unique ecosystems is tightly linked to the specific dynamical regime associated to these topographic features, where oceanic flow interacts with the topography in a rather unique way modifying mixing and biological production. Based primarily on existing and partly on new, targeted interdisciplinary observational surveys and time series data from seamounts, islands and shelf breaks in the eastern tropical North Atlantic and in the South Atlantic (MS02), process oriented regional modelling efforts will be used as to further integrate the observational studies. We will estimate communalities and differences in the physical forcing and ecosystem response for selected systems, such as Saint Peter and Saint Paul, Fernando de Noronha, Cabo Verde Archipelagos, São Tomé und Príncipe, and the self-break region of Northeast Brazil. Results will allow to address the differences between drivers/stressors acting on tropical systems and those found on similar already studied flow-topography situations in Atlantic extratropical sites. Our investigations will also consider the management for conservation.

Task1.1.2: *Equatorial and eastern boundary upwelling* (**UCT**, GEOMAR, IRD, INIP, UFPE, UFHB, CRO, UAC-ICMPA): Equatorial and eastern boundary upwelling is characterized by strongly enhanced biological productivity that is of great societal relevance. In this task we will focus on upwelling in the tropical Atlantic, its physical forcing, advective supply and mixing, its importance for biological production and plankton communities, and the background circulation setting the conditions for the downward export flux. The study is based on existing data, model studies and reanalysis data. We will acquire new data in a strongly interdisciplinary work program allowing to address directly physical-biochemical-biological interactions (MS04). This task will focus on the eastern boundary off Angola/Namibia, on the Gulf Guinea coastal areas as well as on the eastern equatorial Atlantic cold tongue. Specific topics that will be addressed are (i) the seasonal cycle of advection and mixing at the equator and its role for nutrient supply and biological productivity, (ii) the impact of equatorial zonal jets from near the surface to great depth on the downward export flux, (iii) the impact of wind-forcing and coastally-trapped wave propagation on the coastal upwelling in the Gulf of Guinea, and (iv) the Angola-Benguela upwelling forced by local alongshore wind and wind curl, by remotely and locally generated coastally trapped waves, and by mixing due to tidally generated internal waves at the shelf. An important ecosystem stressor in tropical upwelling regions is ocean warming with deoxygenation particularly playing a role in regions already low in oxygen, i.e. the eastern boundary oxygen minimum zones. These climate-change stressors will be addressed in the interdisciplinary field programs.

Task1.1.3: *Mesoscale activity and basin scale connectivity* (**ENS**, GEOMAR, FURG, UKRI, UCT, SU, UAC-ICMPA): Ocean dynamics at scales from small scale mixing via (sub) mesoscale (1-100km) to regional (100s km) and basin scale has a determinant impact on ecosystems. This is particular true at the mesoscale that drives strong ecosystem responses, covering all trophic levels. The South Atlantic basin is characterized by a remarkably rich mesoscale activity. The Cape Basin and the Brazil/Malvinas Confluence zone are the world-ocean hot spots having

a dense coverage of energetic eddies of both polarities (cyclonic and anticyclonic). Moreover, Agulhas rings, connected to the leakage of Indian Ocean water into the South Atlantic and thus to the AMOC, are persistent features of the South Atlantic that are important contributors to the mean circulation and its seasonal variability. In this task we will: (i) estimate quantitatively the mean state and seasonal cycle of the large-scale circulation, its complex nonlinear dynamics and its response to large-scale or remote forcing and outline possible impacts on ecosystem dynamics; (ii) determine how the mesoscale dynamics shape the large-scale currents near the eastern and western boundaries with implications for ecosystems and fisheries; and (iii) assess the spatial-temporal structure of the regional connectivity and mixing by using different kind of observations (satellite, in situ: Eulerian and Lagrangian, shipboard measurements), by implementing new ones in specific currents and in particular structures of the South Atlantic open ocean and by using numerical simulation and ocean reanalyses. The results will provide an opportunity to evaluate the effects of drivers/stressors on ecosystem dynamics.

Deliverables

D1.1.1: *Dynamical characterisation of selected seamounts/islands/shelf-break systems in the tropical Atlantic and implications for conservations efforts* (**UFPE, month 26**). The report will describe the physical forcing of ecosystems in different seamounts/islands/shelf-break regions in the tropical Atlantic and its variability on intraseasonal to seasonal time-scales. Analyses will involve observations and regional numerical modelling.

D1.1.2: *Physical processes in tropical upwelling regions* (**GEOMAR, month 42**). The report will identify and characterize physical drivers of upwelling variability within the different regions of the eastern tropical Atlantic and will address possible responses under climate change. It will include the analysis of different field campaigns.

D1.1.3: *Role of ocean mesoscale in driving ecosystem responses* **(ENS, month 36). A regional assessment of the oceanic mesoscale (eddies, fronts) in the tropical North and in the South Atlantic will be done based on analysis of observational and modelling data (incl. CMEMS products). The report will put the forcing through ocean dynamics in a context with potential stressors.**

Work package number	WP 1.2	Start and end date					1 - 42
Work package title	Phytoplankton and zooplankton distribution, size spectra, primary production, and vertical fluxes						
Participant number	17	16	2	26	23	22	15	34
Short name	ULPGC	UVIGO	GEOMAR	NUIG	UFPE	FURG	INIP	SU
Person/months	48	32	16	18	18	24	35	6

This WP investigates the spatial and seasonal distribution of phytoplankton and zooplankton biomass, diversity and activity in coastal and open-ocean regions of the Tropical and South Atlantic, with the general aim to understand the linkage between environmental variability, plankton size structure, and key biogeochemical processes such as primary production and carbon export. A major focus of this WP is to characterize the size spectra of particles, phytoplankton, and zooplankton, because size structure is a key determinant of energy transfer efficiency from low trophic levels to fish. Using historical data and new observations from planned cruises in the Atlantic, the following specific objectives will be addressed:

Specific objectives
- To describe the temporal (daily to seasonal) and spatial (mesoscale to large-scale) variability in the distribution, abundance and biomass of phytoplankton, zooplankton, and particles. These data will be used to construct size spectra encompassing all particles, phytoplankton and zooplankton over a size (volume) range of >9 orders of magnitude with machine learning techniques and image analysis.
- To assess the interactive effects of different drivers upon phytoplankton and zooplankton biomass and size structure and on primary productivity, based on the analysis of in situ distributions along environmental gradients and on multifactorial laboratory and field experiments.
- To characterize plankton trophic structure and variability, investigating the role of bottom-up and top-down processes.

To investigate diel vertical migration of zooplankton and micronekton using in-situ optical and acoustic instrumentation, including underwater vision profiler and zooplankton hydroacoustic profiler, and to quantify associated vertical fluxes such as organic carbon export and mesopelagic respiration.

Description of work

Task1.2.1: *Variability in phytoplankton biomass, size structure and size-fractionated primary production.* Data of phytoplankton cell size and abundance, measured with flow cytometry and microscopy image analysis, will be used to construct size spectra. Pigment-based chemotaxonomy and bio-optical measurements will also be used to characterize phytoplankton community structure and functional types. Size-fractionated primary production will be measured using radioisotope tracers. Laboratory and field experiments, as well as observations along environmental gradients, will be used to investigate the interactive effect of temperature and macro- and micronutrient supply on phytoplankton metabolic productivity. This task will contribute to deliverable D1.2.1 (**ULPGC,** UVIGO, FURG, NUIG).

Task1.2.2: *Variability in zooplankton biomass, size structure, diversity and trophic interactions.* The spatial and seasonal distribution of zooplankton biomass and diversity in temperate, tropical and subtropical ecosystems will be studied in connection with variability in environmental conditions. Zooplankton size spectra will be constructed using net-collected plankton, in situ observation from ship-tethered cameras (such as the Underwater Vision Profiler, UVP5) and also in situ observation from the Octopus sensor mounted on Argo floats (see WP1.1). We will also investigate the trophic levels and interactions in the zooplankton community, including the role of both bottom-up and top-down processes. The top-down control will be investigated to assess the impact of gelatinous zooplankton and planktivorous fish predation on the abundance, size structure and species composition of zooplankton. There will be C and N stable isotope analyses (in bulk samples and in specific amino acids) to better describe food web structure. This task will contribute to deliverable D1.2.2 (**FURG**, INIP, UFPE, NUIG, FURG, SU, GEOMAR, UFPE).

Task1.2.3: *Vertical migration and associated biogeochemical processes.* The variability in horizontal and vertical distribution of zooplankton biomass and particle stocks (marine snow) will be investigated using multifrequency backscatter profile data, combined with plankton net samples. Data from the UVP5 Argo floats to be deployed in an Agulhas ring and the equatorial current system (see WP1.1), the zooplankton acoustic profiler and the ADCP will be used to characterize diel vertical migration and quantify associated vertical fluxes such as the export of organic carbon and mesopelagic respiration. This task will contribute to deliverable D1.2.3. (**INIP**, ULPGC, GEOMAR, SU, INIP, NUIG).

Data compilation will be completed at month 24 for combined particle, phyto- and zooplankton size spectra, including standardization and quality control (**Milestone 14**). These data, together with those obtained in WP1.3, will feed into the synthesis of the current state of the Atlantic ecosystems (**WP1.5**).

Deliverables

D1.2.1: *Phytoplankton biomass, primary production and size structure* (**ULPGC, month 30**). Report describing the observed spatial and temporal (seasonal) distributions of phytoplankton biomass, primary production and size structure. It will also include an analysis, based on both observations and experiments, of the relationship between environmental drivers and phytoplankton size structure and primary productivity.

D1.2.2: *Zooplankton biomass, diversity and trophic structure* (**FURG**, **month 42**). Report describing an integrated view of the variability in zooplankton, biomass, diversity, size structure and trophic structure, including historical data from latitudinal cruises and seasonal variability obtained from time-series studies in specific areas. Both D1.2.1 and D1.2.2 will serve to streamline the transfer of historical data for interannual/interdecadal variability analysis by CT2 (WP2.1).

D1.2.3: *Vertical migration patterns and associated biogeochemical fluxes* (**INIP**, **month 36**). Report describing the spatial variability, in connection with hydrodynamics, of zooplankton and micronekton diurnal vertical migration patterns and associated biogeochemical fluxes (including carbon export and mesopelagic respiration) from dedicated sampling surveys.

Work package number	WP1.3	Start and end date						1- 42	
Work package title	Small pelagics, mesopelagic fauna and apex predators								
Participant number	6	5	10	15	22	23	25	28	31	35
Short name participant	ZMT	TI	IRD	INIP	FURG	UFPE	UFRPE	ISRA-CRODT	Uni CV	UNAM
Person/months	28.5	33	38	60	42	18	42	18	5	20
Objectives										

WP1.3 The aim of this work package is to study the abundance, diversity and vertical and horizontal distribution of small pelagic and mesopelagic fish and their dynamics over short time scales. We will concentrate on species relevant for fisheries and/or food source for higher trophic level predators. While the compilation of historical trawling and fisheries data will allow describing a general picture of the structure of upper trophic level ecosystem components, the application and integration of state-of-the-art shallow and open-ocean hydro-acoustic data allows to observe daily vertical migrations, distribution patches in relation to hydrographic conditions, and to a certain extent analysis of size structures in meso-, macrozooplankton and nekton. This will significantly improve our understanding of the functioning of and interrelationships in the ecosystems under investigation. To verify and support results from acoustic investigations, shelf and deep-sea trawling down to 1000 m will be performed to verify species composition. Isotope composition and trait based community analysis will deepen our understanding of the food web structure. The comparison between the areas covered in TRIATLAS will allow new and unique interdisciplinary view on the pelagic structure of six key ecosystems in the Tropical and South Atlantic.

Specific objectives:
- Review and compile historical and recent pelagic fisheries data.
- Mapping of size based species and biomass distribution and dynamics on TRIATLAS six key areas.
- Ground-truthing of acoustic data by means of different nets and trawls.
- Analyse trophic ecosystem structure by isotope analysis.

Study latitudinal and vertical distribution patterns for small pelagic and mesopelagic fauna.

Description of work

Task1.3.1: *Small and mesopelagic fauna biodiversity and distribution patterns* (**TI**, FURG, ZMT, IRD, UFRPE, ISRA-CRODT, UNICV, INIP, UNAM, UFPE, DAFF). The South Atlantic hosts a number of different ecosystems governed by large scale patterns of physical and biogeochemical characteristics. This task will include the analysis of mesopelagic resources by means of net sampling in conjunction with hydroacoustics, assessment of biodiversity parameters, trait composition and size spectra incl. comparisons with historical data collections in the open ocean and in the shelf (Southern Brazil, *Maurolicus mülleri*) and island ecosystems (Cabo Verde, including small pelagics).

Task1.3.2: *Trophic relations and export to apex predators* (**ZMT**, FURG, UFPE, TI, IRD, UFRPE, DAFF). To understand the structure and functioning of the six key ecosystems chosen for this project, trophic pathways and efficiencies have to be investigated and understood. In this task we will investigate the trophic interrelationships between different species and components at different trophic levels by means of C/N stable isotope analyses (bulk and, for selected species, compound specific, and isoscapes) to better describe food web structure, regional resource sharing and the dynamics of energy transfer from basal sources to apex predators (tuna/birds/mammals). Trait based analysis and size spectra distribution will be used to complement our understanding of trophic relations. This will allow for a better modelling and comparing of the ecosystems' structure and functioning.

Task1.3.3: *Vertical migration of small pelagic and, mesopelagic fauna* (**ZMT**, UFPE, TI, IRD, FURG, UFRPE, ISRA-CRODT, INIP, UNAM). Many marine organisms exhibit vertical migrations, either on regular daily basis or sporadically for feeding. While mesopelagics rise into surface layers during night for feeding, other species (predators) dive into deeper (low-oxygen) layers during day. A major reason for this migration besides feeding can be recharging blood oxygen content in oxygenated surface waters. These processes contribute to the biological pump in the one or other way and are of different importance in differently structured ecosystems. Multifrequency acoustic measurements are an appropriate tool to assess quantitatively the migration behaviour of meso-/macrozooplankton and neuston and distinguish different size groups. Net catches will be used to verify species and size composition of macrozooplankton and nekton. As a result, this task will enable a better understanding of processes such as daily vertical migration (DVM), quantify such processes for different size classes and organism groups in different Large Marine Ecosystems identify drivers and constraints of this behaviour along latitudinal and/or environmental gradients.

There will be a compilation of data and information from regional cruises during the first month 24 (**Milestone 14**) along with a discussion their contribution to work in **WP1.5**, **CT2** and **CT3** (**Milestone 13**).

Deliverables

D1.3.1: *First comparative mapping of pelagic and mesopelagic fish size spectra, biomass distribution and biodiversity* (**TI**, **month 42**). This report will include data from 3 pelagic biogeographic oceanic regions (Senegal/CaboVerde, Tropical and West Equatorial Atlantic, South Atlantic) and corresponding neritic LMEs (East and South Brazil, Benguela Upwelling) in relation to historical sampling.

D1.3.2: *Comparative trophic structure of 4 LMEs in Central and South Atlantic investigated with standardised*

methodologies (**ZMT**, **month 36**). This report will provide a comparative compilation on strength and interrelationships of key components of the trophic networks in the different ecosystems.

Work package number	WP1.4	Start and end date				1 - 18
Work package title	Social systems					
Participant number	7	14	25			
Short name participant	CAU	INDP	UFRPE			
Person/months	11	10	42			

Objectives

We will map and assess the human activities affecting and being affected by marine ecosystems in the three case studies using the DPSIR approach; this will be based first on available literature, and expert solicitation, and second on stakeholder consultation. We will identify relevant stakeholders for the project as a whole with the help of local partners and specifically for consultation on mapping maritime activities in task 1.4.1 and WP 2.2 and for scenario development and contextualizing the Shared Socioeconomic Pathways (SSP) in WP4.2. We will conceptually and where possible quantitatively assess the current status of fisheries and aquaculture with regards to climate change. A qualitative assessment of other activities including shipping, land-based pollution and energy production will be based on available literature and expert solicitation, to feed into conceptual models in WP4.2. Based on scientific literature and expert solicitation we will develop narratives for fisheries-focused SSPs for stakeholder consultation in WP 4.2.

Specific objectives:
- Map the spatial and temporal extent of human activities with focus on fisheries
- Identify key stakeholders and contact points for the relevant sectors

Construct narratives for fisheries-focused SSPs

Description of work

In addition to the partners requesting PM, DAFF will contribute to WP1.4 via the provision of information on activities regarding South African fisheries and aquaculture.

Task1.4.1: *Mapping human activities in case study areas using DPSIR approach* (**CAU**, INDP, UFRPE). Using available information, literature and expert solicitation on human activities possibly affecting marine ecosystems, we will construct conceptual diagrams of drivers, pressures and state and where possible also quantify the current benefits of these activities. All sources (literature and expert solicitation) used to identify and possibly quantify a link will be documented in an accompanying table, and a map of the current spatial extent will be developed.

Task1.4.2: *Mapping relevant stakeholders including major sectors identified in 1.4.1* (**CAU**, INDP, UFRPE, DAFF). Based on the list of human activities, we will first list potential stakeholders and stakeholder groups, then assess and prioritise the stakeholders to develop a list of relevant stakeholders for the project and to ensure a representative input for the scenario development in task 1.4.3 and WP4.2 (task 4.2.1) to identify the historical dynamics of human activities in WP2.2 and to ensure a wide dissemination of results in WP4.4. The consultation in task 1.4.3 will also be used to refine the conceptual diagrams and maps in task 1.4.1 and to inform the stakeholders about the basis for the modelling work in CT3.

Task1.4.3: *Contextualizing SSPs to case study areas* (**CAU**, INDP, UFRPE). Based on frameworks developed by Maury *et al*. (2017) and Reimann *et al*. (2018), we will identify knowledge and data needed to contextualize SSPs (O'Neill et al. 2016) for the fishing sector and construct a first draft of narratives for each case study to be used in developing the fisheries related SSPs in WP4.2 with stakeholder consultation in a participatory way to be then used as input for the ecosystem models in CT3.

Deliverables

D1.4.1: *Conceptual diagrams of drivers and pressures and state in case study areas* (**CAU**, **month 6**).

D1.4.2: *List of contact points for sectors identified in 1.4.1 in case study areas* (**CAU**, **month 12**).

D1.4.3: *Narratives of contextualized SSPs* (**CAU**, **month 18**).

Work package	WP1.5	Start and end date								11- 48
Work package title	Synthesis									
Participant nr.	2	5	6	12	15	16	23	25	31	34	35
Short name	GEOMAR	TI	ZMT	UCM	INDP	UVIGO	UFPE	UFRPE	UniCV	SU	UNAM
Person/months	13	12	1	6	5	7	23	25	1	2	7

Objectives

WP1.5 will integrate the results of WPs 1.1 to 1.4 into a description of the current state of the Atlantic ecosystem. The synthesis will consider inter alia progress and output with regards to North and South Atlantic from H2020 projects ATLAS and BLUEBRIDGE, the Ocean health index (Halpern et al. 2012), reconcile evidence from the Sea-Around-Us project (www.seaaroundus.org) and IPBES assessments in particular regarding AICHI targets 6 and 14, the Transboundary Waters Assessment Programme (www.geftwap.org), the Global International waters Assessment (GIWA), and OSPAR assessments (2009, Impacts of climate change) and utilize OBIS resources (Ocean Biogeographic Information System) to achieve an assessment of the current state of the Atlantic Ocean. The synthesis will provide input data for model simulations (CT2-3) and socio-economic vulnerability assessments (CT4).

Specific objectives:

- Comprehensive description of the **current** state of the Atlantic ecosystem by taking into account existing assessments, and the current composition, biodiversity and distribution patterns and standing stocks of biological components and fisheries, and social-ecological systems.

- Determine spatial and temporal coherence between biological and physical constituents at larger-scale and mesoscale and indicate long-term shifts in biological components as reaction to environmental drivers.

Description of work

Task1.5.1: *Composition and standing stocks of ecosystem components in coastal and oceanic regions* (**TI**, UFPE, GEOMAR, ZMT, UniCV, FURG, IRD, INDP, ULPGC, UVIGO, SU). New observational and existing and historical data on phytoplankton, zooplankton, pelagic fishes, marine mammals and important pelagic fisheries will be compiled for 3 pelagic biogeographic oceanic regions and corresponding neritic LMEs (East and South Brazil, Benguela Upwelling). Trends in state indicators Marine Trophic Level index and tuna trends at local and regional scales will be calculated. Fisheries data will be obtained inter alia from ICCAT http://www.bluebridge-vres.eu/news/tuna-atlas-vre and national fisheries and landings statistics. Datasets comprising inter alia > 1000 underwater vision profiles (UVP5, Picheral et al. 2010), processed ZooScan-based image files from > 100 Multinet Midi casts, published (e.g. Tara and Malaspina cruise) and archive samples and data (e.g. RV Nansen cruises, German data on mesopelagic fishes from the 1960's to 1970's (Post, 1987)), hydro-acoustic transect data and acoustic profiler casts in conjunction with new observations (e.g. Brazil shelf break survey and SPACES/TRAFFIC projects from the Benguela) will be utilized for comparative analysis. This task will further identify gaps in the ocean observation system (MS08).

Task1.5.2: *Synthetic biomass size spectra, food web structure and process rates* (**UFPE**, GEOMAR, UVIGO, TI, ZMT, SU, ULPGC, UCM, FURG). Biomass size spectra and respective dynamic modelling (R-mizer) enable to derive process rates with regards to transfer efficiency in food webs and zooplankton and nekton growth and mortality via the development or application of transfer functions and application to the assimilated datasets (Brown *et al.*, 2004). Homogenized data sets from task 1.5.1 will be used to estimate process rates. Trophic level and community niche space will be determined by stable isotope analysis (SIA). Dynamic size-spectra-based modelling (R-mizer, Scott et al., 2018) will be one key way to analyse the whole-ecosystem size spectra models (from bacteria to mammals).

Task1.5.3: *Role of physical processes in ecosystem dynamics to describe small- and mesoscale variability in ecosystem components (***ENS**, UCM). The role of physico-chemical processes in structuring plankton and nekton distributions at different spatio-temporal scales (Hauss *et al.*, 2016) will be analysed by means of variance-based methods (e.g. correlation and synchrony analysis) (Engen *et al.*, 2018).

Task1.5.4: *Synthetic assessment of the current state of the Atlantic oceanic and coastal social-ecological systems* (**TI**, CAU, FURG, UFPE, UCT). This task includes reappraisal of existing methodologies according to Fock and Kraus (2016) and reconciliation of evidence from earlier assessments from North and South Atlantic. Normative, procedural and systemic dimensions of assessments will be analysed. The data background from 1.5.1 will be applied to assess the variance explained by each assessment procedure (MS22).

A workshop will be held to discuss the relevance of collected and historical observational data, and model data for establishing ecosystem climatology and climate-ecosystem variability; this discussion is important to facilitate the interdisciplinary nature of the research (**Milestone 13**). A second workshop will be held to begin the synthesis assessing the current status of ecosystem (**Milestone 21, D1.5.2**).

Deliverables

D1.5.1: *Report on food web metrics and physico-chemical and biological process rates of open ocean and neritic*

communities comprising tasks 1.5.2 and 1.5.3 (**UFPE, month 24**). The report will characterize food webs by means of isotope analysis data, biomass spectra and process rates and abiotic properties. Data reporting in collaboration with WP4.4.

D1.5.2: *Assessing the current state of the tropical and subtropical Atlantic – The pelagic ecosystem, fisheries and its socio-economic dimension,* comprising tasks 1.5.1 and 1.5.4 (**TI**, **month 48**). It will include the analysis data of different field campaigns, reconcile evidence from earlier assessment projects, and identify knowledge gaps.

Work package number	2.1	Start and end date					1 - 42
Work package title	Characterising ecosystem variability at interannual to decadal timescales: key metrics and functional relationships/mechanisms						
Participant number	1	2	4	9	10	12	13
Short name participant	UiB	GEOMAR	IMR	CERFACS	IRD	UCM	UCT
Person/months	6	14	10	9	19	12	40
Participant number	20	23	25	29	30	19	
Short name participant	UKRI	UFPE	UFRPE	CSIC	ENS	CRO	
Person/months	28.8	12	12	2	6	13	

Objectives

In WP2.1 we will characterise the interannual to decadal variability of ecosystem-relevant metrics across the South and Tropical Atlantic but with a focus on three case study regions: i) the southern Benguela system, ii) the open-ocean subtropical to Tropical Atlantic, and iii) the north-northeast Brazilian region. For that, we will generate and synthesise observational and model results. The observations will include data from satellites, moored instruments, oceanographic cruise (collection of a variety of abiotic and biotic data) and autonomous vehicles, fisheries and biologging. We will analyse the output from a suite of climate models relevant to the IPCC AR6 process (Table 3.1d) as well as regional ecosystem hindcasts adhering to CMIP6 FishMIP protocols, and from hindcast ecosystem models. Using both models and observations we will add value to the TRIATLAS investment by including outputs from other national and international (including EU) projects. Finally, we will determine the coherence and relevance of the analyses and results from the regional case studies across and beyond the South and Tropical Atlantic through the entire Atlantic Ocean.

Description of work

Task2.1.1. *Variability in physical and biogeochemical parameters* (**CERFACS**, **UCT**, IRD, GEOMAR, IMR, UiB, UFPE, UKRI, IMR, UCM, ENS). In this task, with a focus on the three case study regions, we will determine and characterise the structure and scales of interannual to decadal variability of physical (temperature, salinity, velocity) and biogeochemical (oxygen, nutrients) fields. For this we will combine the analysis of i) satellite and in-situ observations, and ii) existing ocean-forced and ESM simulations performed in CMIP6 and other EU-funded projects. By comparing observations and model output we will evaluate models over the TRIATLAS regions. We will have a further focus on derived variables including upwelling, stratification, circulation and the net effect of mesoscale variability that we expect to change in the future and be potentially important for ecosystem productivity, function and therefore fisheries productivity and predictability.

Task2.1.2. *Variability in biological parameters* (**IRD**, GEOMAR, UFRPE, CSIC, GEOMAR, UCT, UCM, UFPE, CRO.) Here we focus on variability of biological ecosystem assemblages in the case study regions. Biotic components encompass a variety of groups from phytoplankton to top-predators, with highly variable data quality and availability. For primary productivity, we will consider the overall productivity but also, when possible, the functional types of phytoplankton (FTP, e.g. diatoms, cyanobacteria, etc.). FTP are indicators of the underlying biogeochemical processes and constrain upper trophic levels. Variability in phytoplankton size structure will be extended up to zooplankton where data are available (from UVP5 camera system, zooscan). Special emphasis will be given on the impact of the timing of the plankton seasonal cycle as it directly affects fish recruitment success. Micronekton is a key oceanic component; trawl and acoustic data (specific surveys and PIRATA cruises) are available to study the temporal patterns of variability in micronekton biomass and distribution. Fishery (including tuna and other marine resources) landing data will allow for a more comprehensive study of spatiotemporal variability in the Atlantic. Finally, available data on seabirds tagging and tuna biologging will provide further information on changes in top-predators use of space. The set of data will also permit the construction of ecosystem

indicators from observations and ecosystem models and understand their variability through time.

Task2.1.3. *Integrated processes* (**UKRI,** IRD, IMR, UCM, CERFACS, UCT, UFPE). In this task, we will combine the physical, biogeochemical and biological results from the previous two tasks to evaluate the key metrics in each case study region and the relationships between those metrics and the biological productivity. The abiotic and biotic time series will be collocated to make an observation-based assessment of those metrics that are key in describing ecosystem variability and therefore its prediction. We will further evaluate the similarities and differences between the case study regions. We will analyse our ability to observe and model those metrics that are most important for productivity and determine the processes of nutrient input into the euphotic layer, which drives productivity. The team data encompass the physical, biogeochemical and biological components up to top-predators. Given the variety of scales, data and study case of TRIATLAS we would be able to describe and quantify the impact of climate variability (including climate change) on nutriment supply and further productivity in different condition of ocean circulation, stratification or/and upwelling intensity. The analysis of for instance the large-scale ocean circulation and its relevance to stratification and vertical nutriment excursions will allow us to assess the origins and impacts of the variability that we characterise beyond the TRIATLAS region. This will further allow determination of the local mechanisms and potentially predictability in ecosystems, biogeochemical and climate variables that will serve as input for CT3.

A workshop will be held jointly with **WP2.2**, and **CT3** to exchange on key abiotic and biotic metrics of variability at different scales (**Milestone 15**); This will provide important input for **D2.1.1** and assessing predictability (**CT3**).

Deliverables

D2.1.1: *Report on validation of TRIATLAS ESMs using observed and mapped physical and biogeochemical metrics in TRIATLAS case study regions* (**CERFACS, month 30**). This report will synthesise the results from tasks 2.1.1 and 2.1.2 and describe the inter annual to decadal variability in physical, biogeochemical and biological character of the case study regions.

D2.1.2: *Report on the patterns of ecosystem variability in the TRIATLAS case study regions* (**IRD, month 42**). This will report on output from task 2.1.3 and describe how variability in physical and biogeochemical structure affects biological abundance and distribution.

Work package number		WP2.2		**Start and end date**		1 - 47
Work package title		Defining the drivers of interannual to decadal variability, including analysis of extreme events and tipping points				
Participant number	1	12	13	20	24	25	29
Short name of participant	UIB	UCM	UCT	UKRI	UFSC	UFRPE	CSIC
Person/months per participant	6	21	20	16.8	60	12	16
Participant number	30	32	35				
Short name of participant	ENS	UFRN	UNAM				
Person/months per participant	18	48	20				

Objectives

For each TRIATLAS Case study, to
- determine the large-scale physical drivers of climate variability that cause the ecosystem variability, change and stability on interannual and decadal timescales identified in WP 2.1 and assess their relative importance
- analyse extreme events, and understand the interplay between biophysical variability and extremes
- analyse the complex interrelationships between human social drivers and societal impacts of long-term variability and change
- analyse ecosystem tipping points and ascertain where different management strategies might have led to different outcomes
- conclude on commonalities and differences in character of the case study regions

Description of work

Task2.2.1: *Physical drivers* (**UFSC,** ENS, UIB, UCM, UKRI). This task consists of first gaining a better understanding of the climate variability of the TRIATLAS key areas and their physical drivers, using both observations and model simulations and contrasting those against variations from other regions beyond TRIATLAS.

In particular, we will build an integrated representation of the whole Atlantic variability, including tropics, extratropics and Atlantic Meridional Overturning circulation, together with their interactions. We can then link the physical drivers to the ecosystem variability identified in WP2.1, determining the main controlling spatial and temporal scales as well as their relative importance. Special attention will be given to higher frequency physical processes that control interannual and decadal ocean variability as well as the different population regimes of marine organisms. We will determine global teleconnections associated with regional changes in drivers affecting ecosystems: winds, currents, etc. and study the dynamical mechanisms relating local air-sea interactions and impacts on ecosystems: from primary production to fish-population. We will also investigate the role of extreme climate events, such as marine heatwaves and cold spells, on tipping points for marine ecosystems. The influence of dust deposition on Atlantic mean state and variability will be also analysed.

Task2.2.2: *Human Social Drivers and ecosystem regime shifts* (**UCT,** UFRN, UFRPE, CSIC, UNAM, UCT). This task will generate syntheses of human social drivers (e.g. population growth, need for food security, income, health, participation in governance processes) modifying pressures on the marine social-ecological systems that form the three TRIATLAS case studies. Time series for social indicators such as, e.g., those comprising the multidimensional poverty index, will be compiled and their variability and trends explored. Working with members of coastal fishing communities and using the principles of participant-lead research, we will analyse the complex connections between drivers and impacts in the human social dimensions, with particular attention to long-term variability and regime shifts in the social-ecological systems.

Historic ecosystem regime shifts will be examined based on observational time series and model runs. Where ecosystem regime shifts have taken place, we will explore, on the basis of model runs, whether alternative fishing strategies could have led to different outcomes under the given (historic) climate variability (WP2.1) and/or trends. Finally, this task will provide case-study specific guidance on social and economic evaluation of forecasting scenarios in CT3.

Task2.2.3 *Synthesis and assessment of key regional drivers of variability, change and stability* (**CSIC,** UCM, UCT, UFSC, UFRPE, UFRN, UNAM, UKRI). This synthesis task will draw together the information on seasonal to interannual variability and provide an assessment of the commonalities and differences of the study regions. This will include an assessment of the methodology used to describe the systems with a particular emphasis on identifying those elements that are general and applicable to all regions and those that are specific. Using state of the art tools, the work will lead to qualitative and, where possible, quantitative assessments of the relative importance of physical-environmental (T2.2.1) and human social drivers (T2.2.2) through time. What will be crucial in the longer term is to understand the interplay between biophysical variability and extremes (e.g. warming and heat-waves) and fishing scenarios (or other human use scenarios). This synthesis will explore the amplifying and dampening effects of fisheries management strategies relevant to future ocean climate scenarios, in those cases where the databases allows to do so. The commonalities will form an important basis for these analyses. We will generate a comparative set of recommendations for each case study for likely beneficial adaptations of fishing strategies and in general, human uses of marine resources, under climate change, for further analyses in WP4.2.

A workshop will be held on past key drivers of regional (interannual and decadal-scale) variability and change, including analyses of regime shifts (**Milestone 22**); this will facilitate preparation of **D2.2.2**.

Deliverables

D2.2.1: *Report describing the large-scale physical drivers of climate variability and extremes, including marine heatwaves, that affect ecosystem variability, change and stability* (**UFSC**, **month 30**). This report will detail the progress achieved in Task 2.2.1. and also provide a basis for D2.2.2.

D2.2.2: *Report synthesising climate and ecosystem variability, and evaluation of the relative impacts of physical and anthropogenic drivers across case studies, including the impact of regime shifts* (**CSIC**, **month 47**). This report will detail the progress achieved in tasks 2.2.2 and 2.2.3 and synthesise our new understanding concerning key regional drivers of long-term variability, change and stability.

Work package number	3.1	Start and end date					1 - 48
Work package title	Tailored seasonal to multi-decadal forecasts and multi-decadal to centennial scenarios for key climate and biogeochemical drivers of marine ecosystems						
Participant number	11	9	30	8	3	12	27	1
Short name of participant	BSC	CERFACS	ENS	MF-CNRM	NERSC	UCM	UNI	UiB

Person/months	42	36	12	39	21.5	9	10.6	42

Objectives

- Explore and quantify the limits of the seasonal to decadal predictability of relevant climate (temperature, stratification and currents) and biogeochemical drivers (primary production, oxygen and acidification) for marine ecosystems in the Atlantic Ocean and to identify associated uncertainties in state-of-the-art climate forecast systems.

- Deliver improved multi-model climate forecasts (seasonal to multi-decadal) and scenarios (multi-decadal to centennial) for key climate and biogeochemical drivers to the scientific community both in TRIATLAS and beyond.

Description of work

WP3.1 will provide an assessment of the currents levels of predictability (climate/physical and biogeochemical drivers) from seasonal to decadal timescales over the full Atlantic Ocean focusing on the TRIATLAS case study regions, using both existing seasonal or decadal forecasts performed by Earth System Models (ESMs) prepared for CMIP6 and other EU-funded projects (PREFACE, CRESCENDO, PRIMAVERA, APPLICATE and EUCP). In order to enhance our understanding of the predictive capability of current generation of ESMs forecast systems and to improve them, a coordinated set of retrospective climate forecast experiments will be conducted by the TRIATLAS modelling groups, following the recommendations, outcomes and climate model improvements from other EU-funded projects (such as PREFACE). We will then perform improved climate forecasts and scenario simulations over the Atlantic Ocean. A relevant set of tailored climate and primary production variables will be adapted and provided to marine ecosystem modellers to study ecosystem predictability and future changes (WP3.2) that will be useful to evaluate potential future socio-economic impacts (CT4).

Task3.1.1: *Preliminary forecast and scenario assessment of ocean climate and biogeochemistry over the Atlantic* (**BSC, ENS**, BSC, CERFACS, ENS, MF-CNRM, UCM, UiB, UNI). This task aims at assessing the predictability and also future long-term changes of the key climatic and biogeochemical variables that are controlling ecosystem variability, by the analysis of existing state-of-the-art seasonal and decadal retrospective forecasts (such as Séférian et al. 2014) and climate scenarios (present to 2100, e.g., CMIP5 or CMIP6). In particular, we will assess the predictability and quantify the uncertainties of the drivers and processes of marine ecosystems identified from observations in CT1 and inferred from model-data comparison in CT2. We will also explore the impact of model biases on the predictability of marine biogeochemistry, since the EU-funded project PREFACE has demonstrated that systematic model biases hinder the representation of climate variability and deteriorate ESM predictive skills (e.g. Dippe et al. 2018). In a complementary approach, potential predictability will be assessed in a "perfect model" framework by running tailored experiments (see Table 3.1d), in which we will quantify the ability of the models to predict their own climate signals. These experiments will be also useful for assessing drivers of predictability when observations are missing or too sparse.

Task3.1.2: *Improved ocean climate and biogeochemistry forecast frameworks* (**UiB,** NERSC, CERFACS, MF-CNRM, NERSC, UiB, UNI). This task aims at improving the ability of TRIATLAS ESMs to predict the ecosystem drivers that will be measured in CT1 and analysed in CT2 (see Table 3.1d). The benefits of running the forecasts at higher spatial resolution will be estimated (cf. Berthet et al. in prep). This will be especially important in the coastal case-study regions where high-resolution is required to resolve fine-scale ecosystem features and fisheries' heterogeneity. Furthermore, the role of external forcing such as dust will be investigated at basin scale because of its importance for climate (Booth et al. 2011) and primary production (Schlosser et al., 2014). Another avenue for improvements lies in better calibrating climate and biogeochemical models' parameters using the most recent observational data that will be collected in CT1. Better estimate of uncertain climate and biogeochemical parameters (such as the background vertical diffusion or the eddy parameterization scheme for the physics and the particle sinking rate of organic carbon or the zooplankton grazing rate for the biogeochemistry) will be produced using an Ensemble Kalman filter assimilation scheme with a coupled climate-marine biogeochemistry model (Gharamti et al. 2017). This improved model set-up will be used to produce an observations-validated *ocean reanalysis ensemble* (30 members) for the period 1980-2010 that will be used to analyse climate and marine ecosystem variability in CT2 and study ecosystem predictability in WP3.2. The improved models will also be used in T3.1.3.

Task 3.1.3: *Providing frontier seasonal to multi-decadal forecasts and multi-decadal to centennial scenario simulations with TRIATLAS ESMs* (**CERFACS, MF-CNRM**, BSC, CERFACS, MF-CNRM, NERSC, UiB, UNI). We will perform frontier retrospective and real time seasonal and decadal forecasts with improved TRIATLAS ESMs (see Table 3.1d). A common experimental protocol will be designed and implemented amongst the TRIATLAS ESM groups (adapted to the possibilities of the consortium). This may include the forecast period, initial conditions, ESM

initialisation and number of realisations. According to results in Task 3.1.2, higher resolution systems will be tested by some groups for some case studies. Finally, a subset of multi-decadal to centennial scenario simulations will be conducted with some ESMs in order to support the work planned in WP3.2 and in CT4.

Through online discussion (email and web conferencing) and a workshop, we will define a list of diagnostics and data from WP3.1 experiments that will be needed ecosystem models (WP3.2) and vulnerability assessments (WP4.2); and we will agree on a protocol for the coordinated predictability experiments (CT3, WP4.2) (**Milestone 6**).

Deliverables

D3.1.1: *Mid-term project report on the assessment of predictability (seasonal to decadal) and climate change for climate and biogeochemical variables relevant for marine ecosystems* (**BSC, month 24**)

D3.1.2: *Final report on the limits of seasonal to decadal predictability and climate change uncertainties for climate and biogeochemical variables relevant for marine ecosystems, including the impact of model improvements on predictability over the TRIATLAS case-study regions* (**CERFACS, month 48**)

Work package number	3.2		Start and end date		1 - 48
Work package title	Tailored seasonal to multi-decadal forecasts and multi-decadal to centennial scenarios for key marine ecosystems and fisheries				
Participant number	10	13	25	29	32	
Short name of participant	IRD	UCT	UFRPE	CSIC	UFRN	
Person/months per participant	82	23	30	18,5	48	

Objectives

- Adapt state-of-the-art integrated marine ecosystem models to represent key ecosystems and main fisheries resources in the TRIATLAS case-study regions.

- Assess the ability of these models to forecast the ecosystems and resources considered on seasonal to multi-decadal time scales and estimate corresponding uncertainty.

- Carry out multi-model ecosystems and fisheries forecasts (seasonal to multi-decadal) and scenarios (multi-decadal to centennial) in the TRIATLAS case-study regions.

Description of work

The work in WP3.2 is split in 3 different tasks:

Task3.2.1: *Configure and improve ecosystem models in key TRIATLAS regions* (**CSIC, DAFF**, IRD, UFRN, UCT, UFRPE). We will configure a set of state-of-the-art ecosystem models (see Table 3.1d) and couple them to the climate and biogeochemistry models developed in WP3.1, in key TRIATLAS regions, at both sub-regional and basin scale. In particular, we will focus on:

- Atlantic ecosystems (including explicitly tropical and temperate tunas) and fisheries at basin scale. Tunas constitute the bulk of oceanic fisheries landings in the Atlantic, with major economic values for numerous countries in Europe, Africa, South and North America. We will use EcoOcean and APECOSM at 1° spatial resolution to investigate the effects of seasonal to multi-decadal climate variability on major marine communities, key species and associated fisheries.

- Marine communities (including explicitly sardines and anchovies) and fisheries in the Benguela region. We will use OSMOSE, EwE (Ecosim and Ecospace), and APECOSM at ¼° spatial resolution to investigate the effects of seasonal to decadal climate variability on the abundance, spatial distribution and availability to fisheries of major exploited and non-exploited communities in the Benguela. Major species will be distinguished including sardine and anchovy populations that represent the bulk of small pelagic species in South Africa and have major ecological and economic roles.

- Marine communities and fisheries of the Northeast Brazilian shelf. We will use EwE (Ecosim and Ecospace) at ¼° spatial resolution to investigate the effects of seasonal to decadal climate variability and fishing on the spatial-temporal functioning of food-web and associated fisheries, with an emphasis on economically important fish groups.

Task3.2.2: *Assess our ability to predict ecosystems and exploited fish populations from seasonal to multi-decadal time-scales* (**IRD,** UFRN, CSIC, UCT, DAFF, UFRPE).

T3.2.2 will address the following question: *Can we use the "climate-to-fish" models developed in TRIATLAS to forecast the dynamics and spatial distribution of key fisheries resources at seasonal (1-12 month), inter-annual (1-5 years) and decadal (10-40 years) time-scales in the Tropical and South Atlantic Ocean?*

To tackle this overarching question and estimate the predictability horizon of our climate-to-fish coupled models, the spread of the climate-driven ecosystem models as a function of the prediction's horizon will be estimated in two steps (Séférian et al., 2014). First the ecosystem models will be initialized by forcing them with the initialized ESMs simulations developed in WP3.1 and observed fishing effort. Fisheries data (spatial catches and size-frequency) and fisheries-independent data (e.g. acoustic observations, research trawl surveys etc.) will be used to assess the initialized simulations. In a second step, the ecosystem models will be forced by each of the retrospective forecast members of the climate simulations (WP3.1) and observed fishing effort to derive ecosystem and fisheries retrospective forecasts members and calculate their spread. This exercise will use the physics-biogeochemistry forecasts members provided by WP3.1 at 1° and will be designed to address seasonal, inter-annual and multi-decadal forecasts respectively. T3.2.2 will focus on:

- *Atlantic ecosystems (including explicit tropical and temperate tunas) and fisheries at basin scale* simulated with EcoOcean and APECOSM over the **entire Atlantic basin** at 1° resolution. Spatial catches per species groups (FAO 2016) as well as tuna catches and size frequency per fishing fleet from the ICCAT database will be used to assess and calibrate the initialized simulations.

- *Fish communities (including explicit sardines and anchovies) and fisheries* simulated over the **Benguela region** with Ecosim in 0D and with OSMOSE and Ecospace in 2D at 1° resolution. Fisheries data from the DAFF will be used to assess and calibrate the initialized simulations.

- *Marine communities and fisheries in the North-East Brazilian shelf* simulated with Ecosim in 0D and Ecospace in 2D using the physics-biogeochemistry forecasts members at 1° resolution. Available fisheries data from 1977 will be used to assess and calibrate the initialized simulations.

Task3.2.3: *Carry out multi-decadal to centennial scenario simulations of fish stocks and fisheries catches* (**UCT, UFRPE,** IRD, UFRN, CSIC, DAFF)

Here, combinations of RCP-driven CMIP6 climate simulations and SSP-driven fishing effort evolution provided by WP4.2 will be used to drive ecosystem models up to 2100.

- *Atlantic ecosystems (including explicit tropical and temperate tunas) and fisheries* simulated with EcoOcean and APECOSM over the **entire Atlantic basin** at 1° resolution.

- *Fish communities (including explicit sardines and anchovies) and fisheries* simulated over the **Benguela region** in 0D (Ecosim) and 2D (OSMOSE and Ecospace) using the physics-biogeochemistry predictions at 1° resolution. 3D scenario simulations with APECOSM will only be run if ¼° physics-biogeochemistry scenarios are available during the course of the project.

- *Marine communities and fisheries in the NE Brazilian shelf* simulated with Ecosim in 0D and with Ecospace in 2D using the physics-biogeochemistry scenario simulations at 1° resolution.

Deliverables

D3.2.1: *Mid-project report on the improvements of integrated ecosystem models and configuration in each of the regional case-study regions* (**CSIC**, **month 24**)

D3.2.2: *Final report on the assessment of seasonal to decadal predictability of ecosystems & fisheries and climate change scenarios simulations including multi-models uncertainty evaluation* (**IRD**, **month 48**)

Work package number	4.1		Start and end date				1 - 48	
Work package title	Educational and technological capacity strengthening							
Participant number	35	22	14	31	5	29	6	23	10
Short name	UNAM	FURG	INDP	UniCV	TI	CSIC	ZMT	UFPE	IRD
Person/months	1	12	11	11	3	1	2	14	0.5

Objectives

To initiate and facilitate human capital and technological capacity strengthening by proposing concrete collaborative initiatives among South American, African, and EU countries in the field of marine research, including education and training activities and helping initiate a Cross-Atlantic Network of Excellence in Marine Science (CANEMS) as a cross-cutting activity. Further, by enhancing technological capacity development for fisheries data collection and management purposes based on mobile IT solutions.

Description of work

In addition to the partners with requested PM, UiB, UCT, UFRPE, INIP, GEOMAR, and IMR are very active in education and training activities and will provide an in-kind contribution to various task, as listed.

Task4.1.1: *Sea-going training in Marine Sciences* (**UFPE**, FURG, UFRPE, IRD, GEOMAR, INIP, INDP, IMR, ZMT, UniCV)

Interdisciplinary training courses for ship-based marine science instrumentation sampling, data flow and quality control will be implemented for regional training of technical and undergraduate level personnel. This will promote hands on training in all fields of marine sciences on board of research vessels involved in different observing state-of-the-art methods in TRIATLAS. FURG has vast experience with the 'Amazonia Azul' program and IMR conducts the FAO's Nansen Programme surveys. Furthermore, Angola and Brazil are receiving new oceanographic vessels that will require trained personnel and will be used for training. Ship-based training is an excellent opportunity to bring together a new generation of marine scientists and strengthen the Atlantic Research and Innovation Cooperation.

Task4.1.2: *Cross-Atlantic Network of Excellence in Marine Science (CANEMS)* (**FURG**, UFPE, UFRPE, IRD, UNAM, CSIC, UiB, UniCV)

A cross-cutting activity to develop a network among graduate programs involved in the proposal. The network will combine the academic infrastructure and strength associated with TRIATLAS institutions to foster graduate studies in Marine Sciences in the Atlantic Ocean. Support from TRIATLAS would come through access to ship time, laboratories, sample processing, data, and models. TRIATLAS will provide ~€ 200,000 for logistic support that would include sending students to cruises (task 4.1.1), summer schools or sending scientists for teaching and working on collaborative projects.

University programs, potential supervisors and research themes, funding opportunities will be advertised on a dedicated CANEMS portal for graduate students in Marine Sciences within the scope of TRIATLAS. The knowledge exchange within the network will lead to strengthening of individual programs, foster a next generation of young scientists, and contribute to the scope of BG-08 and the Belém statement *to promote and facilitate human capital development and scientific exchange*.

CANEMS will build on the experience of the international Master's program in Benin initiated by IRD and UAC-ICMPA, with participation of UFPE. Ms/PhD theses developed under TRIATLAS will be part of CANEMS. The network will also: 1) foster short term student visits to a foreign institution to attend course and develop studies as part of a degree; 2) implement cotutelle degree among universities participating in TRIATLAS; 3) fund missions of scientists to lecture at graduate programs from the network; 4) promote the TRIATLAS Summer Schools.

Summer schools will provide tools related to key scientific questions investigated under TRIATLAS to early career scientists, professionals and students. Two interdisciplinary summer schools are planned at the moment:
- A summer school on prediction of the Atlantic ecosystem will be held in early 2020 at UNAM in Henties Bay, Namibia, organised by UNAM, IRD, UCT, CSIC, ZMT, and UiB. It will introduce students to the functioning of the ecosystem, and how its dynamics are influenced by anthropogenic and environmental drivers. It will cover ocean and climate variability, as well as long-term climate and ecosystem change, including regime shifts. Exciting developments in modelling and prediction of the combined climate-ocean-ecosystem achieved by TRIATLAS modellers will be highlighted.
- A summer school on the functioning of tropical marine ecosystems, from physics to seabirds will be held in mid-2021 in Recife, Brazil organised by UFPE, UFRPE and IRD. It will provide a comprehensive vision of the structure and function of tropical ecosystems in a changing ocean. Based on observations and models we will focus on transversal questions e.g., how changes in the thermohaline structure impact energy transfer across the food web? This summer school will rely on specialists from a large variety of disciplines that are used to work in an ecosystem perspective.

Activities carried out as part of CANEMS will leverage funds from programs in Norway (CHESS/BCPU), France

(IRD/MARBEC), Germany (DAAD), Brazil (CAPES/CNPq), and will be organized in cooperation with other projects (e.g., BMBF SPACES program, CNPQ INCT-Mar COI). Existing services and tools for the summer schools will be used from the European Copernicus Marine Environment Monitoring Service.

Task4.1.3: *Citizen Science and self-reporting* (**INDP**, TI, UniCV, UFPE, FURG) Improving data collection is an important issue in artisanal fisheries with many remote landing sites and a diverse fishing community. A semi-self-reporting system for Cabo Verde as case study is planned offering mobile devices as incentives to local fishermen enabling to improve the reporting of the catch (what, where, when). Including the expertise of local communities and understanding their motivation in a participatory process is essential in adopting the necessary tools, and the potential for further applications for Brazil will be investigated.

Deliverables

D4.1.1: *Description of sea-going training activities* (**UFPE, month 36**). A compilation of the student training reports in their native languages, so that the reports can serve as guide for future work at their home country.

D4.1.2: *Report on Cross-Atlantic Network of Excellence in Marine Science* (**FURG**, **month 48**). The report will summarize all CANEMS activities, including a list of TRIATLAS related theses from associated graduate programs, students having benefited from summer schools, travel support or PhD cotutelle programs.

D4.1.3: *Report on Artisanal fisheries self-reporting system* (**INDP**, **month 46**)

Work package number	4.2		**Start and end date**					1 - 48
Work package title	Ecological, social and economic futures							
Participant number	7	22						
Short name of participant	CAU	FURG						
Person/months	24	48						

Objectives

WP4.2 will develop the quantification of the contextualized SSPs for the fisheries in the case study areas as input for the ecosystem models in CT3 by using the draft narratives from WP1.4 and further consult with relevant stakeholders and experts (including scientists and policy makers). We will also identify possible future pathways for other activities to be used in conceptual modelling to explore possible future development of stressors other than fisheries and climate change in the three case studies. To prioritize and visualize areas of specific concern, we will identify ecological hotspots as well as areas of high maritime activities based on input from WP1.4 and WP2.2. Furthermore, WP4.2 will contribute to new value chains by conducting an ex-ante assessment on the anchoita fisheries and its conversion to a consumption fisheries is in support of EU's long term strategy to support sustainable management.

Specific objectives are:
- Quantify SSPs contextualized for fisheries as input for the ecosystem models in CT3
- Compare normative scenarios of social and economic development with ecosystem scenarios derived from ecosystem models in CT3
- Develop conceptual models to analyse different scenarios and estimate the effect on different sectors and communities in case study areas
- Conduct an ex-ante assessment on the anchoita fisheries and its conversion to a consumption fisheries
- Identify ecological hotspots in the SW Atlantic to visualize areas of high concern for conservation.

Description of work

Task4.2.1: *Quantification of contextualized SSPs* (**CAU,** FURG)

We will design the narratives with the fundamental underlying logic of the SSPs, focusing on elements of social and economic change that often cannot be covered by formal models; organize the narratives in terms of model "input tables" describing in qualitative terms the main SSP characteristics and elaborate the basic elements of the SSPs in terms of demographic and economic drivers using quantitative models. The contextualized SSPs will be used to inform the ecosystem models in CT3.

Task4.2.2: *Future development of maritime sectors* (**CAU**)

We will engage with relevant local stakeholders identified in WP1.4.2 and interview them about their objectives and their perception of most desirable and most likely development of their respective maritime sectors. We will also send out questionnaires to selected representatives of local communities to gather the general perception of current and possible future impact of different maritime sectors on marine ecosystems. Based on these, we will prioritize a set of contrasting scenarios, to be tested in conceptual models to be developed in 4.2.3

Task4.2.3: *Conceptual models and impact assessments* (**CAU**)

We will develop conceptual models based on the DPSIR diagrams from WP1.4 in consultation with relevant stakeholders and backed by data and model output where possible and by expert solicitation where necessary. This participatory modelling approach will either be done in focus group meetings, stakeholder workshops, one-to-one interviews or questionnaire surveys, depending on the availability of stakeholders and adapting to the local situation in the case study areas. The conceptual models will be used to analyse scenarios identified in task 4.2.1 and task 4.2.2 and using the output from ecosystem models from CT3 to perform impact assessments and identify the effect of changing ecosystems and shifts in distribution and productivity of commercially important fish stocks on selected communities and maritime sectors.

Task4.2.4: *Identification of areas of high biodiversity* (**FURG**). Analyses and modelling of historical data on the spatial distribution of biological production, species diversity of marine organisms and oceanographic features to identify areas of ecological and biological significance (EBSAs). Emphasis will be on the characterization and modeling of the spatial distribution of fisheries and shipping and its relation with areas of high biodiversity to contribute to the sustainable use of these areas for conservation and for the provision of food and income. This study will use a suite of Species Distribution Models (SDMs) and Geographical Information Systems (GIS) tools to create suitability maps of high biological diversity.

Task4.2.5: *Ex*-ante assessment on the anchoita fisheries and its conversion to a consumption fisheries (**FURG**). Here we will develop an ex-ante protocol to investigate the potential to switch from a reduction fishery towards a fishery for human consumption, i.e. *Engraulis anchoita*. We will account for climate change effects and investigate the change needed in the supply chain and the management of such a fishery.

Deliverables

D4.2.1: *Quantified SSPs for use in ecosystem models* (**CAU**, **month 24**)

D4.2.2: *Impact assessments for case study areas and selected sectors and communities* (**CAU**, **month 48**)

D4.2.3: *Report on the distribution of hotspots of biodiversity and of maritime activities in the Southwestern Atlantic* (**FURG, month 42**)

D4.2.4: *Report on the assessment of the anchoita fisheries and its conversion to a consumption fisheries* (**FURG, month 36**)

Work package number	4.3		Start and end date			1 - 48	
Work package title	Data management						
Participant number	1						
Short name of participant	UiB						
Person/months per participant:	12						

Objectives
- To provide continuous technical and organizational management for observational and model output data according to the formal requirements of the H2020 Open Research Data Pilot and FAIR ensuring open access to all peer-reviewed scientific publications relating to its results.
- To provide a common disk space for exchange of new datasets (model, observation) and meta-information for access of already existing data sets.
- To utilize a professional web-based collaboration suite including sophisticated communication modules

Description of work

Observational and model output data management:

TRIATLAS data are collected, produced, and will be long-term archived (in open access archives) in various WPs, and progress is ensured and measured by milestones (Table 3.2a). Best practices for physical, biochemical,

and biological measurements relevant for WP1.1, 1.2, 1.3 will be followed, this includes the definition of common standardised protocols for collection of acoustic and biological data and samples in WP1.2 and WP 1.3 (Milestone 4). We will list the available observed data products from CT1 and CT2 (including human social drivers) that will be available for investigating long-term ecosystem changes and predictability for all case study regions. This will be achieved through online discussion (email and web conferencing) and a workshop (Milestone 8).

Professional data managers from the Bjerknes Climate Data Centre hosted at UiB ensure an efficient use of a larger infrastructure and will coordinate the data flow, have a strong cooperation with the WPs leaders, and address the data needs of the consortium by giving access to TRIATLAS data within the consortium according to intellectual property rights (IPR) and by providing access to existing public data archived in open access repositories. We will also make TRIATLAS collected/compiled data available to external data portals (e.g., EMODnet).

A professional data management plan will state what observational, model output, software and social sciences data will be generated, define the access and IPR, state the final long-term open access repository for the various data types, define responsibility for long-term archival, and state when and how the data will be made publicly available. WP4.3 will oversee, coordinate, and assist the consortium to ensure that the data are visible and available via the portal. Furthermore, it will be compliant with the formal obligations following the Open Research Data Pilot under H2020 and the FAIR data management principles.

Task4.3.1: *Data actions: acquisition; harmonization; assimilation; formatting; processing; archival; integration; quality control; attribution to PI; documentation; sharing; online access; long-term preservation; and dissemination* (**UiB**). Feeding metadata and data streams into international programs and projects (eg. GEO, GEOSS and GMES; NASA's GCMD; OpenAIRE); providing access (according to intellectual property rights) to all project partners (observed and model output data); providing a data management plan being compliant with the formal requirements by H2020 FAIR policy and Open Research Data Pilot following the 'gold' standard. This task is performed in cooperation with the respective beneficiaries and work package leaders.

Task4.3.2: *A commonly accessible disk space* will be established using the Norwegian e-infrastructure NIRD (National e-Infrastructure for Research Data) for data exchange within the TRIATLAS consortium (**UiB**).

Task4.3.3: *Information management with respect to data:* sophisticated communication modules to guarantee efficient and smooth flow of information: supplying a pivotal Virtual Research Environment - VRE (communication server, document server, electronic mailing lists, web sites, data portal, etc.); developing and maintaining the central www based project portal to all stakeholders; elaborate user interfaces scalable for different stakeholders (**UiB**).

Deliverables

D4.3.1: *Data management and implementation plan* (**month 3**)
D4.3.2: *Common disk space for data exchange established* (**month 3**)
D4.3.3: *First version of project's data portal* (**month 6**)
D4.3.4: *Report on available observational data and selected model data* (**month 12**)

Work package number	4.4	Start and end date					1 - 48
Work package title	Dissemination and Communication						
Participant number	1						
Short name of participant	UiB						
Person/months per participant	16						

Objectives

The overall objective of WP4.4 is to enable efficient dissemination, exploitation and communication of TRIATLAS results. In particular, WP4.4 will:

- Make use of stakeholder knowledge in the project and make project results easily accessible and exploitable for stakeholders
- Ensure coherence of project activities with related EU and international policy initiatives
- Obtain good synergies with relevant other projects and initiatives

- Inform relevant target audiences about project activities and results

Description of work

Task4.4.1: *Communication and collaboration with stakeholders* (**UiB**) D4.4.2

Core theme 4 leads in collaboration with the UiB project office will advise, facilitate and monitor stakeholder contact which is happening in work packages 1.4, 2.2, 4.1 and 4.2, as summarized in Section 2.2b. The UiB project office will organize special sessions with regional/local stakeholders at project meetings in Brazil, Cape Verde, and South Africa. A list of relevant local stakeholders within the case study areas will be produced in WP1.4; the stakeholders will be grouped in various categories (fisherfolk, managers, policy makers). Further details on local stakeholder groups, their needs and interests and expected impact are given in Section 2.2a. Factsheets about the project aims and relevant project results will be sent to the stakeholders; these will be available in English, French, and Portuguese. Factsheets will be tailored to stakeholder needs through discussions at the special stakeholder sessions. There will 5-10 fact sheets prepared. We will distribute these according to the interests of the different stakeholder group, via the TRIATLAS list of stakeholder contacts, D1.4.2.

Task4.4.2: *Collaboration with relevant EC services and international organisations to ensure coherence of project activities with related policy initiatives* (**UiB**) D4.4.2

Close cooperation with DG Research and Innovation and other relevant EC services will be performed as described in Section 2.2. Contact points for these stakeholder groups will be identified earlier in the project with the help of the TRIATLAS project officer in Brussels. We will also target regional policy makers, funding agencies, and development cooperation agencies; and contact points for these will be established with help of the project partners who already have relevant experience and networks. Regular (at least once a year) communication and dialogue with these contact points will ensure TRIATLAS research can be of most use to these institutions. For contributing to policy making in an international arena, at least one project side event at a relevant international event such as COP 26 or UN HLPF on Sustainable Development will be organized, preferably together with other related projects, see Section 2.2. A science-policy session will also be arranged in Brussels in the final six months of the project. The communication office will keep PIs informed of meetings of relevant management organisations and encourage presentations at such events (e.g., International Council for the Exploration of the Sea, Sub-Regional Fisheries Commission, Benguela Current Commission). Fact sheets about the project aims and relevant project results will also be used to inform relevant fisheries management bodies, governance structures responsible for marine spatial planning, and development agencies.

Task4.4.3: *Cluster with other relevant projects and initiatives* (**UiB**) D4.4.2

The project will cluster with other projects financed under topic BG-08, with other Atlantic research projects, with related activities on ocean sustainability supported by the Belmont Forum, and with on-going activities such as EMODnet. In particular, TRIATLAS will become a stakeholder of the BG-08 CSA ANNCHOR and be involved in a number of its platforms. Tight clustering of these projects will make it possible to create an **All Atlantic Research Alliance,** increasing the effectiveness of funding and of dissemination and exploitation measures, and leading to improved assessments of the entire Atlantic ecosystem; these are the overarching aims of the topic BG-08. Clustering will be achieved by participation in the Atlantic Ocean Research and Belém All-Atlantic Research Forums; by participation of relevant project PIs in TRIATLAS project meetings and stakeholder events, and vice versa; and by co-organize sessions at international conferences. We plan for at least two joint activities during the project. A current list of project contact points will be maintained. See Section 2.2 for more details.

Task4.4.4: *Communicate relevant project activities and results to target audiences in the partner countries* (**UiB**) D4.4.1, D4.4.3

At project start the project office will collect a list of local PR contacts in the partner countries. This list will be used to disseminate project news to the target audiences in the partner countries. The communication officers at the project office will create targeted news releases on project activities and results in various formats: news stories from the project such as written news stories, picture based stories and short videos. The hashtag #triatlas will be created to utilize social media channels already existing at partner institutions for targeted dissemination of project news to interested audiences. Facebook announcements will be used to raise awareness for project events. See also Section 2.2b.

Task4.4.5: *Promote the project activities to a wider audience and ensure good project visibility* (**UiB**) D4.4.3

At the start of the project, the project office will create the project Website where all other dissemination material re-directs to (Milestone 1), and will keep it updated continuously throughout the project. The project office will also produce general project information material (project overview slides, posters) to be used by project PIs to present the project. The communication officer will encourage the organisation of special sessions at international

scientific conferences. The communication officer will once a year review the success of the project's communication strategy by quantifying social media visibility in the different countries, and modify the strategy if necessary. See also Section 2.2b.

Deliverables

D4.4.1: *List of PR contacts at all partner institutions* (**UiB**, **month 5**)

D4.4.2: *Summarized report on events with stakeholders and policy makers* (**UiB**, **month 36**)

D4.4.3: *Project dissemination materials (news releases, general project information material, short videos, fact sheets)* (**UiB**, **month 42**)

Work package number	5		Start and end date			1 - 48
Work package title	Project Management					
Participant number	1					
Short name of participant	UiB					
Person/months per participant	48					

Objectives

The overall objective of WP5 is to ensure the TRIATLAS project reaches all its project objectives as part of its obligations under the EC Grant Agreement. In particular, WP5 will:

- Ensure efficient scientific, administrative and financial management of the project
- Monitor project progress and take corrective actions if necessary
- Ensure efficient interaction with the European Commission and within the managerial bodies of the project
- Ensure and monitor efficient exploitation and dissemination of project results

Description of work

Task5.1: *Implementation of the management structures and procedures* (**UiB**) D5.1 UiB will set up the project office as described in Section 3.2 which will ensure professional administrative, legal and financial management of the project. This includes specifically: administration of the **grant agreement**, setting up a **consortium agreement**; **establish managerial bodies,** plan, organise and follow up a **kick-off meeting** (in Bergen). The scientific project manager will assist the coordinator in these tasks and will be in charge of day-to-day management of the project during the entire project period.

Task5.2: *Financial Management* (**UiB**), Ensure an efficient financial management in compliance with the Grant Agreement and Consortium agreement. The financial project manager will oversee the budget and timeline of the project on a day-to-day basis in order to ensure that the budget is adhered to and the project is completed on time; Transfer payments from the Commission to the Consortium in accordance to the Grant Agreement and the Consortium Agreement; Reviewing the individual beneficiaries financial statements and consolidating the report to the Commission; Day to day communication with beneficiaries regarding financial matters, giving advice on interpretation of the Grant Agreement and in particular the criteria for eligible costs.

Task5.3: *Facilitate efficient information flow and communication within the project and with the EC* (**UiB**), The project office will establish dedicated tools to facilitate smooth and targeted information flow within the consortium. This includes mailing lists for specific project management bodies (see Section 3.2), preparation and maintenance of a project internal website, and a regular project newsletter. Information flow towards the EC will be performed through personal contact with the project officer, and other bodies within the EC when relevant.

Task5.4: *Monitoring the progress of the project* (**UiB**) The project office will monitor all scientific, financial and managerial aspects of the project to ensure they are designed and implemented in such a way that the milestones and deliverables are achieved whilst complying with EU, legal and ethical requirements, and to take appropriate corrective measures when needed. This also includes coordinating the preparation of **Project Periodic and Final Reports**, as well as preparation, conduction and follow-up of **Annual Project Meetings**. The annual meetings are planned to be held in Cape Town, Cabo Verde, Germany, and Brazil, and this choice enables side-meetings with regional stakeholders to be held to promote project results and facilitate stakeholder engagement (WP4.4).

Task5.5: *Develop the PEDR and monitor its implementation* (**UiB**) D5.2 The plan for exploitation and dissemination of the project results (PEDR) as drafted in Section 2.2a will be fully developed and presented as D5.2. It will formulate respective activities of WP4.3 in detail, with concrete objectives, milestones and deadlines. The project office will be in charge of monitoring that the plan is implemented as planned.

Deliverables

D5.1: *TRIATLAS Consortium Agreement* (**UiB**, **month 1**)

D5.2: *Plan for exploitation and dissemination (PEDR)* (**UiB**, **month 3**) An initial plan is outlined in Section 2.2a.

Table 3.1c: List of Deliverables

Deliverable (number)	Deliverable name	Work package number	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
1.1.1	Dynamical characterisation of selected seamounts/islands/shelf-break systems in the tropical Atlantic and implications for conservations efforts	1.1	UFPE	R	PU	26
1.1.2	Physical processes in tropical upwelling regions	1.1	GEOMAR	R	PU	42
1.1.3	Role of ocean mesoscale in driving ecosystem responses	1.1	ENS	R	PU	36
1.2.1	Distributions of phytoplankton biomass, size structure and productivity	1.2	ULPGC	R	PU	30
1.2.2	Variability in zooplankton, biomass, diversity, size and trophic structure	1.2	FURG	R	PU	42
1.2.3	Zooplankton vertical migration and associated biogeochemical fluxes.	1.2	INIP	R	PU	36
1.3.1	First comparative mapping of pelagic and mesopelagic fish size spectra, biomass distribution and biodiversity	1.3	TI	R	PU	42
1.3.2	Comparative trophic structure of 4 LMEs in Central and South Atlantic investigated with standardised methodologies	1.3	ZMT	R	PU	36
1.4.1	Conceptual diagrams of drivers and pressures and state in case study areas	1.4	CAU	R	PU	6
1.4.2	List of contact points for sectors identified in 1.4.1 in case study areas	1.4	CAU	R	PU	12
1.4.3	Narratives of contextualized SSPs	1.4	CAU	R	PU	18
1.5.1	Report on food web metrics and physico-chemical and biological process rates of open ocean and neritic communities	1.5	UFPE	R	PU	24

Deliverable (number)	Deliverable name	Work package number	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
1.5.2	The current state of the tropical and subtropical Atlantic – The pelagic ecosystem, fisheries and its socio-economic dimension	1.5	TI	R	PU	48
2.1.1	Report on validation of TRIATLAS ESMs	2.1	CERFACS	R	PU	30
2.1.2	Report on the patterns of ecosystem variability in the TRIATLAS case study regions	2.1	IRD	R	PU	42
2.2.1	Report describing the large-scale physical drivers of climate variability and extremes, including marine heatwaves, which ultimately cause ecosystem variability, change and stability	2.2	UFSC	R	PU	30
2.2.2	Report synthesising climate and ecosystem variability, and evaluation of the relative impacts of physical and anthropogenic drivers across case studies, including the impact of regime shifts	2.2	CSIC	R	PU	47
3.1.1	Mid-term assessment of predictability and climate change, including relevant biogeochemical variables	3.1	BSC	R	PU	24
3.1.2	Final report on the limits of seasonal to decadal predictability and climate change uncertainties, including relevant biogeochemical variables	3.1	CERFACS	R	PU	48
3.2.1	Mid-project report on the improvements of integrated ecosystem models and configuration in each of the regional case-study regions	3.2	CSIC	R	PU	24
3.2.2	Final assessment of seasonal to decadal predictability and climate change scenarios simulations of ecosystems & fisheries	3.2	IRD	R	PU	48
4.1.1	Report on the description of sea-going training activities.	4.1	UFPE	R	PU	36
4.1.2	Report on Cross-Atlantic Network of Excellence in	4.1	FURG	R	PU	48

Deliverable (number)	Deliverable name	Work package number	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
	Marine Science					
4.1.3	Report on the artisanal fisheries self-reporting system	4.1	INDP	R	PU	46
4.2.1	Quantified SSPs for use in ecosystem models	4.2	CAU	R	PU	24
4.2.2	Impact assessments for case study areas and selected sectors and communities	4.2	CAU	R	PU	48
4.2.3	Report on the distribution of hotspots of biodiversity and of maritime activities in the Southwestern Atlantic	4.2	FURG	R	PU	42
4.2.4	Report on the assessment of the anchoita fisheries and its conversion to a consumption fisheries	4.2	FURG	R	PU	36
4.3.1	Data management and implementation plan	4.3	UiB	DEM	PU	3
4.3.2	Common disk space for data exchange established	4.3	UiB	DEC	PU	3
4.3.3	First version of project's data portal	4.3	UiB	DEC	PU	6
4.3.4	Report on available observational data and selected model data	4.3	UiB	R	PU	12
4.4.1	PR contacts	4.4	UiB	R	PU	5
4.4.2	Summarized report on events with stakeholders and policy makers UIB	4.4	UiB	R	PU	36
4.4.3	Project dissemination materials	4.4	UiB	R	PU	42
5.1	Consortium Agreement	5	UiB	R	PU	1
5.2	PEDR	5	UiB	DEM	PU	3

Table 3.1d: TRIATLAS models and experiments (existing and new)

ESM models						
Model name	Partner	CT and WPs	Model version	Region	Processes represented	Resolution
CNRM-ESM2-1	MF-CNRM CERFACS	CT2, CT3(WP3.1) CT4	Atmos.: ARPEGEv6 Ocean: NEMOv3.6	Global	3D, eulerian, thermodynamic, Navier-Stokes, nutrients chemistry,	LR: Atmos: 1.4 °, L91 Ocean: 1°, L75

			BGC: PISCESv2-gas		biological production	HR: Atmos: 0.5°, L91 Ocean: 0.25°, L75 Marine biogeochemistry coarsened at 0.75° (Berthet et al., in prep)
EC-EARTH ESM	BSC	CT2, CT3(WP3.1) CT4	Atmos: IFS Ocean: NEMOv3.6 BGC: PISCES	Global	3D, eulerian, thermodynamic, Navier-Stokes, nutrients chemistry, biological production	Atmos: 0.8°, L91 Ocean: 1°, L75
NorESM	UiB	CT2, CT3(WP3.1) CT4	Atmos.: CAM Ocean: MICOM BGC: HAMOCC	Global	3D, eulerian, thermodynamic, Navier-Stokes, nutrients chemistry, biological production	Atmos: 2°, L26 Ocean: 1°, L51
IPSL-ESM	ENS-LMD	CT2, CT3(WP3.1) CT4	Atmos: LMD Ocean: NEMOv3.6 BGC: PISCES	Global	3D, eulerian, thermodynamic, Navier-Stokes, nutrients chemistry, biological production	Atmos: 2°, L39 Ocean: 1°, L75

Marine Ecosystem Models						
Model name	Partner	CT and WPs	Model version	Region	Processes represented	
APECOSM	IRD	CT2, CT3 (WP3.2) CT4	APECOSM v3.2 + v4.0	- Atlantic - Benguela	3D, eulerian, size-based predation, DEB bioenergetics, passive transport, active movements, schooling	
OSMOSE	IRD	CT2, CT3 (WP3.2) CT4	OSMOSE v3.2	- Benguela	2D, lagrangian, size-based predation, growth, niche model, dispersal	
EwE	CSIC EII UCT UFRGN	CT2, CT3 (WP3.2) CT4	EwE	- Atlantic - Benguela - Nordeste	0D or 2D, eulerian, fixed predation, dissipation, niche model, dispersal	

Existing experiments (performed outside TRIATLAS) **					
Experiment description	Experiment framework	ESM	Partner	Resolution	Used in
piControl (500 years) historical (1850-2014) Scenarios (2015-2100)	CMIP6 CRESCENDO	CNRM-ESM2-1	MF-CNRM	LR : Atmos: 1.4°, L91 Ocean: 1°, L75	CT2, CT3
piControl (500 years) historical (1850-2014)	CMIP6	EC-EARTH	BSC and EC-Earth	Atmos: 1.4°, L91 Ocean: 1°, L75	CT2, CT3

Scenarios (2015-2100)		ESM	consortium	
Seasonal and decadal forecasts	CMIP6, Nansen Legacy Project	NorESM	UiB	Atmos: 2º, L26 Ocean: 1º, L51	CT3
Reanalysis 1980-2010	CMIP6	NorESM	NERSC	Atmos: 2º, L26 Ocean: 1º, L51	CT2, CT3
piControl (500 years) historical (1850-2014) Scenarios (2015-2100)	CMIP6 CRESCENDO	NorESM	UNI	Atmos: 2º, L26 Ocean: 1º, L51	CT2, CT3
piControl (500 years) historical (1850-2014) Scenarios (2015-2100) Decadal forecasts	CMIP6	IPSL-CM6	ENS	Atmos: 2º, L79 Ocean: 1º, L75	CT2, CT3

** NOTE: the multi-model ensemble CMIP6 will be also used for variability studies and forecast assessment in CT2/CT3

TRIATLAS Experiments to be performed in CT3

Experiment description	Performed in	ESM	Partner	Resolution
Perfect model predictability experiments with ESMs	Task 3.1.1 (WP3.1)	EC-Earth-ESM CNRM-ESM2.1 NorESM	BSC MF-CNRM UiB/UNI	Atmos: 0.8 º, L91 Ocean: 1° , L75 Atmos: 1.4 º, L91 Ocean: 1° , L75 Atmos: 2º, L26 Ocean: 1º, L51
Bias reduction experiment (wind forcing)	Task3.1.1 (WP3.1)	EC-Earth-ESM	BSC	Atmos: 0.8 º, L91 Ocean: 1° , L75
Impact of increasing resolution	Task3.1.2 (WP3.1)	CNRM-ESM2.1	MF-CNRM CERFACS	Atmos: 0.5 º, L91 Ocean: 0.25° , L75
Role of external forcing (dust)	Task3.1.2 (WP3.1)	CNRM-ESM2.1	MF-CNRM	Atmos: 1.4 º, L91 Ocean: 1° , L75
Data assimilation with ESMs	Task3.1.2 (WP3.1)	NorESM	NERSC/UNI	Atmos: 2º, L26 Ocean: 1º, L51
Seasonal forecasts (retrospective + real time)	Task3.1.3 (WP3.1)	CNRM-ESM2.1 EC-EARTH-ESM NorESM	MF-CNRM BSC UiB/NERSC	Atmos: 1.4 º, L91 Ocean: 1° , L75 Atmos: 0.8 º, L91 Ocean: 1° , L75 Atmos: 2º, L26 Ocean: 1º, L51
Decadal forecasts (retrospective + real time)	Task3.1.3 (WP3.1)	CNRM-ESM2.1 EC-EARTH-	CERFACS BSC	Atmos: 1.4 º, L91 Ocean: 1° , L75 Atmos: 0.8 º, L91 Ocean: 1° , L75

		ESM NorESM	UiB/NERSC	Atmos: 2º, L26 Ocean: 1º, L51
Scenario experiment	Task3.1.3 (WP3.1)	CNRM-ESM2.1	CERFACS UiB/NERSC	Atmos: 1.4°, L91 Ocean: 1° , L75

3.2   Management structure, milestones and procedures

3.2.1. Organisational structure and procedures for decision-making

The management structure of TRIATLAS follows the DESCA Model Consortium Agreement for H2020, and the specific management bodies have been assigned accordingly. A Consortium Agreement for the TRIATLAS project will be in place at month 1 of the project (see WP5, D5.1). TRIATLAS management bodies and their interaction is schematically summarized in fig 3.2.1, and described in more detail below:
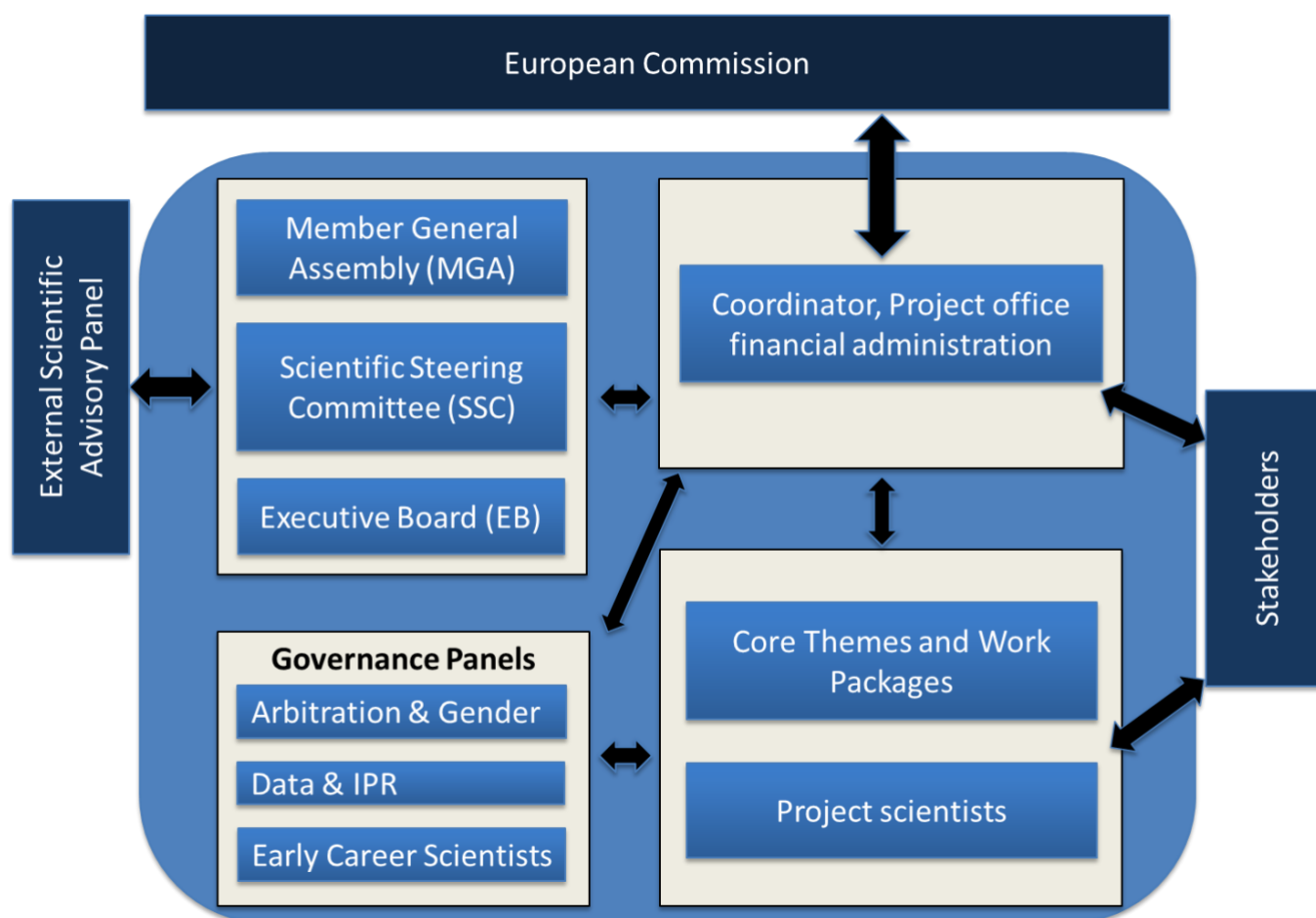
Figure 3.2.1: TRIATLAS management bodies and their interaction, and interaction with external bodies.

3.2.1.1 Decision-making bodies

The Members General Assembly (MGA)

Role and tasks: Ultimate decision-making body of the project

The MGA will be responsible for all major formal decisions regarding project strategy, amendments to the Description of Action, amendments to the Consortium Agreement, decision and allocation of the budget in accordance with the contract, and any change to the Consortium. Decisions in the MGA need 75% of the votes present at the meeting. The MGA will act upon proposal from the Scientific Steering Committee and the Executive Board and decide on the following issues:

- Political and strategic orientation of the project
- Any major change in the scientific plans
- Any major budget reallocation between partners
- Any alteration of the Consortium Agreement
- The acceptance of new Contractors as well as any exclusion of Contractors
- Any premature completion or termination of the project

Members: Each contracting institution will appoint one senior representative to attend the meetings (usually the **contact PI**), who is authorized to take decisions concerning the project on behalf of the institution. It should be a senior scientific person who knows the field of research and has the necessary experience and qualifications to take decisions on major scientific, administrative and financial issues as well as decisions on the use and exploitation of results. All contracting institutions will also be responsible for the allocation of the necessary administrative, scientific and financial resources to carry out the share of the project contracted to them.

Meetings: Once a year on the Annual Project Meeting. If needed, extraordinary meetings will be held.

The Scientific Steering Committee (SSC)

Role and tasks: Proper execution and implementation of the MGA decisions

The SSC will advise on the overall scientific policy, direction and management of the project to be decided by the MGA. All communication with the MGA will normally be through the Project Office. The responsibilities of the SSC will include:

- Acting on the initiative of the Executive Board (EB) on issues related to fulfilling the scientific objectives
- Assessing scientific progress against the objectives and, when necessary, making recommendations to the EB
- Approving all reports and implementation plans to the European Commission
- Providing advice on any call for and evaluation of new contractors, participants or partners that might be needed to finalize the project's objectives
- Linking with the External Scientific Advisory Panel and approbating any recommendation from this panel
- Giving recommendations to the EB on any scientific aspects it foresees as requiring ethical considerations

Members: The SSC includes the core theme leaders, one representative of the work package leaders (with the others as deputies), and the project coordinator with vice coordinator as deputy.

	Lead, and co-lead
Coordinator	Noel Keenlyside (UiB), Heino Fock (TI)
CT1	Heino Fock, Peter Brandt (GEOMAR)
WP1.1	Peter Brandt (GEOMAR), Moacyr Araujo (UFPE)
WP1.2	Emilio Marañón (UVIGO), Santiago Hernández León (ULPGC)
WP1.3	Werner Ekau (ZMT), José H. Muelbert (FURG)
WP1.4	Jörn Schmidt (CAU)
WP1.5	Heino Fock (TI), Ralf Schwamborn (UFPE)
CT2	Elaine McDonagh (UKRI), Astrid Jarre (UCT)
WP2.1	Elaine McDonagh (UKRI), Arnaud Bertrand (IRD)
WP2.2	Belen Rodriguez Fonseca (UCM), Astrid Jarre (UCT)
CT3	Roland Séférian (MF-CNRM), Emilia Sanchez-Gomez (CERFACS)
WP3.1	Roland Séférian (MF-CRNM), Emilia Sanchez-Gomez (CERFACS)
WP3.2	Olivier Maury (IRD), Ronaldo Angelini (UFRN)
CT4	Jörn Schmidt (CAU), José H. Muelbert (FURG)
WP4.1	José H. Muelbert (FURG), Gael Alory (IRD)
WP4.2	Jörn Schmidt (CAU), Luciano Dalla Rosa (FURG)
WP4.3	Benjamin Pfeil (UiB)
WP4.4	Gudrun Sylte (UiB)
WP5	Project Manager (UiB)

Meetings: Once a year on the Annual Project Meeting, and at least once in between by SKYPE.

Executive Board (EB)

Role and task: supervisory body for the project execution

The EB shall report and be accountable to the MGA. The EB will implement decisions on executive management, prepare decisions to be approved by the MGA, and ensure that adequate management is in place to monitor the science and perform quality control of deliverables. The EB will also decide on smaller issues which occur on a day-to-day basis and that do not warrant the involvement of a larger group for practical reasons. Major decisions and recommendations will be made with one vote per member of the EB. All communication with other Management Bodies will be through the Project Office.

The responsibility of the EB will include

- Enforcing decisions of the MGA
- Ensuring the preparation of reports and work plan
- Informing the SSC about project progress, any problems and risks encountered and any change in strategy

Members: The EB will include the project coordinator, the vice coordinator, two core theme leaders, and the project manager as minute writer. These will be appointed at the first SSC meeting.

Meetings: 4 times a year by skype or telecon. If needed, extraordinary meetings will be held.

Project office

Role and task: Implement professional management of the project, project PR office

The Project Office will be organized at UiB. It will be responsible for the day-to-day management of the project and acts upon decisions taken by the EB, the SSC and the MGA. UiB will also coordinate data management activities in collaboration with WP4.3, as well as dissemination, exploitation and communication activities in close collaboration with WP4.4.

Members: The **Project Coordinator** will be Noel Keenlyside at the University of Bergen (UiB). He has the overall responsibility for the management and delivery of the project as well as its representation to the outside world. He is the contact person to the European Commission for all major decisions. The **Vice Project Coordinator** Heino Fock at the Thünen Institute (TI) will act as **Deputy project coordinator** to fill in for the Project Coordinator when under exceptional circumstances he may be absent. The **project manager** assists the project coordinator in all detailed tasks, keeps the communication within the consortium running, helps to coordinate the work among the different work packages and panels, supports in problem solving, plans the project's kick-off and annual meetings together with the responsible host partner institute, compiles the periodic reports, and ensures that all deliverables as well as milestones are provided in time. The **financial/administrative** manager takes care of the correct distribution of funds, coordinates the financial reporting of the consortium, and provides assistance in legal issues. **The Bjerknes Climate Data Centre** hosted by the Geophysical Institute at the University of Bergen ensures that data created by the project are properly archived and disseminated along with enriched metadata according to the FAIR data management guiding principles as demanded for projects within H2020, that intellectual property rights are obeyed, and that the data sets archived undergo a rigorous quality assurance and control, see also Section 2.2a and WP4.3. The **communication manager** will coordinate and follow up all project communication activities, see also Section 2.2b and WP4.4.

Meetings: Daily interaction, meetings upon request

3.2.1.2 The governance panels

The governance panels represent cross-cutting activities between WPs and partners. They report and give expert advice to the decision-making bodies on their respective topics at 6 months intervals. Panels will be proposed and elected by the MGA on the project's kick-off meeting. Panels will meet at Annual Project Meetings; extraordinary meeting will be held if needed.

Early Career Scientist Panel

This panel provides a meeting point and network for all early career scientists (Master students, PhD students and Post-Doctoral Research Fellows) who work in TRIATLAS. The aim is to enhance integration and visibility of these scientists in the project, and to increase synergistic aspects among these scientists.

Members: all Master, PhD, Post Doc of the consortium, 2 of them to be panel leaders

IPR and Data panel

Management of intellectual property, knowledge and data will be regulated by the Consortium Agreement and the TRIATLAS data management plan as described in Section 2.2a. The Intellectual Property Rights (IPR) and data panel will be responsible for monitoring that IPR procedures are implemented according to the Consortium Agreement, and for clarifying (IPR) issues in case of conflicts (such as co-authorship, distribution and release of data by and to the consortium, breeches in following up the data management plan). The IPR panel will also give general advice to the EB about all aspects of IPR.

Members: the data manager (also leader of WP4.3) and 2-3 other members to be elected at the kick-off meeting.

Gender and Arbitration Panel

The members will make recommendations on relevant arbitration and gender issues and will report to the EB on minor issues and to the MGA on major issues. Typical tasks in gender related issues could be related to recruitment of TRIATLAS staff and monitoring of how special needs for female researchers are being taken into account in the various research and management activities. Arbitration issues could be to resolve conflicts among partners in relation to the project. Typical examples could be conflicts on authorship of publications based on results obtained during the project period. The panel will review the conflicts together with the involved partners and propose solutions. This process will be laid out in the consortium agreement.

Members: a gender balanced panel of 4 people from North and South partners of the consortium and representing different core themes.

3.2.1.3 Scientific advisory panel and stakeholder contact

The **External scientific advisory panel** will provide TRIATLAS with high-level advice on the scientific directions of the project, as well as exploitation and dissemination of project results. It will consist of the following distinguished scientists:

- **Ajit Subramaniam** is Research Professor at the Lamont-Doherty Earth Observatory of Columbia University. He uses remote sensing, ocean optics, phytoplankton physiology, biological and physical oceanography and geographical information systems to better understand how the marine ecosystem functions and can be managed. He works closely with biogeochemical oceanographers and ecosystem modellers, and uses satellite data to provide broader spatial and temporal scales to in-situ shipboard measurements and complement model results.
- **Molly Baringer** is the Deputy Director of the Atlantic Oceanographic and Meteorological Laboratory, and an observational oceanographer with a diverse background that spans a range of topics from the meridional overturning circulation, to quantifying the impact of observations on forecasts, to chemical transports of carbon in the ocean. She represents the interests of the laboratory (through management, leadership and interaction with stakeholders) that conducts basic and applied research related to oceans and climate, coastal ecosystems, and tropical meteorology. Specific areas of intersection with this program include AOML's work with marine fishery managers in the US to improve stock assessments through the use of environmental observations of ocean circulation features, climate model downscaling to predict climate impacts on fisheries and corals, and development of techniques to measure nutrient concentrations in the coastal zone.
- **Alistair Hobday** completed a BSc (Hons) in Biological Science at Stanford University, a PhD in Biological Oceanography at the Scripps Institution of Oceanography, and held a National Research Council Postgraduate Fellowship at the Pacific Fisheries Environmental Laboratory in Monterey, California. His research spans a range of topics, including spatial management and migration of large pelagic species, environmental influences on marine species, the impacts of climate change on marine resources, and development and testing of adaptation options for marine conservation, fisheries, and aquaculture. He leads the Marine Climate Impact and Adaptation area at CSIRO. In addition to his climate research, Alistair has co-led the development of risk assessment methods for assessing the ecological sustainability of Australia's fisheries. He was co-chair for the

international IMBER program CLIOTOP (Climate Impacts on Top Ocean Predators) from 2010-2015, and now serves on the Scientific Steering Committee.

- **Stefan Gelcich** is an assistant professor at the Pontificia Universidad Católica in Chile and a researcher with Center of Applied Ecology and Sustainability, where he is working on threats and impacts of global drivers on ecosystem services and policies. Gelcich oversaw a series of pilot projects on marine no-take zones in Chile. Through these projects, he examined the social and ecological conditions that facilitate the successful design and scalability of marine no-take-zones. Gelcich found that linking territorial user rights for fisheries and marine biodiversity conservation policies can be an effective way to manage biodiversity, especially in developing countries. Gelcich hopes to eventually develop a financial model concerning possible future economic incentives for no-take areas. His primary objective is to scale up marine conservation through the active participation of fishers.

Contact with Stakeholders will be coordinated by the communication manager and undertaken within WP1.4, 2.2, 4.1, 4.2 and 4.4. A list of various stakeholder groups will be established at the beginning of the project with help from project partners, and the project officer in Brussels. Many of the project partners have direct contact with regional stakeholders, belong to institutions (ministries) that are stakeholders, and are experience in interacting with stakeholders. Contact with stakeholders will be via email, special sessions arranged at annual meetings in South Africa, Brazil, and Cabo Verde, side events at conferences, and a policy session in Brussels. These are described in Section 2.2a and WP4.4.

3.2.1.4 Management procedures

Overall scientific management and decision making

Professional management and progress monitoring of the project will be organized through the arrangement and timing of the different work packages and tasks as presented in Section 3.1, in the Gantt chart, the concept diagram (Fig. 1.1). Milestones (see Table 3.2a) and deliverables (see Table 3.1c) serve as control points for the coordinator and will be monitored and followed up through an effective and transparent internal communication system as described below. Leads have been identified for all tasks, milestones and deliverables to ensure efficient management of the project (as indicated in bold in the work package tables). Operative tasks and procedures for project management and the concrete deliverables are described in WP5. Decisions will be made by the decision-making bodies as described above, with support and advice from the internal governance panels and the external advisory boards.

Table 3.2a: List of milestones

No.	Milestone name	Related WP	Due month	Means of verification
1	TRIATLAS website online	5, 4.4	3	Website url
2	Data management framework established	4.3	3	Execution of D4.3.1
3	Compilation of sources to identify and quantify where possible human activities affecting marine ecosystems (for D1.4.1)	1.4	3	Repository of available literature and list of regional experts
4	Initial agreement on common protocols and best practices for data collection (physical, biochemical, acoustic and biological)	1.1-1.3, 4.3	6	Table of best practices, protocols and data formats
5	Establishment of a list of stakeholder contact points for all relevant sectors (T1.4.1)	1.4, 4.4	6	Email communications with designated contacts
6	Recommendations on key climate and biogeochemical diagnostics and protocol for coordinated predictability experiments between climate and ecosystem modellers	3.1-3.2, 4.2	6	Diagnostics list and coordinated experiments protocol
7.	Cross-Atlantic Network of Excellence in Marine Science portal	4.1	6	Website url
8	List of observed data products including human social drivers that will be available to understand long-term ecosystem changes for all case study regions	1.5, 2.1 2.2, 3.1, 3.2, 4.3	12	Table of available data products, and updated data portal
9	Interdisciplinary summer school on prediction of the Atlantic ecosystem to be held in the first half of 2020	4.1	12	School program and list of participants

No.	Milestone name	Related WP	Due month	Means of verification
10	Ship-based training course in marine science instrumentation sampling, data flow and quality control	4.1	19	Course program and list of participants
11	Completion of local stakeholder consultation on current and possible future impact of different maritime sectors on marine ecosystems, for scenario selection for testing in conceptual models (T4.2.3)	4.2	22	Documentation of consultations performed with selected stakeholders
12	Revision of agreed common protocols and best practices for data collection (physical, biochemical, acoustic and biological)	1.1-1.3, 4.3	24	Revised table of best practices, protocols and data formats
13	Assessment of the relevance of collected and historical, and model data for establishing ecosystem climatology and climate-ecosystem variability	1.1-3.2	24	Workshop report (agenda, participants and main conclusions)
14	Observational data collected during the first 24 months of the project available for synthesis and analysis in CT2 and use in CT3	1.1-3.2, 4.3	24	Updated data portal
15	Exchange of key abiotic and biotic metrics and variability at different scales	2.1-3.2	24	Table of key metrics for ecosystem variability
16	Data from preliminary set of TRIATLAS ESMs experiments available to WP3.2 and WP4.2	3.1, 3.2, 4.2	24	Updated data portal
17	Summer school on integrated study of tropical marine ecosystems, from physics to seabirds	4.1	24	School program and list of participants
18	Prototype of self-reporting software	4.1	24	Software manual
19	Field phase test and start of self-reporting system	4.1	30	First fisherfolk reports
20	Questionnaires developed and distributed to local community and sector (urban, rural) representatives	4.2	30	Questionnaires and list of representatives
21	Ship-based training course in marine science instrumentation sampling, data flow and quality control	4.1	31	Course program and list of participants
22	Synthesis workshop for preparation of D1.5.2	1.1-1.5	36	Workshop report
23	Synthesis workshop for preparation of D2.2.2	2.1, 2.2	36	Workshop report
24	Sector-derived possible future scenarios developed for impact assessments	4.2	36	Description of set of scenarios
25	Provide ecosystem and fisheries scenario simulations for incorporation into CT4 scenarios	3.2, 4.2	42	Updated data portal
26	All TRIATLAS data long-term archived according to the requirements of the H2020 Open Research Data Pilot and FAIR	4.3	48	Updated databases

Internal communication

The TRIATLAS management structure enables a smooth information flow, both vertically (bottom-up and top-down) and horizontally among partners and management bodies (Fig. 3.2.1). Tools for internal information flow (see WP5, WP4.3) are the protected internal project website, dedicated email lists, and the project meetings. The target is to reach maximum transparency for all involved parties and hence increase synergy. In addition to their role as decision-makers in the SSC, the CT and WP leaders also mediate information flow between SSC and partner PIs, to ensure that the decisions of the MGA and SSC are followed up in the daily work on the project tasks. Partner PIs will mediate information flow to their institute co-workers. A regular project newsletter summarizing recent project activities and achievements will be created by the project office and sent to all project participants.

Reporting to the European Commission

The project coordinator, supported by the project manager, is responsible for communication with the European Commission and for coordinating the continuous and periodic reporting (see WP5). Deliverable reports will be compiled by the responsible partner and quality-checked by a WP or CT leader before formally approved by the project coordinator and submitted to the EC. For periodic reporting, WP leaders will collect information on the progress in their WP and send them to CT leaders and the Project Office. All formal scientific reports and the final report to the Commission will have to be accepted by the SSC. The scientific project manager coordinates, facilitates and supervises the reporting processes.

Project meetings

The project Kick-off meeting marks the effective launch of the project (see WP5). It reinforces the consortium's commitment to the shared project goals and clarifies the responsibilities of each in the endeavour. Annual project meetings (see WP5) involve the entire consortium and will take place at months 12, 24, 36 and 48 or very soon thereafter. The kick-off meeting is planned to take place in Bergen, and the annual meetings are planned to be held in Cape Town (Astrid Jarre), Cabo Verde (Carlos Santos), Germany (Heino Fock), and Brazil (Moacyr Araujo); with contacts already identified. SSC, EB meetings and meetings of the different boards and panels will be held on these annual meetings, and will report and provide feedback to the MGA. Workshops associated with milestones/deliverables are also planned to coincide with annual meetings to save travel costs. Work packages will report on their progress in plenary and plan their work for the next project period in break-out sessions which allow for cross CT or WP interaction when necessary.

Gender action plan

Questions such as: 'Whose interests and needs are served with TRIATLAS?' 'Who will be the users of the knowledge that is to be produced?' and 'Who can benefit and in which way from the research?' will be of particular relevance for WP1.4, WP2.2, and WP4.2 e.g., for having a gender perspective when identifying stakeholders. The Gender Action Plan of TRIATLAS will be a working document to promote discussion and management of gender issues within the project structure and consortium. It will be formulated, implemented and monitored by the Gender and Arbitration Panel. Particular goals are: Promote gender equality in recruitment; Promote gender equality in capacity strengthening activities; Increase the visibility of female scientists in TRIATLAS; Develop avenues of support to enable scientists with small children to participate in project meetings and conferences and to have more flexibility in working time; Invite women to scientific and organizing committees.

3.2.2 Appropriateness of the management structures and procedures

Due to its large consortium (35 partners), the project can be considered as large by the DESCA definition. The management structure of TRIATLAS therefore follows the DESCA recommendations for "Governance structure for Medium and Large Projects", which recommends, in addition to the Member General Assembly and the Steering Committee, an Executive Board as the supervisory body for the execution of the project, and a Management support team (Project office) to assist the Executive Board and the Coordinator.

The governance panels support the decision-making management bodies with expert advice and take responsibilities for special tasks as described above. By this they contribute to solving conflicts, and enable visibility and fair treatment of all groups of researchers represented in the project and of their research results.

The external scientific advisory panel gives advice on the scientific progress of the project. A stakeholder body will be composed of selected individual (contact points) of the various relevant stakeholder groups. This body will facilitate co-design of research, co-production of knowledge (through tailoring of factsheets), and the dissemination and exploitation of project results.

The clear roles and tasks of the different management bodies enable clear and straight management procedures as described above. The milestones plan will enable the project office to keep track on the project progress as promised in the work plan (see Section 3.1). **We therefore consider the proposed management structure and procedures as appropriate to manage a project of this size and complexity, and to enable the project to reach its scientific and strategic objectives.**

3.2.3 Innovation management

The major innovation potential of TRIATLAS lies within the proposed advances in numerical modelling and prediction, and the development of new observation and fisheries monitoring tools (see Section 1.4 – Innovation potential). Innovation management and Management of IPR in TRIATLAS is therefore closely linked to management of data and data products, which is described in detail in Section 2.2a, and will also be outlined in the

project's Consortium Agreement (D5.1). The management of IPR from technical innovations such as the next-generation in-situ tools for particle and zooplankton recording, and the mobile data collection tool for small-scale fisheries (see Section 1.4 and Table 2.2) is also described in detail in Section 2.2a. Management of data and IPR will enable a smooth and responsible dissemination of this foreground knowledge to relevant stakeholders, and by this facilitate its exploitation. Procedures and strategies for Exploitation and Dissemination of the project results will be described in more detail in the PEDR (D5.2) which is outlined in Section 2.2a. Conflicts in the management of IPR and data will be dealt with by the IPR and data panel as described above.

3.2.4 Risks and risk management
Critical scientific/technical as well as managerial risks, their likelihood level and proposed mitigation measures are indicated in Table 3.2b.

Table 3.2b: Critical risks for implementation

Description of risk *(level of likelihood: Low/Medium/High)*	WP involved	Proposed risk-mitigation measures
Scientific/technical risks:		
Deployment/recovery of observational equipment fails or cruise cancelled (technical problems, piracy risk in the area) *(low-medium)*	1.1,1.2	Participants will strive to find other opportunities (other ships) to deploy/replace equipment. Equipment measuring continuously can be recovered upon a later cruise such that data is not lost.
Exchange of biological samples is hampered *(low)*	1.2,1.3	All participants will follow the Nagoya ABS protocol and sign respective agreements
Data sharing hampered by technical (internet speed, formats, data volumes) or personal (ownership) issues (low)	1.1-3.2, 4.2-4.4	Data manager and participants are experienced in sharing data and can finding solutions when difficulties arise (sending disks, data conversion); partners are obliged to adhere to open data sharing as outlined in the data management plan.
Numerical simulations delayed by technical issues or insufficient access to computing resources (low)	3.1,3.2, 4.2	Participants are experienced with using all TRIATLAS models and have technical support available to resolve issues, and have access to several computing platforms; One of the other TRIATLAS ESM and ecosystem models or earlier model versions can be used as a fall back option
Contact to relevant stakeholder groups cannot be made *(low)*	1.4, 2.2 4.2	Participants are experienced in stakeholder engagement and local partners have already contact to relevant stakeholders, particularly in the fishing sector
Managerial risks:		
Central project personnel (coordinator; CT/WP leader; management team member) become unavailable (low)	all	Vice/co-leaders steps in, new deputies recruited from consortium, another management team member step in
Delays in reporting and communication because of large size of consortium (low)	5	Robust management structures with clear roles and procedures; experienced management team
Project activities and results not considered or understood by the different target audiences (medium)	4.4	Clear plans for dissemination and communication of project results, robust communication management structures, communication manager formulates messages targeted towards each audience
Communication in English can be a challenge for some partners (low)	All	Project office co-workers are fluent in French and Portuguese, good experience from previous project collaboration

3.3   Consortium as a whole

The consortium partners in CT1 comprise expertise for both the North and South Atlantic and contribute in the respective work packages. In terms of ecosystem research, partners have excellent expertise in long-term monitoring in the North Atlantic in tropical, temperate, boreal and subarctic waters. With regards to fisheries research and marine oceanography TI, GEOMAR, IMR, UiB are outstanding institutions with focus over the

Greenland, Irminger Sea, North Sea, and Nordic Seas; ULPGC, GEOMAR, UVIGO on North Atlantic and Canary Current Large Marine Ecosystem. With regards to long-term fisheries and ecosystem monitoring in the South Atlantic, DAFF, UCT, UNAM, INIP, IMR, UFRPE, UFPE have a large experience. The consortium has also expertise in dedicated large scale sampling campaigns in the tropical, subtropical Atlantic (AWA project; TI, GEOMAR, ZMT, IRD); in designing, implementing and analysing trans-basin mooring arrays RAPID and SAMOC (UKRI, ENS). The consortium has also participated in relevant projects: PREFACE (GEOMAR, TI), MAFIA (ULPGC), ABRAÇOS and TAPIOCA (IRD, UFPE, UFRPE), and focussed experimental field studies (GEOMAR (SFB 754), UVIGO, ULPGC). This provides an excellent foundation for evaluating the state of the whole Atlantic.

Several partners have contributed to specific reports of the World Ocean Review (WOR5: ZMT, WOR4: CAU, WOR2: TI), and the UN World Ocean Assessment. They have participated as lead-authors to the IPBES global assessment of the state of biodiversity and the ecosystem services it provides to society (IRD, UCT), to the IPBES European and Central Asia regional assessment (CSIC), and to the IPBES Deliverable 3(c): Policy support tools and methodologies for scenario analysis and modelling of biodiversity and ecosystem services (IRD). Some partners are also involved in assessments of marine ecosystem state and trends globally through the IndiSeas programme (IRD, UCT, CSIC, UCT), and have been dealing with MSFD assessment procedures at national and regional level (TI) or regional ecosystem assessments (UCT). In addition, several partners are involved within the H2020 RISE project PADDLE, whose objective is to analyse opportunities and limits of marine spatial planning in the Tropical Atlantic.

In terms of marine ecosystem field, partners have achieved a fair balance between European partners and Brazilian and African partners. Taking into account the operation ranges of the different observation platforms and vessels, field campaigns are proportionally assigned to partners with regards to inshore and coastal waters as well as offshore waters.

CT2 includes expertise in the analysis of physical and ecosystem observations and expertise in modelling those physical and biological systems on a range of time and space scales. This core theme forms a bridge and shares investigators with CT1 (observations) and CT3 (modelling) described elsewhere. CT2 will make the links between physical, biogeochemical and ecosystem variability and examine the physical and human drivers of that variability. To that end, the team brings particular expertise in extreme events (UFSC), and regime shifts from a social-ecological systems perspective (UCT). ENS is an outstanding contributor to the SAMOC array and an expert on the structure and drivers of the mesoscale circulation and its impact on the large scale. UKRI leads the UK's ABC fluxes program that adds biogeochemistry to the large scale circulation measured by the RAPID array at 26.5N. CT2 furthermore involves scientists with specific experience in the complex interrelationships between human social drivers, pressures and impacts in all three case studies (UFRN, UFRPE, UCT). They will collaborate with specialists in air-sea interactions and atmospheric drivers (UCM) and ecosystem modellers (CSIC, UCT, UFRN) to jointly assess the relative importance of the various drivers of variability and change.

The consortium also integrates partners with a high background in climate modelling and climate prediction from seasonal to decadal timescales (UiB, NERSC, UNI, CERFACS, MF-CNRM, BSC). The climate modelling institutions involved in TRIATLAS (CT3) largely contribute to the development and implementation of state-of-the-art climate and ESM models that participate in CMIP6 (NorESM, CNRM-ESM2.1, EC-Earth, IPSL-CMIP6). They participate (or have participated) in relevant EU-proposals related to model improvements and climate prediction (SPECS, PREFACE, CRESCENDO). With regard to climate variability and predictability the consortium have contributed to a number of leading studies on this topic with a highly international recognition (UiB, BSC, CERFACS, MF-CNRM, UCM). Some partners have been or are contributing and leading authors of the 5th and 6th Assessment Reports (AR5, AR6) of the IPCC (MF-CNRM, CERFACS, BSC). There is also a considerable expertise in data assimilation approaches (NERSC, UNI) for the ocean to provide initial conditions for climate forecasting. The ecosystem modelling groups involved in TRIATLAS are amongst international leaders in the development and use of integrated end-to-end ecosystem models (CSIC, IRD, UCT). The models that they have developed (EwE, APECOSM, OSMOSE), which will be used in the project, are all contributing to the ISIMIP marine ecosystem and fisheries model intercomparison program FishMIP. These groups have a high international recognition in the field. They have all been involved in the development of climate-driven marine ecosystem scenarios using their models at global and regional scales.

As shown above, the partners have considerable expertise in EU projects. To coordinate the project and ensure the proper integration of all aspects and disciplines, UiB has an experienced team that can build upon the proven

workflow of the PREFACE project. Additionally, several partners (UCT, ZMT, DAFF, GEOMAR, FURG, UFPE, UFRPE, CAU, UniCV, INDP) have an experience of several years of cooperation in international projects.

CT4 is covering all aspects regarding capacity development, stakeholder engagement, data management and outreach. Therefore, the expertise of partners in CT4 cover capacity development, especially on oceanography (UNAM, FURG, UniCV) and fisheries (INDP, TI, ZMT), with experience in on-board training (FURG, UFPE) and running summer-schools (UNAM, IRD, UCT, UiB) , stakeholder engagement (FURG, CAU) and data management and outreach (UiB). CT4 will use the academic expertise of TRIATLAS participants to initiate a Cross-Atlantic Network of Excellence in Marine Science (CANEMS), a collaborative effort to maximize capacity strengthening in the Atlantic Ocean. Capacity development will be organised and led by partners bridging the Atlantic from South America (FURG, UFPE) to Africa (UNAM, INDP, UniCV) supported by European partners (TI, CSIC, ZMT, IRD). This initiative will specifically support early career scientists in developing capacity for ocean and ecosystem observation and modelling through exchange of Master and PhD-students in on-board training and summer-schools. CT4 will also support all other CTs with respect to stakeholder dialogue and exchange of knowledge between different user groups. Partners have been part of large EU projects in the region like PREFACE (INDP, TI, CAU, UiB) and RISE (IRD, UFPE, ZMT) and collaborative projects like AWA (IRD; ZMT, INDP, CAU). Specific knowledge is available on translating science into advice and perform integrated ecosystem assessments through leading roles in intergovernmental organizations like the International Council for the Exploration of the Sea (CAU, TI). ICES is also a link to science in the North Atlantic and links to governance structures in the EU (DG MARE and DG ENV) and other international bodies like Regional Fisheries Management Organizations (RFMOs, North Atlantic Fisheries Organization (NAFO), North East Atlantic Fisheries Commission (NEAFC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT)). Partners have also close links to marine and fisheries governance structures in the South like the Sub-Regional Fisheries Commission (INDP) and the Benguela Large Marine Ecosystem Programme (UNAM). UiB has successfully handled the data management for large EU projects CARBOOCEAN, CARBOCHANGE, COCOS, GEOCARBON and PREFACE, and member of the OECD Global Science Forum expert group on International Coordination of Cyber-infrastructures for Open Science. UiB has also longstanding expertise in Dissemination, Exploitation and Communication.

Non-European partner countries

TRIATLAS includes 14 partners from Brazil and African countries bordering the Atlantic. These partners are all eligible for funding according to the BG-08 call. Importantly, they bring essential local competences as described above.

Involvement of commercial partners

The development of data collection technology based on mobile devices offers a prospect for further commercial use in terms of adopting software and IT infrastructure, maintenance and support. A commercial partner however is not involved at this stage of the project. The main exploitation of project results is of scientific and political nature or directly beneficial to local communities, and relevant stakeholders will be involved as explained in Sections 2.1 and 2.2.

3.4   Resources to be committed

All 35 participants have a valid role in the project, and TRIATLAS requests 11 m EUR to ensure that all participants have adequate resources in the project to fulfil their roles. TRIATLAS has set in order to achieve its ambitious goals that necessitate research activities that extend over entire Atlantic; are interdisciplinary; include many partners from the north and south; include observational and capacity strengthening programs; include a wide range of (ocean, climate, ecosystem and impact assessment) models; involve stakeholders, and have extensive dissemination and exploitation measures. Together these activities address the BG-08 call and support the implementation of the Belém Statement.

Personnel costs

The major part of the project budget is dedicated to personnel costs, amounting to ~77% of the total budget and summarised in Table 3.4a. TRIATLAS will count with a total of 2088 person-months (PM) to develop its activities and reach its objectives. The staff effort allocation to the different WPs is proportional to the challenges to be addressed and to the complexity of the work involved. CT1 with research extending over 6 key areas, with 5 WPs, and involving observational component has 50% of the total PM. CT2 with mix of observational and modelling

analysis focusing on three case studies, with 2 WPs, has 20% of the total PM. CT3 contains the modelling and prediction activities, with 2 WPs, has 20% of the total PM. CT4 has the remaining 7% of the total PM, with 3% allocated to impacts assessment and 3% to capacity strengthening. Project management (including data management and communication and dissemination in CT4) amounts to 7% of the total PM; this amount is justified given the complexity of the consortium, and exploitation and dissemination measures that extend from Europe to Africa and Brazil.

The share of budget received by each partner is proportional to the costs required to perform the tasks they are involved in, considering both concrete work tasks and tasks within management and coordination such as WP and CT leads. The coordinating institution (UiB) has the largest requested PM contribution as it contributes to 3 scientific WPs and is leading WP 4.3 (Data Management), WP4.4 (Dissemination and Communication) and WP5 (Project Management). Most partners have been allocated between 24 to 48 PM ensuring sustained contribution to the project. Several other partners (GEOMAR, IRD, UCT, INIP, FURG, UFPE, UFRPE, UFRN) have substantially more than 48 PM. These partners generally consist of several teams contributing to several different WPs. A few partners have only around 12 PM allocated (IMR, UNI, SU), and are included to provide specific competence and are generally closely associated with bigger partners (e.g., UiB). DAFF provides a key data to the project, and as is a national department of the South African government only requests minor costs to participate in the project.

The distribution of costs among the different regions (Europe - 77%, South Africa - 7%, Brazil - 11%, and other African countries - 5%) ensures proper integration of non-European partners into the consortium and is consistent with vision of Belém Statement. Thus the necessary expertise from the region is included in the project, and this will allow strengthening of both south-south and south-north cooperation.

Other costs

Apart from personnel costs, UiB budget other indirect costs amount to ~266 k EUR. These are to cover the costs for the project meetings and stakeholder events, the travel costs for the members of the External Scientific Advisory Board and invited stakeholders, a science-policy meeting in Brussels, clustering activities with related projects, costs for the dissemination material in various formats, for networking with the European Commission and being present at relevant international events as outlined in Section 2.2, and for capacity strengthening activities (see below).

Several project partners claim costs connected to travel, expensive research consumables, cost for open access publication and computing costs in addition to personnel costs, see Table 3.4b below. Justification for other major budget items is now described.

Observations (~13% of total budget)

TRIATLAS will focus on field work and seagoing experiments to better understand the drivers and stressors of the marine ecosystem in the Tropical and South Atlantic. The planned activities that are based on applying state of the art equipment, facilities and technology will contribute to sustain and enhance the Tropical and South Atlantic observing system established by the international research community. TRIATLAS will contribute to continue and enhance long-term ocean observatories, like e.g. the PIRATA network, the Cabo Verde Ocean Observatory (CVOO), moorings at the western (off Brazil) and eastern (off Angola) boundary and along the equator. TRIATLAS will perform a large number of research cruises into the tropical and South Atlantic bringing together scientist, technicians and students from different fields including physical oceanography, biogeochemistry, biology, and fisheries and from different countries in Africa, South America and Europe. TRIATLAS will thus establish new and improve existing links between different countries and institutions and between different disciplines. The largely interdisciplinary cruises will apply modern instrumentation to study physical, chemical and biological processes at the same time aiming to improve the system understanding of the tropical and South Atlantic ecosystem.

TRIATLAS will invest 620 k EUR through UKRI and ENS in the observing array at 34.5S (WP1.1). This array is the flagship project of the SAMOC group and represents a multimillion Euro investment by multiple nations (US, Brazil, Argentina, South Africa, France) that was first deployed in 2009. TRIATLAS will enhance the array through a full-depth mooring (including temperature, salinity and direct velocity measurements) at the western boundary (UKRI) and enhancement of the instrumentation in the eastern part of the array (ENS), deployed for up to three years. The UKRI mooring is new and was the key recommendation for an enhancement to the array that came out of the joint UK-US-Brazilian-Argentinian-French-South African COCOA (Collaboration of overturning circulation observing arrays in the Atlantic) Workshop that was held at UK in July 2015; the ENS observations

make up a core part of the array. TRIATLAS will gain considerable added value from the national contributions but also benefit from direct in-kind contribution of Argentinian and South African ship time for mooring deployments. These observations will be used to characterise time-series of circulation from the mesoscale to basin scale. In addition TRIATLAS will directly observe ecosystem-relevant parameters using autonomous floats, deployed in mesoscale feature (eddies), that have bio-relevant sensors on them, deployed at 34.5S. We will further analyse these observations to relate the integrated effect of the circulation on regional ecosystem-relevant metrics in WP1.1 and WP2.1 and relate these time series to drivers of variability in WP2.2. This analysis will also include other observation from, for instance, satellites and Argo.

Capacity strengthening

TRIATLAS commits 200 k EUR to capacity building and training with/in countries bordering the South and Tropical Atlantic Ocean. These funds will support sea-going training of students, two summer schools, and the missions of scientists to lecture at graduate programs participating in the Cross-Atlantic Network of Excellence in Marine Science (CANEMS). These activities will provide essential training essential for master and PhD students to them perform work within TRIATLAS and contributing to meet the projects objectives; and represents a unique opportunity to foster a next generation of young scientists in the Atlantic Ocean within the scope of BG-08 and the Belém statement to promote and facilitate human capital development and scientific exchange and to bring together a new generation of marine scientists and strengthen the Atlantic Research and Innovation Cooperation. As such, TRIATLAS will provide support to the new WASCAL program on Climate Change and Marine Science hosted by UniCV, Mindelo. WASCAL (West African Science Service Centre on Climate Change and Adapted Land Use) is a large-scale research-focused Climate Service Centre designed to enhance the resilience of human and environmental systems to climate change and increased variability. WASCAL is implemented in a collaborative effort by West African and German partners (amongst others BMBF).

Complementary resources

TRIATLAS is an ambitious project and its real cost is actually much higher than the amount indicated as total costs in the budget tables. It is difficult to accurately estimate these costs, but to provide an idea of their magnitude we have listed below examples of the resources that will complement the TRIATLAS project from several partners: these complementary resources will be brought into the project by the participation institutions, thanks to own funds and funds provided by national science foundations. The complementary resources listed below cannot be pinned down to an exact value, but the order of the estimates provided is believed to be right. They show the commitment of the partners to the project and indicate the add value of the EU funding. Resources of the proposed project complementing the EU contribution are the following (listed per partner institution):

- Costs associated with 5 ship cruises planned to collect new data for work in CT1 amounts to 5.2 m EUR. The costs of ship time are estimated to be between 10-30 k EUR per day. These particular cruises are German funded and carried out by GEOMAR, ZMT and TI. FURG in addition is contributing around ~0,8 m EUR in ship time;
- All partners will contribute up to 15 PM in terms of in-kind personnel costs. Significant contributions will be: IRD contributes 70 PM (~500 k EUR), FURG contributes 288 PM (~450 k EUR), , UCT contributes 60 PM (~80 k EUR).

Table 3.4a: Summary of staff effort in person months (PM). *Cells in blue and bold indicate the WP leader and co-lead. Note PM have been rounded up.*

Participant	CT1 WPs 1.1	1.2	1.3	1.4	1.5	CT2 WPs 2.1	2.2	CT3 WPs 3.1	3.2	CT4 WPs 4.1	4.2	4.3	4.4	WP 5	Total PM
1. UIB						6	6	42				**12**	**16**	**48**	130
2. GEOMAR	**34**	16			13	14									77
3. NERSC								22							22
4. IMR						10									10
5. TI			33		**12**					3					48
6. ZMT			**29**		1					2					32
7. CAU				**11**							24				35
8. MF-CNRM									**39**						39
9. CERFACS						9			**36**						45
10. IRD	42		38			**19**			82	1					182
11. BSC								42							42
12. UCM					6	12	**21**	9							48
13. UCT	61					40	**20**		23						144
14. INDP	23			10	5					11					49
15. INIP	50	35	60												145
16. UVIGO		**32**			7										39
17. ULPGC		**48**													48
18. UFHB	20														20
19. CRO	26					13									39
20. UKRI	19					**29**	17								64
21. UAC-ICMPA	29														29
22. FURG	24	24	**42**							**12**	48				150
23. UFPE	**35**	18	18		23	12				14					120
24. UFSC							60								60
25. UFRPE			42	42	25	12	12		30						163
26. NUIG		18													18
27. UNI								11							11
28. ISRA-CRODT			18												18
29. CSIC						2	16		18	1					37
30. ENS	12					6	18	12							48
31. UniCV	5		5		1					11					22
32. UFRN							48		**48**						96
33. DAFF															-
34. SU	4	6			2										12
35. UNAM			20		7	20				1					48
Total PM	384	197	305	63	101	184	238	212	201	56	72	12	16	48	2088
% of total PM	50%					20%		20%		7%					100%

Table 3.4b: 'Other direct cost' items (travel, equipment, other goods and services, large research infrastructure)

1 / UiB	Cost (€)	Justification
Travel	161 349	To participate in project meetings and conferences. Travel funds for summer schools. Travel funds for International Scientific Advisory Board and invited stakeholders, networking and clustering
Other goods and services	104 480	Hosting project meetings and workshops, dissemination material and activities, publications, audit
Total	265 829	
2 / GEOMAR	**Cost (€)**	**Justification**
Travel	25 000	Travel to project meetings, workshops, conferences, travel to expeditions and experiments at sea
Other goods and services	130 000	CFS, mooring consumables (batteries, wires, etc.), glider consumables (batteries, telemetry, etc.), transportation of instruments; spare parts for UVP5, shipping of UVP5, Consumables for Zooplankton sampling (fixative, bottles, tin cups), data storage
Total	155 000	
4 / IMR	**Cost (€)**	**Justification**
Travel	36 267	To participate in project meetings and conferences
Total	36 267	
7 / CAU	**Cost (€)**	**Justification**
Travel	14 000	To participate in project meetings and conferences
Other goods and services	89 000	Audit costs, publications, observations costs
Total	103 000	
10 / IRD	**Cost (€)**	**Justification**
Travel	15 000	To participate in project meetings and conferences
Other goods and services	157 000	Audit costs, Aquadopp currentmeters for 6S-83 PIRATA buoy, material for maintenance 0E-0N equatorial ADCP moorings, 2 T/C sensors SBE-37-IMP for 6S-8E PIRATA buoy
Total	172 000	
14 / INDP	**Cost (€)**	**Justification**
Travel	6 750	To participate in project meetings and conferences
Other goods and services	14 151	Field work and analysis
Total	20 901	
15 / INIP	**Cost (€)**	**Justification**
Travel	19 000	To participate in project meetings, surveys and conferences
Other goods and services	19 395	Inception meeting, workshops, sample reading, Data analyses and publication, including language editing
Total	38 395	
16 / UVIGO	**Cost (€)**	**Justification**
Travel	10 404	Travel to project meetings, workshops, and conferences
Other goods and services	72 000	Consumables for phytoplankton abundance and primary production measurements (incl. radioisotopes and other chemicals, flow cytometry supplies, expedition shipping costs, and analytical costs)
Total	82 404	
17 / ULPGC	**Cost (€)**	**Justification**
Travel	12 000	Travel to project meetings, workshops, conferences and oceanographic cruises
Other goods and services	46 000	Publication costs, transport of equipment for cruises, spare parts for samplers and acoustics

Total	58 000	
18 / UFHB	**Cost (€)**	**Justification**
Travel	8 000	Travel to project meetings, workshops and conferences
Other goods and services	500	Publications costs
Total	8 500	
19 / CRO	**Cost (€)**	**Justification**
Travel	8 000	Travel to project meetings, workshops and conferences
Equipment	1 000	Onset thermometers
Total	9 000	
20 / UKRI	**Cost (€)**	**Justification**
Travel	68 441	Participation in TRIATLAS project meetings, interaction with data scientists, travel and subsistence for mooring deployment and recovery cruises.
Other goods and services	123 937	Audit; consumables for tall mooring, wire, batteries, shackles, swivels, anchors; shipping equipment to and from cruises
Total	192 378	
21 / UAC-ICMPA	**Cost (€)**	**Justification**
Travel	8 000	Travel to project annual meetings, workshops and conferences
Other goods and services	2 100	Publication in international journal and PhD student participation to scientific others seminars and workshop
Total	10 100	
22 / FURG	**Cost (€)**	**Justification**
Travel	48 900	Travel to project annual meetings, workshops and conferences. Travels for sea-going training.
Other goods and services	46 230	Publications, observations costs, ship costs
Total	95 130	
23 / UFPE	**Cost (€)**	**Justification**
Travel	84 880	Travel to project meetings, workshops, conferences summer schools and sea works
Other goods and services	44 880	Sea-going training, publication costs, batteries for ADCPs
Total	129 760	
24 / UFSC	**Cost (€)**	**Justification**
Travel	12 000	Total of 4 round trips Brazil-Europe for TRIATLAS workshops and/or meetings
Other goods and services	3 200	Total of 2 publication fees
Total	15 200	
25 / UFRPE	**Cost (€)**	**Justification**
Travel	38 400	4 scientists to annual meetings of the project
Other goods and services	22 400	Laboratory material, open access journals
Total	60 800	
26 / NUIG	**Cost (€)**	**Justification**
Travel	4 800	Travel to project meetings, workshops and conferences
Other goods and services	27 700	Consumables for Flow Cytometry, Membrane Inlet Mass Spectrometer and reagents for chemical analysis.
Total	32 500	
28 / ISRA-CRODT	**Cost (€)**	**Justification**
Travel	10 400	Travel to project meetings, conferences and workshops
Total	10 400	
29 / CSIC	**Cost (€)**	**Justification**

Travel	21 800	Travel to project meetings, workshops and international conferences
Equipment	4 000	Hardware multicore workstation for running spatial simulations
Other goods and services	12 500	Software licencing (ArcGis, Adobe and Visual Studio), fee for open access publications
Total	38 300	
30 / ENS	**Cost (€)**	**Justification**
Travel	34 900	To participate in TRIATLAS annual meetings, oceanographic cruises, international conferences and WP meetings
Equipment	100 000	Deep oceanographic moorings, additional sensors for Argo profiling floats and moorings
Other goods and services	52 060	Scientific publications, Shipping for moorings and Argo floats, Consumables for moorings (frames, batteries, weights, releases, and spheres), hard disks, audit costs
Total	186 960	
31 / UCV	**Cost (€)**	**Justification**
Travel	9 150	Travel to project meetings, conferences and workshops
Equipment	12 300	Lab equipment (software for hydroacoustic data visualization and analysis, inverted microscope, plate stirrer, vortex stirrer, etc.)
Other goods and services	8 000	Consumables
Total	29 450	
32 / UFRN	**Cost (€)**	**Justification**
Travel	25 800	Travel to project meetings, workshops and conferences
Other goods and services	3 800	Workshop organization in Brazil
Total	29 600	
33 / DAFF	**Cost (€)**	**Justification**
Travel	12 800	Travel by DAFF staff (2) to project meetings
Total	12 800	
34 / SU	**Cost (€)**	**Justification**
Travel	3 200	Travel to meetings and workshops
Other goods and services	36 000	3 disposable cameras to be mounted on floats
Total	39 200	
35 / UNAM	**Cost (€)**	**Justification**
Travel	5 750	Travel to project meetings, workshops and conferences
Equipment	2 900	Otolith saw and diamond blades for otolith slicing for chronologies
Other goods and services	4 150	Material needed for otolith preparations: Casting resin, glue resin, microscope slides, shipping of otoliths, etc. Open access fees or submission fees for publications.
Total	12 800	

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Section 4: Members of the consortium

4.1 Participants

01 University of Bergen UiB

Description of the organisation

The University of Bergen (UiB) www.uib.no is an internationally recognised research university with more than 14,500 students and close to 3,500 employees at 7 faculties. Yearly around 250 candidates are awarded with a PhD degree. The University is engaged in the European Union's Framework programmes for research and technological development and has been designated as a European Research Infrastructure and a Research Training Site in several scientific fields. UiB has so far completed more than 150 EU research projects, about 20% of them as coordinator. UiB is currently involved in 69 H2020 collaborative research projects, 18 of which it coordinates. UiB researchers and administrators receive professional support from a dedicated research support team consisting of advisers from different divisions such as finance, research administration and communication during applications and for project management.

The Geophysical Institute (GFI) has attracted most EU funding of all institutes at UiB and is currently partner in 14 collaborative EU projects, one as coordinator. GFI is the largest of such institutes in Norway in physical oceanography, and by hosting the collaborative Bjerknes Centre for Climate Research it is equally a leading contributor to international climate research. GFI has in its strategic plan to continue to lead in both observational and modelling oriented studies of oceans and climate, including climate prediction.

Particularly relevant for the project

Professional routines and structures within research support and administration and many years of experience with successful coordination and management (administrative, financial and data) of large collaborative EU projects make UiB a suitable candidate to coordinate this project. UiB also holds an office in Brussels for increased networking with the EC and guidance in terms of policy matters. Professional and highly experienced staff at the communication office of the Bjerknes Centre for Climate Research, and their extensive network across education, industry and policy-makers, also make UiB an ideal candidate for managing all dissemination and communication activities. The GFI also hosts the Bjerknes Climate Data Centre, an international data service center for managing and archiving research data according to the FAIR principle. GFI has extensive experience in studying climate variability in the Atlantic and has led the development of the Norwegian Climate Prediction Model. It coordinated the EU FP7 funded project Enhancing Prediction of Tropical Atlantic Climate and its Impacts (PREFACE) that contribute to improving climate prediction in this region and to understanding how climate is impacting the marine ecosystem there. These activities continue within the new Bjerknes Climate Prediction Unit that involves around 20 staff and has the mission to enhance climate prediction to the level where it benefits society, and thus facilitate the needed transition to operational prediction.

Roles and tasks in the project

UiB will be the coordinator of TRIATLAS. It will host the project office including the project director, project manager (WP5) and data manager (WP4.3). It will also host the Dissemination, Exploitation and Communication manager (WP4.4). UiB will contribute to WP2.1 in identifying observed relations between physical and biological in the three case study areas; to WP2.2 to characterise the relevant large-scale climatic drivers; and to WP3.1 to perform perfect prediction experiments (T3.1.1), develop an approach to initialise biogeochemistry component of the Norwegian Climate Prediction model (T3.1.2), and to deliver climate predictions with the model (T3.1.3). This work will be done in close collaboration with NERSC and UNI.

Relevant personnel

Prof. Noel Keenlyside (male) is a Professor at GFI, with extensive experience in climate variability, modelling, and prediction, with particular focus on seasonal-to-decadal prediction in the Atlantic. He has authored/co-authored 99 peer review publications, including in the high-ranking (2) Nature, (1) PNAS, (2) Nature Communications, (2) Nature Climate Change, and (1) Reviews of Geophysics journals. According to ISI Web of Knowledge, 96 of these have been cited a total of 5170 times, with an average citation rate of 55, and an h-index of 34. He holds an ERC Consolidator grant and coordinates the Bergen Research Foundation funded 5-year Bjerknes Climate Prediction Unit. He coordinated the highly relevant EU FP7 PREFACE project, and has extensive experience in supervision

of researchers, postdoctoral scientists and PhD students. He is internationally recognized for his contributions, serving on the CLIVAR Climate Dynamics and CLIVAR Atlantic Region panels.

Dr. Benjamin Pfeil (male), head of the Bjerknes Climate Data Centre, has successfully carried/carries out the data management for EU CARBOOCEAN, EU CARBOCHANGE, EU COCOS, EU GEOCARBON, EU PREFACE, NFR CO2Base, SOCAT (Surface Ocean CO2 Atlas) and is leading the ocean part for the ESFRI ICOS. He is a member of the OECD Global Science Forum expert group on International Coordination of Cyber-infrastructures for Open Science and of the UN Sustainable Development Goal (SDG) target 14.3 (ocean acidification) expert group on methodology development.

Ms Gudrun Sylte (female), head of the Communication office at the Bjerknes Centre for Climate Research, which has a wide experience in communicating climate research to the general public via social and traditional media, schools and public events.

Other relevant participants: Shunya Koseki, Lea Svendsen, Nour-Eddine Omrani

Relevant publications, products, services or other achievements

1.   Counillon, F., N. Keenlyside, I. Bethke, Y. Wang, S. Billeau, M. L. Shen, and M. Bentsen, 2016: Flow-dependent assimilation of sea surface temperature in isopycnal coordinates with the Norwegian Climate Prediction Model. Tellus A, 68, 32437

2.   Mohino, E., N. Keenlyside, and H. Pohlmann, 2016: Decadal prediction of Sahel rainfall: where does the skill (or lack thereof) come from? *Climate Dynamics*, 47, 3593-3612

3.   Koseki, S., N. Keenlyside, T. Demissie, T. Toniazzo, F. Counillon, I. Bethke, M. Ilicak, and M.-L. Shen, 2018: Causes of the large warm bias in the Angola–Benguela Frontal Zone in the Norwegian Earth System Model. *Climate Dynamics*, 50, 4651-4670

4.   Surface Ocean Carbon Dioxide Atlas (SOCAT), Global Data Analysis Project (GLODAP), and Global Carbon Budgets (marine) data management services

5.   Bjerknes Centre for Climate Research social media outreach (e.g., https://www.facebook.com/Bjerknessenteret/; https://twitter.com/BjerknesBCCR; https://www.instagram.com/bjerknessenteret/; https://www.flickr.com/people/148211268@N03/) and experience in working with school children from kindergarten to high school (e.g. https://turspor.h.uib.no; https://ektedata.uib.no)

Relevant projects or activities

1.   2013–2017, EU FP7: Enhancing Prediction of Tropical Atlantic Climate and its Impacts (PREFACE)

2.   2014 – 2017, NFR: Enhancing seasonal-to-decadal Prediction Of Climate for the North Atlantic Sector and Arctic (EPOCASA)

3.   2018–2023, Bergen Research Foundation: Bjerknes Climate Prediction Unit

4.   2015–2020, ERC: Synchronisation to enhance reliability of climate prediction

5.   2018-2023, NFR: The Nansen Legacy project

Relevant infrastructure

UIB is a main user of the governmental Norwegian High Performance Computing facilities (sigma2.no); Prof. Keenlyside is part of its "Resource Allocation Committee". UIB/GFI hosts the Bjerknes Centre for Climate Research and Prof. Keenlyside is co-leader of the new centre of excellence, the Bjerknes Climate Prediction Unit.

02 Helmholtz Centre for Ocean Research Kiel GEOMAR

Description of the organisation

GEOMAR (www.geomar.de/en/) is among the largest non-university research institutions in the field of marine sciences in Germany (1000 staff, incl. 450 experienced scientists and about 200 doctoral candidates), and a member of the Helmholtz Association, Germany's largest non-university scientific organisation. The centre's mandate is the inter- and multidisciplinary investigation of all relevant aspects of modern marine sciences. Research is conducted worldwide in all oceans. The main research topics are grouped in four divisions: Ocean Circulation and Climate Dynamics, Marine Biogeochemistry, Marine Ecology, and Dynamics of the Ocean Floor. GEOMAR cooperates closely with national and international research institutions and with a number of SMEs active in marine science and technology.

The scientific breadth and the state-of-the-art infrastructure, particularly adapted for deployments in the open ocean and the deep sea, gives GEOMAR a unique profile and a central collaborative role within the marine science community. Its modern infrastructure includes four research vessels, a large number of ship-based and autonomous observing systems, experimental platforms and state-of-the-art analytical facilities.

Particularly relevant for the project

GEOMAR participates with the Physical Oceanography and Experimental Ecology research units. The Physical Oceanography research unit has significant experience in the whole range of sea-going observational work with a particular focus on the tropical Atlantic, including state-of-the-art technologies like autonomous instrumentation (glider, floats), multi-year, multi-disciplinary deep-sea ocean moorings (including development of real-time data access technologies). Relevant activities of the Experimental Ecology research unit encompass worldwide sea-going activities with in-situ measurement of particle size, characteristics, and zooplankton composition at high spatial and temporal resolution. For both groups, there is a great experience in multidisciplinary research practiced during many research cruises in different ocean basins studying particularly physical-biological interactions.

Roles and tasks in the project

GEOMAR will contribute to CT1 (CT1 co-lead, WP1.1 lead) and CT2. In CT1, WP1.1 GEOMAR will focus on physical processes affecting ecosystems in equatorial and eastern boundary upwelling regions, in seamount, island and continental shelf regions with a focus on the Cabo Verde archipelago, and basin scale connectivity including the mesoscale eddy field and large scale circulation. In WP1.2 GEOMAR focuses on zooplankton and sinking particles, and on the construction of size spectra. Both groups, physical oceanography and experimental ecology will contribute to the synthesis within CT1 (WP1.5) as well as to the characterising of ecosystem variability on interannual to decadal timescales (WP2.1).

Relevant personnel

Prof. Peter Brandt (male) is Professor in the research unit Physical Oceanography. His main interests are the role of the tropical ocean in climate variability, oceanic oxygen variability, equatorial dynamics, mesoscale eddies and diapycnal mixing. He is PI of the German project SFB 754 A4 regarding the ventilation of tropical oxygen minimum zones, the German projects BMBF RACE and BANINO studying tropical Atlantic circulation variability and the EU PREFACE project (deputy coordinator). He is member of the PIRATA Scientific Steering Group. He was chief scientist on more than 10 major research cruises into the tropical Atlantic focussing on interdisciplinary physical, biogeochemical and biological studies.

Dr. Helena Hauss (female) is Scientist in the Experimental Ecology research unit. Her interests encompass the impact of changing nutrient stoichiometry, warming and acidification on marine pelagic food webs, the impact of oxygen minimum zones on zooplankton physiology and distribution, as well as the ecology of early life stages of marine fish. She uses in situ imaging and hydroacoustics to characterize the pelagic ecosystem response to environmental drivers from local to global scales.

Dr. Rebecca Hummels (female) is a Scientist in the research unit Physical Oceanography. Her scientific interests include the large-scale ocean circulation with particular emphasis on the western boundary circulation in the tropical South Atlantic and upper ocean mixing processes within the equatorial Atlantic as well as other off-equatorial regions within the tropics. She is the Co-PI of the BMBF RACE program and part of the SAMOC Team.

Dr. Johannes Karstensen (male) is a Scientist in the research unit Physical Oceanography. His scientific interests include the large-scale ocean circulation with particular emphasis on upper ocean processes and on the interaction between physical, biogeochemical and ecosystem processes. He is the PI of the Cabo Verde Ocean Observatory-mooring (part of TRIATLAS) and was chief scientist for two international mesoscale eddy surveys in the

tropical/subtropical South Atlantic. Current H2020 projects he is involved are AtlantOS (vice-coordinator), Blue-Action and SeaDataCloud.

Dr. Rainer Kiko (male) is a Scientist in the research division "Marine Ecology". His scientific interests include the application of in-situ imaging systems for studies of zooplankton and particles in tropical oceanic regions. He integrates citizen science to characterize the imaged organisms (https://planktonid.geomar.de) and uses the image data to calculate particulate matter flux and to characterize the impact of zooplankton organisms on biogeochemical cycles.

Relevant publications, products, services or other achievements

1. Biard, T., Stemmann, L., Picheral, M., Mayot, N., Vandromme, P., Hauss, H., Gorsky, G., Guidi, L., Kiko, R. and Not, F. (2016) In situ imaging reveals the biomass of giant protists in the global ocean. Nature, 532 (7600). pp. 504-507. DOI 10.1038/nature17652.

2. Karstensen, J., Fiedler, B., Schütte, F., Brandt, P., Körtzinger, A., Fischer, G., Zantopp, R., Hahn, J., Visbeck, M., and Wallace, D. (2015) Open ocean dead zones in the tropical North Atlantic Ocean, Biogeosciences, 12, 2597-2605, doi:10.5194/bg-12-2597-2015.

3. Kiko, R., A. Biastoch, P. Brandt, S. Cravatte, H. Hauss, R. Hummels, I. Kriest, F. Marin, A. M. P. McDonnell, A. Oschlies, M. Picheral, F. U. Schwarzkopf, A. M. Thurnherr, L. Stemmann (2017) Biological and physical influences on marine snowfall at the equator, *Nat. Geosci.*, **10**, 852–858, doi:10.1038/ngeo3042.

4. Stramma, L., S. Schmidtko, J. Luo, J. Hoolihan, M. Visbeck, D. Wallace, P. Brandt, and A. Körtzinger (2012) Expansion of oxygen minimum zones may reduce available habitat for tropical pelagic fishes, Nature Climate Change, 2, 33–37, doi:10.1038/nclimate1304.

5. Tchipalanga, P., M. Dengler, P. Brandt, R. Kopte, M. Macuéria, P. Coelho, M. Ostrowski, and N. S. Keenlyside (2018) Eastern boundary circulation and hydrography off Angola – building Angolan oceanographic capacities, Bull. Amer. Meteor. Soc., doi:10.1175/BAMS-D-17-0197.1.

Relevant projects or activities

1. GEOMAR is successful in acquiring external funding from national and international sources. With regard to EU programmes, GEOMAR has had about 45 EU-FP7-projects and coordinates 9 of 23 Horizon 2020 projects. Most relevant projects are:

2. 2013-2018 EU-FP7-Env., Enhancing PREdiction oF Tropical Atlantic ClimatE and its impacts (PREFACE)

3. 2015-2019 EU-H2020-BG, Optimizing and Enhancing the Integrated Atlantic Ocean Observing System (AtlantOS)

4. 2008-2019 German DFG SFB 754, Climate-Biogeochemistry Interactions in the Tropical Ocean

Relevant infrastructure

GEOMAR has available all required seagoing equipment including shipboard (CTD/LADCP systems, Underwater Vision Profilers, multinet, microstructure measuring systems), and moored instrumentation, and autonomous gliders. Observational data will be stored and made freely available from the Kiel Ocean Science Information System (OSIS).

03 Nansen Environmental and Remote Sensing Centre NERSC

Description of the organisation

The Nansen Environmental and Remote Sensing Centre (NERSC, http://www.nersc.no) is an independent non-profit research foundation established in 1986 and affiliated with the University of Bergen. Since 2012 the Center is a national environmental research institute with basic funding from the Ministry of Climate and Environment. The center generates interdisciplinary scientific expertise in Earth system environmental and climate research, satellite remote sensing, modelling and data assimilation. It is composed of more than 70 researchers and support staff. The Nansen Center is one of four partners in the Bjerknes Centre for Climate Research (BCCR).

Particularly relevant for the project

NERSC has initially introduced the Ensemble Kalman Filter (EnKF) data assimilation method, kept its further theoretical development for state and parameter estimation and in particular for its applicability to non Gaussian distributed variables such as ocean biochemistry - using Gaussian anamorphosis and iterative smoother. The methods have been successfully applied and tested for 1) real-time ocean forecasting systems (Sakov et al. 2010, Gharamti et al. 2017b) - leading the Copernicus Marine Environmental Monitoring service for the high latitude seas and Arctic Ocean, which provide 10-day forecast of ocean physics and biochemistry every day 2) in earth system seasonal-to-decadal prediction with the Norwegian Climate Prediction Model (Counillon et al. 2016) that will contribute to DCPP (Decadal Climate Prediction Project) and for estimation of ocean biochemistry parameters (Gharamti et al. 2017a). Finally, NERSC assist the Nansen-Tutu Centre for developing an ocean reanalysis and a forecasting system for the Agulhas and the Benguela region.

Roles and tasks in the project

NERSC will be involved in CT3, WP3.1. In T3.1.2, NERSC will improve the behaviour of the system by doing parameter estimation of ocean physic and biology with the EnKF and will assist the researcher at UiB in performing reanalysis and climate prediction experiments (T3.1.3).

Relevant personnel

Dr. Francois Counillon (male) is an experienced researcher at NERSC with expertise in data assimilation, operational oceanography and climate prediction. He is leading the development of the data assimilation in the Norwegian Climate Prediction Model (NorCPM) that addresses the problem of seasonal-to-decadal prediction with the Norwegian Earth System; has been one of the main developer of the TOPAZ system that is the main marine core system for the Arctic region in Copernicus (http://www.copernicus.eu); and develloped several high-resolution forecasting regional systems for the Gulf of Mexico, the South China Sea and the Agulhas Region. He has authored and co-authored 30 peer review publications, that have been cited a total of 605 times, with a h-index of 13 according to google scholar.

Dr. Annette Samuelsen (female) is an experienced researcher and leads the ocean modeling group at NERSC. Her research expertise is the development and application of coupled physical-biological models to understand and to predict the lower trophic levels using a combination of models with both in-situ and remotely sensed observations to study the interaction between physical ocean processes and the marine ecosystems. The models are used both in the context of marine forecasting and climate studies and include the use of data assimilation for state and parameter estimation. She has 21 peer-review publications, cited 353 times with an H-index of 10 according to google scholar.

Relevant publications, products, services or other achievements

1.   Counillon, F., N. Keenlyside, I. Bethke, Y. Wang, S. Billeau, M. L. Shen, and M. Bentsen, 2016: Flow-dependent assimilation of sea surface temperature in isopycnal coordinates with the Norwegian Climate Prediction Model. Tellus A, 68, 32437.

2.   Gharamti ME, Tjiputra J, Bethke I, Samuelsen A, Skjelvan I, Bentsen M, et al. Ensemble data assimilation for ocean biogeochemical state and parameter estimation at different sites. Ocean Modelling. 2017a;112.

3.   Gharamti ME, Samuelsen A, Bertino L, Simon E, Korosov A, Daewel U. Online tuning of ocean biogeochemical model parameters using ensemble estimation techniques: Application to a one-dimensional model in the North Atlantic. Journal of Marine Systems. 2017b;168.

4.   P. Sakov, F. Counillon, L. Bertino, K.A. Lisaeter, P.R. Oke, and A. Korablev, TOPAZ4: an ocean-sea ice data assimilation system for the North Atlantic and Arctic, Ocean Science, 8, 633-656, 2012

5.   Wang Y, Counillon F, Bertino L. Alleviating the bias induced by the linear analysis update with an isopycnal ocean model. Quarterly Journal of the Royal Meteorological Society. 2016.

Relevant projects or activities

1.   2016 –2019, EU H2020: Deep-sea Sponge Grounds Ecosystems of the North Atlantic (SponGES)

2.   2016-202, Copernicus Marine Environment Monitoring Service (CMEMS)

3.   2018-2022, NFR, Infrastructure for Norwegian Earth System modelling (INES)

4.   2018–2023, Bergen Research Foundation: Bjerknes Climate Prediction Unit

5.   2014 – 2017, NFR: Enhancing seasonal-to-decadal Prediction Of Climate for the North Atlantic Sector and Arctic (EPOCASA)

Relevant infrastructure

NERSC is a main user of the governmental Norwegian High Performance Computing facilities (sigma2.no); NERSC is leading a work package in the Infrastructure for Norwegian Earth System modelling Project.

04 Institute of Marine Research IMR

Description of the organisation

The Institute of Marine Research in Bergen, Norway (IMR, http://www.imr.no/en) undertakes research and monitoring on marine resources, aquaculture, marine ecosystems and ocean climate with the mission to provide scientific advice in the above to the authorities, industry and society. With about 1000 employees, IMR is amongst the biggest research institutes of this kind in Europe. The institute operates seven research vessels of which range of operations extends from the Norwegian coastal waters through Polar and Nordic Seas to the Southern Ocean. The primary mandate area of research concentrates on the ecosystems of the Barents, Norwegian and North Seas, and the Norwegian coastal zone. However, one of the vessels operated by IMR, the R/V "Dr. Fridtjof Nansen", is dedicated to monitoring fisheries resources and the environment around tropical oceans in the framework of the FAO EAF-Nansen Project (http://www.fao.org/in-action/eaf-nansen/en).

Particularly relevant for the project

IMR has extensive experience in combining physical observations with model simulations into efficient tools supporting ecosystem-based fisheries management. The numerical simulations developed at IMR paired with observing systems have become a core component in the operational management of the Norwegian salmon aquaculture industry. Particle tracking models for studying larval fish drift are the key ingredients in these simulations. On the other hand, IMR has extensive experience in studying tropical fish habitats for the early and life stages of demersal and pelagic fishes off West Africa stemming from the long-standing operation of the R/V "Dr. Fridtjof Nansen" and participation of IMR scientists in research programs in the frame of the FAO EAF-Nansen Project. The accumulated experience in both research areas warrants the preparedness of IMR to implement the tasks undertaken in TRIATLAS.

Roles and tasks in the project

IMR will mostly contribute to Task2.1.1 by characterising impacts of the eastern tropical Atlantic climate variability on changes in distribution of nursery areas for small pelagic fishes (mainly *Sardinella aurita* and *S. maderensis*) under the interannual Benguela and Atlantic Niño/Niña scenarios. The numerical simulations to characterize physical variability within the range of latitudes characterizing principal habitat of the southeastern sardinella stock (0°-17°S) will be carried out using a NEMO model forced by a realistic interannual forcing. The LADiM particle tracking model (http://ladim.readthedocs.io/en/documentation/intro.html) will be used to conduct the larval drift simulations. The simulations will be validated against existing observations on large-scale circulation and upwelling (WP1.1), and against historical trawling and acoustic survey data (WP1.3).

Relevant personnel

Marek Ostrowski (male) is a Scientist in the Oceanography and Climate research group at IMR. His research interests are centred around the tropical Atlantic variability and its impacts on population dynamics tropical small pelagic fishes with focus on West Africa. He has 20 years of experience in building capacity in oceanography and marine data management around Africa. He initiated and creation of the historical data archive from the RV Dr. Fridtjof Nansen surveys comprising oceanographic data. He has been the IMR's leading scientist in the previous EU-funded research project focusing on the African ecosystems.

Dr. Bjørn Ådlandsvik (male) is a Scientist in the research group Oceanography and Climate at the Institute of Marine Research, Bergen. His scientific interests include regional ocean circulation modelling and in particular transport by particle tracking models. He applies such models to biological questions such as transport of fish eggs/larvae and salmon lice. He is the developer of the LADiM particle tracking model.

Dr. Paul Budgell (male) is a Senior Scientist in the research group Oceanography and Climate at the Institute of Marine Research, Bergen. His research interests include ocean modelling and the study of ocean climate, in particular interannual variability and downscaling of global earth system model results to the regional ocean scale. He has developed a 1/12 degree All Africa Ocean Model (AAOM) based on NEMO and conducted decadal-scale hindcast simulations with AAOM that will provide fields to characterize physical variability in the region of interest and to be used in LADiM particle tracking in this study.

Jens-Otto Krakstad (male) is a Scientist in the research group "Marine Research in developing Countries" at IMR. His research interests include early life history stages of demersal and pelagic fish along West Africa. He is currently working with the EAF-Nansen program and with several bilateral research cooperation projects with African and Asian countries. Krakstad been cruise leader on more than 40 demersal and pelagic research surveys off Africa.

Relevant publications, products, services or other achievements

1.   Myksvoll M.S., Sandvik A.D., Albretsen J., Asplin L., Johnsen I.A., Karlsen Ø., Kristensen N.M., Melsom A., Skardhamar J., andÅdlandsvik B., 2018, Evaluation of a national operational salmon lice monitoring system – from physics to fish, Submitted to PLoS ONE

2.   Sandvik A.D., Bjørn P.A., Ådlandsvik B., Asplin L., Skarðhamar J., Johnsen I.A., Myksvoll M.S., and Skogen M.D., 2016, Toward a model-based prediction system for salmon lice infestation pressure, Aquacult Environ Interact, 8, 527–542

3.   Denamiel, C., P. Budgell, and R. Toumi (2013), The Congo River plume: Impact of the forcing on the far-field and near-field dynamics, *J. Geophys. Res.*, *118*, 1-27, doi: doi:10.1002/jgrc.20062

4.   Jarre, A., et al. (2015), Synthesis: climate effects on biodiversity, abundance and distribution of marine organisms in the Benguela, *Fish. Oceanogr.*, *24*, 122-149, doi:10.1111/fog.12086

5.   Sarré, A., Demarcq, H.,Keenlyside, N., Krakstad, J-O, Thiao, D., Elayoubi S., Jiyid M. A, Faye, S., Mbaye E., and Brehmer, P. 2018. Spatial shift of small pelagic fish as early warning for food security in North-West Africa. *Progress in Oceanography* accepted

6.   Tchipalanga, P., M. Dengler, P. Brandt, R. Kopte, M. Macuéria, P. Coelho, M. Ostrowski, and N. S. Keenlyside (2018) Eastern boundary circulation and hydrography off Angola – building Angolan oceanographic capacities, Bull. Amer. Meteor. Soc., doi:10.1175/BAMS-D-17-0197.1

Relevant projects or activities

IMR is the key partner in global fisheries, marine ecosystem and climate monitoring program, the UN FAO-led EAF Nansen Project. In addition to the scientific input, the institute provides logistics and core research staff for conducting surveys, as well as post-survey data curation for the African project partners. The project has generated a unique time series of oceanographic, ecosystem and fisheries data along the coasts of West Africa. The surveys with the R/V Dr. Fridtjof Nansen off West Africa are continuing. The latest campaign covering the entire West African was accomplished in 2017. The next expedition is planned in 2019.

Joining African partners in the EAF Nansen project, IMR has participated in the two previous EU research programmes related to African marine ecosystems, ENVIFISH (funded under FP4-INCO, 1998-2001) and PREFACE (funded under FP7-Env, 2013-2018). In those projects, in addition to implementing scientific objectives, IMR provided logistics and data curation infrastructure for the participating African institutions that acquired data through the EAF Nansen Programme in support of their research collaboration with other European partners.

Relevant infrastructure

Supercomputing facilities.

05 Johann Heinrich von Thuenen-Institut, Bundesforschungsinstitut fuer Laendliche Raeume, Wald Und Fischerei TI

Description of the organisation

TI is one of 4 Federal Research Institutes of the German Ministry of Food and Agriculture (BMEL) providing scientific advice to the ministries with regards to agriculture and food economy, forestry and wood economy, fisheries and aquaculture with a total staff of 922 employees in 14 institutes.

The Thünen-Institute of Sea Fisheries with a personnel of 64 provides the scientific basis to guide the sustainable use of natural marine resources and evaluates the ecological and economic conditions required to achieve this goal. TI-SF prepares decision support with respect to the Common Fisheries Policy of the EU (CFP) and international marine conventions (i.a. NEAFC, NAFO, CCAMLR, OSPAR, IWC, ASCOBANS) of which Germany is a member state. Through its scientific monitoring programmes and research activities, the institute contributes to a general increase in knowledge about marine systems for the benefit of the international community.

Particularly relevant for the project

TI has conducted Atlantic wide pelagic research since 1966 with research cruises covering the area from Greenland to the Antarctic and resumed activities in 2012 with renewed relationships with partner institutes in Senegal, Mauritania and Cabo Verde with a focus on capacity development, sustainable use of marine resources and global food security.

Roles and tasks in the project

TI acts as co-coordinator to TRIATLAS, in support of UiB. TI also co-leads WP1.5 and contributes to WP1.3. Further contributions will be to WP4.1 with regards to capacity development and support of decentralised data collection devices.

Relevant personnel

Heino O. Fock (male) is leader of the Marine Ecosystems working group at TI with a staff of 4. He currently supervises 2 PhD candidates and 1 Masters student. Main areas of expertise are pelagic and marine resource dynamics and diversity in tropical, upwelling and boreal/sub-arctic areas [1-3], and assessments of human impacts and ecosystem state, developing tools therefore and linking environmental objectives and policy objectives [4-6].

Relevant publications, products, services or other achievements

1.   H.O. Fock, S. Czudaj, Size structure changes of mesopelagic fishes and community biomass size spectra along a transect from the Equator to the Bay of Biscay collected in 1966-1979 and 2014-2015, ICES J. Mar. Sci. (2018). doi:10.1093/icesjms/fsy068

2.   H.O. Fock, B. Matthiessen, H. Zidowitz, H. v. Westerhagen, Diel and habitat-dependent resource utilisation by deep-sea fishes at the Great Meteor seamount: niche overlap and support for the sound scattering layer interception hypothesis, Mar. Ecol. Progress Ser. 244 (2002) 219–233

3.   H.O. Fock, Deep-sea pelagic ichthyonekton diversity in the Atlantic Ocean and the adjacent sector of the Southern Ocean, Glob. Ecol. Biogeogr. 18 (2009) 178–191

4.   H.O. Fock, G. Kraus, From metaphors to formalism: A heuristic approach to holistic assessments of ecosystem health, PLoS One. 11 (2016) e0159481

5.   V. Stelzenmüller, H.O. Fock, A. Gimpel, H. Rambo, R. Diekmann, W.N. Probst, U. Callis, F. Bockelmann, H. Neumann, I. Kröncke, Quantitative environmental risk assessments in the context of marine spatial management: Current approaches and some perspectives, ICES J. Mar. Sci. 72 (2015) 1022–1042

6.   H.O. Fock, M. Kloppmann, V. Stelzenmüller, Linking marine fisheries to environmental objectives: A case study on seafloor integrity under European maritime policies, Environ. Sci. Policy. 14 (2011) 289–300

Relevant projects or activities

1.   2013 – 2018   FP7 PREFACE: Enhancing Prediction of Tropical Atlantic Climate and its Impacts, European Commission grant agreement 603521

2.   2013 - 2017   AWA: Ecosystem Approach to the Management of Fisheries and the Marine Environment in West African Waters, Federal Ministry of Education and Research (German Federal Ministry of research and Education, BMBF, 01DG12073A)

3.   2016 – 2019 CLIMA: Changes in fish distribution and species composition as a result of climatic changes in the East Greenland Ecosystem: implications for fisheries and management (Ministry of Foreign Affairs Norway,

RER 15/0008)

4.   2018-2020 TRAFFIC: Trophic TRAnsfer eFFICiency in the Benguela Current (German Federal Ministry of Research and Education, BMBF, 03F0797D)

Relevant infrastructure

TI operates 3 research vessels, and one cruise is planned for TRIATLAS extending into the South Atlantic in 2020.

06 Leibniz Centre for Tropical Marine Research ZMT

Description of the organisation

ZMT (www.leibniz-zmt.de/en/) was founded in 1991 as an associated institute of Bremen University. Since 2009 it is member of the Leibniz Association (WGL) with four departments, namely Ecology, Biogeochemistry, Ecological Modelling and Social Sciences. It is Member of the Center for Marine Environmental Sciences (MARUM) and the German Marine Research Consortium (KDM). ZMT is the only scientific institute in Germany that focuses on tropical and subtropical coastal ecosystems only and their importance for nature and people. With its work, the ZMT provides a scientific basis for the protection and sustainable use of these tropical coastal ecosystems. In addition to research, the focus lies on the development of competencies and consultation services – always in close cooperation with international and national partners. ZMT hosts around 200 people including about 60 scientists, 60 PhD candidates and a varying number of guest scientists, fellows and graduate students.

Particularly relevant for the project

ZMT has long-standing cooperation (since 1991) with Southern African and Brazilian research partner institutes. Its experience in research in coastal waters is extensive including various disciplines and looking back to several short and long-term projects along the western and eastern Central and South Atlantic coasts, including various research cruises off East Brazil, NW and SW Africa.

Roles and tasks in the project

ZMT will co-lead WP1.3 and will contribute to the synthesising WP1.5 with providing strong experience in the research in the Benguela and Canary Current as well as the Northeast Brazilian coast. With its strong background in Capacity Development and Social Science research ZMT will also contribute to establishing measures in WP4.1 (Summer school).

Relevant personnel

Werner Ekau is a fisheries biologist with a focus on tropical fish and ichthyoplankton (Ekau et al. 2010, Grote et al. 2012, Geist et al. 2013) and works since 1999 in the Benguela upwelling area. Werner Ekau participated in the interdisciplinary German-funded GENUS project (2009-2015; Ref. BMBF 03F0650D) focused on carbon flux and nutrient cycles, and coordinated the cluster "Productivity" focusing on the role of key plankton and fish species, and the impact of hypoxia and oxygen minimum zones on the ecophysiology and behaviour of organisms in the pelagic system. In the framework of this cooperation more than 20 research cruises have been conducted together with African partners since 1999, as well as experimental work carried out jointly in labs in Swakopmund and Cape Town. He also participated in the trilateral project AWA (Ecosystem Approach to the management of fisheries and the marine environment in West African waters; 2013-2017; Ref. BMBF 01DG12073B) project off NW Africa co-chairing work packages 2 and 5. AWA was an integrated large cooperative project that was realized through a strategic partnership with France, Senegal, and Mauritania with CECAF (Committee for Eastern Central Atlantic Fisheries) as major partner. Ekau was member of the SCOR Working group 128 (Natural and Human Induced Hypoxia in the Ocean).

Relevant publications, products, services or other achievements

1.   Ekau W, Auel H, Hagen W, Koppelmann R, Wasmund N, Bohata K, Buchholz F, Geist S, Martin B, Schukat A, Verheye HM, Werner T (2018) Pelagic key species and mechanisms driving energy flows in the northern Benguela upwelling ecosystem and their feedback into biogeochemical cycles. J Mar Syst:1–14

2.   Geist SJ, Kunzmann A, Verheye HM, Eggert A, Schukat A, Ekau W (2015) Distribution, feeding behaviour, and condition of Cape horse mackerel early life stages, Trachurus capensis, under different environmental conditions in the northern Benguela upwelling ecosystem. ICES Journal of Marine Science 72:543–557

3.   Geist SJ, Ekau W, Kunzmann A (2013) Energy demand of larval and juvenile Cape horse mackerels, Trachurus capensis, and indications of hypoxia tolerance as benefit in a changing environment. Marine Biology 160:3221–3232

4.   Ekau W, Auel, H., Pörtner, H.-O., Gilbert, D.: Impacts of hypoxia on the structure and processes in the pelagic community (zooplankton, macro-invertebrates and fish). Biogeosciences. 7, 1669–1699 (2010).

5.   Ekau W, Verheye HM (2005) Influence of oceanographic fronts and low oxygen on the distribution of ichthyoplankton in the Benguela and southern Angola currents. Afr J mar Sci 27:629–639

Relevant projects or activities

1.   2018 -2021: TRAFFIC - Trophic TRAnsfer eFFICiency in the Benguela Current - Identifying differences in trophic pathways and ecosystem services in the Northern and Southern. Coordinator of project and one sub-project

2.   2013 -2017: Dynamics of estuarine tropical fish communities - Within the strategic partnership project AWA (Ecosystem Approach to the management of fisheries and the marine environment in West African waters; Ref BMBF 01DG12073B) we contribute to develop the scientific basis for an ecosystem approach to the management of fisheries and marine environment in West African waters

3.   2009-15: GENUS (Geochemistry and Ecology of the Namibian Upwelling System). Research Project on the ecosystem structure and energy flows in a poly-pulsed upwelling system under climate change impact. Sub-project of trophic relationships in ichthyoplankton community and coordination of biological work package

4.   1999-2008: Benguela Environment Fisheries Interaction & Training Programme (BENEFIT). Participation in the Environmental Research and Training Programme of BENEFIT with two bilateral projects with the Marine and Coastal Management (MCM) in Capetown on "Maintenance mechanisms of zooplankton and ichthyoplankton populations in frontal systems." and "Trophic interactions vs. abiotic forcing – Impact of predator-prey relationships vs. low-oxygen on the life cycle of zooplankton key species"

5.   1990/91 and 1994-98: Sedimentation processes and productivity in the continental shelf waters off east and northeast Brazil - JOPS-I and JOPS-II (Joint Oceanographic Projects). The aim was to create an interdisciplinary project to investigate the processes controlling the sedimentation and productivity in the eastern and northeastern continental shelf regions of Brazil with participation of 81 scientists from 22 institutes

6.   1990 – 96: Coordinator for projects in Marine Science within the bilateral agreement of Science and Technology between Germany and Brazil

Relevant infrastructure

ZMT is equipped with the relevant instruments and equipment to carry out envisaged analyses. Experience and necessary devices for DNA- and isotope-analysis are available. The biological lab is fully equipped to analyse zooplankton and fish samples. A transportable Simrad EK80 echo device is available to be used on ships and cruises of opportunity. Various nets are available to carry out the ground-truthing of acoustic data.

07 Christian-Albrechts-Universität zu Kiel CAU

Description of the organisation

Christian-Albrechts-Universität zu Kiel (CAU) is a full university owned by the German State of Schleswig-Holstein. At its eight faculties it currently teaches about 23.000 students, with 1.165 scientific staff involved both in teaching and research. In research, CAU is well-profiled; e.g. it currently holds 3 projects funded by the German "Excellence Initiative" and has participated in over 40 projects funded by EU's 6th Framework Programme and over 30 projects under the EU's 7th Framework Programme. The Department of Economics, has a long tradition in the field of resource economics and has coordinated several major research projects. In particular, the department hosts the research groups Resource, Ecological and Environmental Economics, which contributes within the 'Cluster of Excellence' *Future Ocean*, funded by the German Federal Government. The working group is dealing with questions of sustainable fisheries management and social-ecological systems analysis. The group consists of leading scientists in the field of resource economics, population dynamics of exploited fish stocks, marine ecology and social-ecological systems research.

Particularly relevant for the project

Members of the CAU participating in the project TRIATLAS have long experience in studies of multispecies fisheries systems, sustainability research in marine and coastal systems and worked on social and economic aspects of artisanal fishing communities in the Baltic and in Africa, particularly in Senegal, Cabo Verde and Nigeria. They are experienced in the development and implementation of large scale interview surveys and in the participatory development of conceptual system models. They also worked on scenario development in the context of the initiative 'The World In 2050'

(http://www.iiasa.ac.at/web/home/research/twi/TWI2050.html).

Roles and tasks in the project

CAU will be responsible for WP1.4 to map human activities in the case study areas and respective relevant stakeholders for the development of contextualized Shared Socioeconomic Pathways as input for the ecosystem modelling in CT3. CAU will further coordinate CT4 with all relevant work related to stakeholder engagement and working on social and economic aspects in relation to the case study area ecosystems. CAU will particularly contribute to WP4.2 on future scenarios and impact assessments.

Relevant personnel

Dr. Jörn O. Schmidt senior research scientist at the Faculty of Business, Economics, and Social Sciences of Kiel University. He is specialized in inter- and transdisciplinary work and his research foci are social-ecological systems analysis and concepts of sustainability in the ocean. This includes the application of coupled ecological-economic models in developing practical management advice, the use of questionnaire surveys with communities, science communication with stakeholders and the use of alternative communication methods like games for education and communication (e.g., 'ecoOcean', www.ecoocean.de). He was work package leader within the AWA project, a trilateral initiative between Germany, France and several West African countries and the PREFACE project, an EU project with several African Partners dealing with impact of climate change on the Tropical Atlantic and effects on small fishing communities as well as PI in KoBeFisch, dealing with sustainable consumption and use of marine fish from the Baltic Sea. He is also German representative in the Science Committee (SCICOM) of the International Council for the Exploration of the Sea (ICES) and co-chair of the Strategic Initiative of the Human Dimension in Integrated Ecosystems (SIHD).

Relevant publications, products, services or other achievements

1.   TWI2050 - The World in 2050 (2018). Transformations to Achieve the Sustainable Development Goals. Report prepared by The World in 2050 initiative. International Institute for Applied Systems Analysis (IIASA), Laxenburg,   Austria. www.twi2050.org
2.   Nielsen JR, Thunberg E, Holland DS, Schmidt JO et al. (2018) Integrated ecological–economic fisheries models—Evaluation, review and challenges for implementation. Fish and Fisheries, 19(1): 1–29
3.   Thébaud O, Link J, Kohler B, Kraan M, López R, Poos JJ, Schmidt JO and Smith D (2017) Managing marine socio-ecological systems: picturing the future. ICES Journal of Marine Science, 74(7):1965-1980
4.   Ba A, Schmidt JO, Dème M, Lancker K, Chaboud C, Cury P, Thiao D, Diouf M, Brehmer P (2017) Profitability and economic drivers of small pelagic fisheries in West Africa: A twenty year perspective. Marine Policy.   76:   152–158
5.   Marshak AR, Link JS, Shuford R, Monaco ME, Johannesen E, Bianchi G, Anderson MR, Olsen E, Smith,DC,

Schmidt JO, Dickey-Collas M (2017) International perceptions of an integrated, multi-sectoral, ecosystem approach to management. ICES Journal of Marine Science, https://doi.org/10.1093/icesjms/fsw214

Relevant projects or activities

1.   2019 – 2022   Humboldt-Tipping - Social-Ecological Tipping Points of the Northern Humboldt Current Upwelling System, Economic Repercussions and Governance Strategies, Federal Ministry of Education and Research (BMBF)

2.   2016 – 2017   Adding Fuel to the Fish: Perceptions and Adaptability of Nigerian Fisherfolk to Impacts From Climate Change and Petroleum Production, Cluster of Excellence 'Future Ocean'

3.   2015 – 2018   KoBeFisch: Nachhaltiger Konsum und Bewirtschaftung von Meeresfischen (Sustainable Consumption and Management of Marine Fish), Federal Ministry of Education and Research (BMBF)

4.   2013 – 2017   PREFACE: Enhancing Prediction of Tropical Atlantic Climate and its Impacts, European Commission

5.   2013 - 2017   AWA: Ecosystem Approach to the Management of Fisheries and the Marine Environment in West African Waters, Federal Ministry of Education and Research (BMBF)

08 Météo-France, Centre National de Recherches Météorologiques MF-CNRM

Description of the organisation

The Centre National de Recherches Météorologiques (MF-CNRM) is the research department of Météo-France. It is responsible for conducting the largest part of the research activities in weather forecasting, climate modelling, atmospheric chemistry, land-surface processes including snow related processes, oceanography, and for coordinating research/development within other departments of Météo-France, from the historical data rescue to numerical weather forecast, avalanche prediction, or wave and storm surge forecasting. Within MF-CNRM, the climate research group «GMGEC» is in charge of the development of global state-of-the-art CNRM climate models (CNRM-CM) and Earth system models (CNRM-ESM), which includes components dealing with the atmosphere dynamics and chemistry (ARPEGE), ocean and sea ice (NEMO-Gelato), land surface & biosphere (SURFEX), and oceanic biogeochemistry processes (PISCES). Alongside the development of its climate and Earth system model, MF-CNRM contributes to the study of climate variability, of the projection of climate at global and regional scales, of atmospheric chemistry, ocean-air interactions and global carbon cycle. MF-CNRM has a long history within the climate research community and contributes to the successive IPCC reports.

Particularly relevant for the project

The implication of MF-CNRM in TRIATLAS in particularly relevant for the following reasons:

First, MF-CNRM has actively participated in international research activities on the evaluation and improvement of seasonal forecasting since the mid-1990s, among which European Commission-funded projects DEMETER (2000-2003), FP6-ENSEMBLES, and FP7-SPECS. Since 2005, MF-CNRM contributes to the international efforts in dynamical seasonal forecasting as one of the partners of the EUROSIP consortium (with MetOffice, ECMWF, NCEP and JMA) who delivers each month a 7-month range forecast based on a multi-model approach. Since January 2016, MF-CNRM is a subcontractor of ECMWF for the delivery of operational seasonal forecasts within the Copernicus Climate Change Service (C3S). Second, MF-CNRM has a solid expertise on climate research and a growing expertise in Earth system modelling which has been developed through its participation to FP7-COMBINE and more recently in H2020-CRESCENDO as a work-package leader. Its experience on both seasonal-to-interannual forecast and Earth system modelling has enabled MF-CNRM scientists to explore the predictive capability of policy-relevant Earth system components (such as the carbon fluxes and the net marine productivity, refer to the publication list) that is of a particular interest for TRIATLAS.

Roles and tasks in the project

MF-CNRM will lead CT3: "**Climate and marine-ecosystem prediction, uncertainty and assessment of sustainability**" and WP3.1 "*Tailored seasonal to decadal predictions for key climate and biogeochemical drivers of marine ecosystems*" and will contribute to (i) the assessment of seasonal to interannual predictability of marine biogeochemistry and relevant physical drivers and (ii) improved model predictions in terms of relevant climate variables for marine ecosystems.

Relevant personnel

Dr. Roland Séférian (male) is early career scientist involved in the development of the carbon cycle components of CNRM-ESM. His main expertise is on marine carbon cycle and biogeochemistry and its relation to climate change and climate variability. He is the author or co-author of about 40 peer-reviewed articles and has participated to the elaboration of the IPCC Special Report on 1.5°C as a lead author. He is involved in several international initiatives such as Global Carbon Project (GCP) or MARine Ecosystem Model Intercomparison Project (MAREMIP).

Dr. Aurore Voldoire (female), scientist, is in the climate division since 2001 and is mainly in charge of the development of CNRM-CM. Her main research activities concern the ocean-atmosphere coupled interactions and their impact on climate variability. She was involved in the FP7 PREFACE project in which she coordinated the work package on climate model mean state biases in the tropical Atlantic. She is author or co-author of about 60 peer-reviewed articles.

Dr. Lauriane Batté (female), is a scientist in the climate prediction team at CNRM. Her research focuses on ensemble climate forecasting at sub-seasonal to seasonal time scales. She has experience in assessing seasonal forecast quality in multi-model databases (DEMETER, ENSEMBLES, Copernicus C3S) and has worked on stochastic perturbation techniques in both CNRM-CM and EC-Earth as part of the FP7 SPECS project.

Relevant publications, products, services or other achievements

1.   **Roland Séférian, Sarah Berthet, Matthieu Chevallier**: *Assessing the Decadal Predictability of Land and Ocean Carbon Uptake*. Geophysical Research Letters 02/2018; 45(6237)., DOI:10.1002/2017GL076092

2.   Desiree Tommasi, Charles A. Stock, Alistair J. Hobday, Rick Methot, Isaac C. Kaplan, J. Paige Eveson, Kirstin Holsman, Timothy J. Miller, Sarah Gaichas, Marion Gehlen, Andrew Pershing, Gabriel A. Vecchi, Rym Msadek, Tom Delworth, C. Mark Eakin, Melissa A. Haltuch, **Roland Séférian**, Claire M. Spillman, Jason R. Hartog, Samantha Siedlecki, Jameal F. Samhouri, Barbara Muhling, Rebecca G. Asch, Malin L. Pinsky, Vincent S. Saba, Sarah B. Kapnick, Carlos F. Gaitan, Ryan R. Rykaczewski, Michael A. Alexander, Yan Xue, Kathleen V. Pegion, Patrick Lynch, Mark R. Payne, Trond Kristiansen, Patrick Lehodey, Francisco E. Werner: *Managing living marine resources in a dynamic environment: The role of seasonal to decadal climate forecasts*. Progress In Oceanography 02/2017; 152., DOI:10.1016/j.pocean.2016.12.011

3.   **Roland Séférian**, Laurent Bopp, Marion Gehlen, Didier Swingedouw, Juliette Mignot, Eric Guilyardi, Jérôme Servonnat: *Multiyear predictability of tropical marine productivity*. Proceedings of the National Academy of Sciences 07/2014; 111(32)., DOI:10.1073/pnas.1315855111 Goubanova, K, E. Sanchez-Gomez, C. Frauen, **A. Voldoire**, 2018, Respective roles of remote and local wind stress forcings in the development of warm SST errors in the South-Eastern Tropical Atlantic in a coupled high-resolution model, *Clim. Dyn.*, accepted

4.   **Voldoire, A**. E. Exarchou, E. Sanchez-Gomez, T. Demissie, A-L. Deppenmeier, C. Frauen, K. Goubanova, W. Hazeleger, N. Keenlyside, S. Koseki, C. Prodhomme, J. SHonk, T. Toniazzo, A.-K. Traore; Role of wind stress in driving SST biases in the Tropical Atlantic, Clim. Dyn., submitted

5.   Prodhomme, C., **L. Batté**, F. Massonnet, P. Davini, O. Bellprat, V. Guemas, and F. Doblas-Reyes, 2016: Benefits of increasing the model resolution for the seasonal forecast quality in EC-Earth. *Journal of Climate, vol. 29, pp 9141–9162*, DOI:10.1175/JCLI-D-16-0117.1

Relevant projects or activities

MF-CNRM is or has been involved in a number of relevant FP7 and H2020 projects including:

1.   **COMBINE**, which aimed at improving Earth system models and their ability to predict climate by including new components such as atmospheric chemistry, carbon cycle and land ice

2.   **PREFACE**, which aims at reducing systematic climate model biases in the Tropical Atlantic in order to improve seasonal-to-decadal forecasts

3.   **SPECS**, which focuses on climate prediction at seasonal to decadal timescales

4.   **CRESCENDO,** which aims at developing and improving Earth system components of European IPCC-class Earth system models. CRESCENDO also aims at supporting the European contribution to the 6th phase of the coupled model intercomparison project that will serve as a basis for the elaboration of the 6th IPCC assessment report

5.   **APPLICATE**, whose goal is to improve weather and climate predictions in the Arctic, and to investigate atmospheric and oceanic linkages between Arctic climate change and mid-latitude weather and climate

6.   **EUCP**, which aims at developing an ensemble climate prediction system based on high-resolution climate models for Europe for the near-term (about 1-40 years). This new system will produce climate information for risk assessments and climate change adaptation programs

Relevant infrastructure

As the French numerical weather service institution, Météo-France benefits from its own High Performance Computing facility.

09 Centre Europeen de Recherche et Formation Avancee en Calcul Scientifique CERFACS

Description of the organization

The CERFACS is a research organisation that aims to develop advanced methods for the numerical simulation and the algorithmic solution of large scientific and technological problems of interest for research as well as industry, and that requires access to the most powerful computers currently available. The CERFACS hosts interdisciplinary teams, both for research and advanced training that are comprised of physicists, applied mathematicians, numerical analysts, and software engineers.

Particularly relevant for the project

The CERFACS team matches perfectly the task proposed in the climate prediction part of the TRIATLAS proposal by the following reasons: i) The team has participated in relevant European Commission funded projects dealing with global and regional studies of climate variability and related predictability (i.e. PREDICATE, DYNAMITE, ENSEMBLES, SPECS, PRIMAVERA, APPLICATE), in particular in the Tropical Atlantic region (PREFACE). The team has also participated to international projects as AMMA, CMIP5 and CMIP6 (in particular in the decadal prediction and high-resolution modelling part). CERFACS team members are currently involved in the DCPP (Decadal Climate Prediction Panel), in charge of the coordination of the scientific and practical aspects of decadal climate prediction research within WCRP. ii) The CERFACS is also an outstanding institution in climate engineering related to software development and climate data infrastructures. It develops the OASIS coupler software, currently used by more than 25 climate modelling groups. iii) The CERFACS has acquired a high expertise in the development of climate portals data to provide climate information to users, as well as in the infrastructures for handling huge data volumes, CMOR/CMIP standard formats and ESGF servers.

Roles and tasks in the project

CERFACS is co-leading the CT3 and WP3.1. It is also involved in WP2.1 (CT2). In CT2 CERFACS will explore drivers of climate variability and predictability and interannual and decadal timescales associated to the primary production over the TRIATLAS regions (WP2.1, T2.1.1). In CT3 CERFACS will be in charge of the design and realisation of the tailored decadal predictions with the CNRM-ESM.2 model, and deliver data from these climate predictions to WP3.2 and CT4 (WP3.1 -all tasks).

Relevant personnel

Dr. Emilia Sanchez-Gomez (female) is the principal CERFACS investigatorfor TRIATLAS. Dr Sanchez-Gomez is a senior research scientist with 15 years of experience in climate research including tropical and midlatitude variability and predictability studies, regional climate modelling, links between the large scale circulation and extreme events and downscaling techniques, improvement of the initialization techniques to deal with climate drift in climate prediction. She has been strongly involved in the WCRP/CMIP5 decadal exercise and several European projects (e.g DYNAMITE, ENSEMBLES, COMBINE, SPECS, PRIMAVERA). She is the principal CERFACS investigator for the EU PREFACE project, where she is also WP and CT leader. She is author of more than 20 peer-reviewed papers.

Dr. Christian Page (male) is a high-level research engineer at CERFACS. He has been active in research and development for more than 18 years, covering a large spectrum of atmospheric sciences topics. He has been involved in many large projects. Currently, he is mainly doing research and development in the infrastructure to provide climate scenarios data to users. He is strongly involved at European and International Levels on facilitating access to climate data for a large range of users, through dedicated services and portals, notably through the H2020 EUDAT project, RDA, and ESGF Compute Working Team. He is also leader of the Data Networking WP in the IS-ENES2 European Project.

Dr. Sophie Valcke (female) holds a "highly qualified" research engineer position at Cerfacs, working on the development of a high-resolution atmosphere-ocean-ice coupled models. Sophie Valcke leads a team of 3 engineers for the developments of the OASIS coupler used by more than 40 climate modelling groups around the world. Through the user support provided for the OASIS coupler. Sophie Valcke is Cerfacs Principal Investigator for the current IS-ENES2 (Infrastructure for the European Network of Earth System Modelling) European project and for the Centre of Excellence in Simulation of Weather and Climate in Europe (ESiWACE) where her main focus is the technical and scientific aspects of ocean-atmosphere coupling.

Dr. Marie Pierre Moine (female) is a research engineer at CERFACS, graduated in Atmospheric Physics (Ph.D of University of Toulouse, 2001). Dr Moine is working in the context of national, European and international projects dealing with climate modelling and data management, from production to user accessibility through dedicated networks (ESGF). Currently involved in the preparation of the next international climate project (WCRP/CMIP6)

and high-resolution climate simulations for recent or ongoing projects (FP7-SPECS, FP7-PREFACE, H2020-PRIMAVERA). She also takes part in HPC and massive data infrastructure projects (H2020-EUDAT, H2020-EsiWACE).

Dr. Christophe Cassou (male) is a senior climate researcher of more than 15 years experience. He has been involved in a number of international and European projects dealing with climate variability and predictability mainly in mid-latitude regions. Actually he is an active member of the Decadal Climate Prediction Project (DCPP), in charge of coordinating the decadal prediction experiments in CMIP6. He is the author of more than 30 peer-reviewed publications.

Relevant publications, products, services or other achievements

1. Moine, M. -P., Valcke, S., Lawrence, B. N., Pascoe, C., Ford, R. W., Alias, A., Balaji, V., Bentley, P., Devine, G., Callaghan, S. A. and Guilyardi, E. (2014) Development and exploitation of a controlled vocabulary in support of climate modelling, Geoscientific Model Development, 7, pp. 479-493, doi:10.5194/gmd-7-479-2014

2. Déandreis, Céline, Christian Pagé, Pascale Braconnot, Lars Bärring, Edoardo Bucchignani, Wim Som de Cerff, Ronald Hutjes, Sylvie Joussaume, Constantin Mares, Serge Planton, 4. Maarten Plieger, (2014), Towards a dedicated impact portal to bridge the gap between the impact and climate communities: lessons from use cases, Climatic Change, 125 (3-4), 333-347, doi:10.1007/s10584-014-1139-7

3. Sanchez-Gomez, E., Cassou, C., Ruprich-Robert, Y., Fernandez, E. and Terray, L. (2015) Drift dynamics in a coupled model initialized for decadal forecasts, Climate Dynamics, 46 (5), pp. 1819-1840, doi:10.1007/s00382-015-2678-y

4. Boer, G. J., Smith, D. M., Cassou, C., Doblas-Reyes, F., Danabasoglu, G., Kirtman, B., Kushnir, Y., Kimoto, M., Meehl, G. A., Msadek, R., Mueller, W. A., Taylor, K. E., Zwiers, F., Rixen, M., Ruprich-Robert, Y. and Eade, R. (2016) The Decadal Climate Prediction Project (DCPP) contribution to CMIP6, Geoscientific Model Development, 9, pp. 3751–3777, doi:10.5194/gmd-9-3751-2016

5. Goubanova, K., Sanchez-Gomez, E., Frauen, C. and A. Voldoire (2018), Respective roles of remote and local wind stress forcings in the development of warm SST errors in the South-Eastern Tropical Atlantic in a coupled high-resolution model, Clim., Dyn., https://doi.org/10.1007/s00382-018-4197-0

Relevant projects or activities

1. FP7-PREFACE (11/2013-04/2018)
2. FP7 SPECS (10/2012-10/2016)
3. H2020-PRIMAVERA (11/2016-11/2020)
4. FP7-CLIPC (01/2012-12/2016)
5. IS-ENES I (03/2009-03/2013) and II (03/2014-03/2018)

Relevant infrastructure

Two super-computers provide CERFACS with an aggregate peak capacity of about 330 Tflop /s for processing our main simulation requirements. These resources are complemented by our participation in national (French GENCI) and international calls (ex. Prace and Incite programs). A central NFS server with a capacity of ~1000 TO is accessible from all clusters and workstations. CERFACS also benefits of the free access to external resources and infrastructures, in particular to the Météo-France and CEA super-computers.

10 Institut de Recherche pour le Developpement IRD

Description of the organisation

The IRD (Institut de Recherche pour le Développement) is a French multidisciplinary research institute dedicated to working closely with partner countries on global development issues. Placed under the supervision of the French Ministry of Research and the Ministry of Foreign Affairs and International development, the IRD uses an original approach on development research and expertise throughout its international network in over 90 countries. The IRD aims at using its research and tools for the benefit of countries that make science and innovation the prime levers for development. Emphasizing interdisciplinarity, the IRD has focused its research for over 75 years particularly in Africa, Latin America, and the French tropical overseas territories. Its research, training and innovation activities are intended to contribute to the social, economic and cultural development of southern countries. In the coming years, the major issues of development research will focus on the Sustainable Development Goals with emphasis on 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development) and 13 (Take urgent action to combat climate change and its impacts). These areas need to be tackled by responding to the aspirations and singular priorities of states, who themselves are sensitive to exchanges between the economic, social, cultural and geographical areas. Beyond this new international context, including the diversity of situations in the South and the current crises, the IRD, with its academic partners, must promote an ethic of partnership.

Particularly relevant for the project

IRD conducts a series of Research Projects in collaboration with southern countries involved in TRIATLAS, in particular Brazil, Benin, Senegal, Côte d'Ivoire and South Africa (*e.g.* ABRAÇOS, AWA, PADDLE, PIRATA, TAPIOCA, AtlantOS and PREFACE). These Projects encompass most aspects addressed in the four CTs of TRIATLAS (physical oceanography including the PIRATA array, observation of biological processes from plankton to apex predators, ecosystem modelling, capacity building, and human consideration in socio-ecosystems). Three IRD Joint Research Units (UMR) are particularly involved in TRIATLAS: LEGOS (http://www.legos.obs-mip.fr/), LEMAR (www-iuem.univ-brest.fr/LEMAR) and MARBEC (www.umr-marbec.fr/en/).

Roles and tasks in the project

IRD will contribute to CT1, CT2 (co-lead WP2.1), CT3 (co-lead WP3.2) and CT4 (co-lead WP4.1). In WP1.1 IRD (LEGOS) will focus on studies in the Gulf Guinea, its coastal areas as well as on the eastern equatorial Atlantic cold tongue (mesoscale processes). In WP1.3, IRD (LEMAR) will focus on the pattern of distribution of a variety of ecosystem components using acoustics, trawl and biologging data. In WP1.5, IRD (MARBEC, LEGOS) will contribute to conceptualise the patterns in ecosystem structure and function from physics to apex predators. In WP2.1, IRD (MARBEC, LEGOS) will contribute to the development of scenarios comparing ocean productivity under various condition of stratification, and to document the variability of oceanographic parameters in the eastern tropical Atlantic. In WP3.2. IRD (MARBEC) will set-up end-to-end ecosystem models' configurations (OSMOSE and APECOSM) to study the predictability of ecosystems and fisheries in South Africa (including sardines and anchovies) and at the scale of the entire Atlantic Ocean (including tropical and temperate tunas). In WP4.1 (LEGOS, MARBEC, LEMAR) IRD will contribute to maintain and support the regional Capacity Development efforts in West Africa and to make available its large Atlantic network to promote capacity building among partners/countries. Finally, IRD (MARBEC, LEMAR) will take advantage on a variety of project involving stakeholders (*e.g.* AWA, PADDLE) to reach non-academic communities.

Relevant personnel

Dr. Arnaud Bertrand (male) is senior scientist in MARBEC. Specialist in 'ecosystem acoustics'. He is PI of the ABRAÇOS surveys and of the LMI TAPIOCA, and co-PI of WP2: 'Key ecosystem dynamics for Marine Spatial Planning' of the H2020 UE RISE PADDLE Project. He is currently based in Brazil, Recife, as visiting Professor in UFPE and UFRPE.

Dr. Sophie Bertrand (female) is senior scientist in MARBEC. Her field of expertise embraces marine ecology. She's co-PI of WP5 of the H2020 UE RISE PADDLE Project. She is currently based in Brazil, Recife, as visiting Professor at UFRPE.

Dr. Bernard Bourlès (male) is senior scientist in LEGOS and works in physical oceanography, observations & data analysis. Co-Chair PIRATA and coordinator of PIRATA France, he initiated capacity development programs in West Africa. He is involved (and IRD person in charge) in the EU projects PREFACE (FP7: WP3 & WP4) and AtlantOS (H2020: WP3).

Dr. Gaël Alory (male) is a senior scientist in LEGOS and works in physical oceanography, observations & model

analysis. He is involved in capacity development programs in West Africa. He was associated to EU project PREFACE as co-leader of WP5 "Joint observations – model comparison".

Dr. Patrice Brehmer (male) is senior scientist in LEMAR and works in fisheries and fisheries acoustics. He is PI of the international consortium AWA project (14 countries and 42 laboratories) was associated to PREFACE as core theme leader (CT5 "ecosystem impact").

Dr. Olivier Maury (male) is a senior scientist in MARBEC. He is a marine ecologist, population and ecosystem modeller. He has developed the integrated mechanistic models of marine ecosystems APECOSM. He is Lead Author in the IPBES Models and Scenarios report.

Dr. Yunne Shin (female) is a senior scientist in MARBEC. She is a marine ecologist, and has developed the regional ecosystem model OSMOSE. She is co-chair of the IOC/EuroMarine "IndiSeas" program, member of the GOOS Biology and Ecosystems Panel, and of the IPBES global assessment of biodiversity and ecosystem services as a Coordinating Lead Author.

Other relevant participants: MARBEC: N. Barrier, F. Marsac ; LEGOS: F. Marin, J. Jouanno, A. Chaigneau, S. Cravatte, S. Illig, M.-H. Radenac, J. Llido, I. Dadou, Université Paul Sabatier; Yves Morel, CNRS; LEMAR : Y. Perrot.

Relevant publications, products, services or other achievements

1.   Bourlès, B., et al., 2008; The PIRATA program: history, accomplishments and future directions, *Bulletin of the American Meteorological Society*, 89(8), 1111-1125
2.   Bertrand A., Grados D., Colas F., Bertrand S., et al., 2014. Broad impacts of fine-scale dynamics on seascape structure from zooplankton to seabirds. *Nature Comm.*, 5: 5239
3.   Herbert, G., B. Bourlès, et al, 2016. New Insight on the upper layer circulation north of Gulf of Guinea, *J. Geophys. Res.-Oceans*, 121, doi 10.1002/2016JC011959
4.   Tittensor D., […], O. Maury, […], Y. J. Shin, et al., 2018. A protocol for the intercomparison of marine fishery and ecosystem models: Fish-MIP v1.0. *Geosci. Model Dev.*, 11, 1421–1442
5.   Diankha O., Ba A., Brehmer P. *et al*. 2018. Contrasted optimal environmental windows for both sardinella species in Senegalese waters. *Fisheries Oceanography*, 27, 351-365

Relevant projects or activities

PIRATA ("Prediction & Research moored Array in the Tropical Atlantic"; 1997 to date); PREFACE (EU FP7; 2013-2018); AtlantOS (EU H2020; 2014-2019); PADDLE (EU H2020 RISE "Planning in a liquid world with tropical Stakes: solutions from an EU-Africa-Brazil perspective"; 2017-2021); AWA (BMBF-IRD; 2013-2017), International Joint Lab. TAPIOCA (IRD-UFPE-UFRPE; 2018-2022).

Relevant infrastructure

IRD has representatives (with visiting scientists) in Brazil, Benin, Senegal, Ivory Coast and South Africa. IRD organizes regular oceanographic cruises (yearly PIRATA cruises, ABRACOS) with the technical contribution of the IRD Service Unit "IMAGO" (Brest) that gathers a team of engineers/technicians and technical equipment for oceanographic measurements. This unit is ISO 9001 certified since 2009.

11 Centro Nacional de Supercomputación BSC

Description of the organisation

The Barcelona Supercomputing Center-Centro Nacional de Supercomputación (BSC, https://www.bsc.es) combines unique high performance computing facilities and in-house top research departments on Computer, Life, and Earth sciences, and in computational applications in science and engineering. It is the main provider of public supercomputing services in Spain, coordinating the Red Española de Supercomputación and representing Spain in international initiatives such as PRACE. The Earth Sciences (ES) Department focuses on the atmosphere-ocean-biosphere system and is structured around four groups with more than 70 researchers and support staff. It is a highly productive scientific entity that has published more than 160 research peer-reviewed articles over the last 5 years, many in high-impact journals. Within the ES Department, the climate prediction group (CPG) aims at developing a climate forecast system based on the EC-Earth model and performs regular assessments of its predictive capacity, and compares it with other operational and quasi-operational systems in the world. It currently participates in 10 European and 4 national projects.

Particularly relevant for the project

The CPG at the BSC has a long experience in seasonal to decadal climate prediction, reflected in its active participation in several European projects with a strong component on climate prediction (see list below). Of particular relevance was the FP7 project SPECS, led by BSC, in which specific, innovative global forecast system experiments were coordinated to test hypotheses for the improvement of seasonal to decadal predictions. The group has been expanding its research activities on prediction, and is contributing to the development of the CMIP6 version of the Earth System model EC-Earth, to be available by the end of summer 2018. In addition, members of the group are producing the initial conditions that will be used in decadal predictions of ocean biogeochemistry, using the biogeochemical component PISCES. With the final model version, the group will strongly contribute to DCPP (Decadal Climate Prediction Project), and C4MIP (Coupled Climate-Carbon Cycle Model Intercomparison Project).

Roles and tasks in the project

The CPG will be involved in different tasks of WP3.1: "Tailored seasonal to multi-decadal forecasts and multi-decadal to centennial scenarios for key climate and biogeochemical drivers of marine ecosystems", including the performance of near-real time decadal forecasts with EC-Earth and the biogeochemical model PISCES, sensitivity experiments to test the impact of different initialization strategies on the decadal forecast skill, and the development of bias-correction methods to improve the forecast skill for some selected case studies.

Relevant personnel

Dr. Eleftheria Exarchou (female) is a physical oceanographer and climate modeler. During the last three years she has been a researcher in the climate prediction group of the Earth Sciences department in BSC, during which she has obtained an extensive experience in climate predictability from seasonal to decadal timescales. She has been actively involved in the FP7/H2020 funded projects SPECS, PREFACE (leader of WP11), and PRIMAVERA, the ERC funded project SEACHANGE, as well as national Spanish projects (RESILIENCE and HIATUS). She will lead the seasonal-to-decadal climate prediction activities at the BSC.

Dr. Raffaele Bernardello (male) is a Marie-Curie fellow in the climate prediction group at BSC and his expertise and research interests are in the broad context of the interactions between climate dynamics and ocean biogeochemistry. As part of his MSC project, Raffaele is working on the assessment of the predictability of biogeochemical properties in the upwelling systems of the Atlantic Ocean. He has participated to 3 national projects (Spain: OAMMS; UK: BATMAN; USA: NOAA-NA10OAR4320092), one FP6 project (SESAME) and one ESA project (ENVISAT-A0290), and is the PI of a Spanish project (DeCUSO). He will be responsible for all activities involving the biogeochemical model PISCES.

Dr. Pablo Ortega (male) is co-leader of climate prediction group at the BSC, and has a broad expertise in decadal climate variability and predictability in the North Atlantic region. His research background includes the development of new ocean initialization strategies, the realization and analysis of perfect model experiments, and the investigation of physical mechanisms and climate impacts through the development of process-based studies. He supervises the work of 8 postdocs and 1 PhD student and is currently leading the BSC activities in two H2020 projects (APPLICATE, INTAROS), a Spanish national project (DANAE), and a Belgian project (PARAMOUR). He will coordinate all the BSC contributions to WP3.1.

Relevant publications, products, services or other achievements

1.   Exarchou, C. Prodhomme, L. Brodeau, V. Guemas and F.J. Doblas-Reyes. Origin of the warm eastern

tropical Atlantic SST bias in a climate model. Clim. Dyn. (Published online)

2.   Volpi, D., V. Guemas, F.J. Doblas-Reyes, E. Hawkins and N. Nichols (2017). Decadal climate prediction with a refined anomaly initialisation approach. Clim. Dyn. 48, 1841-1853

3.   Volpi D., V. Guemas and F.J. Doblas-Reyes (2017). Comparison of full field and anomaly initialisation for decadal climate prediction: towards an optimal consistency between the ocean and sea-ice anomaly initialisation state. Clim. Dyn. 49, 1181-1195

4.   Guemas V., F.J. Doblas-Reyes, I. Andreu-Burillo and M. Asif (2013). Retrospective prediction of the global warming slowdown in the past decade. Nat. Clim. Change 3, 649-653

5.   Bernardello R., I. Marinov (2014). Response of the Ocean Natural Carbon Storage to Projected Twenty-First-Century Climate Change, Journal of Clim. 27, 2033-2053

Relevant projects or activities

1.   PREFACE (FP7-ENV-2013-603521) www.preface-project.eu Project to enhance prediction of tropical Atlantic climate and its impacts

2.   APPLICATE (H2020-BG-2016-2017-727862) https://applicate.eu/ Project on polar climate variability, predictability and impacts

3.   EUCP (H2020-SC5-2016-2017-776613) https://www.eucp-project.eu/ Project to develop an innovative European climate prediction system

4.   MPREX (H2020-WATER-2014-641811) http://www.imprex.eu/   Project to improve predictions and management of hydrological extremes

5.   PRIMAVERA (H2020 SC5-01-2014-641727) https://www.primavera-h2020.eu/   Project to advance in high-resolution global climate modelling

Relevant infrastructure

All the BSC infrastructure and support is available to the BSC-ES members: a 13 PFlops supercomputer, a long-term storage, commodity computational facilities with both physical and virtualised environments, a solid project management team, and the outstanding collaborations with researchers in computing sciences. The BSC operational forecast systems runs at MareNostrum IV supercomputer, but the systems are redundantly implemented in another HPC platform (Minotauro). MareNostrum IV is one of the 7 Tier-0 PRACE systems currently available for European scientists. Its peak power is 11.15 Petaflops, and has a total of 165,888 processors and a main memory of 390 Terabytes. The operational products are located in a Big Data storage system of 2 PBytes that will be accessible through THREADS technology in the near future.

12 Universidad Complutense de Madrid UCM

Description of the Organization

The Universidad Complutense de Madrid (UCM) is the largest university in Spain. With a tradition beyond 5 centuries, UCM has become a very important institution in terms of higher education and research activities. UCM counts more than 85.000 students, 65 bachelor degrees, 105 master degrees, and 6000 researchers. From 2012 there has been a total income of almost 40M€ for research activities. The uniqueness of UCM has favoured the awarding of the "Campus of International Excellence" label to the institutions joining this "Campus de Moncloa", in which Global Change and New Energies, Agri-Food Industry and Health are among the most important clusters.

UCM group integrates TROPA and OEQDYN research groups. TROPA, founded in 2002, has expertise in climate variability, leading and participating in national and international projects, and collaborations with external institutions (ICTP, UPMC, UiB, NCAS, IRD, MPI, UCLA). In the last 5 years, TROPA group has published more than 40 papers in SCI journals, developing skills in numerical simulations with GCMs (Speedy, UCLA-AGCM-MIT-OGCM, all running at UCM), and becoming a reference group in tropical Atlantic variability studies (e.g. Polo et al., 2008; Rodríguez- Fonseca et al., 2009, 2011,2015; Losada et al., 2010,2012; Losada and Rodríguez-Fonseca, 2016; Mohino et al. 2011; Martín-Rey et al. 2012). See http://tropa.fis.ucm.es/web. OEQDYN has expertise in physical and biological modelling, particularly of phytoplankton (Aksnes 2011, Beltrán-Heredia 2017).

Particularly relevant for the projects

Broad experience in climate variability in the Atlantic, with particular emphasis in tropical Atlantic variability air-sea interactions and atmospheric drivers. Experience in cooperation activities involving education and research with countries across Africa. In particular, the group has led 6 national cooperation projects to supervise PhD theses and research activities in the Laboratory Simeon Fongang of Dakar (Senegal). Experience in modelling, with development of special routines for coupling the UCLA atmospheric model to the MIT ocean model, thus reducing model bias (in the framework of FP7 PREFACE). Also, development of a statistical model (S4CAST) to evaluate the predictability of climate-related variables in relation to sea surface temperature forcing. In the past 10 years, the group has supervised 15 PhD theses, all related to climate variability in the Atlantic.

Roles and tasks in the project

UCM will co-lead WP2.2 and be particularly involved in T2.2.3. Additionally, UCM will contribute in the determination of the size structure and spatial distribution of phyto- and zooplankton (WP1.5) and will analyse climate and biological variability and associated timescales (WP2.1). The determination of the teleconnections associated with changes in parameters affecting ecosystems will be performed in WP2.2. Also, in WP2.2, a synthesis analysis of the dynamical mechanisms relating local air-sea interactions and impacts on ecosystems: from primary production to fish-population. Finally, analysis of potential predictability of primary production and fish population will be done in WP3.1.

Relevant personnel

Belen Rodríguez-Fonseca (**female**) is Full Professor at UCM and principal investigator (PI) of TROPA (PhD degree from 2001). She has over 50 publications in SCI journals, extensive experience in tropical and extratropical climate variability and a record of national and EU projects (PREFACE and AMMA among others) dealing with tropical Atlantic variability and teleconnections. From 2011 she has active cooperation projects with Senegal, supervising PhD Theses and doing research in climate services in Africa (upwelling, precipitation and malaria). She has participated in more than 20 projects and is first author of a referenced paper about the influence of the Atlantic Niño on the triggering of ENSO and a review paper of the SST impact on Sahelian droughts. In the last 10 years she has supervised 12 PhD Theses and 25 Masters . H-index of 17.

Teresa Losada (female) is Assistant Professor at UCM since early 2018. She works in TROPA group since 2004 and is head of its climate model division. She has expertise in tropical Atlantic variability and West African climate, mostly on interannual timescales. She has co-authored 29 papers in SCI journals, 14 of them in the last 5 years, 24 of them in Q1. She has participated in 12 projects, including 2 EU projects (AMMA-EU and PREFACE) and 3 projects of international cooperation.

Francisco J. Cao (male), Head of the Out of Equilibrium Dynamics Group, has expertise in stochastic dynamics modelling applied to population dynamics and phytoplankton, with publications in leading Ecology journals (OIKOS, Marine Ecology Progress Series, Theoretical Population Biology). He has led 4 national and 2 European (EEA) projects.

Elsa Mohino (female) is Assistant Professor at UCM. She has co-authored 25 papers in SCI journals, 13 of them

in the last 5 years, being lead author of a referenced paper about decadal variability in the Atlantic (Mohino et al., 2016). She has participated in 2 EU projects, AMMA-EU and PREFACE, in which she was responsible for the WP related to tropical Atlantic variability. She has also participated in 5 Spanish National Research projects, leading two of them (related to seasonal-to-decadal climate prediction in the tropical Atlantic), and 4 cooperation projects with West Africa, in two of which she was the PI. She has supervised 2 PhD Theses defended in 2015 and 2018 and is currently co-supervising another. She has advised 10 Master Theses.

Irene Polo (female) is Assistant Lecturer at UCM. She has experience in climate variability at different time-scales: from weather regimes to decadal prediction and most of her research is focused in the Atlantic sector. She has been part of many international projects as EU (AMMA, PREFACE), UK-NERC (CSSP-China, RAMOC, VALOR) delivering in the WPs. According to google scholar, 26 peer-review publications in SCI (80% in Q1, with 770 citations and h-index of 14).

Relevant publications

1.   Beltrán-Heredia, DL Aksnes, FJ Cao, *Phytoplankton size scaling with nutrient concentration*, Mar. Eco-Prog. Ser. 571, 59-64 (2017)

2.   Martin-Rey M., I. Polo, B. Rodriguez-Fonseca, T. Losada and A. Lazar (2018) Is there evidence of changes in Tropical Atlantic Variability modes under AMO phases in the observational record? J. Climate, 31, 515-536

3.   Mohino, E., Keenlyside, N., & Pohlmann, H. (2016). Decadal prediction of Sahel rainfall: where does the skill (or lack thereof) come from?. *Climate dynamics*, *47*(11), 3593-3612

4.   Robson, I. Polo, D. L. R. Hodson, D. P. Stevens and L. C. Shaffrey (2017) Decadal prediction of the North Atlantic subpolar gyre in the HiGEM high-resolution climate model. DOI 10.1007/s00382-017-3649-2

5.   Rodríguez-Fonseca, B., Mohino, E., Mechoso, C. R., Caminade, C., Biasutti, M., Gaetani, M., ... & Polo, I. (2015). Variability and predictability of West African droughts: A review on the role of sea surface temperature anomalies. *Journal of Climate*, *28*(10), 4034-4060

Relevant projects or activities

1.   2014-2015: Stochastic Dynamics in Ecology. 005-ABEL-CM-2014A (EEA Grants).

2.   2013–2018, EU FP7: Enhancing Prediction of Tropical Atlantic Climate and its Impacts

3.   (PREFACE)

4.   2013-2016: Multiscale Climate Variability. Agronomical and Economical Impacts . National Project.

5.   2018-2020: PRE4CAST: Climate Predictability in the Atlantic Sector. National Project.

6.   2016-present: Determination of Coastal upwelling from daily navigation charts (1700 to present). CGL2015-72164-EXP. National Project.

Relevant infrastructure

The group is a relevant user of EOLO, a high performance computing cluster that belongs to the Climate Change Laboratory of the Excellence Campus of UCM. http://www.campusmoncloa.es/es/infraestructuras/eolo/

13 University of Cape Town   UCT

a. Marine Ecology & Fisheries Group

Description of the organisation

With a ranking among the top 200 universities world-wide (Times Higher Education and Quaquarelli Symonds ranking systems), and ranking first in Africa, the University of Cape Town is an inclusive and engaged research-intensive African university that inspires creativity through outstanding achievements in learning, discovery and citizenship; advancing a more equitable and sustainable social order and influencing the global higher education landscape. UCT has a long, proud and productive history in marine science, as well as in under- and postgraduate education.

Particularly relevant for the project

Interdisciplinary research in the fields of marine ecology and system-based approaches to management of human activities in the ocean, hosted in UCT's Department of Biological Sciences, have been key to the continued success of marine science at UCT, and its outputs and researchers have received prominent global recognition. The Department hosts the South African Research Chair in Marine Ecology & Fisheries (ME&F), whose team has contributed to FPs 6 and 7 in projects such as DARMA, ECOFISH and MEECE. The group focuses on developing methodology for the implementation of interdisciplinary, systems-based approaches to fisheries, including methodology to tease apart the relative impact of environmental (climate) and anthropogenic (fisheries, pollution) drivers on inter-annual to decadal timescales. Senior members of ME&F group have actively participated in, and continue to provide leadership to, national and international research, development and management advisory fora.

Roles and tasks in the project

UCT_ME&F co-leads CT2, "Ecosystem changes: variability, controls and extremes" in TRIATLAS, and provides major contributions to WP2.2 and WP3.2. For WP2.2. UCT_ME&F provides expertise in human social drivers and related indicators, as well as in data- and model-based analyses of ecosystem tipping points and regime shifts. For WP2.2. and WP3.2 combined, UCT_ME&F contributes ecosystem modelling using the EwE suite of models for the Benguela case study, including the generation of hindcasts and forecasts of the effect of management strategies in different ocean climate scenarios. UCT_ME&F further contributes to WP2.1 with expertise in the Benguela case study.

Relevant personnel

Prof Astrid Jarre (female) holds the South African Chair in Marine Ecology and Fisheries, hosted by UCT's Department of Biological Sciences. A former Chair one of ICES' Science Committees and member of ICES' advisory committees, as well as SSC member of the IGBP/SCOR Global Ocean Ecosystem Dynamics Programme (GLOBEC), Prof Jarre recently co-ordinated the Synthesis of the Norad-funded project "Climate effects on biodiversity, abundance and distribution of marine ecosystems" in the Benguela Current large marine ecosystem, linked to the science programme of the Benguela Current Commission. She has extensive experience with CEC-funded projects. In TRIATLAS, Prof Jarre will co-lead CT2.

Dr Lynne Shannon (female) is Chief Scientific Officer in the ME&F group. She will contribute to CT2 and CT3. With well over 200 peer-reviewed publications between them in the fields of marine ecosystem modelling, indicators and fisheries management in marine social-ecological systems, the ME&F team has been recognised among the world's top researchers, and currently contribute to the IPBES assessment through lead-authorship, and to Future Earth's BioDiscovery Programme, as well as the EUROCEANS IndiSeas Programme in scientific leadership roles.

Relevant publications, products, services or other achievements

1.   Jarre A, Shannon LJ, Cooper R, Duggan GL, Gammage LC, Lockerbie EM, McGregor ES, Ragaller SM, Visser N, Ward C, Watermeyer KE, Weller FG, Ommer RE. 2018. Untangling a Gordian knot that must not be cut: Social-ecological systems research for management of southern Benguela fisheries. Journal of Marine Systems, https://doi.org/10.1016/j.jmarsys.2018.01.004

2.   Shannon LJ, Lamont T, Winker H, Coll M., Jarre A. Using available fishery, ecological and environmental time series to examine temporal variability in the southern Benguela ecosystem over the past four decades. ICES Journal of Marine Science, in review

3.   Shannon LJ, Coll M. 2017. Assessing the changing biodiversity of exploited marine ecosystems. Current Opinion in Environmental Sustainability 29: 89-97. https://doi.org/10/1016/j.cosust.2018.01.008

4.   Bundy A, Chuenpagdee R, Boldt JL, de Fatima Borges M, Camara ML, Coll M, Diallo I, Fox C, Fulton

EA, Gazihan A, <u>Jarre A</u>, Jouffre D, Kleisner KM, Knight B, Link J, Matiku PP, Masski H, Moutopoulos DK, Piroddi C, Raid T, Sobrino I, Tam J, Thiao D, Torres MA, Tsagarakis K, van der Meeren GI, Shin Y-J. 2016. Strong fisheries management and governance positively impact ecosystem status. Fish & Fisheries http://doi.org/10.1111/faf.12184

5.   Jarre A., Hutchings L., Kirkman S.P., Kreiner A., Tchipalanga P., Kainge P., Uanivi U., van der Plas A., Blamey L.K., Coetzee J., Lamont T., Samaai T., Verheye H.M., Yemane D., Axelsen B.E., Ostrowski M., Stenevik E.K., Loeng H. 2015. Synthesis: Climate effects on biodiversity, abundance and distribution of marine organisms in the Benguela. Fisheries Oceanography, 24: 122–149. doi:10.1111/fog.12086

Relevant recent projects or activities

1.   EUROCEANS/UNESCO-IOC Project "Indicators of the Seas (IndiSeas)" Phases I&II, since 2005, ongoing

2.   Belmont Forum Climate Change Grand Challenge Project "SEAVIEW", 2015-2017

3.   Belmont Forum Climate Change Grand Challenge Project "GULLS", 2014-2016

4.   EU FP7/EuropeAid Project "ECOFISH", 2012-2016

5.   Norad Project "NansClim: Climate Effects on Biodiversity, Abundance and Distribution of Marine Organisms", 2009-2014

Relevant infrastructure

No major technical infrastructure is required for this team to carry out the proposed work. The South African Research Chair in Marine Ecology and Fisheries will contribute results of postgraduate students' and postdoctoral fellows' research as appropriate, as in-kind contribution to TRIATLAS.

b. Nansen Tutu Centre for Marine Environmental Research

Description of the organisation

The Nansen-Tutu Centre (NTC) is a University of Cape Town non-profit research Centre hosted at the Marine Research Institute and the Department of Oceanography at the University of Cape Town (UCT). The administrative and legal responsibilities reside with the University of Cape Town. It is a joint venture agreement between the signatory partners from South Africa, Norway and France. The vision of the Nansen-Tutu Centre for Marine Environmental Research is to serve Africa through advancing knowledge of the marine environment and climate system in the spirit of Nobel Peace Laureates Fridtjof Nansen and Desmond Tutu. Staff consists of partially funded and seconded associate researchers and administrators from the partner institutes, as well as fully or co-funded MSc and PhD students and Post-doctoral research fellows.

Particularly relevant for the project

The priority research activities at the NTC are ocean modeling and prediction, ocean-atmosphere interaction, climate variability and regional impact, high resolution satellite remote sensing of the regional shelf seas, capacity building and education.

Roles and tasks in the project

Mathieu Rouault will be co-leader of Task1.1.2 (WP1.1). He will work on Benguela Niños, an ocean phenomenon detrimental to the marine ecosystem. Marie-Lou Bachèlery will bring her expertise in coastal Kelvin waves which is an important driver of upwelling and Benguela Niños in the tropical Atlantic, while Jenny Veitch will develop high resolution model and will bring her expertise of the wind-driven upwelling in the Benguela Current system. They will mainly contribute to Task1.1.2 but collaborate with CT2, sharing their expertise of the tropical Atlantic and Southern Benguela to the relevant case studies. Mathieu Rouault will also be co-leader of Task2.1.1 (WP2.1). He will help establish the link between CT1 and CT2 and advise an African PhD student on the topic.

Relevant personnel

Prof Mathieu Rouault (male) is co-director of the Nansen Tutu Center and Professor of Oceanography at University of Cape Town. He holds the South Africa NRF SARCHI Chair of research in Ocean Atmosphere Interaction. His research has led him to all aspects of ocean atmosphere interaction, from creating numerical models to experimental work at sea, from turbulent to global scale, from meteorology and physical oceanography to climatology and more recently to the impact of climate change and variability on regional climate and marine ecosystems. He has co-authored 75 peer reviewed papers and was a work package co-leader of the FP7 PREFACE

project. He has advised Postdoctoral fellowship, PhD and Masters students and teaches Ocean Atmosphere Interaction at UCT.

Marie-Lou Bachelery (female) has a PhD from University of Toulouse in Oceanography and has authored or co-authored 4 peer review papers. She is doing a postdoctoral fellowship at the Nansen Tutu Centre at University of Cape Town on coastal kelvin waves in the Angola Benguela Current, a topic central to CT1.

Jenny Veitch (female) is a modeller that was lecturer in the department of Oceanography and now a researcher at the South African Environmental Observing Network. She is a modeller specialising in the Benguela and Agulhas Current. She has published 15 peer-reviewed papers on the topic.

Relevant publications, products, services or other achievements

1.   Rouault, M., Illig, S., Lübbecke, J. and Koungue, R.A.I., 2018. Origin, development and demise of the 2010–2011 Benguela Niño. *Journal of Marine Systems*. https://doi.org/10.1016/j.jmarsys.2017.07.007

2.   Bachèlery, M.-L., Illig, S., Dadou, I., 2015. Interannual variability in the South-East Atlantic Ocean, focusing on the Benguela Upwelling System: remote versus local forcing. J. Geophys. Res. Oceans 120. http://dx.doi.org/10.1002/2015JC011168

3.   Rouault, M., B. Pohl and P. Penven, (2010) Coastal Oceanic climate change and variability from 1982 to 2009 around South Africa, African Journal of Marine Science 32(2): 237–246

4.   Veitch, J., Hermes, J., Lamont, T., Penven, P. and Dufois, F., 2017. Shelf-edge jet currents in the southern Benguela: A modelling approach. *Journal of Marine Systems*. In press

5.   Veitch, Jennifer A., and Pierrick Penven. "The role of the Agulhas in the Benguela Current system: A numerical modeling approach." *Journal of Geophysical Research: Oceans* 122.4 (2017): 3375-3393

Relevant projects or activities

Mathieu Rouault was involved in the Project FP7 PREFACE, organised a summer school and the PREFACE-PIRATA-CLIVAR Tropical Atlantic Variability conference in Cape Town. He was responsible for a deliverable within PREFACE and supervised two African students who graduated during the project and produced 4 papers. He himself contributed 3 other papers, and Marie-lou Bachelery 2 other papers, to PREFACE. Mathieu Rouault is the chairman of the PIRATA Extension in the Tropical Southeast Atlantic (PIRATA SEE) which is the PIRATA mooring at 6 S 8 E. The first mooring was funded by the Benguela Current Large Marine Ecosystem (BCLME) Project, a project of the Global Environmental Facility (GEF) of the World Bank. Mathieu Rouault and Jenny Veitch are member of the Eastern Boundary System CLIVAR task team. Mathieu Rouault is also co-investigator of the national project ACCESS (African Centre for Climate and Environment Stewardship) that was started by Professor George Philander. Mathieu Rouault was PI of the 2016-2017 ESA GLOBECURRENT Agulhas Current case study that led to 5 publications.

Relevant infrastructure

We only require computer access and UCT has a very good computing facility and clerical support.

14 National Institute for Fisheries Development INDP

Description of the organization

The National Institute for Fisheries Development (INDP) created in 1992, is a public institution, with legal personality and with administrative, scientific and technical autonomy. The INDP is the scientific support of the government in fisheries development, management, policy and planning, as well as in marine biodiversity conservation and marine environment issues. INDP is structured in four departments: The Marine Research and Aquaculture Department (including Statistics Division), the Department of Promotion of the Development of Fishery, the Department of Studies and Projects and the Department of Administration and Finance. The total number of personnel employed in the institute is approximately 100; with 58 % scientists or technicians. The combined budget (including project funding which comprises more than 50% of the budget) is approximately € 8.36 million.

Particularly relevant for the project

The Institute has a research vessel, "Islandia" as well as a laboratory and a times-series oceanographic site, the Cabo Verde Oceanic Observatory (CVOO – www.cvoo.de), which measures temperature, salinity, biological parameters, nutrients, dissolved carbon and oxygen, and includes an oceanographic long-term mooring for in-situ observations. Currently the CVOO lab is located at the Ocean Science Centre Mindelo –OSCM, a joint bilateral initiative between GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany, and INDP of the Republic of Cabo Verde. OSCM is a platform for marine and atmospheric research in the Northeast Tropical Atlantic, and supports the CVOO time series station and field campaigns in the region.

Nonetheless, INDP's main focus is fisheries research and marine biodiversity management, where daily biologic samplings of species are done in order to serve as a basis for studies of population dynamics and assessments to determine the behaviour and abundance of commercially important species and based on that, propose management measures for sustainable fisheries.

Roles and tasks in the project

INDP will participate in activities that enable increasing understanding on the impact of climate change in human activities and marine ecosystems. INDP will thus actively participate in CT1 (WP1.1, 1.4 and 1.5) and CT4 (WP4.1 and 4.4).

Under WP1.1, INDP will focus together with GEOMAR on physical processes affecting ecosystems in eastern boundary upwelling regions, in seamount, island and continental shelf regions with a focus on the Cabo Verde archipelago, and basin scale connectivity including the mesoscale eddy field and large scale circulation. Under WP1.4, INDP will contribute to map and assess the human activities affecting, and being affected by marine ecosystems in Cabo Verde. We will quantitatively assess the current status of main activities with regards to climate change, fisheries and aquaculture and cumulative impacts thereof. Finally in WP1.5, INDP will contribute to the synthesis, including the analysis of the role of physical processes for the ecosystem encompassing incidentally the role of seamounts/oceanic islands, upwelling and frontal processes for production, and an identification of socio-economic drivers as defined in SSP for the development of coastal social systems.

Regarding WP4.1, INDP will collaborate on capacity strengthening activities between South American, African and European countries in the field of marine research (natural and social sciences), including education and training activities (joint PhD courses, student exchanges, visiting scholarships, technical training, participating and hosting possible activities defined on the project. Further, by enhancing technological capacity development for fisheries data collection and management purposes based on mobile IT solutions. INDP will be a key contact point for WP4.4 and play an active role in identifying and communicating with key regional stakeholders.

Relevant personnel

Osvaldina Silva (female) is economist, master's in economics of natural and environmental resources and a PhD fisheries economy in the Bratanha University Ocidental- France, was Director of Studies and Projects department for 7 years now, since the year 2015 is President of the National Institute for Fisheries Development. She has participated in short training on the management of resources in China, France and Spain and has been working with international projects with FAO. PI of PREFACE project from INDP.

Albertino Martins (male) is a fisheries Biologist, holds university degree in Marine Biology and fisheries for Algarve University, works for several years at INDP in stock assessment team, and fisheries statistic division, national coordinator for MARPOROF MAC 2014 project, focal point of NetBiome project and has been director of Fisheries Research Department since 2013. He has attended in-service training courses in Rhode Island University (Stock Assessment), West Africa (Nansis EAF NANSEN Project) and Spain (Fisheries statistics course) and

participated in many international meetings.

Elisia da Cruz (female) is graduated in Sociology (2008) from the University of Mindelo, in Cabo Verde, have a Master in Sustainable Development Management (2013) and doctorate in Marine Science, Technology and Management by the University of Vigo in Spain. In INDP dedicates to the management and monitoring of research, project and extension activities in fishing communities; coordinates the training for technicians of INDP and for the fisheries communities; makes permanent contacts with fisheries communities by providing information on the fisheries sector, and help him to develop projects and other activities. Areas of interest research: Integrated Coastal Zone Management (ICZM), Governance, Public Policyand Sustainable Development, Marine Protected Areas (MPA), Fisheries.

Ivanice Monteiro (female) Marine biologist, master students on Oceanography and Marine Resources Management Cabo Verde University and Campus do Mar (Spain). INDP worker as responsible for the CVOO laboratory since the observatory establishment. Actually OSCM laboratories manager. Cabo Verde focal point at PREFACE project.

Vito Ramos (male) PhD student in Oceanography and Marine Resources Management –University of Cabo Verde focusing on "environmental conditions versus fisheries production in the Cabo Verde zone". Project Coordinator at INDP. National focal point for MESA (Monitoring of the Environment and Security in Africa) project and now the GMES (Global Monitoring for Environment and Security) project. Current scientific coordinator of the OSCM.

Péricles Silva (male) PhD student in Oceanography and Marine Resources Management – Cabo Verde University and Campus do Mar (Spain) 2016-2019 (ongoing). Thesis topic on the behaviour of Yellow fin tuna based on tagging with pop up tags from wild life. He's the site manager of the OSCM and has large experience on field word related to oceanography and participated on several in cruises on board of different research vessels.

Nuno Vieira (male) Marine biologist by the University of Cabo Verde, since 2010 he is worker of INDP, most specifically collaborator of CVOO, where he is responsible for the deployment and recovery of the autonomous instruments and some maintenance of the CTD, he also supports lab analyses. He also supports the marine biodiversity projects and soon he will start working together with the stock assessment INDP team.

Elizandro Rodrigues (male) Marine Biologist, Master student in Oceanography and Marine Resource Management by the University of Cabo Verde and Campus do Mar (Spain). Work as technician at INDP and assigned to OSCM. My specialty is Biological Oceanography, more precisely the study of zooplankton utilizing the Zoo scan approach and with great interest in acoustic surveys.

Relevant publications, products, services or other achievements

1.   González, J.A., R. Triay-Portella, A. Martins & E. Lopes (2017) Checklist of brachyuran crabs (Crustacea: Decapoda) from the Cabo Verde Islands, with a biogeographic comparison with the Canary Islands (Eastern Atlantic). Cahiers de Biologie Marine, 58: 137-151

2.   González, J.A., A. Martins, J.I. Santana, R. Triay-Portella, C. Monteiro, V. García- Martín, S. Jimémez, G. González-Lorenzo, J.G. Pajuelo, J.M. Lorenzo & M. Biscoito (2014) New and rare records of fishes (Osteichthyes) from the Cabo Verde Islands (eastern- central Atlantic Ocean). Cybium, 38 (4): 289-300

3.   González, J.A., O. Tariche, A. Martins, J.I. Santana, R. Triay-Portella, C. Monteiro, S. Correia & J.G. Pajuelo (2014, in press) O camarão soldado Plesionika edwardsii (Crustacea: Decapoda: Pandalidae) das ilhas de Cabo Verde - Avaliação e recomendações para uma exploração sustentável. Trabalhos apresentados na VIII Reunião Ordinária do Conselho Científico, Instituto Nacional de Desenvolvimento das Pescas. São Vicente, Cabo Verde. 17-18 Maio 2012

4.   Fiedler, B., Grundle, D. S., Schütte, F., Karstensen, J., Löscher, C. R., Hauss, H.,Wagner, H., Loginova, A., Kiko, R., Silva, P., Tanhua, T., And Körtzinger, A.: Oxygen utilization and downward carbon flux in an oxygen-depleted eddy in the eastern tropical North Atlantic, Biogeosciences, 13, 5633–5647, doi:10.5194/bg- 13-5633-2016, 2016

5.   Fischer, G., Karstensen, J., Romero, O., Baumann, K.-H., Donner, B., Hefter, J., Mollenhauer, G., Iversen, M., Fiedler, B., Monteiro, I., And Körtzinger, A.: Bathypelagic particle flux signatures from a subtoxic eddy in the oligotrophic tropical North Atlantic: production, sedimentation and preservation, Biogeosciences, 13, 3203–3223, doi:10.5194/bg-13-3203-2016, 2016

Relevant projects or activities

INDP has experience in of execution of several projects. Specifically in the field of oceanography, fisheries research and marine biodiversity management:

1. OSCM provides in this region logistical support for international research campaigns and projects and therefore bringing the benefits of this research infrastructure to the attention of the international scientific community. OSCM highly welcomes international investigators to conduct field work in the West African region

2. EUROSITE PROJECT - International Network of Oceanographic Observatories (Center for Marine Sciences of the University of Southampton - England and IFM-GEOMAR, MAXPLANK Institute, University of Kiel - Germany)

3. TENATSO - le project TENATSO – Tropical Eastern North Atlantic Time Series Observatory IFM/Geomar Germany

4. ESTRAMAR Project - Marine-Maritime R+ D+I Strategy in Macaronesia / University of Las Palmas de Gran Canarias (ULPGC) Canary Islands; Canary Islands Institute of Marine Sciences (ICCM) Canary Islands; University of the Azores; APRAM - Administration of the Ports of the Autonomous Region of Madeira, SA

5. Projecto NETBIOME 2 - Strengthening European Research Cooperation for the Management of Tropical and Subtropical Biodiversity towards a Smart and Sustainable Development of ORs and OCTs (Plocan /Netbiome2)

6. Projecto AMESD – African Monitoring of the environment for sustainable development - African union/ UE / ACP

Relevant infrastructure

OSCM is a platform for marine and atmospheric research in the Northeast Tropical Atlantic, and support the CVOO time series station and field campaigns in the region. The center is available to national and international scientific marine community and offer teaching and training possibilities as well as a very good logistic expertize importing and exporting scientific equipment and samples. OSCM is provided with: two universal laboratories, one wet lab, two workshops for maintenance and repair of oceanographic equipment, a main hall with a gantry crane for installation of lab containers and maintenance of large-scale scientific equipment, storage space (incl. fridges and freezers (-20, -40, -80°C) and gas storage), two conference rooms, three offices for guest scientists and technical and social facilities.

INDP has three vessels, one of them "Islandia" is a small oceanographic vessel that operate as CVOO support and available for different national and international partners on marine research. The others two, is fishing vessels used for experimental fishing

One meeting room with capacity for 30 people, and auditorium with capacity for 100 people, among other support structures for events

15 The National Fishery and Marine Research Institute INIP

Description of the organisation

INIP is the only non-university research institution in the field of marine sciences in Angola and is classified by the Ministry of Higher Education and Science and Technology as a research and development institution. The INIPM mandate is the inter- and multidisciplinary investigation of all relevant aspects of modern marine sciences. The main research topics are grouped in four divisions: Ocean Circulation and Climate Dynamics, Living Marine Resources Dynamics, Pollution and Biodiversity. To improve the researcher work and marine scientific knowledge, closely cooperation at national, regional and international level are maintained with institutions (institutes, programs, projects) like Benguela Current Convention (BCC), Nansen Program under FAO and IMR support, GEOMAR, ODINAFRICA, University of Cape Town to mention a few.

The infrastructure gives INIP a unique profile and a central collaborative role within the marine science community and includes three research centers, in Luanda, Benguela and Namibia. In the course of this year marine research will be further enhanced with the 74-meter Oceanic Research vessel "R/V Baía Farta" equipped with state-of-the-art, analytical facilities, to respond the oceanographic and marine living resources dynamics.

Particularly relevant for the project

INIP participates with the physical oceanography and living resource data. The Physical Oceanography and teams has significant experience by participating in the in several research surveys on board of the research vessel Dr. Fridtjof Nansen and Meteor in the whole range of sea-going observational work with a particular focus on the Southwest Atlantic circulation and characteristics and plankton composition at high spatial and temporal resolution, studying particularly physical-biological interactions. The Dr. Fridtjof Nansen surveys has also high focus on the dynamic of the transboundary pelagic fish resources and INIP has available one of the longest time series data in Africa (35 years).

Roles and tasks in the project

The INIP will involve in task of packages WP1.1, WP1.2 and WP1.3. For this, the data set of collected with RV Dr. Fridtjof Nansen and others vessels, from fixed station and others sources will be available to contribute to core themes CT1. The INIP participation will be an opportunity to improve the capacity building of its own staff and strengthen the partnership with international experienced research agencies.

In the WP1.1 the focus will be on the physical process and the temporal changes in the water mass properties in the tropical south Atlantic. WP1.2 the group has experience in measuring the primary production, microzooplankton grazing (dilution method), phytoplankton abundance zooplankton abundance and biomass using the ZooScan.

Within the WP1.3 the group will contribute with experience on the role of small pelagic and mesopelagic fish species in the Golf and Benguela current large marine ecosystems. The knowledge of Abundance of key species, vertical and horizontal distribution of different size fractions, and trophic will be used to determine the reaction to large scale changes.

Relevant personnel

Pedro Tchipalanga (male) is a senior researcher at INIP (Auxiliary Researcher), with experience in marine environment and physical oceanography research. He participated in more than 20 research cruises and 10 research projects. In the last years he has been working in close cooperation with Geomar research teams that resulted in 3 publications. His research activities contribute to understanding oceanography along the coastal zone of Angola.

Miguel André António (male) is a researcher at INIP. He has more than 15 years of experience in working with Marine resources and involved in many research projects at national, regional and International level. His research activities focus on Pelagic and Mesopelagic behaviour and dynamic of most important economic Angolan pelagic species. Currently he is involved on the EAF Nansen Program linked to the project of dynamics of eggs and larvae on the southwest Atlantic ecosystem.

António Joaquim da Costa Barradas (male) is a researcher at the INIP (Researcher). He has more than 10 years of experience in work in Marine resources. His focus is on the behaviour of horse mackerel species and in the last years has been involved on the component 5 project PREFACE entitled Impact of climate change on the diversity and function of tropical Atlantic pelagic species and the effects on the economy of Southern African countries. Under this component he is developing with the Norwegian partnership a subproject on the effect of climate variability on seasonal migration pattern of Angolan stock of sardinella schools. Under the Nansen Program is part of the regional team on the link between environmental variability and horse mackerel. He has under his supervision three technicians.

Sónia Silva (Female) is a researcher at the INIP. She has more than 10 years of experience in work in biological oceanography with the focus on the dynamics of phytoplankton along the Angolan coast. She is involved on the project of Luanda bay ecological assessment which its approach is to reduce the environmental risk and increase quality of life of surround the bay. She is also involved for a long time in the projects on the bloom of harmful algae that frequently publishes information on the "Harmful Algae News". She has under her supervision three technicians.

Relevant publications, products, services or other achievements

1.   Gammelsrød, T., C.H. Bartholomae, D.C. Boyer, V.L.L. Filipe and M.J. O´Toole, 1998: Intrusion of warm Surface Water along the Angolan-Namibian Coastal in February_March 1995: The Benguela Niño. S. Afr. J. Mar. Sci., 19: 41-56

2.   Silva. S and I. Rangel, 2006 First Records of Gymnodinium catenatum, Gambierdiscus toxicus and Pyrodinium bahamense on northern Luanda coast, Angola. HARMFUL ALGAE NEWS An IOC Newsletter on toxic algae and algal blooms nº:32

3.   Tchipalanga, P., M. Dengler, P. Brandt, R. Kopte, M. Macuéria, P. Coelho, M. Ostrowski, and NS. Keenlyside (2018) Eastern boundary circulation and hydrography off Angola – building Angolan oceanographic capacities, Bull. Amer. Meteor. Soc., doi:10.1175/BAMS-D-17-0197.1

4.   Tchipalanga Pedro, 2003 - Sea Level Anomalies Associated with Warm and Cold Events along the Angolan Coastal Zone. Submitted, University of Cape Town

5.   R. Kopte, P. Brandt, M. Dengler, P. C. M. Tchipalanga, M. Macuéria, M. Ostrowski, 2017 - The Angola Current: Flow and hydrographic characteristics as observed at 11°S. Journal of Geophysical Research.Volume 122, Issue 2. February 2017.Pages 1177–1189

Relevant projects or activities

INIP is successful participating in the EAF- Nansen Programme and PREFACE project. The overall objective is to improve knowledge on the basic biology, ecology, and dynamics, and refine methodology for stock assessment and management of major exploited small pelagic fish stocks and comprise the topics:

1.   Describe current knowledge on variations in abundance and distribution of pelagic species and collate data which can be used in relation to management of shared

2.   Study and estimate interactions among pelagic fish and their response to environmental forcing

3.   Trends in oceanographic regimes at the northern extremity of the Benguela system

Relevant infrastructure

INIP with new research vessel Baía Farta will have available all required seagoing equipment including shipboard (EK 80 ecosounder, CTD/LADCP systems, Underwater Vision Profilers, multinet). In the future this observational data will be stored and made available from the INIP to Ocean Science Information System (OSIS).

16 Universidad de Vigo UVIGO

Description of the organisation

University of Vigo, founded in 1990, has 15,000 students and 1,400 permanent teaching and research staff, and with 40 Faculties and Schools in three campuses sustains teaching and research in humanities, sciences, and engineering. The University hosts the International Campus of Excellence Campus do Mar, which is a multi-institution venture for teaching, research and transference in the fields of marine science and technology.

Particularly relevant for the project

UVIGO contributes to TRIATLAS through the Biological Oceanography Group at the Faculty of Marine Sciences. Our group investigates the ecology and biogeochemical role of marine microbial plankton, carrying out observations and experiments in coastal and open-ocean waters, with particular interest in the NW Iberian upwelling region, the Atlantic subtropical gyres and the Equatorial Atlantic. During the last 10 years, the group has led 20 research projects and contributed more than 150 publications in SCI journals. Our expertise, relevant to TRIATLAS, includes the measurement of phytoplankton diversity and size structure as well as key ecosystem functions mediated by plankton such as primary production, respiration, N2 fixation and calcification.

Roles and tasks in the project

Within CT1, UVIGO will co-lead WP1.2 (Primary and secondary production, phytoplankton and zooplankton distribution) and contribute to WP1.5 (Synthesis). UVIGO will investigate the spatial and temporal variability, in relation to environmental drivers, of phytoplankton size abundance and size biomass spectra, functional group diversity, and size-fractionated primary production. We will also conduct multifactorial laboratory and cruise experiments to assess the interactive effects of different climate change-related stressors upon phytoplankton productivity. In conjunction with the analysis of in situ variability across environmental gradients, these experiments will be used to determine how a complex matrix of climate-driven stressors affects phytoplankton productivity.

Relevant personnel

Emilio Marañón (male) is Professor (Profesor Titular) at Universidad de Vigo since 1999. His main research interests are the ecology and biogeochemical role of marine phytoplankton. His expertise is the measurement and analysis of the diversity, size structure and metabolic activity of phytoplankton, including primary production, respiration and calcification. He has been PI of 12 national and EU-funded research projects, has supervised 7 completed PhD theses, and authored more than 85 articles in SCI journals (h-index=38, >4,300 citations, Google Scholar). Dr. Marañón has participated in numerous oceanographic expeditions, having been chief scientist in two major latitudinal cruises in the tropical and subtropical Atlantic Ocean. He is Associate Editor of Biogeosciences and Journal of Plankton Research and is Faculty Member (Ecosystem Ecology) of F1000Prime.

Beatriz Mouriño-Carballido (female) is Associate Professor (Profesora Contratada) at Universidad de Vigo since 2013. Her research is focused on understanding physical-biological interactions in marine plankton communities over a broad range of temporal and spatial scales. She has been PI of 7 national research projects, has supervised 1 completed PhD Thesis, and published 43 peer-reviewed articles (h-index=16, Scopus). She has participated in 17 oceanographic expeditions (two as chief scientist) in the NW Iberian upwelling ecosystem, the Bay of Biscay, the tropical and subtropical Atlantic and Pacific, and the Southern Ocean.

Ana Fernández-Carrera (female) is a postdoctoral research fellow at University of Vigo since 2014. Her research interests focus on the high-resolution spatial variability of primary production, N2 fixation, and C and N isotopic composition of phytoplankton in the central Atlantic. She is author of 17 articles in SCI journals.

María Aranguren-Gassis (female) is a postdoctoral research fellow at the University of Vigo since 2016. Her current research interest is phytoplankton adaptation and acclimation to climate change, focused on trade-offs between phytoplankton responses to several simultaneous environmental stressors. She is author of 15 articles in SCI journals.

Relevant publications, products, services or other achievements

1.   Marañón E, Pérez-Lorenzo M, Cermeño P, Mouriño-Carballido B (2018) Nutrient limitation suppresses the temperature dependence of phytoplankton metabolic rates. The ISME Journal, doi:10.1038/s41396-018-0105-1
2.   Fernández-Castro B, Mouriño-Carballido B, Marañón E, Chouciño P, Gago J, Ramírez T, Vidal M, Bode A, Blasco D, Royer SJ, Estrada M, Simó R (2015) Importance of salt fingering for new nitrogen supply in the oligotrophic ocean. Nature Communications, 6, doi:10.1038/ncomms9002
3.   Marañón E (2015) Cell size as a key determinant of phytoplankton metabolism and community structure.

Annual Review of Marine Science, 7, 241-264. doi: 10.1146/annurev-marine-010814-015955
4.   Aranguren-Gassis M, Serret P, Fernández E, Herrera JL, Domínguez JF, Pérez V, Escánez J (2012) Balanced plankton net community metabolism in the oligotrophic North Atlantic subtropical gyre from Lagrangian observations. Deep-Sea Research I, 68, 116-122

Mouriño-Carballido B, Graña R, Fernández A, Bode A, Varela M, Domínguez JF, Escánez J, de Armas D, Marañón E (2011) Importance of N2 fixation versus nitrate eddy diffusion along a latitudinal transect in the Atlantic Ocean. Limnology and Oceanography, 56, 999-1007

Relevant projects or activities

Project TERRIFIC (PI: E. Marañón), funded by the Spanish Ministry of Economy and Competitiveness (2015-2018), investigates, through laboratory experiments with chemostats, field surveys in coastal and open-ocean waters, and analyses of Atlantic phytoplankton databases, the role of temperature and resources in the control of phytoplankton metabolism and community size structure. Project INTENSO (PI: M. Aranguren-Gassis), funded by Xunta de Galicia (2017-2019), aims to determine the effect on nutrient depletion on phytoplankton resource allocation during acclimation to increasing temperature. Project STICSTOF (PI: A. Fernández-Carrera), funded by Xunta de Galicia (2017-2019) focuses on the high-resolution spatial variability of primary production and N2 fixation along the equatorial Atlantic. Project REMEDIOS (PI: B. Mouriño), funded by the Spanish Ministry of Economy and Competitiveness (2017-2019) is focused on investigating the role of mixing in controlling phytoplankton growth and productivity in the Iberian upwelling ecosystem.

Relevant infrastructure

The University's Station of Marine Sciences of Toralla (ECIMAT) provide facilities for research in biological oceanography, including a small vessel for coastal work, temperature-controlled chambers and open-air mesocosms, flow cytometers and a FlowCam instrument. The Centre for Research and Technology Support (CACTI) has both scanning and transmission electronic microscopes, a radioisotope lab with scintillation counters, and a proteomics service with several HPLC systems and mass spectrometers.

17 University of Las Palmas de Gran Canaria ULPGC

Description of the organisation

The University of Las Palmas de Gran Canaria (ULPGC), created in 1989, has 11 Institutes covering all fields of knowledge. It hosts several marine institutes clustered into a "Marine Scientific and Technological Park" to help make more dynamic the transfer of R&D+i results to the society in the Canary Islands and among our neighbours, as well as helping to launch technology-based companies. The participants in this proposal belong to the "Institute of Oceanography and Global Change, IOCAG" (http://iocag.ulpgc.es), a leading university marine institute in Spain. IOCAG conducts research on oceanography, marine ecosystems and fisheries oceanography, combining ecophysiology, biogeochemical cycles and carbon fluxes with food chain ecology, fisheries and marine conservation. IOCAG has extensive experience in coordinating and managing national and European research programs, with special emphasis in the Canary Current Eastern Boundary Upwelling Ecosystem and the subtropical northeast Atlantic.

Particularly relevant for the project

Members of the IOCAG-ULPGC participating in the project TRIATLAS have long experience in studies of biological oceanography, linking physical and biogeochemical processes to variability in plankton (from bacteria to phytoplankton and zooplankton) and micronekton community structure and biomass, as well as to primary production and grazing. In particular, the participants are leading experts in the field of respiration in the ocean, where they combine different ecological (microWinkler, mass spectrophotometry, optodes, flow respirometry, and electron transfer system, ETS, activity) and biogeochemical (carbon fluxes, OUR) approaches, to estimate respiration in the water column. They have been working in different oceanic regions spanning from tropical to polar regions.

Roles and tasks in the project

IOCAG-ULPGC will mostly contribute to WP1.2 ("Primary and secondary production, phytoplankton and zooplankton distribution"). The group has long expertise in measuring particulate and dissolved organic matter (POC, DOC), primary production, microzooplankton grazing (dilution method), phytoplankton abundance (combining different flow cytometry systems; FacScalibur and Cytosense), zooplankton abundance and biomass (ZooScan), and microplankton, zooplankton, and micronekton respiration. The group will also make use of an AZFP (Acoustic Zooplankton Fish Profiler) attached to the oceanographic rosette, operating at 38, 120, 200, and 450 Khz, in order to track the distribution of large zooplankton and micronekton (mesopelagic fishes and decapods) to correlate with physical, chemical, and other biological data.

Relevant personnel

Prof. Santiago Hernández-León (male) is a full (Chair) professor at ULPGC, with extensive experience in micro-zooplankton, and micronekton research, especially in vertical distribution and metabolism of epi-, meso-, and bathypelagic organisms. His research interest is related to the effect of climate on the ecology and physiology of plankton communities. He participated in more than 50 research oceanographic cruises, and 40 research projects, being principal investigator in 11. He authored/co-authored 128 papers, being 109 in peer reviewed publications, including the high-ranking PNAS and Nature Communications, several reviews, and international methodology manuals on zooplankton ecology. According to Scholar Google, the author have >4500 citations, and an h-index of 34. He has been the supervisor of 15 PhD thesis and several master thesis.

Prof. Javier Arístegui (male) is Full Professor of Ecology at ULPGC. His expertise spans from microbial oceanography to biogeochemistry and plankton ecology. He has large experience in integrated studies addressing the coupling between marine biogeochemical cycles and ecosystems, with emphasis on subtropical regions and upwelling ecosystems. He has been vice-chair of of the IGBP program IMBER (Integrated Marine Biogeochemistry and Ecosystem Research). Presently is Editor in Chief of "Deep Sea Research II" and Associate Editor of "Frontiers in Marine Science". Lead Author for the "IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (2017-2019)". In 2015 he was awarded with the "Helmholtz International Fellow Award", a prestigious prize from the German Helmholtz Association.

Relevant publications, products, services or other achievements

1.   Arístegui, J., E.D. Barton, XA Alvarez Salgado, A.M.P. Santos, F.G. Figueiras, S. Kifani, S. Hernández-León, E. Mason, E. Machu, H. Demarcq. 2009. Sub-regional ecosystem variability in the Canary Current upwelling (Review). Progress in Oceanography, 83: 33-48

2.   Ariza A.V., J.C. Garijo, J.M. Landeira, F. Bordes, S. Hernández-León (2015) Migrant biomass and respiratory carbon flux by zooplankton and micronekton in the north east Atlantic Ocean (Canary Islands). Progress

in Oceanography, 134, 330-342

3.	Gómez-Letona, M., Ramos, A.G., Coca, J., Arístegui, J., 2017. Trends in Primary Production in the Canary Current Upwelling System—A Regional Perspective Comparing Remote Sensing Models. Frontiers in Marine Science, 4: 370. DOI:10.3389/fmars/2017.000370

4.	Irigoien X., T.A. Klevjer, A. Røstad, U. Martinez, G. Boyra, J.L. Acuña, A. Bode, F. Echevarria, J.I. González-Gordillo, S. Hernández-León, S. Agustí, D.L. Aksnes, C.M. Duarte, S. Kaartvedt (2014). Large fish biomass and trophic efficiency in the open ocean. Nature Communications, 5, 3271, DOI: 10.1038/ncomms4271

5.	Schmoker, C., S. Hernández-León, A. Calbet (2013). Microzooplankton grazing in the oceans: impacts, data variability, knowledge gaps and future directions. Journal of Plankton Research, 35, 691-706

Relevant projects or activities

1.	2009-2013. Consolider-CICYT. Global change and exploration of biodiversity in the global ocean (MALASPINA)

2.	2012-2015. CICYT. The Biological Pump in Mesoscale Eddies (PUMP)

3.	2013-2015. CICYT. Migrants and Active Flux In the Atlantic ocean (MAFIA)

4.	2016-2019. CICYT. Constraining organic carbon fluxes in an Eastern Boundary Upwelling system (Cape Blanc; NW Africa)(FLUXES)

5.	2017-2019. CICYT. Biomass and Active Flux in the Bathypelagic Zone (BATHYPELAGIC)

Relevant infrastructure

ULPGC provides oceanographic services and infrastructure (http://www.sitma.ulpgc.es/en) of gliders, autonomous underwater vehicles (AUV), acoustic profilers (AZFP), Flow Cytometry, Mass Spectrometry, Microscopy, etc., through the Marine Technology Service (SITMA) and IOCAG to different scientific and technological support services for studies related to operational oceanography, satellite oceanography, marine robotics, ocean monitoring and coastal pollution control, automated risk prevention systems, biodiversity monitoring and sustainable use of marine resources.

18 Universite Felix Houphouet Boigny UFHB

Description of the organisation

The LAPA-MF (Laboratory of physical atmospheric, oceanography, environment Science and Fluid mechanics) is a laboratory of the Training and Research Unit of Sciences in Structures of Matter and Technology (UFR SSMT : www.ufrssmt.org/) of Felix Houphou't Boigny University (UFHB, www.univ-fhb.edu.ci/) in Ivory Coast. Created since 1972, the LAPA-MF is involved in basic education, research, doctoral training and is currently running by 35 Lecturers and Researchers. The LAPA-MF fields of investigation in research concern: (i) the climate variability in West Africa through the study of physical and chemical parameters, as well as its socio-economic impact (agriculture, water resources, health, fishing, environment É); (ii) the study of the Earth's magnetic field, which is important in radio-communications as well as mining prospecting; (iii) the problems related to Fluid Dynamics, Energy Engineering and the environment through the habitat and (iv) Physical oceanography. Thereby, it consists in four research teams: (1) Ocean/Atmosphere interaction and climate variability, (2) Aerosols and atmospheric pollution, (3) Geomagnetism and Aeronomy and (4) Fluid mechanics. The LAPA-MF runs a doctoral training mainly supported by the Master and a PhD of external geophysics (tropical climate). The LAPA-MF maintains numerous partnerships and collaborations: at the national level (SODEXAM, ASECNA, CURAT, IGT, CRO, Geophysical Station LAMTO), at the regional level (UCAD-Dakar (LPA-SF), University of Bamako, Ouagadougou, Ilorin in Nigeria, University of Niamey, ENAC-Niamey, University of Abomey Calavi) and at international level principally with French institute (IRD, Laboratory of Aerology, LEGOS, LOCEAN, IGE).

Particularly relevant for the project

UFHB through the Ocean/Atmosphere interaction and climate variability team of LAPA-MF participates in the project TRIATLAS. The researchers of this team have been working in several projects related to the climate variability in West Africa and the ocean variability in the tropical Atlantic. In particular, they characterize the coastal upwelling of the Gulf of Guinea with database collect from the Regional Program of Physical Oceanography in West Africa coastal network (PROPAO) and also with numerical analysis. They have experience in numerical modeling (regional modeling with ROMS), collecting and data analysis that allow them to participate and to carry out the objectives of the project TRIATLAS.

Roles and tasks in the project

The LAPA-MF will mostly contribute to TRIATLAS through CT1, WP1.1, Task1.1.2 for numerical studies (ROMS-PISCES, NEMO) related to coastal and equatorial upwellings in the Gulf of Guinea (dynamics, processes, mesoscales).

Relevant personnel

Dr. Sandrine Djakouré (female) is a researcher in physical Oceanography. She is a member of the Ocean/Atmosphere interaction and climate variability team of the LAPA-MF. She is also the lecturer in charge of the ocean modeling class of the Master of Energy, Tropical Climate and Environment of UFHB. Her research interests are related to ocean modeling, upwelling, ocean currents, sea surface temperature, cyclonic eddies, pelagic Sargassum, physico-biogeochemical interactions and ocean-atmosphere interactions.

Prof. Aman Angora (male) is Professor and the team leader of Ocean/Atmosphere interaction and climate variability of the LAPA-MF. His research interests include upwelling systems, sea level monitoring, coastal vulnerability and climate change. He is also lecturer in general physics at UFHB. He is a member of Global Sea Level Observing System (GLOSS) Group of Experts and the national coordinator since 2002. He was the regional coordinator for coastal observing systems ODINAFRICA III from 2004 to 2008 and the ODINAFRICA-IV Regional Coordinator for the Guinea Current Large Marine Ecosystem (Benin, Cameroon, Congo, Ivory Coast, Ghana, Guinea, Nigeria, Togo) from 2009-2014 and the coordinator for the development of African Coastal and Marine atlas (ACMA).

Dr. Elisee Toualy (male) is a researcher in physical Oceanography at the LAPA-MF. His research field of interest are coastal and equatorial upwelling processes (SST, data and products analysis), interannual variability.

Relevant publications, products, services or other achievements

1.   Djakoure, Ss, V. Kone, 2017. Respective roles of the Guinea Current and local winds on the coastal upwelling in the northern Gulf of Guinea, Journal of Physical Oceanography, 47, 6, 1367-1387, doi: 10.1175/JPO-D-16-0126.1

2.   Kones, S. Djakoure. A biophysical model of Sardinella aurita early life history in the northern Gulf of Guinea, Progress in Oceanography, 2017, 151, 83-96, doi 10.1016/j.pocean.2016.10.008

3.   E Toualy, A Aman, P Koffi, F Marin, TE Wango. Ocean Swell Variability along the Northern Coast of the Gulf of Guinea. African Journal of Marine Science, vol. 37, no 3, pp. 353-361, 2015

4.   Djakoure, Ss, J .Veitch, and V. Kone, 2014: Coastally trapped eddies in the north of the Gulf of Guinea. J. Geophys. Res.,119, http://dx.doi.org/10.1002/2014JC010243

5.   Kouadio, Y. K., S. Djakoure, A. Amanne Ali, V. Kone, and E. Toualy, Characterization of the Boreal Summer Upwelling at the Northern Coast of the Gulf of Guinea Based on the PROPAO In Situ Measurements Network and Satellite Data, 2013, International Journal of Oceanography, ID 816561, http://dx.doi.org/10.1155/2013/816561

Relevant projects or activities

The LAPA-MF maintains numerous partnerships and collaborations:

1.   2013–2017, EU FP7: Enhancing Prediction of Tropical Atlantic Climate and its Impacts (PREFACE)

2.   2011-2013, JEAI-IRD ALOC-GG: Jeune Equipe Associée IRD: Analyses Littorales, Océaniques et Climatiques au Nord du Golfe de Guinée (Ivory Coast and Benin)

3.   2007-2010, PROPAO (Regional Program of Physical Oceanography in West Africa coastal network (monitoring of coastal Sea Surface Temperature sensors)

4.   2002-2008: The international AMMA (African Monsoon Multidisciplinary Analysis) program

5.   2005-2007: EGEE (Etude de la circulation océanique et du climat dans le Golfe de Guinée)

Relevant infrastructure

The Science Center of Innovation of the Felix Houphouet Boigny University hosts the National Computing Center of Ivory Coast (CNC-CI).

19 Centre de Recherches Océanologiques CRO

Description of the organisation

The CRO (National Oceanography Research Center in Ivory Coast) was created in 1958. Its mission is to improve knowledge of the aquatic environment for its conservation and for sound and operational management of our natural aquatic resources, be they renewable or non-living or mineral. The CRO consists in three research departments (fish farming, environment, and living aquatic resources) and a department dedicated to scientific publications (edition, library). Main research fields are: oceanography and coastal management, quality and ecological functioning of aquatic ecosystems, biodiversity, biology and ecology of aquatic ecosystems, management and exploitation of aquatic resources, fish farming. CRO also has for mission to train in the research by the research. To achieve this, CRO welcomes on average 7 PhD and about 15 masters per year. It also hosts the National Center of Oceanographic Data and is thus involved in the UNESCO/IOC ODINAFRICA program.

Particularly relevant for the project

In addition to its training mission, the results of the CRO are used as decision-making tools by various ministries and the agencies of health monitoring, and also disseminated at citizen level.

Roles and tasks in the project

The CRO will contribute to TRIATLAS through the CT1, WP1.1, Task1.1.2, for numerical studies related to coastal upwelling in the north of the Gulf of Guinea and related to CT2, WP2.1, "Characterizing ecosystem variability: key metrics and functional relationships".

Relevant personnel

Dr. Vamara Koné (male) researcher with extensive experience on coupled hydrodynamic and biogeochemical models to study the interactions between ocean physic, biogeochemistry, plankton and marine ecosystem. My research is also focused on the dynamics of the early-life history of small pelagic fishes (sardinella and anchovy) using a biophysical model (Ichthyop). Numerical experiments (ROMS-PISCES) adapted to the north of the Gulf of Guinea, larvae & fishes distribution along the north Gulf of Guinea upwelling system and its variability (relation with dynamics).

Relevant publications, products, services or other achievements

1.   Koné, V., Lett, C., Penven, P., Bourlès, B., and Djakouré, S. (2017). A biophysical model of S. aurita early-life history in the northern Gulf of Guinea. Progress in Oceanography, 151, doi: 10.1016/j.pocean.2016.10.008, 83-96

2.   Djakouré, S., P. Penven, B. Bourlès, J. Veitch and V. Koné (2014). Coastally trapped eddies in the north of the Gulf of Guinea, J. Geophys. Res. Oceans, 119, doi:10.1002/2014JC010243

3.   Koné, V., C. Lett and P. Fréon (2013): Modeling the effect of food availability on recruitment success of Cape anchovy ichthyoplankton in the southern Benguela upwelling system. African Journal of Marine Science, 35, 2, doi:10.2989/1814232X.2013.796893, 1-11

4.   Koné, V., O. Aumont, M. Levy and L. Resplandy (2009): Physical and biogeochemical controls of phytoplankton seasonal cycle in the Indian Ocean: a modelling study, in "Indian Ocean Biogeochemical Processes and Ecological Variability". Geophysical Monograph Series, vol 185, doi: 10.1029/2008GM000700, pp. 147-166

5.   Koné, V., E. Machu, P. Penven, V. Andersen, V. Garçon, P. Fréon and H. Demarcq (2005): Modeling the primary and the secondary productions in the Southern Benguela upwelling ecosystem: A comparative study through two biogeochemical models, Global Biogeochemical Cycles, 19, GB4021, doi:10.1029/2004GB002427

Relevant projects or activities

The CRO is involved in several programs established in close relation with IRD: i) the AIRD PROPAO coastal network (monitoring of coastal Sea Surface Temperature sensors) and the AIRD ALOC-GG program : "Analyses Littorales, Océaniques et Côtières au nord du Golfe de Guinée"; ii) the AWA project(Ecosystem Approach to the management of fisheries and the marine environment in West African waters), launched by a trilateral German-French-African consortium); iii) the international joint laboratory AIRD LMI "ECLAIRS" project and iv) the EU FP7 PREFACE project.

Relevant infrastructure

The different model simulations in the framework of TRIATLAS will be performed by CRO. In situ data collected by CRO will be available for other TRIATLAS partners.

20 UK Research and Innovation UKRI

Description of the organisation

The National Oceanography Centre (NOC) is the UK's largest institution for ocean research and technology development, and is funded by the UKRI (UK Research and Innovation). Together with top-level science, the NOC provides the bulk of the UK's capability for the country's marine research community. This includes provision of major facilities (such as the Royal Research Ships and the deep submergence autonomous and robotic vehicles), and programmes of sustained observing, survey, mapping, data management and other functions.

The NOC Directorate of Science and technology (DST) contains nearly 200 scientists whose activities cover marine physics, ocean modelling, ocean biogeochemistry, technology innovation and marine geosciences. A particular strength of DST is conceiving, designing and delivering large innovative, excellent and interdisciplinary projects relevant to stakeholders from local government to international climate organisations such as IPCC.

Particularly relevant for the project

The Marine Physics and Ocean Climate (MPOC) group at the NOC, leads the UK contribution to the transatlantic mooring arrays at 26°N (RAPID) and 57°N (OSNAP). RAPID and OSNAP are North Atlantic equivalents of the South Atlantic SAMBA array. MPOC are experts in designing, deploying and analysing the data from moorings such as that proposed in WP1.1 to enhance the SAMBA array.

Roles and tasks in the project

NOC will design, deploy and analyse the data from the western boundary tall mooring at 34.5°S (WP1.1). NOC will enhance subtropical South Atlantic circulation estimates in combination with the wider SAMBA (trans-basin array at 34.5°S) effort and deliver these to TRIATLAS.

NOC will co-manage and co-lead CT2 (interannual to decadal variability), WP2.1 (characterising variability in observations and model), and Task2.1.3 (synthesis of physical and biological characterisation).

NOC will contribute analysis of the character (Task2.1.1) and drivers (Task2.2.1) of variability of physical and biogeochemical parameters with a particular emphasis on large-scale circulation driven variability in the Subtropical South Atlantic. NOC will further contribute to the synthesis with biological variability of the character (Task2.1.3) and drivers (Task2.2.3) of change.

Relevant personnel

Elaine McDonagh (female) is the associate head of the NOC MPOC group. With the group head she manages and develops 50 scientists over two sites and oversees the 60 projects that fund the group. She is currently the lead Principal Investigator of two competitively-won projects (with a total value of 5.7MEuros) that examine the role of ocean circulation in the interannual to decadal variability of ocean water mass properties and distribution and the oceanic uptake of heat and carbon dioxide. Each of these projects has multiple national and international partners. An integral part of these projects relates to providing relevant observations for the validation and constraint of ocean models. McDonagh is currently a NOC- lead or co-Investigator on 4 other projects providing expertise in climate-relevant observations.

Julie Collins (female) from the British Oceanographic Data Centre (BODC) has responsibility for quality control and calibration of the RAPID mooring data. Other personnel are as yet unidentified and will come from the pool of NOC technical and scientific staff.

Relevant publications, products, services or other achievements (McDonagh)

1. Desbruyeres, Damien; McDonagh, Elaine L.; King, Brian A.; Thierry, Virginie. 2017 Global and full-depth ocean temperature trends during the early 21st century from Argo and repeat hydrography. Journal of Climate, 30 (6). 1985-1997.10.1175/JCLI-D-16-0396.1
2. Evans, G.R.; McDonagh, E.L.; King, B.A.; Bryden, H.L.; Bakker, D.C.E.; Brown, P.J.; Schuster, U.; Speer, K.G.; van Heuven, S.M.A.C.. 2017 South Atlantic interbasin exchanges of mass, heat, salt and anthropogenic carbon. Progress in Oceanography, 151. 62-82.https://doi.org/10.1016/j.pocean.2016.11.005
3. Meredith, M.P.; Sarmiento, J.L.; Johnson, K.S.; McDonagh, E.L.; ORCHESTRA and SOCCOM Teams, 2017 Advances in understanding the Southern Ocean's role in global climate: the ORCHESTRA and SOCCOM programs. Bulletin of the American Meteorological Society, 98 (8 (Supp.)), supplement State of the Climate in 2016. S168-S169
Kelly, K.A.; K. Drushka; L. Thompson; D. Le Bars; E.L. McDonagh, 2016 Impact of slowdown of Atlantic overturning circulation on heat and freshwater transports. Geophysical Research Letters, 43 (14). 7625-7631.10.1002/2016GL069789

Relevant projects or activities (McDonagh)

1.   PI on NERC Large Grant TICTOC: Transient tracer-based Investigation of Circulation and Thermal Ocean Change. Quantifying and understanding patterns of regional temperature change in the ocean and its impact on regional sea level change

2.   Co-I (NOC Lead) on ORCHESTRA: Ocean Regulation of Climate by Heat and Carbon Sequestration and Transports. A multiple centre national capability program to understand uptake of heat and carbon in the Atlantic sector of the Southern Ocean

3.   Co-I on EC H2020 project AtlantOS (Atlantic Observing System). Integrating and adding value to Atlantic Observing Systems

4.   PI on NERC research programme grant ABC fluxes (Atlantic BiogeoChemical fluxes). Leading the consortium to quantify the strength, variability and impact of carbon and nutrient fluxes at 26N in the Atlantic

5.   McDonagh has been a member of the SAMOC (South Atlantic Meridional Overturning Circulation) group since its inception in 2007. SAMOC is a CLIVAR-endorsed group that focuses on circulation variability in the South Atlantic. The transbasin SAMBA array (that TRIATLAS proposes to supplement) at 34.5°S is the primary observational effort of the SAMOC group

21 UNIVERSITÉ D'ABOMEY-CALAVI UAC-ICMPA

Description of the organisation

The International Chair in Mathematical Physics and Applications (ICMPA) of the University of Abomey-Calavi (UAC), created in 2001, is a supranational and permanent structure to contribute to the development of Mathematical Physics and Applications in Africa. The ICMPA became the UNESCO Chair of Mathematical Physics and Applications (ICMPA-UNESCO Chair) in April 2006. Its objectives are defined as follows: (1) To work out and spread the knowledge and the know-how in Mathematical Physics and Applications; (2) To promote and support young men and women in the area of Mathematical Physics and Applications; (3) To look for active partnerships between the Chair and companies as well as industries for concrete applications of Mathematical Physics to problems of development in society at large.

These objectives, in the many fields encompassed by Mathematical Physics and their Applications, notably entail: (i) The promotion and support of young researchers; (ii) The organization of Master degree and PhD programmes. ICMPA-UNESCO Chair's activities derive from the pre-cited objectives, among which the following initiatives deserve specific mention: (a) The organization every two years of the International Conference on Contemporary Problems in Mathematical Physics (COPROMAPH), with the publication of dedicated Proceedings; (b) the organization of five training programs for M.Sc. and PhD degrees including Physical Oceanography and Applications (regional Master 2 created in 2008 with IRD).

Particularly relevant for the project

The ICMPA-UNESCO Chair is involved in several programs related to regional climate and oceanography, established in close relation with IRD: i) the AIRD PROPAO coastal network and the ALOC-GG program; ii) the AIRD LMI (International Laboratory) "ECLAIRS" project, and iii) the recently accomplished AWA program (Ecosystem Approach to the management of fisheries and the marine environment in West African waters), launched by a trilateral German-French-African consortium).

Roles and tasks in the project

UAC-ICMPA will contribute to TRIATLAS through CT1, WP1.1, for studies related to the circulation and surface conditions (mixed layer & salinity, barrier layer, circulation & meso-scale eddies) in the Gulf of Guinea and the equatorial and coastal upwellings. Namely, Task1.1.2 and Task1.1.3 by (1) studying the interaction between coastal upwelling and the Niger River plume in the North of the Gulf of Guinea, (2) studying the impact of Niger River on the oceanic dynamics of the Gulf of Guinea, (3) analyzing the interannual variability of coastal upwelling in the North of the Gulf of Guinea and its potential link with the equatorial Atlantic Cold Tongue (4) to characterize the eddies in the Gulf of Guinea and to investigate their role on the sea surface salinity and the equatorial Atlantic Cold Tongue.

UAC-ICMPA will ensure also Master Degree training in oceanography and student projects on topics such as i) the role of wind-forcing and coastally-trapped wave propagation for the coastal upwelling in the Gulf of Guinea; ii) how the mesoscale dynamics shape the large-scale currents near the eastern and western boundaries, and many other themes related to the project.

Relevant personnel

Pr. Norbert Hounkonnou (male). ICMPA-UNESCO Chair President. Main contact. Awarded by TWAS and UNESCO, PhD supervisor. Expertise in Mathematical Physics focusing on Non- commutative and Nonlinear Mathematics;

Pr. Ezinvi Baloitcha (male). ICMPA-UNESCO Chair Scientific Secretary: Expertise in Dynamics of Complex Systems, Numerical Simulations and Satellite Products Analysis;

Dr. Casimir Da Allada (male). ICMPA-UNESCO Associated researcher: Expertise in Mixed layer processes, numerical simulations, data and products analysis co-supervision of PhD;

Dr. Frédéric Bonou (male). ICMPA-UNESCO Post doc. Physical processes & impacts of the mesoscale eddies; co-supervision of PhD;

ICMPA-UNESCO PhD (100%): Mesoscales eddies in the Gulf of Guinea.

Relevant publications, products, services or other achievements

1.   Bonou F. K., C.D. Noriega, N. Lefèvre, M. Araujo, 2016: Distribution of CO_2 parameters in the Western Tropical Atlantic Ocean. Dyn. Atmosph. and Oceans, 73, 47-60, http://dx.doi.org/10.1016/j.dynatmoce.2015.12.001

2.   Da-Allada, C. Y., G. Alory, Y. du Penhoat, E. Kestenare, F. Durand, and N. Hounkonnou, 2013: Seasonal mixed-layer salinity balance in the tropical Atlantic Ocean: Mean state and seasonal cycle, J. Geophys. Res., 118, 332–345, http://dx.doi.org/10.1029/2012JC008357

3.   Da-Allada, C. Y., G. Alory, Y. du Penhoat, J. Jouanno, N. Hounkonnou, and E. Kestenare, 2014: Causes for the recent increase for sea surface salinity in the northeast Gulf of Guinea. African J. of Mar. Science, 36 (2): 197–205, http://dx.doi.org/10.2989/1814232X.2014.927398

4.   Da-Allada, C. Y., J. Jouanno, F. Gaillard, N. Kolodziejczyk, C. Maes, N. Reul, and B. Bourlès, 2017: Importance of the Equatorial Undercurrent on the sea surface salinity in the eastern equatorial Atlantic in boreal spring. J. Geophys. Res. Oceans, 122, 521–538, http://dx.doi.org/10.1002/2016JC012342

Lauvergnat, D., E. Baloïtcha, G. Dive and M. Desouter-Lecomte, Dynamics of complex molecular systems with numerical kinetic energy operators in generalized coordinates. Chemical Physics 326 (2006) 500–508

Relevant projects or activities

1.   2013–2017, EU FP7: Enhancing Prediction of Tropical Atlantic Climate and its Impacts (PREFACE)

2.   2017 – 2019, 17-542 RG/MATHS/AF/AC_G – FR3240300147 TWAS project

3.   2005–2015, Prj-15: Grant as contribution towards the ICMPA in Cotonou, Benin: Post-doc positions – 4 PhD fellowships

Relevant infrastructure

ICMPA is today at the core of a major dynamic and active network of specialists in the fields of Theoretical and Mathematical Physics within Africa.

22 Universidade Federal do Rio Grande FURG

Description of the organisation

The Federal University of Rio Grande (FURG) www.furg.br is part of the Brazilian Government Federally funded universities with 2,000 staff members distributed in 13 faculties. More than 10,000 undergraduate and 1,500 graduate students attended FURG in 2017. Each year, about 100 PhD and 300 MSc are awarded by FURG. Because of geographical and historical set up, the institutional policy of FURG is to concentrate studies on "Coastal and Oceanic Ecosystems", and this philosophy is present in all areas of knowledge. As a result, most of the research, academic training and outreach at FURG is interdisciplinary.

The Institute of Oceanography of the Federal University of Rio Grande (IO-FURG) has been intensively involved in the study of the coastal and marine regions since the foundation of the Atlantic Oceanographic Base (BOA) in the 1970s. The scientific knowledge generated in the South Atlantic Ocean in the Brazilian coast along with consolidated educational programs, qualified human resources and modern infrastructure make IO-FURG one of the best Oceanographic institutions in Brazil. IO-FURG has vast experience in conducting multidisciplinary research studies within Brazil and with international partners. Major programs were conducted over more than 40 years of existence of the Institute, which included the Center of Excellence in Ocean Sciences; the Institute of the Millennium; and more recently the participation in several of the Brazilian National Institutes of Science in Technology (INCTs). IO-FURG coordinates one of the 3 National Institutes of Science and Tecnhology for the Oceans, the "Integrated Center of Oceanography (INCT-Mar COI)".

Particularly relevant for the project

Since 1978, FURG operates the Research Vessel "Atlântico Sul" and recently incorporated to its fleet the R.V "Ciências do Mar I", the first of a series of six ships dedicated to the training of Ocean Sciences undergraduate and graduate students in Brazil. IO-FURG has a complete laboratory infrastructure to conduct state-of-the-art research in several fields of Oceanography. As a result, IO-FURG has unique experience in the training of human resources in Ocean Sciences. Its 47 years-old Oceanology Course is the pioneer undergraduate program in Brazil. The accumulated experience in higher education has contributed to the expansion of Oceanography teaching in several Brazilian universities. At the graduate level, IO-FURG's Oceanography Programs have recently been evaluated by the Brazilian Government Education Agency CAPES and have received the highest assessments in the country. The excellence of these Postgraduate Programs reflects IO-FURG's ability to take the tasks assigned under TRIATLAS.

Roles and tasks in the project

IO-FURG will participate in CT1 and 4 and will co-lead WP1.3, WP4.1, WP4.2 focusing its activities in the SW Atlantic Ocean. In CT1, IO-FURG will contribute to WP1.1, WP1.2 and WP1.3 and improve the understanding of the underlying mechanism that govern ocean production in the Southern Brazilian Shelf. In CT4, IO-FURG will contribute with economic studies dealing with new fish products and new fisheries resources in the region. The extensive experience in teaching and training in Ocean Sciences will be used to further capacity building in South Atlantic bordering countries as part of initiatives in WP4.1.

Relevant personnel

José H. Muelbert (male) is a Professor at IO-FURG and a CNPq Research Fellow. Published 36 scientific papers, supervised 3 Post-Docs and 17 Graduate Students and has received funding from CNPq, FAPERGS and IAI. Directed IO-FURG and was a member of the GOOS SC. His main areas of interest in ichthyoplankton, physical/biological processes, modeling of fish larvae transport, spatial modelling and climatic variability. Participated in many projects in the SW Atlantic and now coordinates INCT-Mar COI. Full CV at http://lattes.cnpq.br/8085929420978720

Carlos Francisco Andrade (male) is an Adjunct Professor at IO-FURG with main areas of interest in trace elements and their isotopes (TEIs) / Estuarine and marine contamination. Full CV at http://lattes.cnpq.br/7763660930577976

Carlos Rafael B Mendes (male) is an Adjunct Professor at IO-FURG with main areas of interest in Biological Oceanography, HPLC determination of photosynthetic pigments, Phytoplankton chemotaxonomy (CHEMTAX), Polar Biology and Ecology. Full CV at http://lattes.cnpq.br/8849139109396688

Danilo Koetz de Calazans (male) is a Professor at IO-FURG with research interest on early development of Crustacea. He has coordinated FURG's 'Amazonia Azul Program', an on-board training in Marine Science and participated in IOC/UNESCO WG on capacity development. Full CV at http://lattes.cnpq.br/5252697544274750

Eduardo R. Secchi (male) is an Assistant Professor at IO-FURG with main areas of interest in marine mammals trophic and spatial ecology and trends. Full CV at http://lattes.cnpq.br/2134644742559817

Eunice da C. Machado (female) is an Associate Professor at IO-FURG with main areas of interest in cycling of C, N, Si and trace elements in marine systems, vertical and horizontal fluxes of biogenic matter and interactions at the sediment-water interface. Full CV: http://lattes.cnpq.br/4029692227760541

Lauro Saint Pastous Madureira (male) is a Professor at IO-FURG with main areas of interest in Hydroacoustics applied to fisheries management and ecological assessment, Operational Oceanography and physical/biological processes, Fishery Improvement Projects. Full CV at http://lattes.cnpq.br/3757194104696367

Luciano Dalla Rosa (male) is an Adjunct Professor at IO-FURG and a CNPq Research Fellow. Published 33 scientific papers and supervised 6 Graduate Students. His main areas of interest in marine vertebrate spatial ecology, biotelemetry, species distribution modelling and the influence of climate variability. He coordinates the Whales Project of the Brazilian Antarctic Programme, is a member of INCT-Mar COI and INCT-APA. Full CV at http://lattes.cnpq.br/8832607370916541

Luis Felipe Niencheski (male) is an Emeritus Professor at IO-FURG, CNPq Research Fellow and Adjunct Faculty Member of Skidaway Institute of Oceanography (USA), and Corresponding Member of GEOTRACES (Past SSC Member 2007-2009). Published more than 100 scientific papers, supervised 42 Graduate Students. His research interests are: Estuarine and Marine Chemistry; the study of the modification of nutrients and TEI´s (trace elements and their isotopes) during the transition from the fluvial to fully marine conditions; and submarine groundwater discharge (SGD). Full CV at http://lattes.cnpq.br/1075838747552442

Monica M.C. Muelbert (female) is a Research Associate at IO-FURG. Main areas of interest in marine mammals, biological/physical interactions, biodiversity hotspots, telemetry, southern ocean and climatic variability. Full CV at http://lattes.cnpq.br/0344680339647803

Mônica Wallner-Kersanach (female) is an Associate Professor at IO-FURG and has published 24 scientific papers, supervised 1 Post-Doc and 20 Graduate Students, and has received funding from CNPq. She is a member of the GEOTRACES Brazil group. Her main areas of interest are trace metal speciation, particulate organic carbon and total nitrogen and their isotopes in marine system. Full CV at CV: http://lattes.cnpq.br/7960214506412584

Patrízia Raggi Abdallah (female) is a Professor at ICEAC-FURG. Published 31 scientific papers, supervised 14 Graduate Students and has received funding from CNPq, FAPERGS and CAPES. She is Director of ICEAC-FURG and coordinates several inter-institutional projects. Her main areas of interest in Environmental and Natural Resource Economics, Ocean Economics, Fisheries Economics, Global Changes and impacts on Marine and Coastal Economic, and society. Participated in many projects in the SW Atlantic and now is a member of INCT-Mar COI responsible for "public policies for the sea". Full CV at http://lattes.cnpq.br/6198328194771800

Renato M. Nagata (male) is an Adjunct Professor at IO-FURG with main areas of interest in gelatinous zooplankton, trophic ecology, zooplankton biomechanics, spatial and temporal dynamics of zooplankton. Full CV at http://lattes.cnpq.br/3564202320514333

Rodrigo Kerr (male) is an Adjunct Professor at IO-FURG and a CNPq Research Fellow. Published 31 scientific papers, supervised 1 Post-Docs and 8 Graduate Students (+6 under development) and has received funding from CNPq, CAPES, and FAPERGS. He is head of the CARBON team at Oceans and Climate Laboratory (LEOC) IO-FURG, which has research foci on studying the marine carbon cycle on distinct environments to investigate the role of anthropogenic influence on global climate. Member of the GOAL, the INCT-CRYOSPHERE, the LAOCA Network and the GOA-ON Network. He is currently co-chairing the BrOA network. Full CV at http://lattes.cnpq.br/8913201220635275

Relevant publications, products, services or other achievements

1.   Muelbert, JH; Acha, EM; Mianzan, H; Guerrero, R; Reta, R; Braga, ES; Garcia, VMT; Berasategui, A; Gomez-Erache, M; Ramírez, F. Biological, physical and chemical properties at the Subtropical Shelf Front Zone in the SW Atlantic Continental Shelf. Cont. Shelf Res., 28: 1662-1673, 2008

2.   Niencheski, LF.; Windom, HL.; Moore, WS. Controls on water column chemistry of the southern Brazilian continental shelf. Cont. Shelf Res., 88:126-139, 2014

3.   Kerr, R; Cunha, LC; Kikuchi, RKP; Horta, P; Ito, RG; Muller, MN; Orselli, IBM; Lencina-Avila, JM; De Orte, MR; Sordo, L; Pinheiro, B; Bonou, FK; Shubert, N; Bergstrom, E; Copertino, MS. The Western South Atlantic Ocean in a High-CO2 World: Current Measurement Capabilities and Perspectives. Environ. Manage, 57: 740-752, 2016

4.   Araujo MLV, Mendes CRB, Tavano VM, Garcia CAE, Baringer MON. Contrasting patterns of phytoplankton pigments and chemotaxonomic groups along 30ºS in the subtropical South Atlantic Ocean. Deep-Sea Research part I.120: 112-121, 2017

5.   Abdallah, P.R.; Sumaila, U.R. An historical account of Brazilian public policy on fisheries subsidies. Marine Policy, v. 31, p. 444-450, 2007

Relevant projects or activities

FURG has a successful record in acquiring external funding from Brazilian and international sources. Regarding current participation in TRIATLAS, FURG coordinates:

1.   National Institute for Science and Technology "Integrated Oceanography and Multiple Uses of the Continental Shelf and the Adjacent Ocean" (INCT-Mar COI)

2.   Project "Advanced Studies in Oceanography of Medium and High Latitude" (CAPES CMAR2)

3.   Scientific Subsidies for Spatial Management and Ecosystem Approach to Demersal Fisheries in the South and Southeast of Brazil (CNPq)

Relevant infrastructure

Research Vessel "Atlântico Sul" and R.V "Ciências do Mar I" are fully equipped oceanographic vessels able to conduct appropriate studies for the TRIATLAS proposal in the South Brazilian Shelf and Shelf Break region. IO-FURG has a complete laboratory infrastructure to conduct state-of-the-art research in several fields of Oceanography, particularly in the disciplines related to CT1 and CT4.

23 Universidade Federal de Pernambuco UFPE

Description of the organisation

Located in the Northeast of Brazil, the Universidade Federal de Pernambuco (UFPE) www.ufpe.br is one of the best institutions of higher education in the country and its history goes back to the foundation of the first law school in the country, in 1827. UFPE is currently the third most sought-after public university in Brazil, with over 150 thousand applications each year from students from all over the country. The public institution is considered the best in the northern part of Brazil regarding teaching and scientific research, according to evaluations from the Ministries of Education (MEC) and Science and Technology (MCTIC). It is composed by 03 Campi (160 ha), 12 Academic Centres, 105 Undergraduate Programmes (over 30.000 Undergraduate students), 189 Graduate Programmes (over 12.000 Graduate students), 4.000 Researchers, 3.000 Faculty Members and 4.000 Administrative Staff.

At UFPE, the Department of Oceanography (DOCEAN, www.ufpe.br/docean) is the oldest, largest and most reputable centre of Oceanography in North and Northeast of Brazil. Created in 1952, the DOCEAN is the second oldest oceanography research center in Brazil. The MSc./PhD. Program in Oceanography (PPGO) is the most important in the North and Northeast of Brazil, completing 36 years of existence. This program has contributed to the formation of 400 MSc. and 150 PhDs. The team of the Project is developing research directly with the DOCEAN and with the Center for Risk Analysis and Environmental Modelling – CEERMA (ceerma.org/), located at UFPE.

Particularly relevant for the project

The DOCEAN-UFPE has as priority the teaching and research in the field of Oceanography, in addition to transmitting oceanographic knowledge to the society. The research lines cover the four major areas in which Oceanography is subdivided (Physics, Chemistry, Geology and Biology). DOCEAN is a reference center in Tropical Oceanography for Brazilian and foreign institutions, and its collections of planktonic, benthic and nectonic organisms are the target of consultation by several researchers. This collection was formed from the participation of its researchers in very numerous oceanographic expeditions along the Brazilian coast. These cruises were carried out thanks to agreements signed with different Brazilian organisms (Brazilian Navy, CAPES CNPq, IBAMA, FINEP, …), as well as to technical and scientific cooperation with institutions in Australia, France, Germany, Spain, Italy, Japan, UK and USA. All this background gives to DOCEAN a singular expertise on the understanding of the processes that govern the functions of islands (atolls and archipelagos) and coastal systems (beaches, estuaries, lagoons and reefs) in the western tropical Atlantic.

Roles and tasks in the project

UFPE will contribute to CT1, WP1.1 (co-lead), WP1.2, WP1.3 and WP1.5 (co-lead), CT2, WP2.1 and CT4, WP4.1. In WP1.1, UFPE will participate on the analysis of physical processes affecting ecosystems in western boundary regions, in seamount, island and continental shelf areas with a focus on the Saint Peter and Saint Paul and Fernando de Noronha Archipelagos and the self-break region off Northeast Brazil. In WP1.2 UFPE will contribute to understand the seasonal, interannual and spatial variability in the distribution, abundance and biomass of phytoplankton and zooplankton in the above western boundary systems. In WP1.3, UFPE will contribute to stable isotope analysis to investigate the trophic interrelationships and will also study vertical migrations of marine organisms. In WP1.5 UFPE will contribute to overall organization and synthesis of CT1. In the WP2.1 (CT2), UFPE will perform studies using modelling and observations to characterise the physical and ecological variability (from interannual to decadal timescales) of the above-mentioned study case sites in the western boundary. These efforts will focus to improve our understanding of observed and simulated relations between the physical (climate) and ecosystem variability, looking to stablish overall key metrics and functional relationships/mechanisms relevant to CT3. In WP4.1 UFPE will foster cross-Atlantic educational and technological capacity development, with emphasis on collaborative initiatives between South American and African countries and EU in the field of marine research.

Relevant personnel

Prof. Moacyr Araujo (male) is an Associate Professor of the Department of Oceanography (DOCEAN-UFPE), Brazil. He is the Director of the Center for Risk Analysis and Environmental Modeling (CEERMA-UFPE), Brazil. He has authored/co-authored 86 peer review publications, with focus on geophysical fluid dynamics, ocean-atmosphere and physical-biogeochemical interaction and modelling in the tropical Atlantic. Since 1998, he was chief scientist on more than 10 major research cruises into the tropical Atlantic focussing on interdisciplinary physical, biogeochemical and biological studies. Moacyr acted as supervisor of 17 MSc. and 14 PhD works. He is a member of the Scientific Steering Committee and Co-chair of the Project Prediction and Research Moored Array in

the Tropical Atlantic (PIRATA) and Co-chair of the WG 1-Scientific Basis of the Brazilian Panel on Climate Change (PBMC). He is Chair of the Brazilian Research Network on Global Climate Change (Rede CLIMA) and member of the Atlantic Research Panel (ARP) of the Climate and Ocean: Variability, Predictability and Change/World Climate Research Programme (CLIVAR/WCRP).

Dr. Paulo Santos (male) is Head of the Research Directorate at the PROPESQ/UFPE. He is Full Professor of the Zoology Department of the UFPE. Since 2013 Paulo has been the Coordinator of the Biodiversity Area and since 2015 he has been a full member of CAPES CTC-ES. He has experience in the areas of Oceanography, Zoology and Ecology, working mainly in the following subjects: Benthos, Mangrove and reefs ecology, Environmental monitoring and anthropic impacts. Already concluded the supervision of more than 30 MSc. and PhD. of Graduate and more than 15 Monographs of Conclusion of Undergraduate level. He acts as an ad-hoc reviewer of national and international journals and for various development agencies. Paulo has published more than 60 articles in scientific journals indexed in the ISI and his quotation reached factor H = 12 in the ISI base and 13 in the Scopus. From 2009 to date, he has published more than 40 articles in periodicals indexed in the ISI.

Dr. Ralf Schwamborn (male) is Associate Professor at the DOCEAN-UFPE. He was a visiting researcher at the lab. of zooplankton of Depto. Zoology at the Federal University of Rio de Janeiro (UFRJ), post-doc researcher at the University of Miami (RSMAS), post-doc researcher at the Alfred Wegener Institute for Polar and Marine Research (AWI). Ralf has experience in the management and coordination of research and development (R&D) projects and in the characterization and monitoring of tropical marine and estuarine ecosystems. He coordinates a Working Group in INCT Tropical Marine Environments that analyses the effect of global changes on these environments. He has experience in Biological Oceanography and Marine Biology, with emphasis on ecology of larvae and juveniles Decapod crustaceans, acting on the following topics: Zooplankton Marine, estuaries, Grass Marine Meadows, reef environments, Mangroves, Stable Isotopes, Ecosystem Dynamics and Trophic Webs.

Relevant publications, products, services or other achievements

1.   Ameida, L., J. L. L. Azevedo, R. Kerr, M. Araujo, M. Mata, 2018. Impact of the new equation of the state of seawater (TEOS-10) on the estimates of water mass mixture and meridional transport in the Atlantic Ocean. Progress in Oceanography, doi: 10.1016/j.pocean.2018.02.008

2.   Silva, T. L. V., D. Veleda, M. Araujo, P. Tyaquiçã, 2018. Ocean-atmosphere feedback during extreme rainfall events in eastern Northeast Brazil. Journal of Applied Meteorology and Climatology, doi: 10.1175/JAMC-D-17-0232.1

3.   Nogueira Neto, A. V., H. Giordani, G. Caniaux, M. Araujo, 2018. Seasonal and Interannual Mixed Layer Heat Budget Variability in the Western Tropical Atlantic From Argo Floats (2007-2012). Journal of Geophysical Research-Oceans, doi: 0.1029/2017JC013436

4.   Tchamabi, C. C., M. Araujo, M. Silva, B. Bourlès, 2017. A study of the Brazilian Fernando de Noronha Island and Rocas Atoll wakes in the tropical Atlantic. Ocean Modeling, doi: 10.1016/j.ocemod.2016.12.009

5.   Servain, J., G. Canaiaux, Y. K., Kouadio, M. McPhaden, M. Araujo, 2014. Recent climatic trends in the tropical Atlantic. Climate Dynamics, doi: 10.1007/s00382-014-2168-7

Relevant projects or activities

1.   1998-, NOAA, IRD/Meteo-France, INPE/DHN: Prediction and Research Moored Array in the Tropical Atlantic (PIRATA, www.pmel.noaa.gov/gtmba/pirata)

2.   2008-, MCTIC: Brazilian Research Network on Global Climate Change (Rede CLIMA, redeclima.ccst.inpe.br/)

3.   2018-2023, IRD, CAPES: International Joint Laboratory on Tropical Atlantic Interdisciplinary laboratory on physical, biogeochemical, ecological and human dynamics (IJL TAPIOCA)

4.   2014-, MCTIC: Nacional Institute in Science and Technology on Tropical Marine Environments – Spatial-temporal Heterogeneities and Responses to Climate Changes (INCT AmbTropic, www.inctambtropic.org/)

5.   2017-2010, EU RISE H2020: Planning in a Liquid world with Tropical Stakes (PADDLE, https://www-iuem.univ-brest.fr/paddle)

Relevant infrastructure

The Department of Oceanography of UFPE has over 3.000 m^2 located in the Technology and Geoscience Center (CTG/UFPE). The DOCEAN is constituted by nine research laboratories: Phytoplankton, Zooplankton, Nekton, Phytobenthos, Zoobenthos, Sea Water Chemistry, Physics, Geology, Mariculture, and an Oceanographic Museum.

These laboratories have research infrastructures to carry out sampling, analysis and quality control of sea data. The CEERMA-UFPE has an updated HPC-CUDA computational structure which allows to perform high resolution numerical simulations for regional and basin-scale ocean dynamics analysis.

24 Universidade Federal de Santa Catarina UFSC

Description of the organisation

Federal University of Santa Catarina (UFSC, http://ufsc.br/) is a leading centre of high education and research in Brazil and has been recognized by its excellence in the area of Marine Sciences involving several research groups that study different aspects of this subject, ranging from climate variability to marine ecology, with a regional focus on the Tropical and South Atlantic. The Centre for Mathematical, Physical and Chemical Sciences hosts research groups on fields of Oceanography and Meteorology and has a postgraduate program in Oceanography while the Centre for Biological Sciences hosts groups on fields of Marine Biology and has a postgraduate program in Ecology. Together, more than 50 postgraduate students and researchers work on the theme.

Particularly relevant for the project

UFSC Department of Oceanography has extensive experience in studying climate and ecosystem variability in the Tropical and South Atlantic and has contributed to current existing international observation programs (PIRATA and SAMOC/SAMBA) by participating on sea-going observational campaigns as well as developing analytical and modelling work. UFSC has a tradition of working closely with national and local governments to extend the acquired knowledge in the field to the society.

Roles and tasks in the project

UFSC will contribute to CT2, WP2.2 by helping to identify physical drivers of interannual to decadal variability that impact marine ecosystems in the Tropical and South Atlantic. More specifically, UFSC main role will be on the analysis of extreme events such as marine heatwaves, their physical drivers and effects on marine ecosystems. Links to the main large-scale modes of climate variability such as ENSO, Atlantic Niño and Atlantic Meridional Modes are also part of UFSC tasks.

Relevant personnel

Dr. Regina R. Rodrigues (female) is an Associated Professor in Physical Oceanography and leads the Climate Group in the Department of Oceanography. She also leads the group of Extreme Events of the Brazilian Network for Climate Change (Rede CLIMA), which consists of groups of experts to determine the impacts of climate change on several areas, ranging from agriculture and water resources to natural disasters, and marine ecosystems, among others. Within this network she works to assist the Brazilian Ministry of Environment in implementing the National Plan for Adaptation to Climate Change. She has received several grants from the Brazilian Research Council and currently supervises one MSc student, one PhD student and one postdoctoral fellow. She is a contributing author on aspects of the impact of climate change on ocean circulation and heat content in the First Global Integrated Marine Assessment, also known as the first World Ocean Assessment elaborated by The Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations. Her research has focused on the impacts of modes of climate variability on the Tropical and South Atlantic. Most recently, she is investigating the mechanisms that generate marine heatwaves in the South Atlantic and their impacts on marine ecosystems, being the key subject to this proposal.

Relevant publications, products, services or other achievements

1.   Rodrigues, R.R., R.J. Haarsma, E.J.D. Campos, T. Ambrizzi (2011). Impacts of Inter-El Niño Variability on the Tropical Atlantic and Northeast Brazil Climate. Journal of Climate, 24, 3402–3422

2.   Rodrigues, R.R. & M.J. McPhaden (2014). Why did the 2011-12 La Niña cause a severe drought in the Brazilian Northeast? Geophysical Research Letters, 41, 1012–1018

3.   Taschetto, A. S., R.R. Rodrigues, G.A. Meehl, S. McGregor, M.H. England (2015). How sensitive are the Pacific–tropical North Atlantic teleconnections to the position and intensity of El Niño-related warming? Climate Dynamics, 1-20

4.   Rodrigues, R.R., E.J.D. Campos, R.J. Haarsma (2015). The impact of ENSO on the South Atlantic Subtropical Dipole Mode. Journal of Climate, 28, 2691–2705

5.   Rodrigues, R.R. & T. Woollings (2017). Impact of atmospheric blocking on South America in austral summer. Journal of Climate, 30, 1821-1837

Relevant projects or activities

1.   Brazilian Network for Climate Change – Rede CLIMA: This is a network of national and international researchers to address the impacts of climate change on several areas and to advice the Brazilian Government. I coordinate the Subsection on Extreme Events. http://redeclima.ccst.inpe.br/, 2009 to 2019

2.   National Programme of Science and Technology on Marine Sciences: This is an interdisciplinary and multi-institutional program to address the impacts of climate change on the Brazilian coastal zone, continental shelf and South Atlantic Ocean, sponsored by the Ministry of Science, Technology and Innovation and the National Research Council. I coordinate the WP on Ocean Modelling: http://inct.cnpq.br/web/inct-mar-coi/home/, 2012-2016

3.   National Programme of Science and Technology on Climate Change – Phase II: This is an interdisciplinary and multi-institutional program to address the impacts of climate change on several areas, ranging from agriculture, health, ecosystems to coastal zones and ocean, sponsored by the Ministry of Science, Technology and Innovation and the National Research Council. I coordinate the WP on Extreme Events and Natural Disasters, 2017-2021

4.   Variability in South Atlantic Ocean Circulation and its Impacts on Climate: Sponsored by The Royal Society and UK-Brazil Newton Fund International Exchanges Scheme (2016/R3). I am the Principal Investigator with Dr. Helen Johnson and Dr. David Marshall (University of Oxford), 2017-2018

5.   The impact of atmospheric blocking and jet variability on the South Atlantic and links to extreme events. Sponsored by the Ministry of Science, Technology and Innovation and the National Research Council. I am the Principal Investigator, 2017-2019

6.   Ocean Downscaling using Future Projections from the Brazilian Earth System Model (BESM). Sponsored by the Ministry of Education and the Coordination of Higher Education. I coordinate the WP on Air-Sea Interaction, 2017-2021

Relevant infrastructure

UFSC has available all the infrastructure necessary to deliver the proposed results, including laboratories, computer facilities and staff time.

25 Universidade Federal Rural de Pernambuco UFRPE

Description of the organisation

The Universidade Federal Rural de Pernambuco (www.ufrpe.br) is a Brazilian public university with more than 15.000 students and 1.200 professors. It has 55 graduations courses and 56 post-graduation courses. The Department of Fisheries and Aquaculture, which will be engaged in the project, has been contributing to the formation of professionals in the area of fisheries, aquaculture, fishing technology, oceanography and applied ecology since 1970, when the undergraduate course on Fisheries Engineering was created. It is also has the Post-Graduate Program in Fisheries Resources and Aquaculture (Master and PhD), created in 2000, with around 100 students.

Particularly relevant for the project

UFRPE has been in the forefront of fisheries and marine ecosystem research in Brazil. It has been the main scientific center in the country, with regard to research on marine apex predators and highly migratory fish species, such as tunas, billfishes and sharks, including extensive work on biologging of several pelagic species. It has also developed various research with stable isotopes, as a tool to better understand the trophic structure and energy flow in the marine ecosystem. The UFRPE staff has also been involved with socioeconomic aspects of fisheries development, particularly of the artisanal and small-scale fishery, predominant in northeast Brazil. Another important field of research has been the productivity processes associated to seamounts and oceanic islands, including extensive research conducted in Atol das Rocas, Fernando de Noronha Island and Saint Peter and Saint Paul Archipelago. The need to improve the sustainability of fishing activities and to reduce the impact of fisheries on marine ecosystem has also been addressed by UFRPE. Activities in this field include the national coordination of the MADE project, done in cooperation with the EC, and the GEF/ FAO REBYC Project, to address the problem of bycatch and discards in the shrimp-trawling fishery in Brazil.

Roles and tasks in the project

UFRPE will be participating in seven work packages: WP1.3; WP1.4; WP1.5; WP2.1; WP2.2; WP3.2 and WP4.1. In WP1.3. UFRPE will participate in the study of: a) the abundance, diversity and distribution of small pelagic and mesopelagic fauna including their relevance for fisheries; b) biologging studies of migratory species, particularly tunas; c) food web structure of selected species based on isotope composition. In WP1.4. UFRPE will contribute to the assessment of human activities affecting, and being affected by marine ecosystems, particularly with regard to the socioeconomic aspects of the tuna fisheries in the Atlantic Ocean and the shrimp-trawling fishery in northeast Brazil. In WP1.5. UFRPE will participate in the synthesis, particularly with regard to the influence of seamounts/oceanic islands and associated upwelling and frontal processes on tuna fisheries. On WP2.1. and WP2.2. (co-coUFRPE will characterize the metrics of relative abundance indices of tuna species in the Atlantic Ocean and will study the influence of interanual and decadal changes in the marine ecosystem on the tuna fisheries. UFRPE will co-coordinate WP2.2. In WP3.2. UFRPE will participate in the modelling of relevant marine ecosystems and fisheries and provide predictions from 1 month to 40 years horizon. Finally, UFRPE will also participate in WP4.1., through collaborative initiatives between South American and African countries and EU in the field of marine research.

Relevant personnel

Fábio Hazin (male). Fisheries Engineer, PhD in Marine Science and Technology. Past functions: National Secretary for Fisheries (2015). Chair of the International Commission for the Conservation of Atlantic Tunas-ICCAT (2007-2011). Chair of the FAO Committee on Fisheries (2014-2016). President of the Brazilian Society of Fisheries Engineering (2010-2012); Brazilian Chief Scientist in ICCAT (1998-2015). Presently: National Coordinator of GEF/FAO REBYC II- LAC Project, and of the ICCAT- AOTTP tuna tagging Project, in Brazil. Scientific Coordinator of the Saint Peter and Saint Paul Archipelago Research Station.

Dr. Paulo Travassos (male). Coordinated the ICCAT WG for the South Atlantic Swordfish stock (2007-2011). Was the Statistical Correspondent of Brazil in ICCAT, from 2000 to 2009. Presently: Chair of the Scientific Subcommittee of the Permanent Committee for the Management of the Tuna Fishery; Brazilian Chief Scientist in ICCAT.

Dr. Thierry Frédou (male). Associate professor and coordinator of the fisheries and Aquaculture post-graduation program. Coordinated several multidisciplinary project using biological trackers such as stable isotopes, otolith microchemistry, heavy metal contamination and ecosystem modelling. Has been working on tuna fisheries since the early 2000´s representing Brazil in ICCAT. Member of the Brazilian Scientific Committee on Tunas species.

Dr. Flávia Lucena Frédou (female). Member of the national Tuna Scientific Subcommittee. Represents Brazil at

ICCAT and Coordinate its Small Tunas Group. Participate in the Ecologically or Biologically Significant Marine Area Description (EBSAS) process organized by the Convention on Biological Biodiversity (CDB). Member of the World Ocean Assessment Pool of Experts (UN). Member of the IUCN Species Survival Commission, IUCN, SSC Sciaenid Red List Authority and IUCN SSC Tuna & Billfishes Specialist Group.

Relevant publications, products, services or other achievements

1.   Lucena-Frédou, F.; Kell, L.; Frédou, T.; Gaertner, D; Potier, M; Bach, P; Travassos, P; Hazin, F.H.V.; Ménard, F. Vulnerability of teleosts caught by the pelagic tuna longline fleets in South Atlantic and Western Indian Oceans. Deep-Sea Research Part II-Topical Studies in Oceanography, v. 140, p. 230-241, 2017

2.   Lucena Frédou, F; Tolotti, M.T.; Frédou, T.; Carvalho, F; Hazin, H; Burgess, G; Coelho, R; Waters, JD.; Travassos, P.; Hazin, F.H.V. Sharks caught by the Brazilian tuna longline fleet: an overview. Reviews in Fish Biol. and Fish., (25) 365-377, 2015

3.   Tolotti, M.T.; Travassos, P.; Frédou, F.L.; Wor, C.; Andrade, H.A.; Hazin, F.H.V. Size, distribution and catch rates of the oceanic whitetip shark caught by the Brazilian tuna longline fleet. Fisheries Research, v. 143, p. 136-142, 2013

4.   Bezerra, N.P.A.; Travassos, P.; Hazin, F.H.V. Vulnerability to longline fisheries of three hammerhead shark species in the south-western and equatorial Atlantic Ocean. Journal of Fish Biology, p. 1-12, 2016

Relevant projects or activities

1.   2017 – current EU MSCA- RISE Planning in A liquiD worlD with tropicaL StakEs: solutions from an EU-Africa-Brazil perspective - PADDLE

2.   2015 – current FAO: Sustainable Management of Bycatch in Latin America and Caribbean Trawl Fisheries (REBYC-II LAC)

3.   2015 – current CNPq: PROTUNA Projeto de Apoio Técnico-Científico ao Desenvolvimento da Pesca de Atuns e Afins no Brasil

4.   2012 – 2018 CNPq: AmbTropic Tropical Marine Environments: Space-Time Heterogeneity and Responses to Climate Change

Relevant infrastructure

Three laboratories of the UFRPE are involved in the proposal (LOP, BIOIMPACT and LEMAR) each of them are equipped with computers, laboratory equipment (microscopes, balance, oven, water distiller, etc.) and field equipment (GPS, etc.). Laboratories in UFRPE have approximately 300m^2 of area with undergraduate and postgraduate students' room permanence, wet laboratory and reference collection room. Laboratories are equipped with freezers for storage of samples, computers for data analysis, microscopes and GPS. In relation to the field collection, the necessary equipment is available. In terms of staff in UFRPE, Doctoral, Master and Graduate students will facilitate the practical execution of the activities predicted in the project.

26 National University of Ireland Galway NUIG

Description of the organisation

Established in 1845, the National University of Ireland Galway (NUIG) is the leading higher education and research organisation in the West of Ireland. It has a student population of over 17,000 and over 1,000 studying at MSc/PhD levels. NUIG is a research-led university and is currently ranked in the top 250 universities in the world (QS world rankings & Times Higher Education for 2016).   In 2016, University income was approximately €220million of which over €50 million was from externally funded research. NUIG is currently involved in 100 Horizon 2020 projects, securing in excess of €45 million in direct funding to NUIG.

NUI Galway places a strong focus on providing a supportive and exciting environment for its researchers and was awarded the "HR Excellence in Research" logo by the European Commission in late 2013 and the Institutional Athena Swan Bronze Award in 2018.

NUIG is in the process of establishing a Researcher Development Centre to support researcher training, researcher career development and integration of researchers into NUI Galway's community. The Centre will support the professional development of researchers by providing guidance with career management and career planning in transferable skills.

Particularly relevant for the project

Researchers at NUI Galway have extensive experience in research on multiple stressors on primary production and in particular on iron and/or nitrogen limitation of pico and nanoplankton in open ocean environments. This includes the IMBER linked project VOCAB which examines the impact of ocean acidification on Irish coastal and offshore waters. Additionally, as part of the SFI centre iCRAG, and in collaboration with the Marine Institute of Ireland, since 2016 an annual biogeochemical survey of pico and nanoplankton abundance has been carried out along the west coasts of Ireland and Scotland has been made as a contribution to the Western European Shelf Pelagic Acoustic Survey (WESPAS).

Roles and tasks in the project

NUIG will directly contribute to WP1.2 (Primary and secondary production, phytoplankton and zooplankton distribution) through their expertise in marine biogeochemistry and bio-optics. The work performed in WP1.2 will be done in close collaboration with the other partners (ULPGC, UVIGO, GEOMAR, UFPE, FURG, SU and INIP).

Relevant personnel

Prof. Peter Croot (male) is the Established Professor of Earth and Ocean Sciences at NUI Galway, whose research focuses on the biogeochemical controls on primary productivity in the ocean and most notably the influence of trace metal speciation (e.g. Fe and Cu) on phytoplankton. Prof. Croot was a participant in 4 open ocean iron enrichment experiments (SOIREE, SOFEX, EisenEx and EIFeX) and has extensive at sea experience with over 600 days at sea on major expeditions in the Pacific, Atlantic and Southern Oceans. He has authored/co-authored 110 peer review publications, including publications in Nature (2) and Science (1). According to ISI Web of Knowledge, he has been cited over 5700 times, with an average citation rate of 51, and an h-index of 37. He has extensive experience in the supervision of researchers, postdoctoral scientists and PhD students and is currently a co-PI in the Irish Centre for Research in Applied Geoscience (iCRAG), a 26M€ SFI research centre. He has served on several international organisations, including most recently the GEOTRACES standards and intercomparison committee and the European Marine Board's working group on the Deep Ocean. He is also currently a member of the EU AtlantOS advisory board.

Relevant publications, products, services or other achievements

1.   Simonella, L.E., Palomeque, M.E., Croot, P.L., Stein, A., Kupczewski, M., Rosales, A., Montes, M.L., Colombo, F., García, M.G., Villarosa, G., Gaiero, D.M., 2015. Soluble iron inputs to the Southern Ocean through recent andesitic to rhyolitic volcanic ash eruptions from the Patagonian Andes. Global Biogeochemical Cycles 29 (8), 1125-1144. DOI: 10.1002/2015GB005177

2.   Heller, M.I. and Croot, P.L. Copper speciation and distribution in the Atlantic sector of the Southern Ocean. Marine Chemistry (2015), 173(0): 253-268

3.   Heller, M.I., D. Gaiero and P.L. Croot. "Basin scale survey of marine humic fluorescence in the Atlantic: relationship to iron solubility and H2O2". Global Biogeochemical Cycles 27(1), 88-100, doi:10.1029/2012GB004427 (2013)

4.   Dammshäuser, A., T. Wagener, D. Garbe-Schönberg and P.L. Croot. "Particulate and dissolved aluminium and titanium in the upper water column of the Atlantic Ocean". Deep Sea Research, 73, 127-139 (2013)

5.   Croot, P.L. and M.I. Heller. "The importance of kinetics and redox in the biogeochemical cycling of iron in the surface ocean". Frontiers in Microbiological Chemistry, 3, (2012). doi: 10.3389/fmicb.2012.00219

Relevant projects or activities

Acronym	Call identifier			Pillar	Role
SOPHIE	H2020-BG-2017-1	2017	P3	Societal Challenges	Beneficiary
Respon-SEA-ble	H2020-BG-2014-1	2014	P3	Societal Challenges	Beneficiary
ATLAS	H2020-BG-2015-2	2015	P3	Societal Challenges	Beneficiary
CERES	H2020-BG-2015-2	2015	P3	Societal Challenges	Beneficiary
GENIALG	H2020-BG-2016-2	2016	P3	Societal Challenges	Beneficiary

Relevant infrastructure

Infrastructure at NUI Galway of relevance to TRI-ATLAS includes two new instruments funded by the Marine Institute of Ireland in 2018; (i) a SeaFAST S2 system for the pre-concentration of trace metals from seawater for subsequent analysis by ICP-MS. (ii) a Membrane Inlet Mass Spectrometer (MIMS) for the measurement of climate relevant trace gases. NUI Galway also has a range of equipment available for use as shipboard analysis systems, including flow cytometry (Accuri C6), Bio-optical measurements and trace metal/nutrient and reactive oxygen species (ROS) analysis systems. Further Flow Cytometry facilities are available within NCBES including a Merck ImageStream mark II imaging flow cytometer.

27 Uni Research AS UNI

Description of the organisation

Uni Research AS (UNI) is a non-profit research company with more than 400 highly qualified employees from more than 30 different nations. The company has an annual turnover of NOK 400 million and consists of six departments. Uni Research carries out research and development in the fields of health, environment, climate, energy, ICT, and social sciences. It is one of four partners in the Bjerknes Centre for Climate Research (BCCR) and a partner in the Norwegian Climate Service Centre (KSS). Uni Climate, a department of Uni Research, carries out multidisciplinary research into the climate of the past, present and future. Uni Climate has a strong research group on marine biogeochemistry with more than 20 years of experience in marine carbon cycle investigations. Uni Climate is ranked excellent in a national evaluation of the Earth Sciences in Norway and is co-hosting the Ocean Thematic Centre (OTC), a central facility of the European Research Infrastructure programme Integrated Carbon Observation System (ICOS). Uni Climate also has strong expertise in global climate modelling and climate dynamics with a leading role in Norway for the use and further development of the new Norwegian Earth System Model (NorESM).

Particularly relevant for the project

Uni Research has established expertise in complex large-scale research projects, such as EVA, the national Norwegian Earth System Modelling project; CARBOCHANGE, the multi-institutional EU-FP7 on the marine carbon cycle; H2020-CRESCENDO, coordinated research on Earth systems and Climate. Uni Climate plays an instrumental role in delivering future Earth system model projections to the last CMIP5 project and were assessed in the last IPCC-AR5. Uni Climate is leading the national Infrastructure project on Norwegian Earth System modelling (INES).

Roles and tasks in the project

Members of UNI participating in the project TRIATLAS have established expertise in coupled physical-biogeochemical ocean modeling focuses on understanding complex interactions between the observed physical variations and the marine ecosystem dynamics for the recent past, present and future time scales. The scientists involved also have experiences in applying emergent constraint and data assimilation techniques to elucidate the source of model spread in projections and optimize ecosystem parameters in the model. Within TRIATLAS, UNI will design and carry out numerical coupled and hindcast model simulations of physical climate and biogeochemistry for the historical period. The simulations will be performed with the latest version of NorESM model components, and be rigorously validated against relevant global data synthesis. In WP3.1, UNI researchers will provide support and analysis for the ocean biogeochemistry simulations done in 'perfect' physical settings. Further, we will determine the primary physical and biogeochemical drivers of the simulated primary production at inter-annual to multi-decadal time scales across the TRIATLAS study region. We will also perform ecosystem parameter optimization with the Ensemble Kalman Filter on poorly constrained ecosystem and physical parameters, and provide optimum hindcast and prediction of ocean biogeochemistry states.

Relevant personnel

Dr. Jerry Tjiputra (male) is a principal scientist, with over 10 years of research experience in global marine biogeochemical modelling. His main interests include understanding climate change impact on the ocean biogeochemistry and ecosystem. He has been actively involved in key European research initiative on the Earth system modeling, marine carbon cycle and ocean acidification (CRESCENDO, CARBOOCEAN, CARBOCHANGE, COMBINE and EPOCA) and is presently leading several national projects. He authored/co-authored 50 internationally recognized peer-reviewed journals with >2500 citations (Google Scholar) and an h-index of 21. In 2014 and 2018, he was awarded the prestigious FRIPRO and TOPPFORSK research projects by the Norwegian research council. He has supervised 1 master thesis, 1 PhD and 6 postdocs.

Relevant publications, products, services or other achievements

1. Tjiputra, J. F., N. Goris, S. K. Lauvset, C. Heinze, A. Olsen, J. Schwinger, and R. Steinfeldt (2018), Mechanisms and early detections of multidecadal oxygen changes in the interior subpolar North Atlantic, Geophys. Res. Lett., 45, doi:10.1029/2018GL077096

2. Gharamti, M. E., J. Tjiputra, I. Bethke, A. Samuelsen, I. Skjelvan, M. Bentsen, and L. Bertino (2017), Ensemble data assimilation for ocean biogeochemical state and parameter estimation at different sites, Ocean Modelling, 112, 65-89

3. Henson, S., C. Beaulieu, T. Ilyina, J. G. John, M. Long, R. Seferian, J. Tjiputra, and J. Sarmiento (2017), Rapid emergence of climate change in environmental drivers of marine ecosystems, Nature Communication,

doi:10.1028/ncomms14682

4.   Tjiputra, J. F., K. Assmann, M. Bentsen, I. Bethke, O. H. Otterå, C. Sturm, and C. Heinze (2010), Bergen Earth system model (BCM-C): model description and regional climate-carbon cycle feedback assessment, Geosci. Model Dev., 3, 123-141

5.   Tjiputra, J. F., D. Polzin, and A. M. E. Winguth (2007), Assimilation of seasonal chlorophyll and nutrient data into an adjoint three-dimensional ocean carbon cycle model: Sensitivity analysis and ecosystem parameter optimization, Global Biogeochemical Cycles, 21, GB1001, doi:10.1029/ 2006GB002745

Relevant projects or activities

1.   2009-2013: FP7-COMBINE: Comprehensive modelling of the Earth system for better climate prediction and projection

2.   2011-2015: FP7-CARBOCHANGE: Changes in carbon uptake and emissions by oceans in a changing climate

3.   2015-2020: H2020-CRESCENDO: Coordinated research in Earth systems and climate

4.   2018-2022: INES: Infrastructure project on Norwegian Earth System modelling

5.   2018-2023: COLUMBIA: Constraining the large uncertainties in Earth system model projections with a big data approach

Relevant infrastructure

UNI will provide the model code and basic technical support for performing the NorESM model simulations. UNI has access and will apply for the computational and long-term storage resources to the Norwegian national infrastructure of super-computing and long-term storage facilities (NOTUR and NorStore), where the model simulations will be performed and archived. UNI is leading the national NorESM infrastructure project INES.

28 Institut Sénégalais de Recherches Agricoles ISRA

Description of the organisation

Founded in 1974, the Senegalese Institute for Agricultural Research (ISRA), which became in 1997 a Public Scientific and Technological Entity, develops and conducts research on crops, livestock, fisheries, forestry and rural socio-economics in order to contribute to the growth of agricultural production. Its main objectives are i)the design and execution of research program on crop production, forestry, animal and fishery and rural economy, ii)the creation of scientific knowledge, the generation of technological innovations and the development of tools for decision support to improve the agricultural sector, iii)the development and transfer of research results, iv) the promotion and research training through research and v)the development of scientific cooperation as well as with African and international research institutions and universities in Senegal. The Centre for Oceanographic Research of Dakar-Thiaroye (CRODT), is the ISRA 's department responsible for fishery research in Senegal. Composed of 87 researchers, engineers and technicians, the CRODT is based in Hann (Dakar), with offices in St Louis, Kayar, Mbour, Joal and Ziguinchor and an oceanographic research vessel « Itaf DEME ». The main missions of the CRODT are i) the evaluation of the fishery resources, ii) the monitoring of the fishery resources and operating systems, iii) providing technical basis of fishery management measures for the sustainable exploitations of fishery resources.

CRODT is strongly involved in the CECAF/FAO working groups on the "assessment of coastal pelagic resources of the North-West Africa area" and the "assessment of demersal resources" and in the evaluation panels within the International Commission for the Conservation of Atlantic Tunas (ICCAT). A last point according to TRIATLAS proposal, ISRA/CRODT is the owner institution for EAF-Nansen data along Senegalese coastline.

Particularly relevant for the project

Located in the most westerly position of Africa, Senegal is the African country the closest to Cabo Verde islands and host one of the most experimented institutions of North Africa regarding oceanographic observations and collection of marine data. This strategic position and research facilities makes CRODT an ideal candidate for assessing the role of small pelagic and mesopelagic fish species between the mainland and the oceanic islands as Cabo Verde. The CRODT has a research vessel equipped with hydroacoustic equipments among the most sophisticated of the region (Simrad EK 60 with two frequencies, 120 and 200 kHz) and is the owner institution for EAF-Nansen data along Senegalese coastline. CRODT's staff has extensive experience in collecting and analysing acoustic data and CRODT had chaired the acoustic network of the region during several years. This background gives it the competence to highly contribute in TRIATLAS milestones like the planned FRV Walther Herwig cruise 2020 to collect material on small pelagic and mesopelagic fish species by means of multifrequency acoustic measurements. Cruises of opportunity like FRV Fridtjof Nansen cruise 2019 in Senegal may be also of important inputs in this TRIATLAS project as well as potential cruises of Senegalese vessel RV Itaf Deme.

Roles and tasks in the project

ISRA will be the institution representing the West African mainland coast in TRIATLAS.

It will contribute to WP1.3 the aim of which is to assess the role of small pelagic and mesopelagic fish species in the main South Atlantic ecosystems and fisheries and their reaction to large scale changes and to investigate the abundance of key species, vertical and horizontal distribution of different size fractions. ISRA will specifically assist in the hydroacoustic observations between Senegal and Cabo Verde in order to identify the vertical migration of small pelagic and mesopelagic (Task1.3.3), as well as their biodiversity and distribution (Task1.3.1).

Relevant personnel

Dr. Abdoulaye Sarré, **(male)** PhD in Marine Biology and acoustics engineer is responsible of small pelagic resources assessment in Senegal using hydroacoustic methods. With extensive expertise gained through his key roles held in the sub region, his inputs may contribute a lot in this TRIATLAS project. He is based in Dakar (Senegal), at the national oceanographic and fisheries center (CRODT) since 1985, former Chairman of the sub regional (Morocco, Mauritania, Senegal, and Gambia) FAO/CECAF Fisheries Acoustics Working Group. He has also chaired working groups on fish stock assessment for the West African Economic and Monetary Union (WAEMU). Dr Sarré has been acoustic expert for Sierra Leone 2008-2011, Ivory Coast 2012 and Guinea equatorial, 2016. He has just completed a PhD thesis at the European Institute for Marine Science (Brest, France), using data collected (FAO, Nansen Project; IRD-BMBF, AWA project) during his career.

Dr. Ismaïla Ndour, **(male)** PhD in Marine and Fish Biology, admitted to the African and Malagasy Council for Higher Education (CAMES) as Research Officer is responsible of marine Plankton (ichthyoplankton, zooplankton, and phytoplankton) study for ISRA/CRODT in Senegal, using nets sampling methods. Dr Ndour is also involved in

the management of marine biodiversity through the Ocean Biogeographic Information System (OBIS), of which he is the focal point for the West African region.

Relevant publications, products, services or other achievements

1.   Sarre *et al*. 2017. Spatial distribution of main clupeid species in relation to acoustic assessment surveys in the continental shelves of Senegal and The Gambia. *Aquat. Living Resour*. 2018, 31, 9

2.   Sarré 2017. Approche acoustique de la dynamique et distribution spatiale des ressources halieutiques de petits pélagiques dans l'upwelling sénégalo-mauritanien. Thése de Doctorat. Sciences de la Terre. Université de Bretagne occidentale - Brest, 2017

3.   Sarre *et al* 2018. Spatial shift of small pelagic fish as early warning for food security in North-West Africa. *Progress in Oceanography*. In revision

4.   M. Tiedemann, Patrice Brehmer, A. Sarré, A. Mouget, S. El Ayoubi, V.Kone, N. Béhagle, Y. Perrot, N. Chouraki, C. Migayrou, U. Uanivi, A.Taleb, E. M. Mbye, E. Rodriguez. Comparative analysis of Diel Vertical Migration between the three Atlantic African Large Marine Ecosystems. International Conference Preface, Lanzarote, 2018

5.   Ndour, I., *et al.* Composition, distribution and abundance of zooplankton and ichthyoplankton along the Senegal-Guinea maritime zone (West Africa). *Egyptian Journal of Aquatic Research*. https://doi.org/10.1016/j.ejar.2018.04.001. In press

Relevant projects or activities

1.   2013–2017, EU DG ENV FP7: Enhancing Prediction of Tropical Atlantic Climate and its Impacts (PREFACE)

2.   2018-2020, Support for the sustainable management of small pelagic populations in the SRFC zone of the (MAVA foundation)

3.   2014 – 2017, Ecosystem Approach to the management of fisheries and the marine environment in West African waters (AWA BMBF-IRD, 2013-2017)

4.   2017-2021 Supporting the Application of the Ecosystem Approach to Fisheries management considering climate and pollution impacts (EAF-Nansen Programme)

Relevant infrastructure

The oceanographic research vessel R/V Itaf Déme is a 36 meters long vessel powered by an engine of 1100 CV, it is equipped with radars Furuno of last generation, an acoustic Simrad system of echointegration using the modern techniques for the assessment of the pelagic stocks, a CTD Seabird 19 probe for collection of environmental data, etc.

29 Consejo Superior de Investigaciones Cientificas CSIC

Description of the organisation

The Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC, www.csic.es) is the largest public multidisciplinary research organization in Spain, with more than 6000 scientist working on different disciplines. The purpose of CSIC is the development, coordination and diffusion of multidisciplinary scientific research. To foster the advance of scientific knowledge and the economic, social and cultural issues, CSIC collaborates with national and international universities, public RTD organizations, SMEs, companies and other scientific and technological institutions. CSIC has 135 institutes or centers, including 51 Joint Research Units with universities or other public research institutions. CSIC has considerable experience both in participating and in managing RTD projects and training research personnel. CSIC has participated in more than 7.700 European projects using different funding instruments, such as Framework Programmes (FP), CECA, INTERREG and LIFE+ Programmes. Under FP7, CSIC has signed more than 440 projects (including 42 coordinated by CSIC as well as 22 ERC). CSIC will participate in TRIATLAS with its largest marine research institute in the Mediterranean Sea, the INSTITUTE OF MARINES SCIENCES (CSIC-ICM, www.icm.csic.es). CSIC-ICM is a multidisciplinary marine research center, including investigations in marine physics, marine geology, marine biology, marine chemistry and technological development.

Particularly relevant for the project

The involved scientists of CSIC-ICM in TRIATLAS belong to the Department of Marine Renewal Resources (www.icm.csic.es/rec/) and have ample experience in marine ecosystem analyses and modelling. The team has a strong expertise in analysing and modelling marine food web dynamics under varying climatological and fisheries conditions and is currently involved in several projects around the globe applying and extending the EwE approach. CSIC-ICM team has a strong experience in visualizing food web dynamics in virtual 3D environments and interconnecting models to perform larger-scale, interdisciplinary assessments. In addition, through the collaboration with the Ecopath Consortium of Research and Development (http://ecopath.org/consortium/) and the Ecopath International Association (EII, http://ecopathinternational.org/) the team is behind the development of ecosystem modelling Ecopath with Ecosim food (EwE) approach (www.ecopath.org). CSIC-ICM team participates in the FISHMIP Inter-Sectoral Impact Model Intercomparison Project – Fisheries sector), an international collaboration initiative lead by Potsdam Institute for Climate Impact (https://www.isimip.org/gettingstarted/marine-ecosystems-fisheries/) and has had an active role in IndiSeas (Indicators for the Seas) international collaborative network (http://www.indiseas.org/) led by the Institute of Research for the Development of France.

Roles and tasks in the project

Partner 29 (CSIC-ICM) will contribute to research within CT2 and CT3 and, specifically, will participate in WP2.1: Characterising ecosystem variability at interannual to decadal timescales: key metrics and functional relationships/mechanisms, in WP2.2: Defining the drivers of interannual to decadal variability including analysis of extreme and tipping points and in WP3.2: Ecosystem predictions. In WP2.2 CSIC-ICM will co-lead Task2.2.3 Synthesis and assessment of key regional drivers of variability, change and stability. CSIC-ICM team will join forces with the Ecopath International Association (EII) for the successful consecution of TRIATLAS ecosystem modelling objectives (WP3.2) and will closely collaborate with personnel from UCT (partner n° 13) and UFRN (partner n° 32) for the development of regional applications of the EwE approach. CSIC will also contribute to organising a summer school (WP4.1).

Relevant personnel

CSIC-ICM team under TRIATLAS is formed by a scientific researcher (Marta Coll), a software engineer (Jeroen Steenbeek) and a contracted postdoctoral researchers (TBD), in addition to one PhD student (Elena Lloret) and one MSc student (TBD).

Marta Coll (female) is a scientific researcher specialized in ecological analysis of complex systems using ecological modelling approaches. Her research focuses on understanding patterns and processes that characterize marine ecosystems and, in particular, changes of, and threats to, marine biodiversity. She studies population, community and food-web dynamics linked with human activities (such as fisheries, climate change, and invasive species), and how these translate into changes in ecosystem structure and functioning, and services that humans obtain from the ocean. She develops and applies a variety of ecological analyses such as ecosystem modelling techniques and statistical tools, and she uses historical data, fisheries statistics, experimental results and field data sets (website: martacoll.science).

Jeroen Steenbeek (male) is a software engineer, and has been a core architect and programmer of the Ecopath with Ecosim software since 2005. He is one of the architects behind OceanViz, a virtual, model-driven 3D

underwater world to explore impacts of marine policy. Jeroen leads the technical committee of the Ecopath Research and Development Consortium, which oversees Ecopath with Ecosim software development, organizes user support, and co-development with external research groups (website: https://es.linkedin.com/in/jeroen-steenbeek).

Elena Lloret (female) is a PhD student at CSIC-ICM starting in April 2018 and investigating seasonal and spatial patterns of biodiversity, trophic structure and energy transfer from the Northwestern Mediterranean Sea ecosystem. A postdoctoral researcher will be contracted through TRIATLAS during part of the execution of the project.

Relevant publications, products, services or other achievements

1. Coll, M., Shannon, L.J., and co-authors Y.-J., 2016. Ecological indicators to capture the effects of fishing on biodiversity and conservation status of marine ecosystems. Ecological Indicators 60, 947-962

2. Coll, M., Steenbeek, J., 2017. Standardized ecological indicators to assess aquatic food webs: the ECOIND software plug-in for Ecopath with Ecosim models. Environmental Modelling and Software 89, 120-130

3. Coll, M., Steenbeek, J., Sole, J., Palomera, I., Christensen, V., 2016. Modelling the cumulative spatial-temporal effects of environmental factors and fishing in a NW Mediterranean marine ecosystem. Ecological Modelling 331, 100-114

4. Steenbeek, J., Buszowski, J., Christensen, V., Akoglu, E., Aydin, K., Ellis, N., Felinto, D., Guitton, J., Lucey, S., Kearney, K., Mackinson, S., Pan, M., Platts, M., Walters, C., 2016. Ecopath with Ecosim as a model-building toolbox: source code capabilities, extensions, and variations. Ecological Modelling 319, 178–189

5. Steenbeek, J., Coll, M., Gurney, L., Melin, F., Hoepffner, N., Buszowski, J., Christensen, V., 2013. Bridging the gap between ecosystem modeling tools and geographic information systems: Driving a food web model with external spatial–temporal data. Ecological Modelling 263, 139-151

Relevant projects or activities

1. Title: SafeNET: Sustainable Fisheries in EU Mediterranean waters through network of MPAs Call: EU-DGMARE (MARE/2014/41) - Pilot project "Marine protected areas: networks(s) for enhancement of sustainable fisheries in EU Mediterranean waters" Institution: Centre National de la Recherche Scientifique & Université Nice Sophia Antipolis IP: Dr. Joachim Claudet & Dr. Paolo Guidetti Dates: 2015- 2018 Budget: 563.000 €

2. Title: KELPEX: Kelp export: fuel for adjacent communities in changing arctic ecosystems? Call: Marinforsk 2015 – Norwegian Governement Institution: Norsk Insitutt for Vannforskning (NIVA), Norway IP: Dr. Eva Ramirez Llodra Dates: 2016- 2018 Budget: 800.000€

3. Title: MERCES: Marine Ecosystem Restoration in Changing European Seas Call: European Union, H2020 Framework (H2020-SC5-2015-two-stage) Institution: Universita Politecnica Delle Marche IP: Dr. Roberto Danovaro Dates: 2016-2019 Budget: 6.651.118,75 €

4. Title: PELWEB: Winners, losers and shifts of PELagic food WEB changes in the western Mediterranean Sea: from ecosystem consequences to future projections Call: PN I+D+I RETOS 2017 Institution: MINECO Spanish Government IP: Dr. Marta Coll & José María Bellido Dates: 2018-2020 Budget: 137.940 €

5. Title: FISHMIP: Inter-Sectoral Impact Model Intercomparison Collaboration Project – Fisheries sector Institution: Potsdam Institute for Climate Impact Research IP: Derek Tittensor, Heike Lotze & Tyler Eddy Dates: 2014-2018

Relevant infrastructure

CSIC-ICM has several Technical Services to support its research activities including modern computer facilities, library and databases through CSIC central facilities, and the new network for maritime activities of the Catalan Government.

30 Ecole Normale Superieure ENS

Description of the organisation

The Ecole Normale Supérieure (ENS, www.ens.fr/en) in Paris, France, is an elite higher education institution (graduate school) for advanced undergraduate and graduate studies, and a prestigious French research center. It encompasses fourteen teaching and research departments, spanning the main humanities, sciences and disciplines. Unique among France's *grandes écoles* for its training in the humanities and sciences, the ENS prepares its students for their role as future leaders in every imaginable professional field: in research, media, public service and private industry. 800 permanent professors and researchers enliven the ENS' educational and scientific life, and work within 15 departments and 32 research units. Most of its students pursue an academic career and ENS counts more than 20 Nobel price or Fields Medal recipients among its alumni. ENS is also a very active research institution, which hosts more than 700 students who prepare a PHD. Research activities translate into more than 1,300 publications per year in international peer-reviewed journals.

The Department of Geosciences of ENS counts some 37 faculty members working in the field of climate sciences (atmosphere, ocean and climate, within the Laboratoire de Météorologue Dynamique) or geology (within the Laboratoire de Géologie).

The Laboratoire de Météorologie Dynamique (LMD) is a joint research unit which brings together the CNRS, the *École Polytechnique*, the *École Normale Supérieure* (ENS) and the *Sorbonne Université* in Paris. The LMD has a total of 180 employees, including 50 scientists and about 70 PhD students and post-docs. Main research themes at the LMD include studying climate evolution, the effects of increasing anthropogenic emissions and the physical processes underlying climate variability. The group at ENS, with ~40 members, has a long tradition of research in ocean and atmospheric dynamics. The LMD is part of the Institut Pierre-Simon Laplace (IPSL) which is a joint action initiated by nine major laboratories in the Paris area. Together these laboratories have expertise in almost all the fields of atmospheric, oceanic and climate science. A particular strength of the IPSL is the ability to build collaborative projects among scientists of different areas of expertise. The IPSL Earth System Model is one of the main models used by the CMIP / IPCC assessments of climate change. The Climate modelling Group of LMD, in nearby Jussieu campus, is at the core of the development of the IPSL ESM (Website: http://www.lmd.jussieu.fr/).

Particularly relevant for the project

ENS participates with the LMD research unit that has significant experience in the whole range of oceanography (sea-going observational work and Earth System Modelling). Seagoing effort has been developed in the last 15 years with a particular focus on the South Atlantic and Southern Ocean, including state-of-the-art technologies like autonomous instrumentation (floats), multi-year, multi-disciplinary deep-sea ocean moorings. There is established already a close cooperation between ENS and TRIATLAS African and south American partners. This includes the GoodHope and South Atlantic Meridional Overturning (SAMOC) projects with, among others, University of Cape Town (UCT), the Department of Environment Affairs (DEA), and CSIR in South Africa, the Universities of Sao Paolo and State of Rio de Janeiro, as well as FAPESP in Brazil, the National Hydrographic Institution, the University of Buenos Aires and the CONICET in Argentina. In the framework of the EU H-2020 AtlantOS (2015-end 2019) observational data but also assessment of observing requirements in respect to ecosystems and climate, and relevant for TRIATLAS, have been assembled. Moreover, during this project we have strongly worked to increase scientific and capacity building collaborations with South Atlantic and tropical Atlantic countries that have contributed to the establishment of the Bélem accord and materialized in new scientific projects, including TRIATLAS. The Earth System Modelling (ESM) component at LMD has strong expertise in linking climate change with marine biogeochemistry and ocean ecosystems with a particular expertise in ocean biogeochemistry modeling to study carbon-climate feedbacks and the impact of climate change on marine ecosystems. LMD in ENS has a great experience in multidisciplinary research in studying particularly physical-biological interactions.

Roles and tasks in the project

ENS will contribute to all core themes with enhanced contributions to CT1, CT2 and CT3. In CT1 (WP1.1) ENS will focus on the physical processes relevant for the ecosystem, primary productivity as well as plankton and biomass distribution in the project's focus areas. The regional focus will be on the South and Tropical Atlantic as well as on the Atlantic connectivity (between boundaries and across hemispheres). It will lead the contributions on open ocean dynamics including eddy processes as Agulhas rings, cyclones, Brazil, Malvinas, Cabo Verde eddies as well as the impact of circulation and eddies on the open-ocean/Coastal interactions and transfers. Moreover, CT1 (WP1.1) ENS will contribute with augmenting the set of observations in the South and Tropical Atlantic to understand the physical drivers associated to mesoscale dynamics. In CT2, WP2.1, ENS will characterize the interannual to decadal variability of ecosystem-relevant metrics across the open-ocean subtropical to tropical

Atlantic using the extended network of observations and analyses developed in WP1. In WP2.2 ENS will determine the large-scale physical drivers of climate variability that cause the ecosystem variability, change and stability on interannual and decadal timescales identified in WP2.1 and assess their relative importance. In CT3, WP3.1, ENS will contribute with climate change experiments using the IPSL Earth System Model and focusing on the Atlantic Ocean, with an improved version of the biogeochemical model PISCES used both for long-term climate projections and short-term seasonal-to-decadal predictions in TRIATLAS.

Relevant personnel

Prof. Dr. Sabrina Speich (female) is a Professor of Oceanography and Climate Sciences at the Ecole normale supérieure (ENS). Her main research interests concern the uncovering and understanding of ocean dynamics and air-sea interactions and they role on climate variability, change and related impacts. She is a world-recognized expert in ocean modeling as well as in organizing wide programs of in situ observations. She is recently focusing her research on scale-interactions in atmosphere-ocean dynamics, and how they affect the Earth climate and marine ecosystems under global warming. In particular, the ocean being the sub-climate system changing the most under the anthropogenic action, she is deeply involved in augmenting and improving the efficiency of a fit-for-purpose integrated ocean observing system and this together a continuous scientific effort to understand the involved processes to better understand, predict and adapt to ongoing and future changes. To reach such goals, she engaged in the international effort by co-chairing the Clivar Atlantic Regional Panel (Clivar ARP) and by participating to the work of others international committees (SCAR, OOPC). She is also deeply involved with in the EU H-2020 AtlantOS project (Executive and Steering committee member and Working Package leader).

Prof. Dr. Laurent Bopp (male) is a Senior Research Scientist at the Centre National de la Recherche Scientifique (CNRS) and adjunct Professor at ENS. His main research interests concern the links between climate change, marine biogeochemistry and ocean ecosystems. He is an expert in ocean biogeochemistry modeling and has been among the first to introduce marine biogeochemistry in climate models to study carbon-climate feedbacks and the impact of climate change on marine ecosystems. He was involved in the last IPCC report as a lead author; he is a member of the Scientific Steering Committee of IMBeR (Integrated Marine Biosphere Research) since 2014; he is also involved in the EU H-2020 CRESCENDO project (WP leader) on the next generation of Earth System models.

Relevant publications, products, services or other achievements

1.   Bopp, L., L. Resplandy, A. Untersee, P. Le Mezo, M. Kageyama, 2017: Ocean (de)oxygenation from the Last Glacial Maximum to the twenty-first century: insights from Earth System model. Phylos. Trans. Royal Soc.s. https://doi.org/10.1098/rsta.2016.0323

2.   Capuano, TA, S. Speich, X. Carton, & R. Laxenaire (2018) : Indo-Atlantic exchange, mesoscale dynamics and Antarctic Intermediate Water. J. Geophys. Res. In press. DOI: 10.1002/2017JC013521

3.   Kwiatkowski, L., O. Aumont, L. Bopp P. Ciais, 2018: The Impact of Variable Phytoplankton Stoichiometry on Projections of Primary Production, Food Quality, and Carbon Uptake in the Global Ocean. Glob. Biog. Cycles. https://doi.org/10.1002/2017GB005799

4.   Maury, O., L Campling, Haritz Arrizabalaga, Olivier Aumont, Laurent Bopp, Gorka Merino, D Squires, W Cheung, M Goujon, C Guivarch, S Lefort, Francis Marsac, P Monteagudo, R Murtugudde, Henrik Österblom, JF Pulvenis, Y Ye, BJ Van Ruijven, 2017: From shared socio-economic pathways (SSPs) to oceanic system pathways (OSPs): Building policy-relevant scenarios for global oceanic ecosystems and fisheries. Global Environmental Change. https://doi.org/10.1016/j.gloenvcha.2017.06.007

5.   Meinen, C. S., S. Speich, A. R. Piola, I. Ansorge, E., Campos, M. Kersalé, T. Terre, M. P. Chidichimo, T. Lamont, O. Sato, R. Perez, D. Valla, M. van den Berg, M. Le Hénaff, S. Dong, and S. Garzoli, (2018) Baroclinic and barotropic flows and the dueling influence of the boundaries. Geophys. Res. Lett., DOI: 10.1029/2018GL077408

6.   Mullon, C., P. Guillotreau, E.D. Galbraith, J. Fortilus, C. Chaboud, L. Bopp, O. Aumont, D. Kaplan, 2017: Exploring future scenarios for the global supply chain of tuna, Deep Sea Research Part II: Topical Studies in Oceanography, https://doi.org/10.1016/j.dsr2.2016.08.004

Relevant projects or activities

ENS is successful in acquiring external funding from national and international sources. With regard to LMD and specifically EU programmes, ENS has had about 31 EU-H2020-projects and coordinates 13 of them.

Relevant infrastructure

ENS has available all required seagoing equipment (CTD/LADCP systems, Underwater Vision Profilers, multinet,

microstructure measuring systems), and moored instrumentation. Observational data will be stored and made freely available from the Coriolis World Ocean data center. Modelling results will be stored and made freely available from the IPSL climate modelling data platform.

31 University of Cabo Verde UniCV

Description of the organisation

The University of Cabo Verde (UniCV) www.unicv.edu.cv is an young and unique public university of Cabo Verde. It was established on 2008, with more than 3,500 students and close to 400 employees at 6 faculties. The University is engaged in research projects, especially in the framework of Transnational Cooperation Program of Azores, Canarias and Madeira. UniCV is currently involved in 7 H2020 collaborative research projects. UniCV researchers and administrators receive some professional support from a team consisting of advisers from divisions such as finance, administration and communication during applications and for project management.

The Faculty of Engineering and Marine Sciences lead at UniCV the marine research especially in the fields of marine biodiversity and coastal oceanography.

Particularly relevant for the project

Under the Master Program on Marine Sciences and Climate Change in the framework of WASCAL Program (http://www.wascal.org/) UniCV will play an important role in the capacity building in the West African countries. So TRIATLAS will offer opportunities to engage students from 11 West African countries in fisheries research contributing for their capacity development. Additionally, the exchanges opportunities and technical training that can be used by the students and the researchers at UniCV will enhance the capacity building in this area.

Roles and tasks in the project

UniCV will participate in the WP1.1, WP1.3, WP1.5, and WP4.1. UniCV will contribute to the observational programs of WP1.1 and WP1.3 around Cabo Verde and the corresponding synthesis (WP1.5). UniCV will further develop the Cape Verdean Master Course in Marine Sciences and Climate Changes (WP4.1).

Relevant personnel

Prof. Corrine Almeida (female) is a lecturer and researcher at Faculty of Engineering and Marine Sciences at UniCV, since 2001. During this period was Coordinator of several training and/or research projects and supervised the final work of several students.

Relevant publications, products, services or other achievements

1.   López, C., Clemente, S. Almeida, C., Brito, A., Hernández, M. 2015. A genetic approach to the origin of Millepora sp. In the eastern Atlantic. Coral Reefs: 1-8

2.   Almeida, C; Lopes, E & Silva, O. 2014. Plano Nacional de Gestão e Conservação de Corais. Direcção Geral do Ambiente. 111p

3.   Lopes-Dos-Santos, R. M., Almeida, C., Pereira, M. D. L., Barroso, C. M., & Galante-Oliveira, S. 2014. Morphological expression and histological analysis of imposex in Gemophos viverratus (kiener, 1834) (gastropoda: buccinidae): a new bioindicator of tributyltin pollution on the west african coast. Journal of Molluscan Studies, Eyu037

4.   Lopes-dos-Santos, R. M. A., Galante-Oliveira, S., Lopes, E., Almeida, C., & Barroso, C. 2014. Assessment of imposex and butyltin concentrations in Gemophos viverratus (Kiener, 1834), from São Vicente, Republic of Cabo Verde (Africa). Environmental Science and Pollution Research, 1-7

5.   Almeida, C. Valoración ecológica del Área Marina Protegida de la Bahía de Murdeira, Isla de Sal, Cabo Verde. 2013. Tese de Doutoramento. Ecología y gestión de los recursos marinos vivos. Universidad de Las Palmas de Gran Canaria, España

Relevant projects or activities

1.   Consultant of the Project "GEF-SGP Cabo Verde Programme Strategy (2015-2018)", funded by UNDP Period: August 2015 to March 2016

2.   Coordinator of the Project "Elaboration of the management and conservation plan of corals", funded by General direction for the environment   Period: January to September 2014

3.   Team Member of the Project "Structure of benthic communities of Integral Natural Reserve of Santa Luzia –   Cabo   Verde: subsidies   for   continuous   monitoring." Activities: Underwater collecting, sorting and identification of samples and reporting Period: September 2009 to January 2010

4.   Consultant on the Marine Biodiversity area of the Project "Consolidation of the Protected Areas System of Cape Verde", funded by UNDP   Period: July 2009 to December 2009

5.   Team Member of the Project "Environmental and Living Resources Assessment of Murdeira Bay, Sal (2006 and 2007)" Activities: Underwater collecting, sorting and identification of samples and reporting

Relevant infrastructure

UniCV is the unique public university of Cabo Verde. In the Campus at São Vicente Island where is established the Faculty of Engineering and Marine Sciences.

32 Federal University of Rio Grande do Norte UFRN

Description of the organization

The Federal University of Rio Grande do Norte (UFRN, Brazil), founded in June 25th 1958, is a Brazilian public university (free), divided in five campi distributed in different locations in the Rio Grande do Norte State (Brazil). Its main campus is located in Natal City (State's capital) and UFRN offers 120 undergraduate programs. The academic community comprises over 43.000 students, 5.500 (technical and administrative staff), and over 2.200 researchers and teaching staff.

Promoting the graduate level, UFRN offers 127 courses (MSc and PhD) through 90 Graduate Programs in which up to 5,000 students are joined. As a consequence of this evolution several PhD Programs have improved their evaluation on the CAPES Brazilian System and UFRN has three programs considered the best ones: Materials Science Engineering Program (the highest level, 7), Psychobiology Program (level 6) and the Ecology Program (level 6). The UFRN' researchers who participate this proposal are professor in this late one.

UFRN is a hotspot of excellence in research, innovation and technology in several fields and is strongly committed with scientific and technological development. Research is seen as necessarily sensitive and engaged with social issues encouraging a knowledge production capable to respond to regional, national and international demands. More than 350 research groups are officially registered at funding agencies developing almost 2000 research projects, many of them with international cooperation.

Some of UFRN's international activities are developed in areas such as Petroleum and Renewable Energies, Physics, Neuroscience, Tropical Medicine, and Ecology. UFRN supports the Ágora Institute of Foreign Languages which, among other activities, offers Portuguese for foreigners, free of charge, to all international students and researchers from partners' institutions.

UFRN maintain an International Relations Office consisting of a structure of coordination, supervision and operational support to the development of internationalization initiatives of teaching, research and community service, particularly in the context of academic cooperation and mobility.

Particularly relevant for the project

UFRN has two departments to collaborate in this proposal: Ecology Department (DECOL) and Environmental Engineering Department (DEAMB). In these departments there are professional routines and structures within research support and administration and many years of experience with successful coordination and management of many research projects with international and national funding.

Researchers in DEAMB have an extensive experience in studying ecosystem modeling in freshwater and marine ecosystems including drivers' influence on fishery activities and natural resources. This department coordinated the funded project Campos Basin Ecosystem Modeling that contribute to improving understanding of Campos Basin the most important area to explore oil in Brazil (near by Rio de Janeiro, Brazilian Southern). In DECOL researchers are able to understand and support small scale fishing activities including local ecological knowledge and fishery value chain approach.

Roles and tasks in the project

Prof Ronaldo Angelini will be the coordinator of WP3.2 (Ecosystem predictions) and he will contribute to WP3.2 (Task3.2.1; 3.2.2 and 3.2.3) in order to assess the predictability of modeled ecosystems from seasonal to decadal time scales providing sustainability levels for the main fishing resources and the impact of climate changes scenarios on ecosystem processes.

Prof Adriana Rosa Carvalho will contribute on WP2.2 (Task2.2.2 and 2.2.3) evaluating the human impacts on marine ecosystems especially in coastal areas comprising small-scale fisheries in order to understand the drivers of physical and biological variability as well as the role of the human (fishing effort, pollution) as key drivers to the landing variability in the ecosystems.

Relevant personnel

Ronaldo Angelini (male) is a professor at UFRN with extensive experience (22 years) as an ecosystem modeler applying the Ecopath approach in freshwater and marine ecosystems in order to understand the role of key species and human drivers on the food webs. R. Angelini have been teaching Ecopath courses in many institutions in Brazil, and in other countries as Colombia, Spain and Iran. He is supervisor of several PhD and Master degree thesis. He has authored/co-authored 48 peer review publications in relevant journals as Ecological Modelling, Ocean & Coastal Management, Freshwater Biology and Reviews in Fish Biology and Fisheries. Recently he coordinated a project to model the marine ecosystem of Campos Basin, the main Brazilian oil exploration area,

publishing a relevant book in Portuguese language (by Elsevier Editor; http://www.sciencedirect.com/science/book/9788535228526)

Adriana Carvalho (female) is currently a professor at UFRN with extensive experience (20 years) working marine and freshwater fisheries management mainly to enlighten the economic role of fisheries and by investigating the human and socioeconomic drivers leading the fishing trends. A. Carvalho has collaborations on this topic with researches in other countries as Canada, Spain and Australia. Currently she coordinates the Post-graduation Program in Ecology (UFRN) and has been supervising several PhD and Master degree thesis. He has authored/co-authored 56 peer review publications including in relevant journals as Biological Conservation, Diversity and Distribution, Scientific Reports of Nature, Fisheries Research, Marine Policy, Ocean & Coastal Management, ICES Journal of Marine Policy and PloS One.

Relevant publications, products, services or other achievements

1.   Bornatowski, H., Angelini, R., Coll, M., Barreto, R. R. P., & Amorim, A. F. (2018). Ecological role and historical trends of large pelagic predators in a subtropical marine ecosystem of the South Atlantic. Reviews in Fish Biology and Fisheries, 28(1), 241–259, https://doi.org/10.1007/s11160-017-9492-z

2.   Lira, A., Angelini, R., Le Loc'h, F., Ménard, F., Lacerda, C., Frédou,T., & Lucena Frédou, F. (2018). Trophic flow structure of a neotropical estuary in northeastern Brazil and the comparison of ecosystem model indicators of estuaries. Journal of Marine Systems, 182, 31–45, https://doi.org/10.1016/j.jmarsys.2018.02.007

3.   Bevilacqua, A. H. V., Carvalho, A. R., Angelini, R., & Christensen, V. (2016). More than anecdotes: Fishers' ecological knowledge can fill gaps for ecosystem modeling. PLoS ONE, 11(5), https://doi.org/10.1371/journal.pone.0155655

4.   Pennino, M. G., Rufener, M., Thomé-Souza, M. J. F., Carvalho, A. R., Lopes, P. F. M., & Sumaila, U. R. (2018). Searching for a compromise between biological and economic demands to protect vulnerable habitats, (May 2017), Scientific Reports, 8(1). Nature Publishing Group, https://doi.org/10.1038/s41598-018-26130-z

5.   Pires, N. M.; Garla, R. C.; Carvalho, A.R. The economic role of sharks in a major ecotourism archipelago in the western South Atlantic. Marine Policy, v. 72, p. 31-39, 2016

Relevant projects or activities

1.   2013-2017. Food Web Modelling in Campos Basin Marine Ecosystem. Petrobras S.A. funding

2.   2014-2017. Applying Ecopath approach on Brazilian Ecosystems. CNPq Funding Agency

3.   2015-2017. Small Scale Fisheries: evaluation, development and management. CNPq Funding Agency

4.   2012-2014. Understanding the role of exotic species on aquatic food web using a modelling approach. CNPq Funding Agency.

5.   2015-2017. Modelling of the role of Top-Predators on food web in South Atlantic. CNPq Funding Agency

Relevant infrastructure

UFRN and the departments involved in this proposal have a adequate infrastructure in your main campus. Ecology Department hosts one of the best Ecology PhD courses of the Brazil.

33 Department of Agriculture, Forestry and Fisheries DAFF

Description of the organisation

DAFF (www.daff.gov.za) is a national department of the South African government that aims for a united and transformed agriculture, forestry and fisheries sector to advance food security and transformation of the sector through innovative, inclusive and sustainable policies, legislation and programmes. The Chief Directorate: Fisheries Research and Development, of the Branch: Fisheries Management of DAFF, is responsible for providing scientific and strategic leadership for natural science research on fisheries resources, scientific advice to support the sustainable and optimal management of aquatic resources, and scientific and strategic leadership for ecosystem research and ecosystem-related advice to support the sustainable and optimal management of aquatic resources.

Particularly relevant for the project

The Chief Directorate: Fisheries Research and Development conducts regular hydroacoustic surveys to estimate the abundance and map the distribution patterns of economically and ecologically important small pelagic fishes (anchovy, round herring and sardine) in the Southern Benguela upwelling ecosystem off South Africa, a focus area and regional case study of the TRIATLAS proposal. These surveys have been conducted since 1984 to the present and provide a >30 year time-series of annual recruitment strength and population biomass of the three small pelagic fish species, including several changes in abundance levels and distribution patterns of these fish. In addition, landings data for the three species are available from 1950 to the present and are spatially-explicit from 1987 onwards.

Roles and tasks in the project

Provision of data on the abundance, and horizontal and vertical distribution of small pelagic fishes from surveys, and fishery landings of these species, for input into WP1.3 (Small pelagics, mesopelagic fauna and apex predators), and in WP1.4 (Social systems) via the provision of information on activities regarding South African fisheries and aquaculture.. Provision of insight into functioning of the pelagic ecosystem of the Southern Benguela and predicted outcomes and scenarios for input to WP3.2 (Ecosystem predictions), contributing to the configuration and improvement of ecosystems models for the Benguela case study region.

Relevant personnel

Dr. Carl David van der Lingen (male) is a Specialist Scientist with extensive experience in the ecology (in particular trophic and reproductive ecology) of small pelagic fishes in the Benguela, and an interest on climate change impacts on these species. He is a member and previous Chair of the CD: Fisheries Research and Development's Scientific Working Group – Small Pelagics (SWG-PEL), has authored/co-authored >100 peer-reviewed scientific publications, has an h-index of 38, has been a member of several international committees including the Small Pelagic Fish and Climate Change (SPACC) programme of GLOBEC, and has co-supervised a total of 23 MSc and 5 PhD students to graduation.

Mrs. Janet Coetzee (female) is a Production Scientist with extensive experience in planning and conducting hydroacoustic surveys of small pelagic fish using a variety of survey platforms with a particular focus on fish behaviour and subsequent acoustic survey bias. She has been involved in several international collaborations in fisheries and plankton acoustics. She is the Chair of the SWG-PEL, has authored/co-authored >50 peer-reviewed scientific publications, has an h-index of 26, and has co-supervised a total of 5 students to graduation.

Mrs. Nandipha Mhlongo (female) is a Production Scientist with experience in reproductive ecology of sardine and anchovy in the southern Benguela and an interest in ecosystem modelling with a focus on small pelagic fish using APECOSM-E. She is a member of the SWG-PEL, has authored/co-authored 4 peer-reviewed scientific publications, and has an h-index of 3.

Dr. Fannie Shabangu (male) is a Production Scientist with experience in hydroacoustic surveys of small pelagic fish and using bioacoustics to track whales. He is the present Vice-chair of the SWG-PEL; has authored 4 papers, 8 popular articles and 2 book chapters; has an h-index of 3 and is currently co-supervising 1 MTech and 2 PhD students.

Relevant publications, products, services or other achievements

1.   Mhlongo, N.M., Yemane, D., Hendricks, M. And Van Der Lingen, C.D. 2015. Have the spawning habitat preferences of anchovy (Engraulis encrasicolus) and sardine (Sardinops sagax) in the southern Benguela changed in recent years? Fisheries Oceanography 24(Suppl. 1): 1-14

2.   Shabangu, F.W., Coetzee, J.C., Hampton, I., Kerwath, S.E., De Wet, W.M. And Lezama-Ochoa, A. 2014. Chapter 7. Hydro-acoustic technology and its application to marine science in South Africa. In: *Reflections on the*

state of research and development in the marine and maritime sectors in South Africa. Funke, N., Claassen, M., Meissner, R. and Nortje, K. (Eds). Council for Scientific and Industrial Research, Pretoria, pp 122-152

3.   Van Der Lingen, C.D., Shannon, L. J., Cury, P., Kreiner, A., Moloney, C.L., Roux, J-P. And F. Vaz-Velho. 2006. Chapter 8. Resource and ecosystem variability, including regime shifts, in the Benguela Current system. In *Benguela: Predicting a Large Marine Ecosystem*. Shannon, V., Hempel, G., Malanotte-Rizzoli, P. Moloney, C. and J. Woods (Eds.). Large Marine Ecosystems 14, Elsevier, Amsterdam, 147-185

4.   Van Der Lingen, C.D., Coetzee, J.C. And L.F. Hutchings. 2011. Causes and effects of changes in the distribution of anchovy and sardine in shelf waters off South Africa. In: *Observations on Environmental Change in South Africa*. Zietsman L. (Ed.). SUN MeDIA, Stellenbosch, pp 252-257. ISBN 978-1-920338024-4

5.   Van Der Lingen, C.D., Hutchings, L., Lamont, T. And G.C. Pitcher. 2016. Climate change, dinoflagellate blooms and sardine in the southern Benguela Current Large Marine Ecosystem. *Environmental Development* 17: 230-243

Relevant projects or activities

1.   2002-2010: Small Pelagic Fish and Climate Change (SPACC) programme of GLOBEC

2.   2014-present: California-Benguela Joint Investigation (CALBENJI) – am Interdisciplinary collaboration on climate change and marine ecosystems research between the United States, South Africa & Namibia (see http://www.faralloninstitute.org/calbenji)

3.   2017-present: EAF-Nansen Programme "Supporting the Application of the Ecosystem Approach to Fisheries Management Considering Climate and Pollution Impacts"

Relevant infrastructure

Research vessels to conduct annual hydroacoustic surveys of small pelagic fish species; monitoring at landing sites to obtain commercial catch data.

34 Sorbonne University SU

Description of the organisation

Born from the merger of Université Pierre et Marie Curie and Université Paris Sorbonne, whose campuses are in the heart of Paris, Sorbonne Université covers all major disciplinary fields and offers new transversal academic and research programs. Sorbonne Université becomes a fully multidisciplinary research-intensive university with three faculties: Humanities and Social Sciences, Medicine and Sciences & Engineering.

With more than 53 400 students (among 10 200 international students), 4400 doctoral students and 6300 researchers, Sorbonne Université is one of the leading French universities.

The university is involved in numerous European and International partnership agreements and has France's largest scientific library and infrastructures bringing together the best talent in a wide array of these disciplines. With 8,500 publications per year (approx. 10% of all publications in France), Sorbonne Université is a major player in international knowledge and innovation economy, offering transversal academic and research programs.

The European Affairs office, which is in charge of the EU projects at the university, has managed so far 150 FP7 and 85 H2020 projects (35 ERC grants and 45 industry-sponsored research chairs). The EU office will manage all the financial, administrative and legal aspects for the participation of Sorbonne Université in this project.

Particularly relevant for the project

One institute of Sorbonne Université is involved in TriatlAS, the Laboratoire d'Océanologie de Villefranche (LOV) belongs to the Institut of Marine Sciences of Villefranche sur Mer (IMEV), one of the three marine stations of Sorbonne University. LOV is recognized as a leading marine research institution and educational facility in the world. LOV gathers more than 30 permanent encompassing many disciplines in oceanography (biology, chemistry, physics, etc.). Since ten years, the involvement of LOV in the development of ecological and biogeochemical sensors for CTD and autonomous vehicle has been recognized. In particular, the Underwater Vision Profiler (UVP) and the Zooscan imaging systems that will be used in TRIATLAS (WP1.1 and WP1.2) have been invented and developed in the LOV to study with high frequency particle and zooplankton distribution in the sea. All the softwares used to recognize the images, archive and distribute the data have also been developed at LOV by the team lead by Stemmann and Picheral.

Roles and tasks in the project

LOV will contribute to CT1 (WP1.1 and WP1.2). In WP1.1, LOV will contribute to the monitoring by equipping autonomous floats with cameras to assess particulate matter and plankton sotcks. In WP1.2 LOV focuses on zooplankton and sinking particles, and on the construction of size spectra. LOV will contribute to the synthesis within CT1 (WP1.5) as well as to the characterising of ecosystem variability on interannual to decadal timescales (WP2.1).

Relevant personnel

Lars Stemmann (Male, Professor, Sorbonne University, Faculty of Sciences) is an expert in using image analysis to study long term variations and spatial patterns in pelagic ecosystem. He has published more than 60 research articles in peer review journals using the data obtained by Camera systems. He has also lead from 2009 to 2016 the Villefranche Imaging Platform for Plankton and Particles, which provides, using the ZOOSCAN and UVP imaging systems, quasi real-time analysis of zooplankton populations since 1966. He has participated in several national (PIA OCEANOMICS) and European research programs (for example FP 8, BRIDGES and JERICONEXT). He was awarded a Research Chair in February 2012 by the CNRS/UPMC to develop the study of pelagic ecosystem using underwater imaging systems.

Marc Picheral (Male, Research Enginee at LOV) has an extensive experience in operational oceanography and instrument development in quantitative imagery techniques. He was recently project manager for the development of the UVP-Octopus sensor in the Bridges H2020 project and lead the of the EcoTaxa application funded by the PIA Oceanomics. He is also the responsible of the Plateforme d'Imagerie Quantitative in Villefranche sur mer (PIQv) which hosts 3 UVP5, 2 Flowcams and 4 Zooscans. Marc Picheral is author of over 40 per-reviewed articles, including 3 articles in Nature and 5 in Science. He was granted a "Cristal du CNRS" award in 2012 for his career.

Relevant publications, products, services or other achievements

1. Biological and physical influences on marine snowfall at the equator, R. Kiko, A. Biastoch, P. Brandt, S. Cravatte, H. Hauss, R. Hummels, I. Kriest, F. Marin, A. M. P. McDonnell, A. Oschlies, M. Picheral, F. U. Schwarzkopf, A. M. Thurnherr and L. Stemmann, Nature Geoscience volume 10, pages 852–858 (2017) doi:10.1038/ngeo3042

2.   Waite, A.M., Stemmann, L., Guidi, L., Calil, P.H.R., Hogg, A.M.C., Feng, M., Thompson, P.A., Picheral, M., Gorsky, G., 2016. The wineglass effect shapes particle export to the deep ocean in mesoscale eddies. Geophysical Research Letters 43, 9791-9800

3.   Romagnan, J.B., Aldamman, L., Gasparini, S., Nival, P., Aubert, A., Jamet, J.L., Stemmann, L., 2016. High frequency mesozooplankton monitoring: Can imaging systems and automated sample analysis help us describe and interpret changes in zooplankton community composition and size structure - An example from a coastal site. Journal of Marine Systems 162, 18-28

4.   Biard, T., Stemmann, L., Picheral, M., Mayot, N., Vandromme, P., Hauss, H., Gorsky, G., Guidi, L., Kiko, R., Not, F., 2016. In situ imaging reveals the biomass of giant protists in the global ocean. Nature 532, 504-+

5.   Stemmann, L., Boss, E., 2012. Plankton and Particle Size and Packaging: From Determining Optical Properties to Driving the Biological Pump, in: Carlson, C.A., Giovannoni, S.J. (Eds.), Annu Rev Mar Sci, pp. 263-290

Relevant projects or activities

1.   2014 – 2018, EU FP8: JERICO-Next, implementing the coastal part of a European Ocean Observing System. In this project, we aim to promote in situ imaging systems for the study of biology in the oceans

2.   2014–2018, EU H2020: BRIDGES, Bringing together Research and Industry for the Development of Glider Environmental Services. This project enabled to miniaturized the UVP5 (used in TRIATLAS WP1.2) to a system adapted to gliders. The prototype is now under test and will be commercialised in 2019 by Hydroptic

3.   2017-2019, Pole Mer-BPI, GOPI, Global Observation of Plankton on Images (GOPI). This project aims at converting the minicamera for gliders developed in BIRDGES to be mounted on floats. The prototype is now under test and will be commercialised in 2019 by Hydroptic

Relevant infrastructure

LOV hosts the Plankton and Particles Imaging facilities (http://rade.obs-vlfr.fr/RadeZoo) and a series of instuments (UVP5 and Zooscan) and own one of the largest plankton image database (ecotaxa.obs-vlfr.fr, 6 billion images). This infrastructure will be used in WP1.1 and WP1.2.

35 University of Namibia UNAM

Description of the organisation

The University of Namibia (UNAM) is the largest and leading institution of higher education in Namibia with 8 faculties and a student population of over 24,500. The participant in this proposal belong to the Department of Fisheries and Aquatic Sciences (DFAS) in the Faculty of Agriculture and Natural Resources (http://unam.edu.na/faculty-of-agriculture-and-natural-resources/fisheries-and-aquatic-sciences), housed at the coast at Sam Nujoma Campus, Henties Bay, Namibia. The campus conducts research on fisheries ecology and marine food web analysis, oceanography, aquaculture and mariculture experiments and fisheries and marine conservation. The DFAS collaborates with the Ministry of Fisheries and Marine Resources, Namibia; the Benguela Current Commission, Namibia; University of Tromsø, Norway; Rhodes University, South Africa and the Bunda College of Agriculture, University of Malawi.

Particularly relevant for the project

The Department of Fisheries and Aquatic Sciences (FAS) is only 10 years old. It has been steadily developing the undergraduate degree in FAS (including students from many southern African countries) and building up the post-graduate student base. Recently, the research has been focused on otolith chronologies and the impact of fisheries and climate change on fish growth in Namibia. Recently, collaborations with EU countries have been established for further development of the otolith chronologies (otoliths collected in Namibia in the 1960s by ICSEAF countries) to investigate fish growth rate changes since the start of exploitation. The involvement in TRIATLAS will further establish this, and add other otoliths (West and North Atlantic) to the collections. UNAM is also involved with a project investigating the long-term changes in abundance of small pelagic and mesopelagic fish along the Namibian coast as seen in the fur seal diet (collaboration with Ministry of Fisheries and Marine Resources), which is directly relevant to TRIATLAS. The TRIATLAS project will also improve undergraduate and post-graduate student development and UNAM will host one of the summer schools planned for the TRIATLAS projects.

Roles and tasks in the project

UNAM will contribute to CT1 (WP1.3, WP1.5), CT2 (WP2.2) and CT4 (WP4.1). In CT1, WP1.3 UNAM will focus on the changes in small pelagic and mesopelagic fish abundances from the point of view of apex predator (fur seals) diet; and it will also contribute to synthesising the results (WP1.5).

In CT2, WP2.2 UNAM focuses on drivers of biological processes by investigating otolith chronologies (long-term changes in fish growth) related to local and remote drivers as well as human drivers (fishery). Both within WP1.3 and WP2.2 student will be trained; and UNAM will also host a summer school in early 2020. And also these activities will contribute to WP4.1 Educational and technological capacity development.

Relevant personnel

Dr. Margit Wilhelm (female) is Scientist and Lecturer in the Department of Fisheries and Aquatic Sciences of UNAM in Henties Bay, Namibia. Her interests encompass fish and marine ecology, population dynamics, including fish otolith chronologies and the impact of temperature and fisheries on fish growth, fish metabolism and fish recruitment.

Relevant publications, products, services or other achievements

1.   Wilhelm MR, Moloney CL, Paulus SC, Kashava S, Brinkman, FRV, van der Plas AK, West WM, Jarre A, Roux J-P. 2017. Biannual otolith zonation of Cape hake (*Merluccius capensis*) in response to environment and fish physiology in the northern Benguela. Journal of Mar0ine Systems. DOI: 10.1016/j.jmarsys.2017.08.001
2.   Jansen T, Kristensen K, Kainge P, Durholtz D, Strømme T, Høgsbro Thygesen U, Wilhelm MR, Kathena J, Fairweather TP, Paulus S, Degel H, Lipinski MR, Beyer JE. 2016. Migration, distribution and population (stock) structure of shallow-water hake (*Merluccius capensis*) in the Benguela Current Large Marine Ecosystem inferred using a geostatistical population model. Fisheries Research 179: 156–167. DOI: 10.1016/j.fishres.2016.02.026
3.   Wilhelm MR, Kirchner CH, Roux J-P, Jarre A, Iitembu JA, Kathena JN, Kainge P. 2015. Biology and fisheries of the shallow-water hake (*Merluccius capensis*) and the deep-water hake (*M. paradoxus*) in Namibia. Chapter 3 In: Hakes: biology and exploitation (1st edition), pp 70-100. Ed. by H. Arancibia. John Wiley & Sons, Ltd: Chichester, UK. DOI: 10.1002/9781118568262.ch3
4.   Roux J-P, Wilhelm MR. 2015. The effects of stock size and environmental variability on Cape hake recruitment in Namibia: an unsolved puzzle (a comment on Kainge et al. 2013). African Journal of Marine Science 37(3): 431–433. DOI: 10.2989/1814232X.2015.1075900
Wilhelm MR, Roux J-P, Moloney CL, Jarre A. 2015. Biannual otolith zone formation of young shallow-water hake

Merluccius capensis in the northern Benguela: age validation using otoliths sampled by a top predator. Journal of Fish Biology 87(1): 1–16. DOI: 10.1111/jfb.12684

Relevant projects or activities

1.   2019-2023, OCEANHUB: Achieving sustainable and equitable fisheries in an ecosystem context for human wellbeing
2.   2018-2023, BCLME III: Improving Ocean Governance and Integrated Management in the BCLME
3.   2018-2023, NFR: The Nansen Legacy project

Relevant infrastructure

The Sam Nujoma Campus (SNC) can host conferences, and / or workshop. It also has accommodation available for visiting staff and students. SNC also houses mariculture experimental facilities.

4.2. Third parties involved in the project (including use of third party resources)

No third parties involved for participants: 1-9, 11-19, 21-28, and 30-34.

10 IRD	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
If yes, please describe and justify the tasks to be subcontracted	
Does the participant envisage that part of its work is performed by linked third parties	Y
IRD includes the Centre National de la Recherche Scientifique (CNRS) and Université Paul Sabatier (UPS) as linked third parties. CNRS is a large research organization in France that employs close to 30000 employees, in all research fields, including environmental research. UPS is the largest University (Paul Sabatier) of Toulouse with academic formations in all aspects of sciences and technology. Specific formation are dedicated to climate sciences with Master Degrees, particularly within the Doctoral School "Universe, Space and Environment Sciences" and the Master "Ocean-Atmosphere and Continental Surfaces". UPS is associated to the regional Master Degree "Ocean-Atmosphere" initiated in 2008 at ICPMA, University of Abomey-Calavi, Cotonou, Benin, and the diploma is jointly delivered by both universities. The Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS) is a French joint research centre of IRD, CNRS, UPS and CNES. It is a member of the Observatoire Midi-Pyrénées (OMP). LEGOS is a multi-disciplinary research organization, concerned with environmental research centered on physical oceanography (large scale and coastal), marine geochemistry and biogeochemistry, spatial hydrology and the dynamics of polar ice sheets. These research themes are linked by an observational approach using remote sensing from satellites. LEGOS is involved in all aspects of satellite missions, especially for altimetric satellites, from the planning and the preparation of algorithms to calibration, validation and exploitation of the results. LEGOS also maintains five observational services and networks. Description of tasks: Within TRIATLAS, involved personnel will contribute to works related to dynamics and meso-scale physical & biogeochemical processes in the eastern tropical Atlantic (WP1.1, WP1.2) and capacity development, in the framework of the regional Master Degree and PhD formations based in Cotonou (Benin) (WP4.1). Personnel involved: Gael Alory (Université Paul Sabatier) Isabelle Dadou (Université Paul Sabatier) Yves Morel (CNRS) CNRS and UPS as third parties to beneficiary IRD are not requesting any contribution for the tasks that will be carried out.	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
If yes, please describe the third party and their contributions	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
If yes, please describe the International Partner(s) and their contributions	

20 UKRI	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
If yes, please describe and justify the tasks to be subcontracted	
Does the participant envisage that part of its work is performed by linked third parties	N
If yes, please describe the third party, the link of the participant to the third party, and describe and justify the foreseen tasks to be performed by the third party	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	Y
If yes, please describe the third party and their contributions	
We will deploy and recover the tall mooring in WP1.1 from an Argentinian ship through a TRIATLAS collaboration with Alberto Piola. As well as benefitting from access to the ship for the mooring logistics TRIATLAS will benefit from Piola's repeat observations in the vicinity of the mooring site which will improve data quality as well as adding value to the data analysis.	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
If yes, please describe the International Partner(s) and their contributions	

29 CSIC	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
Software development and GIS analysis, web development	
Does the participant envisage that part of its work is performed by linked third parties	N
If yes, please describe the third party, the link of the participant to the third party, and describe and justify the foreseen tasks to be performed by the third party	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
If yes, please describe the third party and their contributions	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
If yes, please describe the International Partner(s) and their contributions	

35 UNAM	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
If yes, please describe and justify the tasks to be subcontracted	
Does the participant envisage that part of its work is performed by linked third parties	N
If yes, please describe the third party, the link of the participant to the third party, and describe and justify the foreseen tasks to be performed by the third party	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	Y
Ministry of Fisheries and Marine Resources, Namibia: Otolith collections. Data collections from	

research surveys, commercial and port sampling, otoliths from seal scat sampling.

Zakład Zasobów Rybackich / Department of Fisheries Resources; Morski Instytut Rybacki – PIB / National Marine Fisheries Research Institute; Gdynia, Poland: otolith and data collections from Namibia from the 1960s, 1970s and 1980s (International Commission for Southeast Atlantic Fisheries at the time).

Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
If yes, please describe the International Partner(s) and their contributions	

Section 5: Ethics and Security

5.1 Ethics

The potential for ethical issues have been considered carefully by the project partners. The specific comments below refer to the Section 4 – Ethics of the administrative forms (Part A). Should any ethical/legal issue arise in the proceeding of the project an external and independent ethical advisor will be appointed.

Humans

Research in TRIALTAS will involve survey data on communities in the maritime sector, specifically the fisheries sector (WP1.4, 2.2 and 4.2). During the field work study participants will participate in questionnaire surveys and interviews. Participation is entirely voluntary. We will engage with relevant local stakeholders identified in WP1.4.2 and interview them about their objectives and their perception of most desirable and most likely development of their respective maritime sectors. We will also send out questionnaires to selected representatives of local communities to gather the general perception of current and possible future impact of different maritime sectors on marine ecosystems. Before interviewers obtain basic demographic and socioeconomic information we will explain the goal of our study in a language and terms understandable to the participants and ask each participant for their consent to participate in the survey. Written informed consent will be obtained from all participants prior to the interviews and questionnaires. Participants will be informed about their rights: To know that participation is voluntary; To ask questions and receive understandable answers before making a decision; To know the degree of risk and burden involved in participation; To know who will benefit from participation; To know the procedures that will be implemented in the case of incidental findings; To receive assurances that appropriate insurance cover is in place; To know how their data will be collected, protected during the project and either destroyed or reused at the end of the research; To withdraw their data from the project at any time; To know of any potential commercial exploitation of the research.

Privacy/confidentiality and the procedures that will be implemented for data collection, storage, protection, retention and destruction will comply with national and EU legislation, particularly the General Data Protection Regulation (GDPR). Both the treatment and the experiments pose no risk to the participants.

Copies of ethical approvals by the competent legal local/national Ethics Boards/Bodies/administrations will be documented by the Project Office in collaboration with WP leads involved when required. When submitting the application for scrutiny to the competent local/national ethical boards/bodies for authorization detailed information will be provided on: the procedures that will be used for the recruitment of participants (e.g. number of participants, inclusion/exclusion criteria, direct/indirect incentives for participation, the risks and benefits for the participants, etc.) and the nature of the material that will be collected and how it will be used.

We will design and implement all relevant capacity strengthening and benefit-sharing arrangements for the protection and development of the local communities.

Animals

Animals: The project involves research on *vertebrate* animals (WP1.3), particularly *small pelagic and mesopelagic finfish* relevant for fisheries and/or food source for higher tropic levels, and *seabirds* as representatives of marine ecosystem top predators (main target seabird: boobies; for a detailed species list please See Part A, Section 4: Ethics). The aim is to significantly improve our understanding on the functioning of and interrelationships in the six key ecosystems under investigation and lead to a new and unique interdisciplinary view on the pelagic structure of these Tropical and South Atlantic ecosystems. The research plan involving animals has been guided by the ethical framework of the three R's: Replacement of animals by non-animal models where possible; Reduction in the number of animals used to the minimum number required for valid scientific results and Refinement of procedures and animal care standards to minimise pain, suffering, distress or lasting harm (Russell & Burch 1959; Hooijmans C. et al. 2010) and the Convention on Biological Diversity. Indeed, use of already available data will be prioritised, and trawling is reduced to strict minimum and necessary to verify and support results from comparably less-invasive methods such as acoustic investigations structure of upper trophic level ecosystem components. The bio-logging of seabirds and sampling of finfish will be conducted within national and EU legal frameworks, specifically those relating to animal welfare (i.e. EU Directive 2010/63/EU) and adhere strictly to the respective national regulations as regards research work with seabirds and finfish. Each participating organisation has an Institutional Research Ethics Code and these will be adhered to throughout the life of the project.

5.2 Security

TRIATLAS project will NOT involve activities or results raising security issues.

TRIATLAS project will NOT involve 'EU-classified information' as background or results.
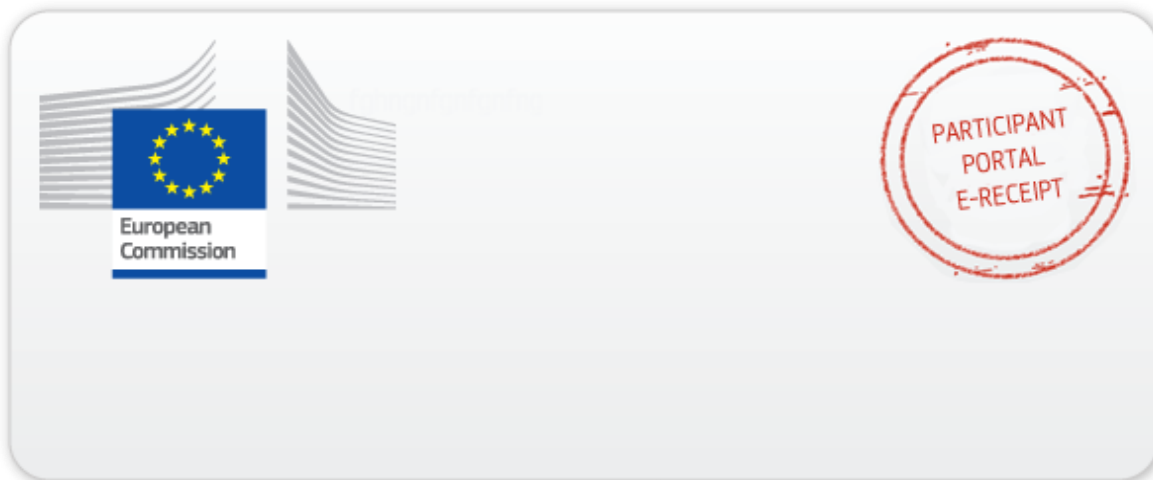
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