



Erasmus Mundus Joint
Master Degree in
Marine Environment

UPV/EHU-SOTON-UBx-ULiège
merconsortium.eu



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MER COMMUNITY SUMMIT 2022 ABSTRACT BOOK

September 7-11, 2022 Bilbao

Organised by MER CONSORTIUM

U Bordeaux, U Southampton, U Liège, U Basque Country



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FOREWARD
MER COMMUNITY SUMMIT 2022

The MER Master Programmes, the MER Consortium and the MER Community ...

**SOTO, Manu; PURDIE, Duncan; D'ANGELO, Cecilia; SCHAFER, Jorg;
ETOURNEAU, Johan; GOBERT, Sylvie; POULICEK, Mathieu; GARCIA, Patricia V.;**
RODRIGUES, Armindo S.; MARIGOMEZ, Ionan

MER CONSORTIUM Joint Programme Board (2017-2018 to 2022-2023)

www.merconsortium.eu

The first MER Consortium (Soton, UBx and UPV/EHU) launched the MER MSc in 2005. The original aim of the programme was to cover broad issues in both marine environment and marine resources. Further, U Liège became a partner and the programme entered the Erasmus Mundus (later on Erasmus+) framework since the academic year 2012-2013 (MER EMMC 2013-2017, MER+ EMJMD 2017-2022 and MER2030 EMJMD 2021-2026). Modulated by the profile of the students and most recent priorities and guidelines in ocean and environmental sciences, the MER programme evolved to focus onto the marine environment and its interactions with marine resources; and U Azores will be a new partner starting in 2022. The programme and the consortium evolve to respond to societal challenges and to emerging needs and opportunities.

The Erasmus Mundus brand made our programme more accessible to students all over the world. More than 450 students from more than 60 countries have followed it, with 400 graduated by September 2022. The Joint Programme Board (JPB) is a permanent structure within the MER Consortium pivotal to create and consolidate networking. The Extended MER Consortium, which includes academy and industry associates, contributes to internships, professional placements and thesis research supervision, as well as to staff exchange. Vivas video streaming and the website are essential tools for community building. Altogether, these are solid pillars for a global MER Community that includes students, alumni, teaching and administrative staff, researchers and stakeholders. The MER Community provides graduates with invaluable options for career development and employment, and maintains long-lasting links amongst all its members.

In June 2016, we celebrated the 10 year MER event, attended by a 60% of our graduates, who represented the 10 MER cohorts. Then, we planned the first MER Community Summit to bring together 15 MER intakes and associates from all over the world in September 2020. Forced by the covid-19 pandemics, this was postponed to September 2022, taken advantage of the 15th graduation as key event. The MER Community Summits every 5 years are conceived as strategic instrument for networking, visibility, employability and career development. In 2026, we plan to celebrate the 20th anniversary with the 2nd MER Community Summit.

The MER JPB members signing this foreword are proud to be a part of this endeavour, only possible thanks to the commitment of students, alumni, teaching and administrative staff, researchers and stakeholders from all over the world. With the support of the Erasmus+ Programme of the European Union: MER+ EMJMD (2017 1919 001 001); MER2030 EMJMD (619789 ENV2).

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

**GUEST LECTURES
MER COMMUNITY SUMMIT 2022**

Wealthy Seas in a Healthy Global Ocean

OPENING LECTURE - Mitxelena Auditorium - Bizkaia Aretoa (UPV/EHU, Bilbao)
September 7th 11:00
Global Ocean Science Report & the UN Decade of Ocean Science
Luis VALDEZ (IOC; IEO)

OPEN LECTURE - Mitxelena Auditorium - Bizkaia Aretoa (UPV/EHU, Bilbao)
September 9th 19:30
Trends in ocean sciences
Marie-Alexandrine SICRE (IOC UNESCO)

CLOSING LECTURE - Ausitorium - Aquarium SS (Donostia - San Sebastián)
september 10 12:00
Designing a Global Observing System for marine life
Patricia MILOSLAVICH (SCOR; U Delaware; U Simón Bolivar)

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OPENING LECTURE

Bizkaia Aretoa UPV/EHU - Bilbao

The Global Ocean Science Report (GOSR) and the UN Decade of Ocean Science for Sustainable Development

VALDÉS, Luis

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Ocean research takes place in an international context. To globally network and promote ocean science, environmental sustainability and good governance at global scale, the United Nations has developed an ambitious portfolio which involves many of the UN agencies and of course the UN member states. This portfolio is aimed to achieve a healthy and safe ocean for all. This lecture will focus on two key elements:

(i) The IOC-UNESCO Global Ocean Science Report: The first Global Ocean Science Report (GOSR) was published in June 2017 and it assesses for the first time the status and trends in ocean science capacity around the world. The GOSR, repeated in 2020, offers a global record of how, where, and by whom ocean science is conducted: generating knowledge, helping to protect ocean health, and empowering society to support sustainable ocean management in the framework of the United Nations 2030 Agenda. The GOSR identifies and quantifies the key elements of ocean science at the national, regional and global scales, including workforce, infrastructure and publications. It is the first collective attempt to systematically highlight opportunities as well as capacity gaps to advance international collaboration in ocean science and technology. This report is a resource for policy-makers, academics and other stakeholders seeking to harness the potential of ocean science to address global challenges.

(ii) The UN Decade of Ocean Science for sustainable development: Connected to the UN Sustainable Development Goal 14, the United Nations has proclaimed a Decade of Ocean Science for Sustainable Development (2021-2030) to support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean. The Ocean Decade addresses the global challenges we face, including those related to ocean, climate, environmental degradation, clean energy, responsible production and consumption and international partnerships. The goals are broad and interdependent, yet each has a separate list of targets to achieve. Several nations' governments have begun to incorporate sustainable development in their planning and policy, with the final goal of producing the "Science we need for the Ocean we want."

Leadership requires to be forward thinking and strategic, and to do this we must understand the wider context in which research is happening. Understanding your context and policy landscape (e.g. the UN policies or understanding research governance issues) help us to be more strategic in the wider context in which we are working. Although some of the UN targets have been criticized for being "aspirational", they have found great legitimacy and ownership. In this regard, it must be stressed that the UN portfolio is open to international project collaboration. It is expected that joint funding programmes with foreign partner organizations enable ocean research (and researchers) to be better funded to achieve the expected goals and a better Ocean for all.

OPEN LECTURE

Bizkaia Aretoa UPV/EHU - Bilbao

Trends in ocean sciences

SICRE, Marie-Alexandrine

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In January 2021, the United Nations launched the Decade of Ocean Science for Sustainable Development (2021-2030) (thereafter named UN Ocean Decade) to address societal issues of the Agenda 2030 on ocean matters (Sustainable Development Goal 14).

The UN Ocean Decade is an unprecedented and unique human endeavor towards a more sustainable and inspiring ocean for the common good. It engages scientists, engineers, policy-makers, NGOs, and civil society in a common frame to bridge knowledge and catalyze transformative science to move towards the ocean we need for the future we want!

We, scientists and global citizens, have a forefront role to play and a responsibility to help finding solutions to problems where we have part of the answer. With the knowledge we have, we can already take local action to enable transformative changes on topics such as pollution or fisheries. Other ocean issues (e.g. acidification) are more difficult to tackle because they require global action and profound changes in the society.

Here, I will present the strategic approach promoted by the Intergovernmental Oceanographic Commission (IOC) of UNESCO with its partners among which the Scientific Committee on Oceanic Research (SCOR), a non-governmental body of the International Science Council (ISC), to address the Challenges of the UN Ocean Decade providing a fantastic opportunity to collectively mobilize to make our ocean great again!

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**CLOSING LECTURE
Aquarium SS - Donostia**

Designing a Global Observing System for marine life

MILOSLAVICH, Patricia

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Globally sustained and coordinated observations of marine biodiversity and ecosystems are urgently needed to systematically assess their status and to understand how ocean life is responding to increased human use and climate change. These observations are required for the global community to predict, mitigate, and manage our ocean.

The Global Ocean Observing System uses the framework of essential ocean variables (EOVs) to document trends in diversity, distribution, and abundance of marine life globally. The observing networks of biological EOVs are the building blocks of a comprehensive observing system.

Here, I describe the process to establish the foundation for a global observing system of marine life including the identification of biological EOVs along with an assessment of the spatial and ecosystem coverage of the existing observing networks, and the elements needed to implement an ocean observing system that integrates marine biodiversity through the UN Ocean Decade.

To Nic Bax, Erin Satterthwaite, Maury Estes, Frank Muller-Karger and all co-authors of the papers presented here. To the sponsors of the GOOS BioEco Panel International Project Office: IOC of UNESCO, CSIRO-Oceans and Atmosphere Australia, the University of Western Australia, the Australian Institute of Marine, and the US Marine Mammal Commission, as well as the PEGASuS 2: Ocean Sustainability Program for supporting the PEGASuS project - Defining the observing system for the world's oceans - from microbes to whales.

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

SCIENTIFIC SESSION 1 - SEPT 7th
Programme

Chairs:

Jorg Schafer, Maria Bebianno, Karla Parga

15:00-15:30 KEYNOTE

Fate and effects of anticancer drugs in the environment

Maria Bebianno (CIMA - U Algarve)

15:30-15:50

Mercury from offshore pipelines in the food web: human and environmental risks

Rebecca von Hellfeld

15:50-16:10

Plastic pollution in Greenland: fate in glacial marine sediment

Karla Parga

16:10-16:30

Polyethylene degradation: The challenge of breaking the unbreakable

Davi Munhoz

16:30-16:50

Marine Debris Management in Indonesia

Ariyo Sahid Sujivo

16:50-17:10

Implications of kinetically-hindered metals in ecotoxicological studies: Effect of platinum spike aging on its toxicity to *Dunaliella salina*

Antonio Cobelo

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country



SCIENTIFIC SESSION 1 - SEPT 7th
Keynote Speaker

Fate and effects of anticancer drugs in the marine environment

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An important group of contaminants of emerging concern (CECs) to the aquatic environment are pharmaceutical compounds. The increasing standards of living along with the aging of the world population contribute to the enhanced need for these compounds that are not completely removed or broken down in wastewater treatment plants. Moreover, more than 80% of the world's municipal and industrial wastewater is released to the aquatic environment without treatment. When present in water, most pharmaceutical compounds maintain the properties for which they were designed for. Among these compounds, anticancer drugs have received little attention. These molecules that are not easily metabolized, enter the aquatic systems unaltered or modified and are known to have cytotoxic, genotoxic, mutagenic, and carcinogenic effects on non-target organisms. Because the number of patients receiving treatment either in hospital or at home continues to increase, it is expected that the amount of these compounds in the aquatic environment also continues to increase. Therefore, the aim of this presentation is to report the sources and effects of these cytotoxic compounds in non-target organisms either individually or in mixtures with other contaminants of concern.

SCIENTIFIC SESSION 1 - SEPT 7th
Oral Presentation

From pipeline to plate - mercury in the marine environment

VON HELLFELD, Rebecca; HASTINGS, Astley

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Mercury (Hg) is a toxic metal that naturally occurs in the Earth's crust. Depending on the surrounding environment, it is present in different species, the most toxic and bioaccumulative of which is methylmercury. Ingesting methylmercury can cause developmental and neurological toxicity in most organisms, a lesson which was learnt after the Minamata Bay incident in the 1960's. Since then, treaties and conventions have been enacted to prevent any further release of Hg, implying monitoring of current environmental concentrations. Mercury has been associated with offshore oil and gas exploration operations as it is also naturally present in petroleum reservoirs. It is transported with the crude oil/gas and can adsorb to e.g., the internal pipeline wall. During the production live of such structures, the risk of environmental Hg contamination is low, however, once production ceases and decommissioning plans are made, the risk of release must be considered. To this end, environmental impact assessments and risk assessments are conducted, ensuring that thresholds such as environmental quality standards for marine environments are not surpassed. However, these environmental standards are frequently derived to protect the marine biota from direct toxic effects of exposure, but do not consider risks for future marine resource users affected by long-term bioaccumulation. Thus, marine mammals are at higher risk of increased methylmercury exposure. They are sentinels of ocean health, and their population and health status has been listed as indicators for the ecological status of marine waters in the UK Marine Strategy Framework Directive (MSFD). In addition, many marine mammals rely on commercially relevant fish species, making them sentinels for human health. This point has not been considered frequently in past discussions of determining the potential human health risks of Hg in the marine environment. The present pilot study aims to model mercury bioaccumulation in a North Sea marine food web, using Ecopath with Ecosim (EwE). The program was originally developed to model food webs for fisheries management purposes, but with the recent development of a contaminant tracer tool (EcoTracer) it has found its application in environmental pollution research. The modelling considers different release scenarios representing the potential Hg pipeline burden and the subsequent release into the North Sea. The results of this work will inform the risk and impact assessment of Hg release into the marine environment. Current gaps in the understanding include the (1) highly localized risk of Hg methylation hindering the development of predictive models, (2) the parameters influencing the development of potential environmental Hg threshold concentrations that are protective of marine mammals, and (3) the exposure risks of humans to methylmercury via through seafood consumption.

The work is made possible by the Windfall Award Fund of the University of Aberdeen.

SCIENTIFIC SESSION 1 - SEPT 7th
Oral Presentation

Plastic pollution in Greenland: fate in glacimarine sediment

**PARGA MARTINEZ, Karla B¹; ANDERSEN, Thorbjørn J²; DA SILVA, Vitor H³;
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Natural processes such as sediment deposition and mineral and biological aggregation easily entrap plastics in the ocean. Particularly, microplastics (MP) settle to the seafloor, where they are buried in the sediment layers and incorporated into the geological record. The composition of marine sediment varies according to the region and in the Arctic, around the Greenlandic Ice Sheet, the rock weathering by glaciers exports silt- and clay-rich sediments into the ocean, known as glacimarine sediment. This fine-grain matrix challenges the purification and extraction of MP as the small grains remain in suspension and flocculation may occur. Thus, a four-step extraction method was developed and applied to generate a record of MP in Greenland as an indication of the footprint this anthropogenic pollutant might have already left in the Arctic. Using ²¹⁰Pb and ¹³⁷Cs dating, the chronology of a sediment core from Egedesminde Dyb (Disko Bay) was established back to the year 1900±5 bridging the plastic boom of the 1950s. MP particles were characterized via FT-IR imaging and a correlation method coupled with a polymer library. QC/QA protocols were applied to a sister core to reduce the risk of loss of the small fraction and ensure a good performance in fine-grain matrices. Building this sediment record would be the first archive of MP pollution in the Arctic showing that MP have been reaching once thought pristine regions and their impact might be greater than previously thought. Furthermore, this long-term accumulation in Greenlandic marine sediment could be compared to global horizons in the search for markers of the Anthropocene.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 801199. It is a collaboration between the University of Copenhagen and Aarhus University and has been partly funded by the Velux Foundations and the Danmarks Frie Forskningsfond.

SCIENTIFIC SESSION 1 - SEPT 7th
Oral Presentation

Polyethylene degradation: the challenge of breaking the unbreakable

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Polyethylene is an environmental issue in agricultural soils due to its non-degradability. This polymer is recalcitrant, and its high molecular mass, low reactivity, and high hydrophobicity hamper enzymatic interaction with the polymer. Hence, polyethylene biodegradation depends on fragmentation and oxidation. This project assesses the potential of microbial treatments to degrade plastic mulch films composed of pure low-density polyethylene (LDPE), commercial LDPE, and PBAT/PLA-based polymers (respectively poly(butylene adipate-co-terephthalate) (PBAT) and polylactide (PLA)). We exposed the mulch films to microbial treatments in low-carbon media (LC) for 6 months and transferred the selected microorganisms dwelling onto the plastisphere to a carbon-free media (CF) with plastics as the sole C-source. Microbial treatments were selected based on Average Weight Loss (%) and SEM imaging. LDPE weight loss was about 4.5%. Ongoing long-term biodegradation experiments in LC, CF, and compost are promising to expand the horizons on LDPE degradation in agricultural fields.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 955334.

SCIENTIFIC SESSION 1 - SEPT 7th
Oral Presentation

Marine debris management in Indonesia

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Marine debris , a persistent solid material that is dumped or left in the ocean by humans, either directly or indirectly, is currently attracting a lot of attention in a number of countries. The volume of marine waste is rising, with plastic waste accounting for about 60-80% of all marine garbage (Moore, 2008). According to Plastic Europe's global production data, 368 million tons of plastic waste were produced in 2019, with 4.8-12.7 million tons ending up in the ocean. With this in mind, the goal of the presented marine debris monitoring is to track the progress of Indonesia's plastic waste management, particularly those that leak into the sea. Marine debris in the sea can originate from both land-based and sea-based operations. The difference between waste generation and waste that is handled is used to calculate the results in this study. The waste is then divided into categories based on its composition, such as organic waste, plastic, metal, and other materials. The estimates focused solely on plastic waste, which is thought to account for the majority of waste reaching the ocean. Furthermore, plastic waste is projected to persist in the ecosystem for a long period, posing a risk to living organisms. According to the findings, the estimated annual release of plastic waste from anthropogenic activities into the oceans in Indonesia (437,382 tons) fell by 28.5% between 2018 and 2021.

Moore, C.J. (2008) Synthetic Polymers in the Marine Environment: A Rapidly Increasing, Long-Term Threat. *Environmental Research*, 108, 131-139.

SCIENTIFIC SESSION 1 - SEPT 7th
Oral Presentation

Implications of kinetically-hindered metals in ecotoxicological studies: effect of platinum spike aging on its toxicity to *Dunaliella salina*

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Platinum (Pt) is considered an emerging environmental micro-contaminant due to its increasing use in anthropogenic activities during the past decades. However, there are still important gaps in the understanding of its biogeochemical behavior in the aquatic environment – e.g. its speciation, reactivity and fate – mainly as a result of the analytical challenge in the determination of its typical ultra-trace environmental concentrations. Also, Pt is a kinetically-hindered metal displaying slow reaction kinetics, which has important implications regarding eco-toxicological studies. That is, investigation of its toxicity under laboratory-controlled conditions may therefore require ensuring that equilibrium speciation conditions are reached before starting the experiments. In order to shed further light on this issue, in this study we have monitored the speciation changes during aging of Pt(IV) spikes in controlled media (seawater) using an UV-Vis spectrophotometry. Platinum toxicity to the green microalgae *Dunaliella salina* was then compared, using standardized tests, with fresh and aged Pt(IV) spikes at the mg L⁻¹ concentration range. Following 96-hour exposure, ecotoxicological assays consisting in spectrometric measurements of chlorophyll-a concentrations and Effective Concentrations (EC) of Pt resulting in the inhibition of 10% and 50% of algae growth rate were calculated (EC10 and EC50, respectively). Daily monitoring of Pt speciation reflected the transition from PtCl₆²⁻ (spike) to hydrolyzed species, probably in the form [PtCl_{3-n}(OH)_{3+n}]²⁻, n=0–3. Exposure experiments showed that after a short period of aging (10 days), Pt(IV) toxicity increased by one order of magnitude compared to freshly spiked media. These results confirm the relevance of considering spike aging to ensure that speciation equilibrium conditions are attained in order to produce environmental realistic eco-toxicological data.

Financial support from the Spanish Ministry of Science, Innovation and Universities (A. Romero-Freire contract, IJC2019-041160-I), and the Portuguese FCT (M. Abdou contract, CEECIND/01777/2018) are gratefully acknowledged. This manuscript is a contribution to the project 'Technology-Critical Elements in Coastal Systems: Concentrations, Bioavailability, Trophic Transfer and Risk Assessment (TEC-RISK)' (Ref. PID2019-111261GB-I00) funded by the Spanish Ministry of Science and Innovation.

**SCIENTIFIC SESSION 2 - SEPT 8th
Programme**

Chairs:

**Nestor Etxebarria, Mary-Lou Tercier-Waeber, Ahmad
Widyatmoko**

09:30 - 10:00 KEYNOTE

**Advanced Sensors for in situ monitoring of bioavailable trace metals
Mary-Lou Tercier-Waeber (U Geneva)**

10:00- 10:20

Application of an Electronic Monitoring (EM) system and Artificial Intelligence (AI) data analysis in a
small-scale tuna fishery
Ahmad Widyatmoko

10:20- 10:40

Scalable Mapping of Chlorophyll-A Photopigments in Coral Reef Using Spectral Images
Michelia Wibowo

10:40- 11:00

Exploring deep ecosystems of the Galapagos Marine Reserve and their benthic fauna: the world Darwin
never saw
Marie Creemers

11:00- 11:20

Data science ethics: bias in data and algorithms
Isabel Corona

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

Advanced sensors for in situ monitoring of bioavailable metals

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The aquatic ecosystems are vital to the livelihood and food security of billions of people, and to the economic prosperity of most countries. Identification at appropriate temporal and spatial scale of chemicals from natural or anthropic sources that may have adverse effects on the ecosystem equilibrium and their living resources is thus crucial. Current research and developments focus on robust, easily usable, cost effective autonomous sensing tools that provide reliable in-situ measurements of key compounds. To reach these objectives, involved institutions have to tackle technical and analytical challenges. This will be illustrated here by the development of innovative sensors and submersible sensing probes that enable autonomous in situ monitoring of trace metal species that are available for uptake by the microorganisms. Examples of in situ applications will be presented to reflect (i) the accuracy of these tools to record short-term subtle variations of the potentially bioavailable metal species, and (ii) the potentiality they offer to identify abiotic and biotic processes that control the concentrations and cycling of the bioavailable trace metal species as well as provide data to support revision of European Environmental Quality Directives and Standards to better assess and manage metal impacts especially on plankton at the base of the food-web.

Financial supports: EU FP7 Ocean 2013.2 - Project ScheMA - Grant Agreement 614002. EU H2020-INFRAIA- Project MEPHY - Grant Agreement 654410-JERICO-NEXT. Swiss National Science Foundation.

Application of an Electronic Monitoring (EM) system and Artificial Intelligence (AI) data analysis in a small-scale tuna fishery

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The use of Electronic Monitoring (EM) and geolocation on fishing vessels is increasingly adopted as a fisheries management tool, for monitoring and surveillance purposes, and as a reliable source of on-board fisheries data. Combined with the use of Artificial Intelligence (AI), large volumes of data generated by EM can be analysed quickly to produce comprehensive fisheries information. The decreasing cost of EM equipment and the rise of cloud computing services enables applications for small-scale fisheries (SSFs). To demonstrate this method, we attached low-cost cameras and GPS tracking devices to handline tuna fisheries vessels in Seram Island, Molucca, Indonesia in 2021. One hundred and three fishing trips were monitored, and 53 trips of them had a second camera dedicated for species identification. Port data collection was conducted on each of these fishing trips. We used the You Only Look at Once (YOLO) AI freeware program, with the deep Simple Online and Real-time Tracking (SORT), and optical character recognition on the Google Collaboratory computing service, to extract the number of individual fish caught and identify by species. We also extracted the time spent and fishing ground location from EM data. Photogrammetry via AI analysis provided a measure of fish length which we then used as a proxy for fish weight. The low-cost EM devices produced decent data sufficient to analysis. Recording at 15 frames per second, the Reolink camera has an average duration of 6 hours and 19 minutes and 2 hours and 18 minutes from the second camera. We found that the YOLO on the Google Colab was able to run up to 32 frame per second during the analysis. The individual fish counting remains a challenge for the model and human intervention is still needed to validate the result. The length measurement was accurate on the small fishes <10 kg and subsequently produce better weight estimation compared to the bigger fish > 10 kg which has many distortions. The fishing ground location was able to be extracted at high spatial accuracy due to five minutes interval ping location from the GPS tracker. The EM was able to fully describe the fishing trip, including night-time operations. This work highlights that the combination of EM and AI could become an alternative source of low-cost, reliable fisheries data collection at sea.

We thank to Yayasan Masyarakat dan Perikanan Indonesia (MDPI) for the collaboration of the research by providing the field assistance and the trial of the EM system in their landing sites.

Scalable mapping of chlorophyll-A photopigments in coral reef using spectral images

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Coral reefs, as one of the most important marine ecosystems, have ecological and economic value due to the diversity of their associative biota. However, with climate change and anthropogenic activity posing global threats to the ecosystems, it is critical to monitor coral reefs in order to preserve biodiversity. With hyperspectral technology, coral reef monitoring can be done quickly over a large area.

In this study, we use HyperDiver, a diver-operable hyperspectral imaging system that captures benthic coverage and provides higher taxonomic resolutions in biodiversity identification and classification. This study utilized HyperDiver hyperspectral data to quantify photopigment concentration and generate abundance maps. The focus of this research will be to demonstrate the ability to identify photopigments underwater, quantify photopigment abundance across the reef survey scale, and investigate the relationship between photopigment variation and taxonomic and environmental settings. This relationship study was carried out combining habitat maps that was provided from previous study in the observation area, and photopigment abundance maps. The resulting photopigment map is expected to assist the analysis in clustering and understanding the variability of pigment groups in different coral colonies.

Exploring deep ecosystems of the Galapagos Marine Reserve and their benthic fauna: the world Darwin never saw

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The Galapagos Marine Reserve is known as one of the most pristine marine protected areas. Its endemic fauna and rich ecosystems have aroused the interest of the scientific community over the decades. Although the Galapagos pelagic megafauna and shallow-water benthic invertebrates have been well documented, the deep-sea ecosystems surrounding the archipelago remains poorly known. In 2015, different deep-water habitats were explored at depths from 290 to 3,373 meters using a s remotely operated vehicle (ROV) during a multidisciplinary oceanographic cruise aboard the E/V Nautilus. Images and videos were recorded along transects and 90 biological samples were collected and sent to expert taxonomists worldwide.

Among the organisms sampled, 30 species were identified as previously undescribed, including specimens of cold-water corals and sponges from three new genera. The presence of vulnerable marine ecosystems (VME) indicator species was noticed on all the sites, and several engineer species and vulnerable habitats were observed such as glass sponge grounds and coral gardens. This characterization of the Galapagos deep-sea benthic invertebrates highlights the diversity and richness of these deep ecosystems and the importance to keep protecting them. In the scope of the recent deep-sea resources exploitation programs, it is a crucial reminder of the need for baseline studies and the relevance of Marine Protected Areas.

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Data science ethics: bias in data and algorithms

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There are many ethical considerations one needs to take when it comes to data analysis. For this talk, we will focus on bias in data and algorithms. We will further emphasize the importance of considering such biases when implementing certain algorithms in your own research. Our ability to collect huge amounts of data has grown enormously in the past years. With this ability came the demand to be able to process and analyze these huge amounts of data. In particular, Machine learning has become very popular in the past decades and is used in a wide variety of fields. Machine learning algorithms are used in our everyday life and can be used to make important and life changing decisions. Hence it is crucial that we consider the biases that such algorithms can contain and attempt to address them. This is to ensure that decisions made from such algorithms don't reflect discriminatory behavior towards certain groups or populations.

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

**SCIENTIFIC SESSION 3 - SEPT 8th
Programme**

Chairs:

Krishna Das, Naiara Rodriguez-Ezpeleta, Iraide Artetxe

15:00-15:30 KEYNOTE

**KEYNOTE - An Eco-Evolutionary Genomics Perspective to Marine Management
Naiara Rodriguez-Ezpeleta (AZTI-BRTA)**

15:30-15:50

The influence of shellfish farming in bottlenose dolphin ecology
Severine Methion

15:50-16:10

Innovation in north sea beam trawl fisheries and survival of Plaice, Thornback and Spotted rays
Allard van Mens

16:10-16:30

Population structure of catadromous thicklip grey mullet in the Basque coast in connection to estuarine homing, exposure to xenoestrogens and development of intersex condition
Anthony Nzioka

16:30-16:50

Yellowfin tuna connectivity in the Indian Ocean: otolith d18O composition as a tracer
Iraide Artetxe

16:50-17:10

Genetic connectivity and hybridization with its sister species challenge the current management paradigm of white anglerfish
Imanol Agirre

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

An eco-evolutionary genomics perspective to marine management

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Achieving a sustainable marine management relies on an appropriate understanding of the status of resources which, in turn depends on the accuracy and completeness of scientific information. Yet often the appropriateness of the information collected is compromised by economical or technological limitations. Thus, there is a need to explore alternative or complementary approaches that can improve marine management for biodiversity conservation. Genetics-based approaches offer the most promising alternatives as they allow the capture of information that cannot be measured otherwise and provide cost-effective alternatives to traditional approaches. Yet, despite this potential, the uptake of genetic methods by the fisheries assessment and marine management process in general is not a reality. Here we have examined the power of genetics to assist fisheries management and conservation focusing on commercial fish species with a range of distributions, having different reproductive behavior, and presenting unique assessment challenges, and on still pristine but with exploitation potential ecosystems such as the deep sea. Genome-wide based information has revealed conservation and management important phenomena such as mismatches between administrative and natural populations, reproductively isolated stock mixing, interspecific hybridization, mislabeling and genetic adaptation; I will discuss the potential impact of these new findings on species conservation. Additionally, we have proven alternative sampling approaches such as environmental DNA as promising avenues for marine conservation as they allow to study marine ecosystems in a non-invasive cost-effective manner; I will discuss the advantages and challenges of this new approach in the next generation marine monitoring era.

The influence of shellfish farming on bottlenose dolphin ecology

METHION, Séverine; DÍAZ LÓPEZ, Bruno

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Studying the ecology of cetaceans living under the pressure of anthropogenic activities is essential for their conservation. Yet, there is a paucity of information on cetaceans and shellfish farming. Using a long-term and year-round dataset, this study investigates the ecology and the behaviour of a coastal cetacean, the bottlenose dolphin (*Tursiops truncatus*), in an important area for shellfish farming (Ría de Arousa, North-West Spain). A resident population of bottlenose dolphins was present year-round in this area. Their seasonal abundance varied from 56 to 144 individuals and their apparent survival was high. Of the investigated environmental factors, depth and shellfish farms were influencing dolphins habitat use. On another hand, thermal stratification and dissolved oxygen were influencing their spatio-temporal aggregation patterns. Foraging behaviour was mainly determined by the sea surface temperature, time of day, and whether the dolphins were foraging within shellfish farm areas. Dolphins were predicted to be more likely found foraging inside these areas than outside (57% vs. 43%). Findings of this study also revealed variation in foraging behaviour among dolphins, with some individuals foraging more frequently than others within the shellfish farms. In turn, individuals that frequently foraged within shellfish farms had weaker associations compared to others. This study generates key insights into the ecology and the behaviour of a coastal cetacean living under the pressure of the shellfish farming industry. It further provides valuable information on conservation priorities for coastal cetaceans living under such pressures, as well as regulations for the shellfish farming industry.

This research is part of a long-term study supported by funding from the Bottlenose Dolphin Research Institute (www.thebdri.com). We thank Niki Karagouni, Victoria Hope, Olga Mosca, Sara de Almeida Simões, Oriol Giralte Paradell and BDRI volunteers for their contribution to support field and laboratory work. We thank INTECMAR for making public the oceanographic data from their stations in the Ría de Arousa. Data collection complies with the current laws of Spain, the country in which it was performed (field work was carried out under a special permit delivered by the Ministerio para la transición ecológica y el reto demográfico).

Innovation in north sea beam trawl fisheries and survival of Plaice, Thornback and Spotted rays

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North sea beam-trawl fisheries are in danger of collapsing due to steeply increasing fuel prices, low and inefficient catch rates, the banning of "pulse" fishing, various societal pressures and the closing of large fishing areas for wind farms and natural reserves. In this presentation we will discuss how research can help this industry tackle these issues by innovations in fishing gear to reduce fuel consumption, bottom impact while increasing fishing selectivity of target species and survivability of discards. Two recent innovations such as 'waterspray' and 'twister' gear might offer solutions while uncovering new challenges. A insight in recent and unpublished survival experiment of rays and model species such as plaice aboard beamtrawl and flyshoot vessels will be presented.

Pieke Molenaar and Edward Schram

Population structure of catadromous thicklip grey mullet in the Basque coast in connection to estuarine homing, exposure to xenoestrogens and development of intersex condition

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High prevalence of intersex condition and oocyte atresia have been reported in thicklip grey mullets (*Chelon labrosus*) inhabiting some of the Basque estuaries in Southern Bay of Biscay (SBB) due to exposure to pollutants. The fact that mullets are catadromous fish opens the question of whether newly hatched larvae are recruited into estuaries for life, or whether adults could move between estuaries after each reproductive migration. This has implications in their history of xenoestrogen exposure and development of intersex testis. This study evaluated the population structure of mullets in Basque estuaries with the aim of understanding its implications in observed gonad alterations. Individuals were sampled in five estuaries in the SBB from 2010 to 2021 and two populations from the Gulf of Cadiz (South Spain) and Thermaic Gulf (Greece) were analysed as outgroups. Otoliths of individuals from the neighbouring estuaries of Gernika and Plentzia (no intersex found) were collected for shape and elemental chemical analysis through SB-ICPMS and LA-ICPMS core-to-edge transect analysis. Total genomic DNA was extracted from tissues for microsatellite marker analysis and 46 microsatellite loci screened for allelic variations. A set of 15 microsatellites was validated for analysis of *C. labrosus* populations, 10 of which were polymorphic. Microsatellites showed the absence of genetic differentiation among populations with Bayesian clustering analysis of the data revealing a single population across all sampled locations, from the SBB to the Mediterranean. These results pointed towards genetic homogeneity and panmixia, suggesting the existence of significant gene flow among the mullet sub-populations in the SBB. This does not rule out the possibility of adult mullets always returning to their estuary of origin. In this sense, otolith shape and chemical composition showed significant differences between mullets of both studied estuaries. This very clear separation suggests that we are facing two sub-populations. This fits the hypothesis that gonad alterations in mullets develop due to exposure to xenoestrogens along their life history and after young-age homing in a polluted estuary.

Yellowfin tuna connectivity in the Indian Ocean: otolith δ^{180} composition as a tracer

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Yellowfin tuna of the Indian Ocean is overfished, and a better understanding of the stock structure and connectivity is needed to enable sustainable management. Here, otolith δ^{180} values of young-of-the-year fish from known nursery areas of the equatorial Indian Ocean (West, Central and East) were used to establish a reference isotopic signature to predict the origin of sub-adult and adult individuals. Sub-adult tuna otolith δ^{180} values from Reunion Island were similar to the West nursery signature, but otolith δ^{180} values of sub-adults from Pakistan were unlike any of the nurseries sampled. Therefore, δ^{180} values from the Pakistan area samples were considered an additional nursery source for predicting the origin of adult tuna, using a multinomial logistic regression classification method. The western equatorial area was the most productive nursery for three fishing grounds sampled, with a minor contribution of Pakistan-like origin fish. Contribution of Central or East nurseries to the adult population was negligible. One adult otolith was analysed by secondary ion mass spectrometry along the otolith growth transect and results were compared with an isoscape approach to infer lifetime movements. This study is an important first step towards understanding the spatial structure and connectivity of the species.

Authors want also to thank to the many people that were involved in the collection of the otoliths used for this study; I Krug from AZTI-BRTA, N Nikolic and A Médiou from MARBEC, Md Ahusan from Maldives Res Inst, M Lansdell and C Proctor from CSIRO, A Priatna, P Lestari, and Md Taufik from Indonesian Res Inst Mar Fisheries, D Parker from CAPFISH Sudafrica, HB Usmani, K Zehra, and Md Wasim Khan from Mar Fisheries Dept Pakistan, and U Shahid, S Meesum R Kazmi, S ul Islam, M Tariq, S Zafar and J Zaidi from WWF Pakistan, we are grateful for all their efforts. We would also like to thank the many vessel owners, skippers, observers, crews, and processors who provided fish for sampling

Genetic connectivity and hybridization with its sister species challenge the current management paradigm of white anglerfish (*Lophius piscatorius*)

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Understanding the inter and intraspecific dynamics of fish populations is essential to promote effective management and conservation actions and to predict adaptation to changing conditions. This is possible through the analysis of thousands of genetic markers, which has proven useful to resolve connectivity among populations. Here, we have tackled this issue in the white anglerfish (*Lophius piscatorius*), which inhabits the Northeast Atlantic and Mediterranean Sea and coexists with its morphologically almost identical sister species, the black anglerfish (*L. budegassa*). Our genetic analyses based on 16,000 SNP markers and 700 samples reveal that i) the white anglerfish from the Mediterranean Sea and the Atlantic Ocean are genetically isolated, but that no differentiation can be observed within the later, and that ii) black and white anglerfish naturally hybridize, resulting in a population of about 20% of, most likely sterile, hybrids in some areas. These findings challenge the current paradigm of white anglerfish management, which considers three independent management units within the North East Atlantic and assumes that all mature fish have reproductive potential. Additionally, the northwards distribution of both species, likely due to temperature raises, calls for further monitoring of the abundance and distribution of hybrids to anticipate the effects of climate change in the interactions between both species and their potential resilience.

**SCIENTIFIC SESSION 3 - SEPT 8th
Programme**

Chairs:

Elisa Sainz de Murieta, Regina Asariotis, Jordan Gacutan

17:40-18:10 KEYNOTE

**Climate change and coastal transportation: a sustainable development challenge
Regina Asariotis (UNTAD)**

18:10-18:30

Kenyan coastal community perceptions on climate change and fisheries resource management
Enmanuel Gafo

18:30-18:50

Ocean Accounting: bridging marine science and policy for sustainable development
Jordan Gacutan

18:50-19:10

Nature-Based Solutions in Coastal and Estuarine Areas of Europe
Roberta Pegorer

19:10-19:30

How Is the Ocean Anthropogenic Carbon Reservoir Filled?
Xabier Davila

19:30-19:50

Somos OceanoS (SOS) - Innovative science communication to combat climate change and improve
marine conservation
Verónica Relañó

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

Climate change and coastal transportation: a sustainable development challenge

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With over 80% of global trade in goods carried by sea, seaports are key nodes in the network of global supply chains and critical for access to global markets, as well as the ocean economy. At the same time, ports are at the frontline of climate change and at high risk of impacts. Rising mean and extreme sea levels and extreme weather can result in significant damage, as well as costly disruption and delay across supply chains, with potentially far-reaching consequences for international trade and the sustainable development prospects of the most vulnerable nations, such as small island developing States. Given what is at stake and the potential costs of inaction, adaptation for seaports is a matter of strategic socio-economic importance and increasing urgency. However, much more needs to be done. Drawing on UNCTAD's extensive related work, including peer-reviewed research, the lecture will highlight key challenges, as well as approaches to adaptation and areas for accelerated action.

Thanks are due to the multidisciplinary network of experts and collaborators who have provided valuable contributions to UNCTAD's related work over the years, including research and capacity-building with a focus on the Caribbean (<https://SIDSport-ClimateAdapt.unctad.org>).

Fishing community self-definitions of wellbeing across demographic groups and an international border

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Wellbeing refers to a state where human needs are met, where one can act meaningfully to pursue one's goals, and where one enjoys a satisfactory quality of life. As such, evaluating individual and community wellbeing is an important aspect of conservation work in communities. Ensuring that conservation results in improvements to wellbeing is of paramount importance, and is thus often measured in artisanal fishing communities. However, often, wellbeing is monitored using standard indicators of household income. This is one metric, but it may not capture other values of local communities or allow their voices to be heard. We worked with six artisanal coral reef fishing communities, split on either side of the Kenya-Tanzania international border to determine what goods, services, and values they use to define their wellbeing. In each of the communities, we held focal groups with 5-6 people each representing young men (18-35 years old), young women, older men (36+ years old), older women, and community leaders. In each focal group, we asked participants to list things that they felt were critical to their wellbeing. We defined these items as things they could not survive without. There was no limit on the number of items mentioned. We evaluated responses in terms of differences between the two nations as well as differences within a nation by gender, age, and leadership role. Working on either side of this international border allows us to evaluate how communities that share ecological and cultural similarities, but exist in a different governmental and political context differ in their responses. Our results can be used to understand how different sectors of society might differ in values and needs, and what needs transcend international boundaries and which are more context-specific.

Ocean Accounting: bridging marine science and policy for sustainable development

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Decision makers are rapidly moving towards integrated approaches to understand and manage the human – ocean nexus. For example, ecosystem-based approaches, adopted in frameworks such as Coastal and Marine Spatial Planning (CMSP), and Marine Protected Areas (MPAs), represent the interconnected relationships between society and the ocean. The challenge remains, however, in bridging transdisciplinary knowledge in a systematic way that addresses policy and management needs. Ocean Accounting (OA) uses an emergent framework for the structured compilation and standardisation of ocean data (social, environmental, economic), in a manner consistent with national (macro-economic) and environmental-economic accounting. The OA framework provides a foundation for statistics and indicators produced from a common set of accounting tables, enabling inference of trends over time. Thus, OA provides a means to monitor ecosystem extent and condition, the supply of ecosystem services to society and the ocean economy, as well as the pressures, impacts or risks resulting from human activities. By understanding the beneficiaries of ocean space and resources, we are may better inform equitable and inclusive sustainable development. The compilation of OAs requires significant transdisciplinary collaboration to overcome fragmentation of ocean data and knowledge across a diverse range of stakeholders (e.g., traditional owners, government, research, and sectoral institutions). For example, OA may require remote sensed, in situ or modelled data to capture the extent and condition of ecosystems at scale, while also embedding socio-cultural values of local communities. OA may also disaggregate national accounts to determine the characteristics of an ocean economy and its dependencies and pressures on natural resources. I will provide an overview of the framework and country case studies demonstrating how scientific knowledge and data could be used to bridge the science-policy interface and build awareness to opportunities for collaboration to further the diversity, accuracy, and reliability of scientific data informing the policy sphere.

This research was supported by the Global Ocean Accounts Partnership (GOAP). JG was supported by UNSW Sydney Scientia PhD program.

Nature-based Solutions (NbS) in coastal and estuarine areas of Europe

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Nature-Based Solutions (NbS) represent an opportunity to align environmental and resilience goals at a time of strained budgets in a global context and when short-term needs may run counter to long-term goals. In Europe, NbS fit the mandates of major EU environmental and climate change policies by restoring biodiversity and enhancing climate-resilience and carbon sequestration. Yet, their implementation at scale is still lacking. This study analyzed NbS case studies across European coastal and estuarine areas to draw key lessons, understand better the current status of implementation, and identify key challenges and gaps. From a total of 59 NbS case studies, results show an increase in NbS implementation since 1990s. Most of the case studies are hybrid solutions employing wetlands, predominantly located in the UK and the Netherlands. There is a need for tools and strategies to expand knowledge sharing of lessons learned to enable further replication of successful cases in other areas.

This research was carried out within the EU Project ADAPTA BLUES (ref. LIFE18 CCA/ES/001160). It reflects only the author's view, and the Agency/Commission is not responsible for any use that may be made of the information it contains. The financial support to RM during the commencement of this work through an EU-funded scholarship (MER+ EMJMD), is gratefully acknowledged. BR acknowledges support from Early-Career Res Fellowship from Gulf Res Progr of Nat Acad Sci Eng & Med, although the content is solely responsibility of the authors and does not necessarily represent the official views of the Gulf Res Progr.

How is the ocean anthropogenic carbon reservoir filled?

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McDONAG, Elaine¹; SCHWINGER, Jörg¹; OLSEN, Are¹**

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About a quarter of the total anthropogenic CO₂ emissions during the industrial era has been absorbed by the ocean. The rate limiting step for this uptake is the transport of the anthropogenic carbon (C_{ant}) from the ocean mixed layer where it is absorbed to the interior ocean where it is stored. While it is generally known that deep water formation sites are important for vertical carbon transport, the exact magnitude of the fluxes across the base of the mixed layer in different regions is uncertain. Here, we determine where, when, and how much C_{ant} has been injected across the mixed-layer base and into the interior ocean since the start of the industrialized era. We do this by combining a transport matrix derived from observations with a time-evolving boundary condition obtained from already published estimates of ocean C_{ant}. Our results show that most of the C_{ant} stored below the mixed layer are injected in the subtropics (40.1%) and the Southern Ocean (36.0%), while the Subpolar North Atlantic has the largest fluxes. The Subpolar North Atlantic is also the most important region for injecting C_{ant} into the deep ocean with 81.6% of the C_{ant} reaching depths greater than 1,000 m. The subtropics, on the other hand, have been the most efficient in transporting C_{ant} across the mixed-layer base per volume of water ventilated. This study shows how the oceanic C_{ant} uptake relies on vertical transports in a few oceanic regions and sheds light on the pathways that fill the ocean C_{ant} reservoir.

We thank Tim DeVries and an anon-ymous reviewer for their constructive reviews. XD was supported by a PhD research fellowship from U Bergen. GG was supported by US NSF Grant 88075300. A.B. was supported by Trond Mohn Foundation under GA BFS2016REK01. ELM was supported by UKRI Grants Atlantic Biogeochem Fluxes (ref no. NE/M005046/2) and TICTOC (ref no. NE/P019293/2). AO and SKL appreciate support from Res Council Norway (ICOS-Norway, ref no. 245972). JS acknowledges support by Res Council Norway (Project INES; ref no. 270061). Supercomputer time and storage resources provided by Norwegian e-infrastructure Resh Educ (UNINETT Sigma2, nn2980k & ns980k).

SOS Somos OceanoS - Innovative science communication to combat climate change and improve marine conservation

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Normally there is a lag between specialization and communication, which widens the gap between academics and non-specialists. My research presents how novel ways of communication through a documentary and learning activities can foster more efficient community-led management and effective marine protection. I have developed an interview-based classification system based on an empathy-framework that allows identifying weaknesses in the different phases of a Marine Protected Area (MPA). A peer-reviewed paper was and is of little use to the locals around the San Antonio MPA, who are exposed to environmental challenges, including run-off from abandoned mining, fish meal factories, mass tourism and unregulated fishing, all in the vicinity of Argentina's "most beautiful beach". The question for me was "How to raise awareness among stakeholders that inadequate management of the area is incurring big ecological and social costs?". The attempt: Next to new knowledge generated through research and stakeholder interviews (fishers, industry, tourism, neighbors, NGOs, managers), producing a documentary for everyone to understand and relate to others' perceptions. This is accompanied by a movie tour to reach and engage local stakeholders. The tour includes educational activities for kids, literary contests for teenagers and roundtables. All this creates interest for the MPA and fosters an early sense of responsibility to protect marine ecosystems and brings about an opportunity for change among leaders and locals. The results show how audiovisual channels can be an impactful tool to start a conversation towards marine conservation, relevant for other MPAs with similar socio-ecological characteristics. Keywords: conservation, marine protected areas, science communication, community engagement, inclusivity

This project is now endorsed by United Nations Ocean Decade and it has received the support of the University of British Columbia Public Scholars Initiative, Sea Around Us, Saint Mary's University and University of Comahue.

**SCIENTIFIC SESSION 5 - SEPT 9th
Programme**

Chairs:

Mathieu Poulicek, Carlota Escutia, Hoi Ming Lam

09:30-10:00 KEYNOTE

**Past, present and future of Antarctic Ice Sheet dynamics
Carlota Escutia (CSIC-U Granada)**

10:00- 10:20

Snow depth on Arctic sea ice estimation from Satellite Altimetry and SAR using advanced deep learning methods
Hoi Ming Lam

10:20- 10:40

A SST and carbonate chemistry reconstruction of the Post-industrial Revolution Southwest Pacific
Sara Todorovic

10:40-11:00

Radiocarbon dating and paleoclimate reconstruction on mollusc shells
Dragana Palecek

11:00-11:20

Spatial-ecological relationships of a threatened foundation species across multiple spatial scales
Rick Leong

11:20-11:40

A long-term study of the marine heatwaves in the Western Mediterranean Sea and the Red Sea
Manal Hamdeno

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

Past, present and future of Antarctic ice sheet dynamics

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Given the profound influence of Antarctica on climate, global marine ecosystems and sea level, changes in this region can have widespread consequences for life on Earth, the climate system and humanity. Despite their global importance, the short duration of the instrumental record and the scarcity of measurements in Antarctica and the Southern Ocean (SO) are a major challenge when attempting to understand their functioning and their response to ongoing global warming. One consequence, is the uncertainty on how ice sheets will respond to further warming, reducing confidence in twenty-first century Intergovernmental Panel on Climate Change (IPCC) projections of sea-level rise. In this context, geological records are key to understanding cryosphere and SO dynamics during past warmer-than-present epochs. Among other, these records inform us about patterns of ice sheet retreat and the probability of sea-level rise greater than the IPCC projected range for the end of the century, especially under higher emissions scenarios.

Funding for this research is supported by the Spanish Ministry of Science and Innovation Grant CTM2017-89711-C2-1/2-P cofounder by the European Union through FEDER funds

Snow depth on Arctic sea ice estimation from Satellite Altimetry and SAR using advanced deep learning methods

LAM, Hoi Ming Lam ¹; GELDSETZER, Torsten ¹, YACKEL, John ¹; HOWELL, Stephen Howell ²; SAHA, Monojit ³; STROEVE, Julienne ^{3,4,5}; NANDAN, Vishnu ^{1,3}

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Following the launch of NASA's ICESat-2 in September 2018, orbital alignment of ESA's CryoSat-2 and ICESAT-2 in July 2020 provides near-simultaneous radar and lidar measurements over polar areas every 31 hours. A machine learning (ML) algorithm is being developed to estimate winter snow depth on landfast sea ice in the Canadian Arctic using measurements from satellite altimeters (ICESat-2 and CryoSat-2) and synthetic aperture radar (SAR) imagery (Sentinel-1 and RADARSAT-CM). This is done under the first-order assumption that rougher sea ice, characterized by higher winter season SAR backscatter, entraps more snow, which can be detected by altimetry-derived snow depth. Preliminary results indicate some correspondence between the altimetric surface heights and SAR backscatter coefficient (sigma-nought). This approach can provide greater spatial and temporal coverages for snow depth estimates on Arctic landfast sea ice. A field campaign was done in April 2022 near Cambridge Bay, NU, to measure snow depth and properties on sea ice at near-coincident CRYO2ICE tracks to provide validation datasets.

All authors participated in the design of the experiment. HML, JY, MS carried out field measurements in Cambridge Bay, NU. HML carried out the data analysis.

Observing tropical ocean changes in Anthropocene through coral based paleoclimate reconstructions

TODOROVIC, Sara ^{1,2}; **WU, Henry C** ¹; **LINSLEY, Braddock K** ³; **KUHNERT, Henning** ⁴; **BENTHIEN, Albert** ⁵; **RICHTER, Klaus-Uwe** ⁵; **BIJMA, Jelle** ⁵; **RAITZSCH, Markus** ^{4,5}; **DISSARD, Delphine** ⁶

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Increase in atmospheric CO₂ driven by fossil fuel combustion and land-use change since the Industrial Revolution has set of the period of Anthropocene. The consequences these increasing emissions have are at least two fold for our oceans - global warming, and ocean acidification (OA). Here I will present multi-proxy (e.g. Sr/Ca, δ¹⁸O, δ¹³C, δ¹¹B, B/Ca) reconstructions of sea surface temperature (SST) and salinity (SSS), as well as seawater pH of the Southwest Pacific for the last 250 years. This region of the Pacific is interesting for tracking the development of OA because of the well-constrained interannual to interdecadal SST and SSS variability from existing coral-based reconstructions in this region. Massive Porites sp. corals from Rotuma and Tonga will be analyzed to extend the currently available SST reconstructions and expand the spatio-temporal coverage beyond the instrumental records. We aim to quantify the anthropogenic impact on SST, pH and the ocean carbonate system to achieve a better understanding of the status in the South Pacific under open ocean conditions.

I acknowledge my coauthors and partner institutions for contributions in coral cores and help with sample analysis. I furthermore acknowledge and am grateful for the MER Consortium grant to attend this meeting.

Radiocarbon dating and paleoclimate reconstruction on mollusc shells from the archaeological site of Vale Boi, Portugal.

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Mollusc shells are often found in archaeological sites, given their great preservation potential and high value as a multipurpose resource. Vale Boi (Portugal) is an important archaeological site situated between two different environments: the Mediterranean and Atlantic coasts. Studying this site can give us insight into the ecological and socio-cultural dynamics of different populations that inhabited Southwestern Iberia during the transition from Middle to Upper Paleolithic. Evidence of multiple human occupations at this site indicate it was most likely a seasonal residential camp with a diversified use and processing of available resources including molluscs. Thus, it is crucial to determine their age and use at the site. Additionally, mollusc shells can be used as biomarkers of past climate to reconstruct the environmental conditions present at the time and allow us to reconstruct and study scenarios from the past.

This project is funded by the European Research Council under the European Union's Horizon 2020 Research and Innovation Programme (grant agreement no. 803147 RESOLUTION, <https://site.unibo.it/resolution-erc/en>).

Spatial-ecological relationships of a threatened foundation species across multiple spatial scales

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Foundation species such as corals are found in multiple spatial scales (i.e., local to international scales) and provide many ecosystem services. However, only few studies have investigated their distribution patterns across all spatial scales they exist in. Understanding species distributions across multiple spatial scales can inform species resilience and important spatial scales for restoration and management of threatened foundation species. Sydney rock oyster (*Saccostrea glomerata*) is a threatened, reef-building, intertidal foundation species that is found on the Australian south-eastern coast. The remnant reefs consist of different shapes, size and distances from one another, and limited in knowledge on their ecological patterns. In this thesis, I investigated how oyster population characteristics (e.g., body size), population processes (e.g., recruitment) and biodiversity provision by remnant *S. glomerata* reefs vary with spatial scales they exist in and the processes within these scales. I sampled oyster cores and estimated recruitment with settlement plates on these reefs in three estuaries in the state of New South Wales. I measured oyster density, oyster size, epifaunal abundance, epifaunal biodiversity and community structure from the cores while recruitment was obtained from the settlement plates. These metrics were then compared amongst the spatial attributes found amongst the reefs i.e., within-patch-, patch-, landscape- and regional scales. I found the metrics were related to small-scale attributes i.e., within patches, however their relationships varied amongst the estuaries, suggesting that regional scale processes likely influence species patterns at smaller scales. To investigate whether a regional scale-process is related to the regional scale-patterns, I experimentally determined how oyster recruitment varied with different regional scale-sedimentation levels across six estuaries. I found that high recruitment on reefs was observed with low-sedimentation levels in all estuaries. In summary, my thesis highlights the need to understand ecological patterns of foundation species across multiple spatial scales and the influence of large-scale processes that may drive ecological patterns at smaller scales. From a restoration perspective, prioritising important spatial scales that maximises population characteristics and ecosystem function of the target species can aid in efforts to promote long-term oyster reef restoration success.

We acknowledge the traditional custodians of the lands and estuaries we sampled, the Jerrinja (Crookhaven River), Tharawal (Port Hacking) and Awabakal (Hunter River) people. We also thank undergraduate student and external volunteers for their fieldwork and lab work assistance. We appreciate the loan of various lab apparatus from AMEE, FAMER and CMEG labs. Scientific collections were made with Dept Primary Indust, New S Wales (NSW DPI) Res Permit P13/0007-2. Research was funded by an Aus Res Council Linkage Grant LP180100732, in collaboration with The Nature Conservancy, NSW DPI, NSW Dept of Planning, Industry and Envir and the Sydney Inst of Marine Sci Foundation. RL was supported by a U New S Wales Univ Internat Postgrad Award (UIPA).

A long-term study of the marine heatwaves in the Western Mediterranean Sea and the Red Sea

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Global warming brings climate-related challenges and impacts to marine life, such as marine heatwaves (MHWs). Large-scale episodes of unusually high ocean temperatures, known as MHWs, can negatively impact ecosystems, threaten economies, and intensify storms. MHWs are becoming more intense, longer, and more frequent worldwide. Coastal marine ecosystems that are already under stress are particularly vulnerable. The goal of this PhD project is to investigate the evolution of MHWs at the surface and subsurface of the western Mediterranean Sea (WMED) and the Red Sea (RS). The physical drivers that lead to MHWs are not well understood and hinder our ability to predict and mitigate such events. Therefore, in this study, we seek to understand the interplay between the potential mechanisms leading to MHWs, sub-daily variability, and subsurface evolution in order to quantify their effects and improve our predictive capabilities. In addition, the impact of MHWs on the two ecosystems characterized by the presence of seagrasses in the WMED and corals in the RS will be investigated.

SCIENTIFIC SESSION 6 - SEPT 9th

Programme

Chairs:

Miren P Cajaraville, Kari Lehtonen, Rebecca Von Hellfeld

15:00-15.30 KEYNOTE

Dumped munitions in the sea: fate, impacts and risks

Kari Lehtonen (SYKE)

15:30-15:50

Synergic effect of nitrate exposure and heat wave on the growth and antioxidative activity of microalgae, *Chlamydomonas reinhardtii* and *Raphidocelis subcapitata*

Sabiha Akter

15:50-16:10

Environmental interactions with an offshore, long-line mussel farm and its conservation potential

Llucia Mascordá

16:10-16:30

Oil dispersant application in cold environments: copepod toxicity and microbial community dynamics

Tamer Hafez

16:30-16:50

Mangrove Threat Index: an easy-to-use tool for local decision makers to predict the likelihood of mangrove loss

Valentina Platzgummer

16:50-17:10

Determination of the size at first sexual maturity (SL50) for the Manila clam (*Ruditapes philippinarum*) in the Arcachon Bay (French Atlantic coast) for a potential Minimum Conservation Reference Size revision

Tifanie Briaudeau

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

The dark legacy of sea-dumped munitions: environmental risks and management prospects

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From the late 1940's to the early 1960's, hundreds of thousands of tonnes of chemical warfare agents (CWA), consisting of mustard gas and arsenic-based substances were dumped at coastal and offshore areas in Europe and elsewhere around the globe. Massive amounts of outdated conventional munitions containing highly toxic explosives such as TNT and RDX were also disposed of in a similar manner until 1975 when the London Convention prohibiting sea dumping in general came effective. Together with the legacy of the previous wars in the form of unexploded ordnances (UXO) at the sea bottom the current situation can be literally described as an environmental time bomb. Environmental problems associated with the dumped warfare materials are emerging at an accelerating pace due to the progressive corrosion, which is now starting to reach a point when the toxic substances are leaking out in a serious way. In many countries this news has led to significant public concerns, and requests for mitigation activities are spreading fast. Marine traffic, coastal and offshore activities including the installation of wind parks and oil and gas pipelines are increasing rapidly, and issues related to the use of the seabed are more acute than ever.

The Baltic Sea and the adjacent Skagerrak Strait are focal post-war munition dumping areas with an approximated amount of 50,000 and 190,000 tonnes of CWA-containing munitions, respectively, in addition to the largely unknown quantities of other conventional war materials. In these areas, studies on the munition-related compounds have now been ongoing for almost two decades and all the key mechanisms leading to potential large-scale damage of the marine ecosystem have been confirmed: the release and transport of the substances to other areas as well as their bioaccumulation and toxicity. The next actions include updated risk assessments at the dumping sites using the acquired new information and the ensuing local and regional level decision-making on the management of the issue by applying the technologies available for mitigation.

In this presentation we go through the global history and current situation concerning sea-dumped warfare materials, focusing on the Baltic Sea. Information on the biological effects of the munition-related substances, measured in laboratory experiments or observed in field studies, and their contribution to the risk assessment is a key feature of the presentation.

Synergic effect of nitrate exposure and heat wave on the growth and antioxidative activity of microalgae , *Chlamydomonas reinhardtii* and *Raphidocelis subcapitata* .

SABIHA, Akter¹; DE BOECK, Gudrun¹; SCHOELUNCK, Jonas¹; ABDELGAUWAD, Hamada²

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Any change on community structures and abundance of algae can affect the overall energy flow of a fresh water ecosystem. Abundance, metabolic and antioxidant activity of algae are highly dependent on temperature, and the availability of nitrate in the water body. However, it remains unknown how microalgae respond to simultaneous exposure to elevated temperature and nitrate pollution. We investigate the interactive effects of nitrate and heat wave on growth, and antioxidant accumulation of *Chlamydomonas reinhardtii* (CH) and *Raphidocelis subcapitata* (PS). A 3 × 3 factorial design was used, where algae were exposed to one of three ecologically relevant levels of nitrate (0, 50, or 200 mg/l NO₃) at temperatures 20 °C for 2 weeks then at 24°C and 26°C respectively. A positive synergic effect of elevated temperature and nitrate on the growth and metabolic activity (sugar) of algae was observed on both algae. Highest oxidative stress expressed as MDA was observed at 20°C on 0 mg/l of nitrate medium. A strong decrease of MDA was found in the 3rd experimental week at 24°C. Antioxidant activity, polyphenols and proline were significantly high at 200 mg/l and 50 mg/l nitrate medium than 0 mg/l nitrate in both algae. Where at both short and long heat waves polyphenols increases but proline decrease. MDA and antioxidant were independent of nitrate exposure at 50mg/l and 200mg/l. The result shows that both CH and PS had similar response to nitrate and temperature with different magnitude. The results highlight that simultaneous exposure to elevated temperatures and nitrate pollution improve algal growth, metabolism and antioxidant activity.

Environmental interactions with an offshore, long-line mussel farm and its conservation potential

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Bivalve aquaculture has traditionally been established in shallow, sheltered waters in inshore areas generating notable negative environmental impacts due to the accumulation of waste products. The recent global expansion of the offshore industry is perceived to have a lower environmental impact coupled with a higher growth potential. As ecosystem engineers, mussels can positively contribute to marine ecology through carbon storage, nutrient remediation, coastal defence and enhancing biodiversity. Hence, the development of offshore aquaculture has the potential to provide one of the most sustainable sources of protein to feed our growing population. Since 2013, the University of Plymouth has been monitoring the UK's first large scale offshore mussel farm in Lyme Bay, UK. Using a range of underwater survey vehicles and sampling techniques (Towed Video Array, BRUV, ROV, PelagiCam, ADCP or sediment grabs), the study has been valuable in showing the farm's potential to increase ecosystem value and contribution to the production of the area. Results to date show large aggregations of benthic and pelagic organisms beneath and around mussel ropes relative to control sites. The farm is acting as a fish aggregation device (FAD), shelter, refuge, nursery, food source and increasing the integrity of the ecosystem by creating a hard-bottom reef-like habitat in historically heavily fished ground. Offshore mussel farms such as the Lyme Bay present the exclusion of fishing activities (mobile and static gear) from farmed grounds, which may not only provide the potential to enhance both commercial and non-commercial species producing a spill over effect but, present the prospect for benthic habitats to be restored to previous state, serving as a de facto MPAs.

As marine biodiversity continues to decline, it is paramount to reconcile nature conservation and the sustainable development of the oceans. If we want to meet international marine conservation targets such as Aichi and the SDGs, the Blue Economy and in particular, aquaculture as the fastest growing food industry, must move forward together. Offshore mussel farming might be preferable to other destructive extractive activities happening in multi-use MPAs and PPAs whilst it presents as a sustainable alternative to overfishing. With the prospective to recover damaged habitats, boost ecosystem services and provide effective in-situ conservation of biodiversity if effectively managed, offshore mussel farms may have the ability to become part of a wider marine conservation strategy. With this in mind, the Lyme Bay mussel farm was used as a case study on the ICES/IUCN-CEM-FEG Workshop on testing OECM practices and strategies. Improving our understanding of offshore aquaculture–environment interactions is crucial to identify the priorities needed for future research to inform aquaculture conservation policy and management practices as well as its role as part of the Blue Growth Agenda and their potential as OECMs.

Offshore Shellfish Ltd.

Oil and dispersant application in cold environments: copepod toxicity and microbial community dynamics

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In this study, we investigated the toxicological effects of oil Water Accommodated Fraction (WAF), with or without the addition of a chemical dispersant, using copepod based bioassays and changes in native microbial communities. Bioassays using the model organism *Acartia tonsa* showed that WAFs prepared from distilled oils (IFO 180 and Marine gas oil) affected lethal, reproductive and molecular endpoints. However, exposure to crude oil WAF (NNA WAF) mixed with dispersant (FINASOL OSR52) caused high mortality, decrease in fecundity and changes in gene transcription patterns. Additionally, the effects of NNA WAF alone and with dispersant on microbial communities was examined using microcosm experimental scenarios. Finasol OSR52 altered the microbial communities' dynamics in water and in sediment. In fact, communities seeded with hydrocarbon degrading bacteria were the main drivers of the degradation rate of PAHs.

Horizon 2020 GRACE project and the doctoral grant from the university of the Basque country and university of Pau

Mangrove Threat Index: an easy-to-use tool for local decision makers to predict the likelihood of mangrove loss

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Despite many conservation efforts, mangrove extension worldwide is still declining because of pressures from human activities as such as urban development, aquaculture and agriculture, and this trend is expected to continue in the future. The objective of the research is to develop a cost-effective and participative methodology for mangrove monitoring that allows local decision-makers to gain insights on the level of anthropic pressure on mangroves, building on data coming from both top-down monitoring initiatives and local knowledge, providing a link between top-down and bottom-up approaches to mangrove governance. The methodology consists of two main elements: an R package integrated with a GIS interface, that generates the Mangrove Threat Index. Results about the application of the methodology to the case study of mangroves in Mexico are presented, together with a discussion about the strengths, weaknesses and future directions of the tools developed.

This research has been carried out in the context of the Master thesis for the MER+ MSc in Marine Environment and results are expected to be published in the next month.

Determination of the size at first sexual maturity (SL50) for the Manila clam (*Ruditapes philippinarum*) in the Arcachon Bay (French Atlantic coast) for a potential Minimum Conservation

CAILL-MILLY, Nathalie¹; SANCHEZ, Florence¹; BRU, Noëlle¹; BENITO, Denis²; RUIZ, Pamela²; IZAGIRRE, Urtzi²; BRIAUDEAU, Tifanie^{1,2}

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The Manila clam (*Ruditapes philippinarum*) represents a great resource for fisheries within the Arcachon Bay (SW of France). Some specificities (uncommon globular shape, growth slowdown observed from 32 mm, ...) suggest that the current Minimum Conservation Reference Size (MCRS) set at 35 mm in Europe is not adjusted for this particular case. The present study aims to determine the size at first sexual maturity SL50 for this local population. Clams from 10 to 41 mm (n=1420) were collected from four intra-basin sites from June to August 2021 for gonad histological analysis. Six gonadal maturity stages were identified and individuals were classified as immature (stages 0, 1 and 2) and mature (stages 3, 4 and 5) for the SL50 calculation. The SL50 was estimated at 26.7 ± 0.5 mm. The newly estimated SL50 represents a key element for the European Commission to consider a revision of the MCRS for the clam population in the Arcachon Bay.

The authors wish to acknowledge the invaluable support from the local fishermen involved in sample collection: Ankh Geyre, Kévin Bermudez, Délia Bernardi, Maud Vial, Brice Bernardi et David Lamourous. This work was funded by the FFP (France Filière Pêche – « Enjeux immédiats»); the CNPMM (Comité National des Pêches Maritimes et des Élevages Marins); the CRPMM NA (Com Rég des Pêches Mar Élevages Marins – Nouvelle-Aquitaine); the CDPMM33 (Com Dépl Pêches Mar Élevages Marins - Gironde) and Ifremer, under the ACOPALBA project. TB profited from a postdoctoral fellowship funded by Next Generation EU.

**POSTER SESSION - SEPT 9th
Programme**

**Chairs:
Jerome Bonnin, Jon Saenz, Ikerne del Valle**

**13:30-15.00
Poster Lunch - Chillida Hall**

1. How to get a job after MER
Ana Elisa Almeida Ayres
 2. The pore density of benthic foraminifera: a quantitative nitrate reconstruction tool in the intermediate Pacific
Anjaly G Menon
 3. The IsA time series: a high- Arctic model system for climate change
Chestaa Chitkara
 4. Zooplankton survival due to instantaneous salinity reductions: a REDstack experimental power plant case
Danila Uvarov
 5. Factors affecting the conservation of African Oystercatchers on Robben Island, South Africa
Josu Melendez
 6. Tintenstrich communities: occurrence, mobility and potential risk of cyanobacteria and their toxins in lichen communities
Juliana de Araujo
 7. PADAV: A Shiny App to help with the analysis and visualisation of protein microarray data
Marie-Catherine Bouquieaux
 8. Novel sustainability standards for supply chain operations: paving the way for innovative traceability system in the Adriatic seafood sector
Nicola Matovic
-

**POSTER SESSION - SEPT 9th
Programme**

Chairs:

Jerome Bonnin, Jon Saenz, Ikerne del Valle

13:30-15.00

Poster Lunch - Chillida Hall

9. Glacial - Interglacial atmospheric CO₂ variability:
testing of biological pump/ventilation change hypothesis in Southwest Pacific
Priyanka Soni
10. Applications of numerical models at Coastal Dynamics Ltd. (CDL)
Salomi Seeram
11. Galician marine mammals: ecology and behaviour of whales, dolphins and porpoises
Séverine Methion & Olga Mosca
12. Photogrammetry, a emergent tool for marine conservation
Torcuato Pulido
13. Assessing sea-level trends in South East Asia to the Pacific Islands
and sensitivity test with IPCC 6th Assessment Report (AR6) Sea-Level Projections
Yochi Okta Andrawina
14. Microplastic contamination: A review of policies and solutions
Davi Munhoz
15. Impact of polystyrene nanoplastics on a Wadden Sea microbial community capable of biodegrading
biopolymers
Lia Corbett
16. Genetic structure of Corsican spiny lobsters as revealed with nuclear markers
Nine Doutreloux
-

**POSTER SESSION - SEPT 9th
Programme**

Chairs:

Jerome Bonnin, Jon Saenz, Ikerne del Valle

13:30-15.00

Poster Lunch - Chillida Hall

17. Exclusive Economic Zones (EEZs) and marine conservation
Veronica Relaño
18. A mussel, a zebrafish, and a whale meet in a bar...
Rebecca Von Hellfeld
19. Water Science Policy – an NGO founded by MER graduates at Oxford
Christian Fischer
20. Arteries.blue – An interactive storytelling platform about rivers
Christian Fischer
21. Trends in abundance and catch for the silver scabbardfish, *L. caudatus*, from 1990 to 2019 in the Azores
Archipelago
Gloria Mariño-Briceño
22. El Pueblo es El Mar (the People are the Sea) - Workshop / Documentary
Veronica Relaño
23. Changing seawater temperature, sand, air and weather phenomenon due to climate change on nesting
survivance, abundance and size, their impact on ratio male/female and prediction for future of the *Dermochelys*
coriacea sp
Florian Sellier
24. How can we create successful conservation projects?
Romina Preciado-Perez
-

How to get a job after MER

ALMEIDA AYRES, Ana Elisa

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My talk is about how to get a job after Marine Environment and Resources Master experience. During my master I have attended to Careers Fairs, summers courses, talked to professors and friends about my plans and invested my time on self-knowledge and language skills. I believe all these small acts and mindset contributed to be successfully hired by a Fisheries Consulting Company as soon as I finished my master. I believe my talk can help fresh and alumni students to broaden their horizons and see how opportunities as this MER Community Summit 2022 can boost their lives and careers. My first advice would be "Know yourself". I have spent the first semester trying to figure out who I was and what I wanted. I have done some self-knowledge courses and lists of my strengths, weakness, interests, what I am good at, what I am not good at, what people say that I am good at. The next step is "Make a plan". Check for visa requirements, write your cv in several languages, practice for interviews and exercises for recruitment processes. Also do not miss the opportunity of learning the languages of the countries where you are living, it helps with the networking. The last advice would be "Go out there". Socialize. Be attentive on what is going on in the university where you are studying and check their e-mails. When I was in Southampton, there were professionals from companies, such as Fugro and ERM who sent emails saying they would give a referral for those who decided to apply for job positions in their companies. Go to career fairs, it was in one of them where I got my job in UK. Also, make a use of summer courses. It seems we are eligible for free summer courses while we are enrolled in University of Bordeaux. A friend of mine managed to go to Antarctica thanks to a person she met in the summer course. Those are mine advices based on mine experience and of my friends who succeeded on having jobs or PhD opportunities after MER experience.

The pore density of benthic foraminifera: a quantitative nitrate reconstruction tool in the intermediate Pacific

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Large-scale use of chemical nitrogen fertilizers and the burning of fossil fuels leads to the severe rise of fixed nitrogen in the biosphere. Nitrate (NO₃⁻) is an important macronutrient that can be limiting in some marine environments. Our study aims to generate a widespread, quantitative reconstruction of bottom-water NO₃⁻ concentrations ([NO₃]_{BW}) in the intermediate Pacific covering the last deglaciation. We utilize the pore density of benthic foraminifer *Bolivina spissa* as a proxy for deglacial [NO₃⁻] at different locations of the intermediate Pacific. *B. spissa* is abundant in oxygen-depleted environments all around the Pacific, is able to use NO₃⁻ as an electron acceptor instead of oxygen, and shows a highly significant correlation between its pore density and [NO₃]_{BW}. A comprehensive understanding of past nutrient cycling under rapidly changing climatic conditions such as a glacial termination is one prerequisite to predicting future changes in marine nutrient budgets.

The IsA time series: a high- Arctic model system for climate change

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The Isfjorden-Adventfjorden (IsA) marine time series station in the high-Arctic Svalbard is an excellent model site for studying the ecosystem effects of climate change (Atlantification). The station is periodically flooded by warm Atlantic Water, and thus alternates between “cold” arctic and “warm” Atlantic states, the latter predicted to become more dominant in the future. We have analysed 8 years (2011-2019) of high temporal resolution data (sampled weekly to monthly), focusing on microbial eukaryotes. DNA metabarcoding of 18S rDNA and flow cytometric counts from water-samples collected at 15 and 75m depth revealed a highly seasonal community composition, with recurring annual patterns but also with large interannual differences. We here discuss the data in relation to measured environmental parameters (temperature, salinity, light, photosynthetic biomass, nutrients), with the aim of identifying environmental drivers and predicting ecosystem responses to future climatic scenarios.

Zooplankton survival due to instantaneous salinity reductions: a REDstack experimental power plant case

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In Blue Energy production, energy is generated from the mixing of waters with different salinities in a process called Reverse Electrodialysis (RED). The world's first Blue Energy power plant is currently being tested in the Netherlands. Organisms passing through a RED plant are subjected to multiple stressors, i.e. salinity shock that zooplankton experience when sea water and freshwater mix. Rapid salinity reduction or increases may have negative consequences for planktonic organisms: mortality, decrease in growth rates and impaired feeding ability, but knowledge on this is currently limited. Possible mortality of zooplankton by passage through the Blue Energy facility was investigated through in situ viability assessments as well as experiments where natural zooplankton communities were exposed to sudden salinity reductions. Mortality induced by factors other than osmotic shock were difficult to measure and varied between taxonomic groups. Blue Energy power plant would cause an additional zooplankton mortality. It is important to understand which fraction of entrained zooplankton dies because of the osmotic shock experienced when fresh water and salt water are mixed and what is the influence of factors other than osmotic shock on mortality of zooplankton. The poster presentation will display the results of studies conducted in 2019 at different temperature conditions and draw some conclusions that make it possible to understand the main factors affecting the survival of zooplankton.

Van Walraven Lodewijk, Van der Veer Henk, Evaline van Weerlee

Factors affecting the conservation of African Oystercatchers on Robben Island, South Africa

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Robben Island (33°47'S, 18°21'E), Western Cape, South Africa, has been a World Heritage Site since 1999 on the basis of its historical and cultural significance. However, the island is also important in terms of natural resources, providing breeding habitat for several threatened seabirds and the emblematic African Oystercatcher *Haematopus moquini*. With a world population of about 5,000 in the early 1980s, the African Oystercatcher was classified as “near-threatened” both in South Africa and globally. Robben Island has played a major role in supporting the breeding population of oystercatchers, and since the early 2000s, it has become one of the most important colonies for the species. The numbers of adult African Oystercatchers on the island increased from 40 individuals in 1977 to 550 in 2022. Here, we discuss the main threats for African Oystercatchers (e.g., human disturbance, predation and climate change), their population development over the last decades, and the factors explaining the incredible recovery of the species on Robben Island. The island has been substantially altered since the first occupation by humans in the mid-seventeenth century, particularly with the introduction of alien species. Nowadays, it is a complex ecosystem in which any change in the abundance of a species can trigger unprecedented consequences on the system. Therefore, the monitoring and management of Robben Island has been one of the key factors allowing the recovery of African Oystercatchers.

The Robben Island Museum provided transport to and from the island, accommodation, and logistical support. JMA was supported by the Global Training Scholarship (Department of Industry, Innovation, Trade and Tourism of the Basque Government, in collaboration with UPV/EHU). IQ was supported by the Biodiversity and Development Institute. We are grateful to all the people who has participated in the African Oystercatcher monitoring of Robben Island in one way or another in the period 2001-2022.

Tintenstrich communities: occurrence, mobility and potential risk of cyanobacteria and their toxins in lichen communities

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Subaerial and often dark-colored biofilms, termed Tintenstrich communities (“ink-lines”, TCs) extend on rock surfaces in semi-aquatic environments. TCs are widely distributed in high mountain areas, including large parts of the Alpine region. They are predominantly composed of free-living cyanobacteria and associated with lichen-forming fungi, i.e., cyano-lichens. Cyanobacteria are known to produce diverse bioactive metabolites including toxins that could protect them from grazers. Cyanotoxins pose a major concern for environmental and public health and the World Health Organization defined limits for cyanotoxins in drinking water and recreational water quality guidelines. Despite that, many questions remain unsettled about their role at the soil-water interface. The occurrence of cyanotoxins in the Swiss Alps is currently unknown. As alpine areas are highlighted for playing a major role in the hydrologic system, risk to local water resources of releasing of toxic TCs cyanobacterial metabolites remains undetermined. Additionally, cyanobacteria take part in important ecological relationships triggered and/or remediated by the production of chemical compounds, worth of being explored. Therefore, this work aims to determine the metabolic diversity of the cyano-lichen species in TCs, investigate whether these metabolites could threaten the water quality in the Swiss water catchments, and to assess cyano-lichen interactions with local herbivores.

PADAV: A Shiny App to help with the analysis and visualisation of protein microarray data

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Protein microarray is a method that allows the simultaneous analysis of a variety of different interactions and activities of proteins. Depending on the goal, a study can include many different proteins and numerous samples which can result in a large amount of data. High volume of data can be difficult to analyse and represent in classical software such as Excel. Therefore, more bioinformatics-oriented tools need to be used, for example the R software environment. While, bioinformatics tools are very useful, they can be very time consuming for non-bioinformaticians to use and to produce the best results. The aim of PADAV (Protein Array Data Analysis and Visualisation) application is to ease the use of various tools and more specifically R, for the analysis and visualisation of protein microarray data, by providing an interface that allows easy selection of data (similar to Excel) while using the possibilities and strength of R. Currently, the application allows to normalize data using different methods and data representation using heatmaps and scatterplot.

Novel sustainability standards for supply chain operations: paving the way for innovative traceability system in the Adriatic seafood sector

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Growing concern over sustainability of fishing practices and demanded responsibilities in marine fishery production and trading, leave both Italian and Croatian fishing sectors, which share Adriatic biological resources, lacking appropriate responsiveness. The Adriatic Responsible Fisheries Management (ARFM) certification standards have been developed to assess the compliance of fisheries and seafood processors with responsible and sustainable principles. Product traceability along the supply chain is ensured through the introduced Chain of Custody Standard and Production and Operation Efficiency Standards. We considered best practice models and traceability principles, benchmarking world-leading seafood principles and certification programmes from other industries. The components of the traceability guidelines can be implemented and carefully integrated into planned ARFM scheme so that they are reflective of existing and potential mechanisms of the Adriatic fishing industry.

This study has been realized in the framework of the project PRIZEFISH “Piloting of eco-innovative fishery supply-chains to market added-value Adriatic fish products” funded by the Call 2014–2020 Interreg V-A Italy–Croatia CBC Programme - Priority Axis: Blue innovation. Subsidy Contract N8 10043583. We would like to formally acknowledge the Inter-Departmental Centre for Research in Environmental Sciences (CIRSA) in Ravenna for the support, as well as all project partners who contributed with their comments and suggestions.

Glacial - Interglacial atmospheric CO₂ variability: Testing of Biological Pump/Ventilation Change Hypothesis in Southwest Pacific

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Stable carbon isotope records from marine sediment cores have been used to investigate the ocean's role in regulating the global carbon cycle during Glacial – Interglacial periods. The prevailing hypothesis relates pCO₂ fall to an enhanced biological pump that sequestered carbon from the atmosphere to the deep-sea during glaciations. It is thought that deep-sea was more stratified and reduced deep-water convection in the North Atlantic, both of which would have contributed to more significant sequestration of respired CO₂ in the deep ocean. The release of the excess respired carbon from the ocean is thought to explain the rise of atmospheric CO₂ during deglaciations. The respired carbon storage will show changes in stable carbon isotopes ($\delta^{13}\text{C}$). Here, we use carbon isotope water mixing equations to calculate Atlantic, Pacific, and Antarctic deep-water masses in the LGM. We demonstrate that the contribution of water masses to Southwest Pacific – circumpolar deep-water did change from modern to LGM due to changes in the water mixing ratios.

Prof. Lowell Stott, Prof. Doug Hammond and my colleague Alex Dill

Applications of Numerical Models at Coastal Dynamics Ltd. (CDL)

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CDL has conducted different applications of numerical modelling within its projects. These have included air dispersion, search and rescue, oil spill dispersion and analysis, drill cuttings/mud dispersion, 3D hydrodynamic forecast, spectral wave, sediment transport and flood modelling. In this poster, examples of past numerical modelling projects will be illustrated along with the importance of metocean datasets within these models.

Galician marine mammals: ecology and behaviour of whales, dolphins and porpoises

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The different cetacean species present along the northwest coast of the Iberian Peninsula face continuous anthropogenic pressure in the form of fishing, maritime traffic and aquaculture. Despite this, there are few studies on the ecology of these species in these highly productive waters. This study shows the year-round distribution of different cetacean species present in southern Galicia. Between March 2014 and July 2022, over 600 daily surveys were carried out on board a research vessel, sampling over 30000 km and detecting the presence of over 2000 groups of cetaceans. Twelve cetacean species were identified including five mysticete species (humpback, Minke, Sei, fin and blue whales) and seven odontocete species (bottlenose, common, striped, and Risso's dolphins, pilot whales, harbour porpoise and Cuvier's beaked whale). Habitat use differs among the different species observed, from a coastal distribution within the estuaries to a fully pelagic distribution outside the continental shelf. Likewise, the presence of the different species varies throughout the year, with species having a clear resident character and others being seasonal. This study highlights the importance of the Galician coast for the distribution of cetaceans and the need to establish appropriate management measures to facilitate the conservation of these species.

This research is part of a long-term study supported by funding from the Bottlenose Dolphin Research Institute (www.thebdri.com). We thank Niki Karagouni, Victoria Hope, Sara de Almeida Simões, and BDRI volunteers for their contribution to support field and laboratory work. Data collection complies with the current laws of Spain, the country in which it was performed (fieldwork was carried out under several research permits delivered by the Ministerio para la transición ecológica y el reto demográfico).

Photogrammetry, a emergent tool for Marine Conservation

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Over the past decades, thanks to the development of technology and computing power, new techniques raised. Structure from Motion (SfM) photogrammetry is a non-invasive emergent technique that allows the scientific community to capture, from a three-dimensional (3D) perspective, the ecological and biological processes at a wide range of scales. By applying this methodology is possible to obtain digital reconstructions from single organisms to whole ecosystems by processing series of overlapping images, thus representing a useful cost-effective tool in terms of monitoring and 3D complexity assessments. The objective of this contribution is to present SfM underwater application along different study cases, highlighting the potential of photogrammetry, from the assessment of sponge biomass production to the study of communities inside crucial ecosystems as animal forests, kelp habitats and marine caves.

This research was partly supported by the BlueBio Cofound MEDSPON (Horizon 2020), MPA engage (Interreg Project), Assemble Plus transnational access program and the Polytechnic University of Marche (Ricerca Scientifica di Ateneo).

Assessing Sea-Level trends in South East Asia to the Pacific Islands and sensitivity test with IPCC 6th Assessment Report (AR6) Sea-Level Projections

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The current sea level change (SLC) is crucial for constraining future sea-level projections and preparing coastal community adaptation, but SLC is not smooth and globally uniform process. New PO.DAAC report NASA has the dataset for global and regional sea-level projections based on the IPCC 6th Assessment Report (AR6), but the model's accuracy is unconfirmed. This study examines IPCC AR6 sea-level projections along the coasts of Indonesia, New Zealand, and the West Tropical Pacific Islands. PSMSL tide-gauge data and X-TRACK satellite altimetry were used in this research. Only 34 TGs were selected from 43 active PSMSL and Pacific Sea Level and Geodetic Monitoring (PSLGM) stations in the region for validation. X-TRACK data can be used to detect SLC over those research areas with an average correlation of 0.5 (Pearson(r)) and RMSD around 0.22 mm (lower than 1 mm). Optimizing the ordinary least square approach for estimating sea-level trends in X-TRACK AVISO data and evaluating AR6 IPCC sea-level projections for each climate scenario were the focus of the study (SSP 119, SSP 126, SSP 245, SSP 370, SSP585). Average SLA trend is 4.243 mm/year (CI 95 percent). Overall, our X-TRACK AVISO sea-level trend analysis is similar to SSP 119 and SSP 126, with RMSD below 2 mm.

We would like to thank Tonkin Taylor and the Earth Observatory of Singapore at Nanyang Technology University for supporting these projects.

Microplastic contamination: A review of policies and solution

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Although microplastics is a worldwide concern, most scientific literature restates the issue instead of presenting strategies to cope with it. In light of that, we assembled the currently available knowledge to provide: 1) a timeline of policies directly or indirectly addressing microplastics; 2) upstream responses to prevent microplastics pollution, i.e., circular economy, behavioral change, and market-based instruments, as well as source-specific strategies, focusing on the clothing industry, tire and road wear particles, and antifouling paints; 3) downstream responses tackling microplastics, such as waste to energy, biodegradation, water treatment plants, and cleaning up strategies; and examples of 4) multifaceted responses, e.g., approaches implemented in fisheries and aquaculture facilities. Here, we underline preventive strategies as guiding lights to tackle microplastic contamination and set a baseline for further studies addressing this environmental issue.

We acknowledge MER+ EMJMD 20171919 (EACEA-EU) for the financial support through an ERASMUS+ Scholarship offered to Davi R. Munhoz, and H2020 innovation programme under the Marie Skłodowska-Curie grant to the SOPLAS project (No. 955334).

Impact of polystyrene nanoplastics on a Wadden Sea microbial community capable of biodegrading biopolymers

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The impact of polystyrene nanoplastics (PS NPs) has been studied in some microbial consortiums and found to adversely impact different metabolic processes. Some microbes can metabolically utilize biodegradable plastics such as polyhydroxyalkanoates (PHA) and fully degrade them within weeks to months. The aim of this study was to determine the impact of neutrally charged PS NPs (200 nm) on the PHA biodegradation capacity and cell viability of a microbial community from the Wadden Sea. This community was exposed to a range of NP concentrations (0.001, 0.01, 0.1, 0.325 and 1 µg/mL). The PHA biodegradation capacity was not significantly affected by the PS NPs (One-way ANOVA, $F = 0.476$, $df = 5$, $p = 0.788$), and the community remained viable throughout all treatments. Epifluorescence microscopic images showed that NPs were mostly aggregated in the extracellular polymeric substances (EPS) of biofilms that had formed around the remaining pieces of the biopolymer, which reduced their bioavailability. This possibly explains the lack of impact on biodegradation metabolism and community viability.

The Amaral-Zettler Group, The microbiology and molecular ecology labs at NIOZ

Genetic structure of Corsican spiny lobsters as revealed with nuclear markers

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The spiny lobster (*Palinurus elephas*, Fabricius 1787) is one of the most important economic marine resources of Mediterranean Sea, and also a coastal marine endangered species due to overfishing. To increase the biological knowledge of this species in order to harmonize fishing and conservation, a genetic study has been programmed on the Corsica Island populations (France, Mediterranean Sea). For this, five samples totaling 85 lobsters were taken all around the island from fishermen's brotherhoods. They were genotyped at twenty-one microsatellite loci, adding 15 Atlantic individuals more from Brittany (France) which serve as outgroup. Statistical analyses of genotypes showed slight differentiation between samples but no clear geographic structure. No isolation by distance was detected around the island. Surprisingly, the Atlantic sample is not particularly different from the Mediterranean ones. However, the generalized deviation from panmixia is highly significant and variation partitioning of redundancy analyses point out irregular annual recruitment, probably from several breeding gatherings, suggesting inter-localities and inter-cohorts slight genetic differentiation.

The authors warmly thank David Schikorski (Labofarm private laboratory) who produced the genotypes, Sébastien Cnudde (STARESO) for the map, the Corsican fishermen for providing us spiny lobsters, the CRPMEM Corse and the entire STARESO team for the help on sampling, advice and discussion. The sampling of lobster smaller than the commercial size have been done under the prefectural decree n°614 from 12 October 2020.

Exclusive Economic Zones (EEZs) and marine conservation

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In the last decades, several targets for marine conservation were set to counter the effects of increasing fishing pressure, climate change impacts, and pollution. Measures included protecting 10% of the sea by 2020 and establishing Large-Scale Marine Protected Areas (LSMPAs), for example.

Using the 'reconstructed' catch data for 1950 to 2018 made available by the Sea Around Us initiative, we show that the declaration and enforcement of exclusive economic zones (EEZs) could have a much bigger impact on marine conservation than LSMPAs while being a tool to protect marine biodiversity and effectively contribute to international targets. Here, we compare fishing intensity for different commercial marine species in Pacific EEZs with a no-take or multizone LSMPA.

This research adds another layer of knowledge to advance the use of more comprehensive data to consider more integrated management with stricter regulations and proper enforcement in multizone MPAs and EEZs.

A mussel, a zebrafish, and a whale meet in a bar...

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With the increasing pressure to have the 'perfect' CV to get ahead in research has made decisions regarding degree selection, thesis topics, and PhDs more difficult than ever. However, following one's own interest(s) without considering its 'CV value' can be beneficial. Instead of following the trodden path of 1000s of other early career scientists, following personal interests creates a unique portfolio of skills and abilities not easily matched.

My studies took me from a BSc in environmental science and business management to the MER MSc with a focus on microplastic pollution in the marine environment although I always wanted to work with marine mammals. The MER MSc allowed me to take a PhD position in aquatic ecotoxicology, working with freshwater fish, before becoming a PostDoc in marine food web modelling and mercury accumulation. It is this post that has now allowed me to work in the marine mammal conservation field, monitoring contamination levels and health markers.

Dr Thomas Braunbeck (University of Heidelberg, Germany) for his support and trust in my work during my PhD. Dr Amaia Orbea, Dr Beñat Zaldibar, and Dr Miren Carajaville (PIE- UPV/EHU, Spain) for allowing me to do my thesis with them and their ongoing support, as well as all MER researchers and professors for an incredible experience. Lastly, Dr Astley Hasings and Dr Graeme Paton (University of Aberdeen, United Kingdom) for providing me with the opportunities I have now.

Water Science Policy – an NGO founded by MER graduates at Oxford

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Water Science Policy's mission is to stimulate interest and enable action. We do this by making water content freely accessible to everyone - using as many languages and mediums as we can. We want to captivate and enchant, to make water cool. Using our multimedia tools, our diverse audience can find their own answers to create an impact. Water Science Policy's written and visual stories are one of the most effective ways to truly connect with others and bring faraway problems to readers' hearts, break down scientific problems, and make the unseen seen. WSP believes framing water issues is a vital first step in addressing how we manage and value our water. We are bridge builders in three ways:

1. Connecting science, policy, storytelling, art, data visualisation, and all related disciplines to foster communication and understanding.
2. Closing the gap between science and policy through promoting global targets such as the Sustainable Development Goals (SDGs) and engaging with policy-makers and practitioners in global and regional fora.
3. Helping to connect the world of academia with those of professionals and journalists by giving everyone a voice and channeling these perspectives to a global audience with translated content.

Arteries.blue – An interactive storytelling platform about rivers

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Climate change, water scarcity, pollution and land use change are among the threats to the world's rivers and those who rely upon them. An inability to access water threatens the security, stability and environmental sustainability of all nations, especially in the Global South. By 2025, two-thirds of the global population may face water shortages. As the resource becomes increasingly scarce, the need for states to find ways to resolve conflict and find cooperation grows. From source to sea, arteries.blue tells data-driven river stories. The project uses a mix of interactive data, graphics, articles from academic researchers and photostories from journalists to communicate the challenges, opportunities, and beauty of some of Earth's most vital lifelines.

This project was brought to life by Water Science Policy and 360info; the latter funding part of the development costs.

Trends in abundance and catch for the silver scabbardfish, *L. caudatus*, from 1990 to 2019 in the Azores Archipelago

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Deep-water fisheries gained great importance in the middle of the last century, due to the overfishing of shallower resources and the development of fishing technology. In Portugal, and especially the Azores, the deep-water demersal fisheries represent an important proportion of the total catches. One demersal species of commercial interest is the silver scabbardfish, *Lepidopus caudatus*. To understand how the mean annual abundance of this species has varied, three abundance indexes were constructed through the different databases: survey data (RPN, 1996 to 2019), commercial catches (LPUE, 1990–2017), and official landings (CPUE, 1990–2020). The three normalized mean abundance indexes showed similar peaks in abundance and the linear models calculated for each abundance index illustrated an overall declining tendency of the abundance and demonstrated that RPN predicts higher abundances than CPUE and LPUE. These results highlight the need to further study the stock status of this species for future management.

El Pueblo es El Mar (the People are the Sea) - Workshop / Documentary

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El Pueblo es El Mar (the People are the Sea) tells the story of different coastal communities and stakeholders in an area where marine resources and ecosystems are at the centre of nearly all livelihoods. It explores the communities' perspectives that until now have been overlooked and raises awareness about the ecological, social and economic value of the San Antonio Bay Marine Protected Area. El Pueblo es El Mar highlights the lived experiences, limited management and clashes that occur between conflicts of interest in this protected area. All of these factors serve as learning lessons for the creation and management of Marine Protected Areas (MPAs), not only in Patagonia but in other parts of the world with similar characteristics.

El Pueblo es El Mar is an educational documentary created thanks to the help and collaboration of the people from San Antonio Bay. Come to learn more about science communication and how El Pueblo es El Mar became part of SOS, a project endorsed by the UN Ocean Decade and led by Veronica Relano, a former MER student in 2013!

Changing seawater temperature, sand, air and weather phenomenon due to climate change on nesting survivance, abundance and size, their impact on ratio male/female and prediction for future of the *Dermochelys coriacea* sp

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During those almost 5 months, we were working with marine turtles by studying their general behavior in order to understand how they are impacted in this region. In the center 3 researchers are working in the lab. Their mission is to measure, count and insure the health of turtles. However, among all of them, only a few have a PhD which is not something common in Mexico. As a result, there is a loss of precision in data measurement due also to a small amount of measurement tools. Directly in Mexico I contacted a marine biology supervisor I knew to help me with my thesis. With the help of Mary Cruz Rivera Gonzalez, responsible for the tortugario and Fabien Leprieur marine biologist in University of Montpellier, we were working together in order to help me regarding the collection of data and to assist me in the subject and writing of my thesis. Two species are present in the center: *Lepidochelys olivacea* and *Chelonia mydas*. Concerning the development of the MSc Project, the access to previous data recorded for the last 20 years were shared to extrapolate to establish a potential future scenario in the evolution of marine turtles species in the Pacific Mexican coast. By computing this with climate change parameters and also measurements like the male female ratio of newborns, a decrease in the proportion of eggs over the years and in general the abundance of turtles have been determined. In the next few months, we will try to improve forecasts on the future survival of marine turtles.

The ecological center is in charge of the preservation and the education but also the protection of marine turtles. Strategic learning by taking them from the beach, having a look at the eggs development and protecting them from possible predators and poachers. This master thesis project comes as a complement of studies already realized concerning the threats of all marine turtles species. Indeed, for almost 25 years the number of nests, eggs and newborns has been constantly decreasing. Now, 5 years later, there are no more leatherback nests on the Pacific coast of Mexico. Due to warming temperatures, this species has moved towards the northern region. The general idea is to try through analyses of several climate change parameters to determine if marine turtle species are going to disappear from this region or in the world or when male numbers will reach a point of no return. Through databases concerning sea surface temperature, sand moisture, air temperature, humidity, precipitation, it was possible to establish a connection between the decrease of survival and the ratio proportion. To summarize, a general increase of most parameters will lead in the future to more female presence and if some values are exceeded to a complete death.

I would like to express my special thanks of gratitude to my supervisor in Mexico and in France (River Gonzalez Mary Cruz and Leprieur Fabien) for helping me doing the researches needed on this topic and to know more about marine life and especially marine turtles. Any attempts I have made even if they were not satisfactory help me to understand first what was the work of a researcher and moreover that science can improve every day and we learn from mistakes. Secondly, I would like to thanks all the teachers I had during these two years of Erasmus Master through all the knowledge I accumulate to put them in practise during my internship. To all of you, thanking you.

How can we create successful conservation projects?

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After some years of collaboration in some marine and coastal conservation projects along the Gulf of California which included activities through citizen science, something became apparent, the necessity of non-profit projects to succeed is to be near the community to ensure positive outcomes in the foreseeable future. There must be a commitment to the place to help prolong actions as needed and to push local authorities. Local tour operators, fishermen, and the community should partake in leading roles. Hence, our duty as scientists is to provide data and ensure scientific education making it accessible. Providing proper education and involving different community sectors will lead to sustainable tourism and commercial activities.

MER COMMUNITY SUMMIT 2022 – ABSTRACT BOOK

MER CONSORTIUM: U Bordeaux, U Southampton, U Liège, U Basque Country

