

Whose mangrove is this?

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Ocean Training

9-11 January 2023
Ghent, Belgium

ABSTRACTS



2021 United Nations Decade
2030 of Ocean Science
for Sustainable Development



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Blue Schools in Europe: paving the way to collective action

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Abstract: The importance of protecting and sustainably managing the ocean is gaining increasing political and societal attention. In particular, efforts are made to engage children and to “bring the ocean” into the education system. Recently, the Network of EU Blue schools was launched as part of the wider EU4Ocean coalition supported by the European Commission, DG Mare. In European Blue Schools students are challenged to learn from real-life topics related to the ocean. By bringing marine and maritime contexts to the classroom, students are encouraged to become responsible and engaged ocean-literate European citizens, aware of socio-economic issues and sustainable development challenges, supporting our democratic values and Europe’s environmental ambition. In a European Blue School, teachers do not simply deliver information to their students, but assist them to craft a project where they can research, collaborate, and reflect actively on ocean issues. Students get the opportunity to develop a wide range of secondary (21st century) skills (social skills, solution-oriented thinking, creative thinking, among others). The concept of open schooling fosters a blend between formal and non-formal education and the participation of the community in school activities and projects: the school becomes an “agent of community well-being”, a hub for action and behaviour change. The European Blue School students work on sustainable development issues such as climate change and biodiversity. Some of the main topics that are addressed are “Food from the ocean”, “Ocean and climate”, “Healthy and clean ocean”. Students explore active European Citizenship through ocean subjects. To equip young people for a future as European citizens, we need to stimulate them to engage more in society and feel concerned by local issues and the wider European aims and objectives.

Resources for teachers on the "Ocean and Cryosphere in a Changing Climate"

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Abstract: The essential role of education in addressing the causes and consequences of anthropogenic climate change is increasingly being recognised at an international level. The Office for Climate Education (OCE) develops educational resources and proposes professional development opportunities to support teachers, worldwide, to mainstream climate change education. Drawing upon the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, the OCE has produced a set of educational resources that cover the scientific and societal dimensions, at local and global levels, while developing students' reasoning abilities and guiding them to take action (mitigation and/or adaptation) in their schools or communities.

These resources include:

1. Ready-to-use teacher handbook that (i) targets students from the last years of primary school to the end of lower-secondary school (aged 9 to 15), (ii) include scientific and pedagogical overviews, lesson plans, activities and worksheets, (iii) are interdisciplinary, covering topics in the natural sciences, social sciences, arts and physical education, (iv) promote active pedagogies: inquiry-based science education, role-play, debate, project based learning.
2. A Summary for teachers of the IPCC Special Report, presented together with a selection of related activities and exercises that can be implemented in the classroom.
3. A set of 10 videos where experts speak about a specific issue related to the ocean or the cryosphere, in the context of climate change.

4. A set of 4 multimedia activities offering students the possibility of working interactively in different topics related to climate change.
5. A set of 3 resources for teacher trainers, offering turnkey training protocols on the topics of climate change, ocean and cryosphere.

ONCE UPON A TIME THERE WAS A FISH CALLED COD...

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Abstract: Nowadays, although we know that knowledge is a critical factor in ocean literacy, we already realized that it is not sufficient to actually change individual's behavior. Affections and emotions are also crucial for developing pro-environmental behaviours. In this context, we created a digital educational resource "Once upon a time there was a fish called cod" (<https://projetobacalhau.ie.ulisboa.pt/>) that involves a set of memories related to cod fishing, aimed to promote an environmental and socially relevant learning using the cod as a "flag species". In Portugal, cod fishing is an important activity since the beginning of the XX century. Salted and dried cod was a cheap and easily preserved product and has therefore entered the consumption habits of the Portuguese population, until the present days. However, the Atlantic cod is currently included in the IUCN list as an endangered species. In fact, in the late 1920s, as a result of overfishing and climate change, cod began to become scarce. This digital educational resource involves testimonies of people linked to traditional cod fishing. The resource, that includes interviews, films, text, photographs, allows the exploration of various dimensions associated with the theme: History & Culture, Life on Board, Biology, Fisheries & Sustainability. The main objectives are to: enhance the identity and heritage resources linked to cod fishing; promote culture in its various dimensions; promote environmental awareness and respect for marine diversity; promote greater knowledge about the sustainability of fishing resources. The resource is free to use and is aimed at school age students, and can be explored in school or familiar context. This educational resource is a product of the project "Once upon a time there was a fish called cod: towards a sustainable use of marine resources", funded by Programa Crescimento Azul, from EEA Grants 2014-2021 (PT-INNOVATION-0036) and has the collaboration of Museu Marítimo de Ílhavo.

A new textbook: Oceans and Human Health: Opportunities and Risks (Elsevier Summer 2023)

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Abstract: The new Oceans and Human Health: Opportunities and Risks (Fleming et al 2023) is aimed at high level undergraduates and graduate students, as well as communities. It is interdisciplinary, trans-sector, geographically, and otherwise diverse (including the areas covered, authors involved, and overall vision). In particular, we propose this underlying vision: the relationship between the health of humans and the seas, coasts and ocean are inextricably interconnected; and going forward, there must be profound changes to how we, both as individuals and communities, interact with the ocean to preserve the health of the planet. Historically, Oceans and Human Health: Risks and Remedies from the Seas (Walsh 2008) and Seas, Society and Human Wellbeing (Bowen 2014) established the metadiscipline of Oceans and Human Health (OHH), primarily US-focused and risk-based. Europe expanded OHH through the European Marine Board White Paper on OHH and H2020 funded Seas Oceans and Public Health in Europe (SOPHIE) Project (<https://sophie2020.eu>). European OHH emphasizes the benefits and opportunities, not just risks. On both sides of the Atlantic, there is an increasing emphasis on the importance to human health of “ocean health,” leveraging off frameworks such as Planetary Health and One Health. With increasing interest in OHH globally, several MPAs and their human populations are being deemed “OHH Laboratories” for future understanding and action planning. As global attention of ocean chemical (including plastic) pollution increases, and the role of the Ocean in climate and environmental change established. Understanding the evidence base for blue environments contributions to human physical health and mental wellbeing becomes increasingly important. Global support of OHH is increasing as outlined in the IOC-sponsored international OHH webinar series and 2020 declaration of support by the Asian Pacific Academic Consortium for Public Health, alongside UN SDGs and Ocean Decade.

From Anchoring to Aquaculture: Engaging young women in ocean sciences by teaching traditional maritime skills

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Abstract: The first annual Captain's Academy (a paid, one-week, women-in-STEM internship) was developed and held last August (2022) at Madaket Marine on Nantucket Island, MA. The academy, developed by myself and the owner of Madaket Marine, aimed to educate girls in ocean sciences while giving them hands-on experience in traditional maritime skills that are typically dominated by men. These maritime skills are locally relevant as interns were chosen from historical whaling and modern-day fishing towns. Interns represented both private and public schools (domestic to U.S. and international) and come from a variety of socioeconomic backgrounds. Five modules were taught, including: Maritime Skills (Boating, Navigation), Aquaculture (Oysters for Restoration, Upweller Maintenance), Environmental Monitoring and Stewardship (Snorkel Surveys, Statistics in R), Marine Biology (Seining, Species Identification), and Professional Development (Public Speaking). Modules were developed partially based on what I, an IMBRSea graduate student, wish I was taught as a young teen. This year, being our maiden program, acts as a litmus test for best practices for engaging young women in marine science and maritime fields. Throughout the academy we collected feedback from interns on the curricula they found most engaging vs. pedagogies that did not engage them. We will also collect quantitative data on intern engagement 2-months post-Captain's Academy. For this presentation, I will dissect what pedagogies worked as well as what needs re-working for both our science modules and our traditional maritime education modules. Interestingly, many of the maritime science modules led to discussions on ocean sustainability (like why we can not anchor in eelgrass beds). Overall, we found hands-on activities led by a female in the field were most beneficial. For example, interns responded better to maintaining an oyster upweller than to lectures on filter feeding but gained the same knowledge.

Hybrid European program : between digital entrepreneurship and science education for sustainable development.

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Abstract: The EIT Climate-KIC Climate Leadership Journey is a European initiative. It is proposed under our master degree and prepares students, post graduates and young professionals to lead the transformation aiming at a net zero and climate resilient world. This program lasts 8 months in the year. During this period, the participants attend various events. First, online coaching sessions to improve personal soft skills. Secondly, online “Spark events”, which are seminars dealing with environment, climate change and entrepreneurship related subjects. And thirdly, a summer school, which lasts 2 weeks. During these two weeks, participants work on an international group project proposing solutions to climate change issues. It is a concrete way to learn, by doing so, how to work with people from various backgrounds, which is really important in science. Otherwise at the end of the year, the participants must create their own personal project. For example, this project gives us the opportunity to organize a round table, about sustainability of fisheries, with different stakeholders of marine sciences. The Climate KIC program is an excellent opportunity to widen our perspective and offers completely different opportunities than usual. However this kind of hybrid program, with a big part online, has its limits. This type of international and pluridisciplinary program remains a valuable solution to educate scientists for sustainable development as we will need to deal with environmental issues with a socio-economic insight.

“Develop a wider marine community by an international digital university: the case of UN e-SEA”

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The blue economy combines many challenges for higher education. In one hand, the traditional maritime activities are transformed. In the other hand, many new professional sectors are now involved in marine activities. Furthermore, the sea and ocean are facing many perturbations such as climate change, anthropic pressure, the evolution of value chains, which require big changes. Last but not least, the international community is more and more sensibilized to the environmental issues, while Industry and Ecology are less and less considered as opposite concepts. In this context, the higher education is being pushed to transform quickly and globally, contents, programs, organizations, and education design, in order to absorb the number of needs emerging from various sectors, at both technical and management level. These constraints need for an interdisciplinary perspective and analysis: spatial planning, infrastructure management, logistic and economics, bio-chemical analysis, legal issues, etc. Furthermore, actors involved in tackling against climate change are various, from administrations to civil society, covering several professional cultures and backgrounds. To acculturate this high diversity of stakeholder, it is required first to build common references and concepts and to share and give access to case studies through a common framework and language. This approach appears as a condition for an effective pedagogical and reflexive process related to the future of marine and coastal areas. In their own sphere, Nantes Université and IUML, which are known for interdisciplinary skills not only in sea sciences, but also in human sciences dedicated to maritime activities, has been required for the skills reinforcement in the modernization of maritime trainings, by several countries and organizations.

Facing the lack of researcher's availability, Nantes and IUML imagined a solution consisting in a digital university. UN e-SEA has been developed since 2016 in order to become the first digital university in Sea Sciences. Year by year, the training design has been growing in order to increase its capacity to integrate a wider marine community. The training design of digital learning is based on the following elements:

- An e-training platform accessible all over the world with several levels of access regarding the confidentiality of resources, and the property rights, but also promoting open sources.
- Technical specifications for digital resources, according to competency-based approach, and cognitive ergonomics recommendations.
- Mixed teaching teams associating academics and practitioners.
- A training design methodology specifically built to support interdisciplinary contents.

- A specific business model based on the coexistence of massive courses and customized trainings.

- Service design in order to ensure the individualized pathways.

- Education design which uses project-based-learning approach and co-development, in order to increase relations between students and professionals, and optimize the variety of learner's profiles for training and research.

Beyond the digital platform, UN e-SEA aims at increasing the marine training community by proposing hybrid trainings in association with other universities and training centres all over the world. This action is led using different additional activities:

- International partnership coordination

- International exchanges

- Short mobilities

- Trainings for trainers

- Scientific excursions

- Junior conferences

- Production of open education resources

- Research trainings

After 6 years, the UN e-SEA marine community includes more than 600 users across multiples countries. The next step for the Sea Sciences Digital university is developing a collaborative webportal funded on four pillars:

- Offer a series of existing good practice and a method to create new ones. The expert will chose an area corresponding to this study case (tourism development, quality of water development, adaptation of ports infrastructures, resilience of existing infrastructures and houses to climate change, reduction of macro-wastes...) and will be able to analysis in detail this study case through the same platform.

- Teach people on an existing e-learning platform UN-e-SEA how to understand the interdisciplinary context. We start from the fact that people have already an expertise and a goal.

- Guide experts through an individual program based on a questionnaire about his past experience and expertise by teaching modules complementary to this background and in line with the wish (study case).

- Propose interactive tools in order to increase professional interactions towards user community.

“INTO THE DEEP” – Online learning and community science involvement for all across deep sea ecosystems

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Abstract: Recent technological developments are allowing images and videos of marine ecosystems to be collected by researchers, companies and monitoring organisations are a rapidly increasing rate. New datasets from beneath polar oceans, the deep sea and the complex seafloor topographies of the Mediterranean and elsewhere are providing material which has great applicability for both general education for school and university students, but of additional interest to a host of adults from diverse communities who would be interested in learning about these environments and taking an active role in ongoing research. To open these new datasets to as wide a range of educatory bodies and users as possible, a recent ERASMUS+ training project has been established; "Into The Deep". Over the next two years this project will develop with marine scientists, skilled educators and target users an online image exploration platform which can be used to allow open access to these new data. In addition, this platform, based on the well-known marine image analysis platform "BIIGLE", will allow interested users, as "community researchers" to make input into ongoing research by opening image sets to labelling for key research questions. These questions, integrated into educational material assembled by the team, will be focused on addressing topics such as pollution, global environmental change and biodiversity maintenance. In this presentation we will introduce the platform and educational materials currently under production within the project.

e-courses for masters: online fundamental semester for master on climate – related science disciplines

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Abstract: The Climate Graduate School of the Institut Pierre-Simon Laplace (CGS-IPSL) is currently developing a series of seven courses online for Master students. On these seven courses of 3 ECTS each, three have a strong focus on the ocean: Dynamics of the Ocean and Atmosphere; Contemporary Biogeochemical Cycles; Study of Paleo-climates. Each course is led by a pair of university teachers specialists in their field accompanied by a pedagogical and graphic team in order to design all resources specifically adapted to graduate students and online education. Indeed, our first goal is to open these courses as self-paced learning under the IPSL Learning Management System (Moodle) to students who will be joining CGS-IPSL masters without having all the prerequisites so that they can update their academic background. These courses could also be open to second year CGS IPSL Master students who aimed at acquiring credits on a secondary theme not necessarily developed in their master (e.g. on biogeochemistry for students registered in an ocean – climate master). Finally all the e-resources developed will be made available at least to the educational community of the CGS-IPSL that include several Universities in and around Paris (Sorbonne Universite, Paris Saclay, Universite Versailles Saint Quentin, Université Paris Est Créteil...) in order to reuse these resources for higher education either on-line or face-to-face courses. The courses will be available in both French and English so that international students can have access to these e-resources.

Short Online Courses (SOCs) supporting ocean education and training

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Abstract: Digital education is a novel and accessible learning opportunity giving the possibility to boost individual achievements and gain further education in a flexible time and cost environment. While digital learning usually does not include in-person interaction between educators and learners, and does not involve hands-on field and laboratory practice, it can still act as a channelling tool for these activities by raising awareness about the increasing diversity of study and work topics. Within the EU-Strategic Partnership Ocean Training project, free Short Online Courses (SOCs) have been designed and made available on a Virtual Learning Environment (VLE) platform to enhance knowledge in the field of marine science. SOCs are asynchronous self-learning experiences created to support fundamental synchronous courses and to provide additional relevant and learner-led learning resources in acknowledgement of the diverse educational backgrounds of learners. These SOCs are targeted to students as well as researchers, trainers and any other stakeholder interested in marine science. The newly developed SOCs are user friendly, eye-catching and contain a wide range of stimulating digital resources including videos, pictures, infographics, and interactive tools to entice students to enroll and engage. Since SOCs are short learning modules based on self-paced learning, creators may never interact with users; however, SOCs are dynamic tools, and they feature mechanisms for improvement via users' feedback. All the SOCs have been based on a standardised framework that could be used by other course designers to shape further educational tools on marine science. Here, strengths and weaknesses of the SOCs will be highlighted with the aim to open a discussion about how to further improve them.

Digital tools to support the sharing of learning resources in marine sciences

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Abstract: Every day, university educators in marine sciences create and improve educational resources (documents, video, audio, exams) following the most advanced scientific results. Storing and sharing these resources outside of a teacher's or university's own collection are seldom performed while individuals may have interest to do so to benefit from re-using and integrating free educational materials to their own practice. The EU-Strategic Partnership Ocean Training project is committed to produce free digital toolboxes for marine sciences and for widespread distribution. One toolbox is the production of a repository to allow teachers to post their resources in a citable and exportable format. This tool will increase access to digital learning resources preserving the authorship. To create this tool, we are referring to existing efforts in referencing academic resources for marine programmes, reviewing the need for informative metadata and identifying a publisher to generate DOIs for each resource. The work so far is based on the results of a survey of university educators in marine sciences. We will share a number of the questions and recommendations that emerged, and we will also seek your feedback on the work to date.

e-CalPSuL: Short videos freely available on fundamental concepts in Ocean and Climate science for undergraduate students

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Abstract: The Climate Graduate School of the Institut Pierre-Simon Laplace (CGS-IPSL) and Sorbonne Université (SU) have developed a series of more than 40 short videos capsules (typically 5-10' each) to explain the fundamental concepts in the fields of oceanography, climate, paleoclimate and atmospheric sciences. These videos have been shot by experts in their field who were accompanied by a pedagogical and graphic team in order to adapt the text, scenario and images content specifically to undergraduate students. The videos are all freely viewable on the canal-u tv channel of CGS-IPSL either in English (<https://www.canal-u.tv/chaines/ipsl/short-videos-spoc-undergraduate>) or French (<https://www.canal-u.tv/chaines/ipsl/videos-courtes-spoc-niveau-licence>). More specifically for Oceanography they describe the main features of the ocean's circulation (gyres, thermohaline circulation, convection, Gulf stream, upwelling...) as well as more specific characteristic such the coupling ocean - atmosphere (wind circulation, monsoon, El-Nino Southern Oscillation...) ocean - biology (physics - biology) as well as ocean- climate at different time scales (paleoceanography proxies, Last Glacial Maximum...). The small educational content of each of the resources in these videos allows for a wide variety of uses such as: flipped class, resources for revision before exams, acquiring the prerequisites e.g. before joining a Master, deepen a topic that was not sufficiently developed in class, integration into a Learning Management System such as Moodle with added quiz / resources etc. Depending on the different uses that vary each year, between 5,000 to 15,000 views are made on those videos on our IPSL CSG channel. Polls show that 90% of the first year students who are watching these educational videos found them useful for the introduction course on Earth – Climate – Environment sciences.

Digital immersive experience: Catch your lobster and eat it.

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Abstract: While the Covid Pandemic seems like somewhat of a distant memory it highlighted that technology exists that allows the integration of interactive teaching and learning techniques with the more conventional on-campus style of delivery. Furthermore, the covid crisis served as a catalyst for a transition that appears to be unavoidable in the face of a rapidly progressing digitization, forcing higher education to review and assess the efficacy of existing teaching formats and routines in the face of digital alternatives. The pandemic presented a challenge but also an opportunity to evaluate fully on campus modules and redesign parts of them for a blended delivery, leveraging current technology and pedagogic tools to provide an enhanced student experience. The project Catch your lobster and I eat it was conceptualised during this time aiming to combine science and culinary arts for the development of engaging Digital Learning Resources (DLR) and immersive field, laboratory, and kitchen experiences for students. It will provide students with remote practical-based work experience opportunities. Lobster can be a somewhat difficult to access and a quite expensive commodity for students to work with in both a scientific and culinary context, and this DLR will provide virtual learning experience which will make the species more accessible to the learner. The DLR is exploring the habitat and fishing of the lobster, sustainability aspects, internal and external anatomy, quality and storage aspects, animal ethics and welfare, individual parts of the lobster and their use in a variety of recipes for a selection of dishes, from head to tail to shell, all supported by immersive detailed video documentation, tutorials and interactive quizzes all aimed at better engaging students. Apart from creating this immersive DLR, the experience gained during the development process, and lessons learned will be shared to support and inform future projects of a similar nature.

STREAMING SCIENCE: A NEW FORM OF OCEAN SCIENCE

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Abstract: Nowadays, digital tools allow a limitless number of different learning resources. However, there is still much to be done concerning digital tools and learning in ocean science. As an example: even though it is common to use social media such as Facebook, LinkedIn, or Twitter for ocean science, most young people consume other types of platforms such as TikTok, YouTube, and Twitch. These platforms get more attention from young people, in this way reaching a broader audience. Here, the potential of these last three platforms is discussed and evaluated. First, TikTok is known for having viral clips with millions of visualizations, making it the perfect social media to reach many young people and create a community interested in learning about the ocean. Furthermore, YouTube is also known for having viral videos, which allow a different type of communication. Lastly, Twitch is a platform known for doing live videos of any type e.g., gaming, just chatting, cooking, and traveling. Twitch can also reach a big audience, especially big streamers (people who stream there), to the point of reaching millions of people watching it live. Moreover, apart from the platforms themselves, there are also the streamers, which in a great measure know how to communicate and have an impact on young people. This will help ocean science in terms of audience, and it will attract more people to be interested and learn about the sea. In summary, the channel we use to communicate and spread ocean science and learning is equally important to how we disseminate to a non-scientific public. New platforms allow scientists to connect with a younger audience.

Keywords: digital media, potential, audience, ocean science, Twitch, TikTok, YouTube, stream

The BlueBio COFUND: a Coordinated R&D funding scheme to strengthen Europe's position in the blue bioeconomy.

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Abstract: The BlueBio COFUND (<https://bluebioeconomy.eu/>) is the result of a collaboration between JPI Oceans and the former ERA-NETS COFASP and ERA MBT and consists of 27 partners from 16 countries. The main objective of the BlueBio COFUND is to establish a coordinated R&D funding scheme able to strengthen Europe's position in the blue bioeconomy, based on the launch of call for proposals of co-funded research projects aiming at identifying new and at improving existing ways of bringing bio-based products and services to the market and finding new ways of creating value in the blue bioeconomy. The project is divided into 8 Work Packages mainly related to the management of the co-funded calls. In particular, Work Package 7 (Related Activities) was implemented for delivering actions which can better address the impact of research and valorisation from different stakeholders of the Blue Bioeconomy sector. Specifically, task T7.3 (Human Capacity Building including RRI, Training and Mobility exchange) was dedicated to facilitating the exchange and sharing of knowledge and technology between the ongoing projects by means of ad hoc mobility and training initiatives. Training activities were requested to be explicitly embedded in the research project proposals to be submitted to the BlueBio calls, and the follow-up and monitoring of funded projects also included a specific section on Human Capacity Building (HCB) based on the use of questionnaires. The output of questionnaires has been disseminated to projects coordinators to facilitate the follow-up and the evaluation of their own HCB activities, and in addition it was the base for identifying significant training needs and gaps along the Blue Bioeconomy value chains. As a consequence, to date two Advanced Training Courses on Blue Biotechnologies were also organized, engaging the wider marine community across academia, government (policy and funding) and industry.

IFSEA: a transdisciplinary graduate school for marine, fisheries and seafood sciences

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Abstract: Seafood is one of the most widely traded food commodities in the world and is as an important component of the global food portfolio for fulfilling the nutritional demands of a growing population. However, this sector is facing emerging challenges. How to ensure that seafood is both environmentally and socially sustainable has therefore become a key concern. To this end, the implementation of innovative and transdisciplinary approaches linking traditionally segmented sectors is needed. In light of this, the IFSEA projects aims to create a graduate school specialising in marine, fisheries and seafood sciences in order to carry out innovative research and train researchers and professionals to tackle the environmental, societal and economic challenges of the seafood sector through transdisciplinary approaches. Launched in September 2022 IFSEA benefits from a strategic position in Boulogne-sur-Mer, France's leading fishing port and Europe's largest seafood processing centre, which is home to high-level research laboratories and universities. The IFSEA graduate school brings together local research bodies and socio-economic partners within a programme embracing a transdisciplinary approach. It is structured around 4 complementary research and training themes covering the entire seafood sector: (1) marine ecosystems, from biodiversity to sustainable resources (2) assessment and management of seafood safety and quality (3) supply chain engineering and international trade and (4) governance and coastal planning policies. IFSEA is built on 9 Master's specialities to create a new transdisciplinary training programme that will enable the development of new skills and professions to tackle the challenges of the seafood sector. This 10-year project will also support transdisciplinary research projects through PhD and post-doctoral fellowships as well as international mobility, innovation through cross-fertilisation of disciplines and connections with the socio-economic world.

Blue skills: regional education for dialogue in the Mediterranean region

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Abstract: In line with the EU skills agenda for sustainable competitiveness, social fairness and resilience, the EU strategy for blue economy and the next generation EU for ecological transition and digital transformation, the National Institute of Oceanography and Applied Geophysics - OGS, in partnership with other actors from public and private sectors (universities, research institutions, governmental bodies, industries), is promoting a multidisciplinary training path that aims at overcoming the existing “skill mismatch” in the Mediterranean region between education and training offer and the labor market needs. This initiative has been evolving and a project has been submitted to the national authority (Ministry of university and research – MUR) and positively evaluated and approved. Blue Skills initiative was labelled by the Union for the Mediterranean in 2019 as one of successful best practices to be included within the framework of the Med4Jobs initiative, and received the best project award for skill development and circulation in 2021 by the WESTMED initiative and European Commission. The main goal is to create the conditions to promote joint, complementary and concrete actions to maximise the impact of investing in improving existing skills (upskilling) and training in new skills (reskilling) in the identified field throughout education and bridge the gap between government-industry-academia in the blue economy sector through developing skills and building partnerships in the Mediterranean region with particular focus on youth. To reach these objectives, a tailored made method has been elaborated with a training path including:

a yearly summer school (45-50 participants per year); an advanced master degree in sustainable blue economy jointly organized with the University of Trieste (25 students); access to research infrastructures and international mobility program; support of vocational training and public outreach and scientific communication to local communities.

Raising awareness on Blue Economy topics through non-formal educational activities: the case studies of FAIRSEA and IMPATTO

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Abstract: The Italian National Institute of Oceanography and Applied Geophysics – OGS addresses the issues related to the sustainable blue economy and ocean literacy through dissemination activities addressed to a broader public and adopting different approaches including non-formal methodologies, addressing societal impact within the so-called institutional 3rd mission. In this framework, game based learning is an innovative educational approach that seeks to motivate participants by using game design and game elements to raise awareness on different topics, engaging also difficult targets thanks to the informal approach. Within the framework of the Interreg project FAIRSEA - Fisheries in the Adriatic Sea - a Shared Ecosystem Approach, OGS developed two games based on sustainable fisheries in the Mediterranean, with the aim of making people more aware about the world of fisheries in the Mediterranean Sea. One game was a role play game developed with the Play Decide format, the other is a card game called Fish 'n Ships. Fish n' Ships is a multiplayer card game about marine conservation: fish in a sustainable way in your sea in order to obtain more points than the other players for cards in the sea and cards of caught species. An online version was also published (www.fishnships.it) due to the safety restrictions for gathering in person during the Covid-19 pandemic situation. Within the framework of the project DIVERSO - dissemination and research for a sustainable future, OGS developed a board game called IMPATTO to contribute to the dissemination of a subgroup of Sustainable Development Goals (SDGs) promoted by the United Nations Organization. IMPATTO deals with the different aspects of the activities of a research institution, from finding resources through innovation to project development, in line with the SDGs of the 2030 Agenda. Those experiences testified how game based learning is a useful tool to promote ocean literacy among different targets, spanning from younger generations to adults.

Educating the Irish consumer of the value of under-utilised seafood resources

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Abstract: In Ireland, fish and seafood consumption is generally low across the population. Some catch from Irish fisheries has limited market value, and mainly marketed frozen for export or used for fishmeal. In addition, fish-processing produces biological waste from on-board gutting of fish, then disposed of at sea. On-shore oily-fish processors send waste streams predominantly for fish meal preparation. However, side streams contain nutritious fish ingredients (e.g. liver, roe and milt) which could contribute to enhance foodstuffs protein and ω -3 profile. The driving force of these projects (MSc and PhD) was a need to add value to current underused catch and reduce and reuse fish waste streams. For these reasons the attention focused on adding value to sprats, and using marine fish gonads and fish liver, which are not commonly consumed in Ireland and are considered by fishermen to be a by-product. The outcome was the production a range of new food products for the Irish consumer, (salted air-dried product and four spreads) and tested for physicochemical characteristics, microbial safety, sensory attributes and consumer acceptance. Five products were manufactured highlighting opportunities to use roe, milt and liver and two products that showed opportunities for diversification in the use of sprats. In addition, the projects created highly skilled individuals in the area of utilisation of marine resources, and it also investigated attitudes of younger consumers to seafood consumption and produced a 2h workshop where secondary school students in Ireland were taught about senses and their influence in their food choice with specific focus on seafood products and its consumption. Overall, the projects contributed to highlight the importance of highly nutritious and underutilised resources, showed the opportunities to create new seafood products for Irish consumers and expanded the knowledge of the importance of seafood in diets for healthy individuals.

Ocean literacy for a more sustainable blue economy: Assessing knowledge, perspectives, behaviour and interests in maritime professionals

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Abstract: Ocean literacy initiatives are increasing at local, national and regional scales. These initiatives seek to improve the understanding of ocean-related issues by boosting the connection between humans and the ocean and are carried out as formal, non-formal and informal educational activities. While the raise in the number of ocean-literacy-related trainings is promising, measuring their effectiveness is usually not easy given the lack of baseline data on the ocean literacy levels of participants. However important this baseline data, there are only few studies that quantified the levels of ocean literacy in society, this was mostly done for pupils at school. To date, there is no data on ocean literacy levels available for sectors of society such as the blue economy. In this study, we deployed the Blue Survey, a validated survey to measure ocean literacy, among maritime professionals in Europe. From a total of 710 participants, 536 complete responses were used in the analysis. Using two Exploratory Factor Analyses (EFA), we found that for shaping an ocean literate maritime professional one should consider five factors, viz. knowledge of ocean-related topics, attitudes towards ocean sustainability, ocean-friendly behaviour, attitudes towards the use of the ocean and personal interest. Our results indicated significant relationships between the ocean literacy factors identified and sociodemographic variables (age, coastal origin, blue economy sector, company size and occupation). These results might set a benchmark for current and future blue initiatives targeting maritime workers and may help researchers and practitioners to better align their trainings.

Combining science and art creates unique opportunities in education for sustainable development.

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Abstract: Recent reports investigating the ongoing climate and biodiversity crises have indicated nature's decline is 'unprecedented', species extinction rates are 'accelerating', 'transformative change' is required and it's 'now or never'. Quality education for sustainable development provides a powerful tool to drive action towards addressing the challenges we face. Awareness and knowledge of the effects of ongoing human activities on our ecosystems can influence societal values and attitudes to motivate responsible action towards a more sustainable future. Here, we have undertaken a transdisciplinary project bringing together education, science, art, and taxidermy to highlight the plight of a range of seabird species in the face of ongoing pressures. Our project addresses the three pillars of sustainability providing learning opportunities in environmental, economic, and social sustainability. For example, through the installations we have prepared, we highlight global issues such as climate change, biodiversity loss, food provision, waste management and sustainability in the built environment. We employ ethical taxidermy techniques making use of animal specimens found dead, and when carried out ethically, taxidermy provides a visually impactful, educational tool. Through this creative, innovative, and appealing artistic approach to taxidermy we have developed resources that convey vital messages of conservation and biodiversity protection, as well as social responsibility in protecting our natural heritage. These resources provide unique opportunities for developing a range of lessons to support education for sustainable development in both formal and informal learning environments. We provide an outline of the project tasks and timeline. We also share a case study of the use of the project in providing

education for sustainable development in an informal learning environment during a recent museum exhibition.

A toolbox of ocean-related educational activities tells the 10 years story of project M.A.R.E.

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Abstract: Protected Areas, such as Natural Parks and Reserves, represent a great opportunity to practice educational activities offering concrete approaches towards nature conservation and sustainable development. Since 2013 the Marine Protected Area (MPA) Punta Campanella (Italy) has been running a long-term (9 months) volunteering program called M.A.R.E. "Marine Adventures Respecting the Environment ". M.A.R.E is taking place every year within the ESC/ERASMUS+ programme of the EU that provides funding in the fields of youth volunteering, education and training. The aim is to offer volunteers the opportunity to support the MPA and its staff for joint conservation programmes. In the past 10 years, the park has hosted about 100 volunteers and 40 university interns from 15 different countries of Europe, surrounding areas and the US. Participants come from different educational and cultural backgrounds, bringing a lot of enthusiasm and energy, but with few or no previous experience with marine conservation and outdoor activities. That is where the unique educational programme of M.A.R.E starts. The project is structured in two phases: a 2-months intensive training programme, and a 7-months period of "marine adventures respecting the environment" where the volunteers explore the marine world through a wide range of multidisciplinary activities based on a "learning by doing" approach. The long term results of the project are astonishing: more than a hundred youngsters have been initiated to the world of marine conservation and endorsed the role of environmental communicators with thousands of tourists, runned several educational projects in the local schools, produced tens of in- and outdoor activities and participated in several conferences. The team of M.A.R.E. offers a ready-to-use toolbox containing field-proved ocean-related educational activities elaborated during the 10 years of project M.A.R.E. with the potential of being replicated in other protected areas.

Advancing Scientific Dive Training and its Role in Marine Higher Education

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Abstract: Ongoing rapid global change in our oceans and coastal ecosystems highlight the need for insightful observation and science to support sustainable development. Scientific diving is a nexus for many areas of marine research and diving-based approaches are in growing demand in many fields, from maritime archaeology to environmental sciences and ocean literacy, and, for example, in efforts to understand consequences of rapid biodiversity change in coastal ecosystems. Nevertheless, current training options in higher education are exceptionally limited in many regions and, even when available, the present structures of these programs often have limited applicability in blue economy-based careers. I will discuss ways to develop the contemporary structure of scientific dive training to facilitate its place in marine higher education and provide applicable professional skills for growing demands in ocean sciences and blue economies. Newly developed Finnish models of scientific diving training, established within structures of European scientific diving levels could provide a flexible pathway benefitting a new generation of graduates. I will highlight the changes needed to the structure of the current training programmes to meet the demands of future marine science. This is in-line with strategies laid out within various European initiatives (e.g. AssemblePlus), that call for flexible pathways to train marine scientists with globally applicable field skills that complement their academic training.

Meaningful ocean education: creating educational resources that promote ocean literacy, cross-curricular learning, and collaborative relationships

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Abstract: The Marine Institute's Explorers Education Programme has successfully been working with primary schools introducing ocean literacy activities for over 15 years in Ireland. The programme is funded by Ireland's state agency the Marine Institute and its key success is its approach in working in collaboration with a number of stakeholders including scientists, private organisations, environmental organisations, aquariums and science centres. There is a growing recognition of the importance of healthy ecosystems to our general well-being. The ocean keeps us alive, as well as providing food and other resources including jobs and economic value. Making the public aware of this need for healthy oceans is especially important as the world tackles and adapts to the climate and biodiversity crises. Primary school children are an ideal audience to engage with about the importance of the ocean. Integrating the ocean into the primary school curriculum allows teachers and educators to discuss important topics such as the conservation of the world's oceans while meeting educational goals such as covering STEAM subjects, 21st Century skills, and encouraging children to be active citizens and participants in society. Through the development of printed and online resources relating to deep-sea species, sharks, and healthy oceans (including plastic pollution and climate change), the Marine Institute's Explorers Education Programme aims to encourage children and teachers with varying interests to become engaged with marine conservation in a meaningful way. In addition to demonstrating how the ocean can be used in cross-curricular learning, the aim of these resources is to incorporate the UN Sustainable Development Goals and the ocean literacy concepts into education. In creating informative, wide-reaching, and engaging resources, the Explorers Education Programme aims to create Ocean Champions that together with their peers and families consider a healthy ocean a top priority.

Floating Classroom

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Abstract: The climate and biodiversity crises are at a tipping point, and eco-anxiety is becoming increasingly prominent in modern-day society. However, government officials and policymakers still need to take meaningful actions towards sustainability. The Irish Whale and Dolphin Group (IWDG) is an all Island non-governmental organisation (NGO) based in Ireland. Its mission is to promote a better understanding of cetaceans and their habitats through education, collaboration and research. At the core of its mission is a dynamic education and outreach programme that supports and empowers citizens to become aware ocean advocates with the knowledge and skills to participate in Ireland's growing movement towards a blue and sustainable economy. Floating Classroom is a novel ESD initiative that takes learners outside the classroom and onto the research vessel Celtic Mist. Sailing to different coastal communities, the multidisciplinary approach engages junior cycle students, at-risk youth and adults in ESD topics during a two-week programme. Scientists often use sentinel species like whales and dolphins to monitor the health of marine ecosystems. Sibéal Regan is an experienced marine mammal observer (MMO) and science communicator that has drawn on her personal experiences and knowledge of these charismatic animals to capture people's attention and engage them with ESD topics. In addition to workshops provided by Sibéal during floating classroom dedicated resource packs are given to educators allowing them to continue exploring ocean science inside their classrooms after Floating Classroom has finished. We would appreciate the opportunity to share further information about this project, including how other European organisations could adapt it to suit their needs.

Opening the door of the ocean to students : the educative inputs of oceanographic campaign.

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Abstract: « What is a scientist after all? It is a curious man looking through a keyhole, the keyhole of nature, trying to know what's going on. ». This sentence from officer Cousteau echoes in me. Indeed, taking part in an oceanographic campaign made me feel that for a moment we, scientists, were able to open the door that separates us from the environment. Many people would assure that taking part in an oceanographic campaign is an incredible educative experience. The number of floating universities and campaigns corroborates this : in 2022 in France, both marine science masters at Sorbonne university and at least masters from Brest and La Réunion offered this opportunity. Even if it can be seen as the attractive tip of the iceberg in oceanography : a sound experience on the CV, pleasant memories with the crew and photos of sunset... it brings crucial learnings to students in a context of education for sustainable development. From intense teamwork, collaboration in multidisciplinary international teams to personal maturity and scientific reasoning : scientists-to-be are transformed. Facing real observation conditions, scaling our sampling ability and how complex it is to precisely understand this dynamic environment bring students to re-evaluate their vision on oceanography. These concepts and approaches, that are critical for sustainable development education, need to be lived to be fully understood. However when we consider the cost and carbon footprint of an oceanographic campaign, they can't be generalized as any classes, and this is where innovation in education is crucial. I took part in 2 oceanographic campaigns as a student from Sorbonne University. I intend to collect feedbacks from about twenty other master's students who had this opportunity in order to present a deeper insight of how this experience impacted them.

Floating universities: a high-valuable experience for marine students

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Abstract: Oceanographic expeditions are the core of marine sciences because huge quantities of data are collected and new key features discovered. Thus, involving students through on-float universities is a high-valuable experience that allows them to face the reality of the field, bringing concrete knowledge and skills. Moreover, interacting with international scientists is the perfect way to deepen their knowledge on specific subjects, broaden their curiosity and discover new fields of research. These experiences enable students to tackle issues with a systemic perspective.

'I can see the sea!' – Blue Health to improve the wellbeing of communities from a medical student perspective

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Abstract: Water is necessary for life and humans use water for a range of purposes. The 'blue health' field was investigated over a 6 week experiential period and a subsequent literature review, including a 10 day sailing voyage on the Jubilee Sailing Trust's (JST) Tenacious mixed-ability tall ship. Blue health can be understood as interventions to improve health performed in an aquatic setting (Britton et al., 2018). Methodology: The main lenses of focus were through 'embodiment' and the experience of disabled sailors aboard the Tenacious. A 6 week exploration was undertaken of the blue health field, including activities such as open water swimming and paddleboarding. A review of the databases Medline, Cochrane and Allied and Complementary Medicine (AMED) was performed. The following search terms were used: 'disabl*' AND ('blue health' OR 'water' OR 'water resources' OR 'water movements'). Papers not available in English were excluded. Results: Through the literature search, there was evidence to support the value of a blue health approach, however the quality of evidence available was limited. Interventions, including interoception-improving techniques, audiovisual recordings of sea settings and sailing, hold benefits for patients. These experiences can allow them to form alternative embodied knowledges, in particular around disability. Blue health also has an ecological dimension: protection of the aquatic environment also protects the health of humans. Conclusion: More research is necessary in the blue health sphere on local, national and global levels. Blue health represents an intersection between art, sciences, and disability, and is a valuable resource for people to develop an embodied sensory experience and new social practices with water. Healthcare professionals should inform themselves and their communities on blue health approaches to facilitate improved patient access and directly contribute to this growing field.

The french Marine Universities Network: bridging marine higher education in France, Europe and abroad

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Abstract: The french Network of Marine Universities (RUM) was created in 2011 with the aim of promoting high-level research and higher education in marine sciences at large. By developing relationships between our institutions, the RUM aims to increase the national, European and international visibility of French universities operating in the field of marine sciences. One of our most prominent mission is to offer students a centralized access point to university training in this fundamentally interdisciplinary field, encompassing as exhaustively as possible the various possible courses at the bachelor's, master's and doctoral studies levels within the 17 institutions of the RUM. Many of the RUM Universities are engaged in international relationships regarding marine training (e.g. IMBRSEA, MarineEnvironment+,...). Several of them have set up interdisciplinary Ocean-oriented institutes to promote ocean literacy across disciplines and develop the awareness of our students to the various approaches that are needed to fully grasp ocean matters. The RUM is actively involved in the European Marine Board (EMB) activities with a special focus on training related topics. The RUM has also been at the origin of the France-Quebec Institute for Scientific Cooperation in support of the maritime sector (IFQM), supporting student and teachers exchanges and organizing dedicated summer schools. This presentation will illustrate some of these elements with recent actual achievements.

Cambodia and marine science: a sea of opportunities and needs

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Abstract: Cambodia has been working steadily and proudly since the end of the PolPot regime (7th January 1979) and the following civil war ('90s) to rebuild a deeply hurt country. The education system and academic world have been suffering from the Khmer Rouge regime extermination of the intellectual and scholars of the time, especially in the public sector. Structural bottlenecks in the way foreign investments have been injected into the economy have been characterized by poor medium- to long-term vision and a lack of sustainability hampering the proper establishment of new knowledge and skills within and between the various universities. Local NGOs often have played a major role in channeling European and Asian money into needed action and especially so for what concerns the scene of marine biology and conservation science and education. In this flash lecture we wish to present an overview of the status of marine education in Cambodia and the ongoing collaborations that the Marine Biology Laboratory of Ghent University has fostered during the past 5 years. Finally, we wish to highlight the possibilities and needs for more capacity building in the marine field and to invite all of you to join forces in this much needed effort.

Developing green skills in Nautical Tourism

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Abstract: EnviroNaut is a two years Erasmus+ project which aims to create the first-ever curriculum for the position of “Environmental Officer in Nautical Tourism”. These figures will facilitate the transition of the sector towards more sustainability and environmental protection. The main deliverables of the project will be the creation of a curriculum and a modular online course on ocean education and sustainable practices. The target groups are employees of the Nautical Sector such as skippers, marina’s officers and water sport clubs staff and users. The course is developed in the Vocational Education Training (VET) European frame, where the main objective is to enhance citizens employability and respond to the needs of economy. The online course will be developed on the platform Articulate 360, a smart and effective tool for learning. It will cover 3 types of learning: knowledge, skills and competences; using a combination of direct and experiential learning and some more interactive activities, such as small projects and games. The course is structured in one general mandatory module about Ocean Literacy and Citizen Science followed by four different modules specific to the sectors. The core part of the online course will have a duration of around 15 hours, arriving to 36 hours if all the modules will be completed. The online course is free and can be remotely accessed. After the completion of a final test, a European certification will be released. More information can be found on the project website <https://environaut.eu/>.

LEARNING FOR DEEP OCEAN CITIZENSHIP – DESIGN IMPLICATIONS FOR OCEAN LITERACY PROGRAMMES

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Abstract: The ocean is vital for planetary system health and a place that evokes strong human sensory experiences. Human actions continue to deteriorate ocean health, which is why the United Nations (UN) aim to foster participatory sustainable ocean governance and define ocean knowledgeable citizens as essential for citizenship governance participation. Still, UN's narrow focus on individual pro-ocean behaviours does not bridge the gap between knowledge and collective action, which is criticised by marine social scientist Pamela May Buchan (2021). The presented research formulates practical design implications for ocean literacy programmes to foster Buchan's drivers of deep ocean citizenship, which are emotional attachment to the ocean as a place, ocean identity development, self-efficacy and knowledge. This action-oriented and transdisciplinary work theoretically conceptualises ocean literacy, deep ocean citizenship and opportunities for deep learning through an interdisciplinary literature review and collected empirical qualitative data through semi-structured narrative interviews and participant observations of ocean citizens and education practitioners and conducted an ocean literacy session as a case study. The findings support Buchan's drivers of deep ocean citizenship and suggest two additional drivers: mental and emotional well-being of citizens and just representation of all human-ocean relationships based on a shared acknowledgement of the intrinsic value of the ocean. Accordingly, this research underlines the significance of emotional learning for deep ocean citizenship through ocean-optimistic and solution-oriented learning approaches that utilise mindfulness, critical reflection, and transparent communication to establish deep ocean citizenship.

Ecole Bleu Outremer

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Abstract: Organised by Ifremer and its partners, and supported by the French Government, the Ecole Bleu Outremer (Ultramarine Blue School) is a novel concept mixing training, capacity-building and raising awareness in marine sciences, designed to be conducted every 2 years in a distinct oceanic basin. Its objectives are to:

- Mix and train students from different sectors (oceanography, maritime careers, arts) during a campaign aboard an oceanographic vessel;
- Raise and share awareness on ocean sustainability issues.

The first edition took place aboard the Marion Dufresne, in July 2022, between La Réunion and Mayotte islands. Participants (around 160, among which 75 students) originated from those

territories but also neighbouring countries (Mauritius, Seychelles, Madagascar, Tanzania, Comoros and Kenya) and mainland France, and included:

- Scientific students (Bachelor to PhD) in marine science, with a joint supervising team of scientists;
- Trainees in maritime careers, and their supervisors;
- Students in art schools;
- « Marine science ambassadors »;
- A media/communication team;
- Personalities from arts, culture, and scientific exploration.

The programme on board was designed to maximise interaction and mutual discovery among participants. The journey chosen for the campaign allowed students to receive training in several disciplines, with a strong focus on marine biodiversity and the seismic activity around Mayotte. The scientific questions at stake were strongly related to issues with a great societal impact (conservation biology, fishing resources, pollution, biodiversity, monitoring and management of marine protected areas, climate change), and students were encouraged to brainstorm and come up with creative ideas and solutions towards a sustainable ocean. Thanks to a strong communication plan, the project has an impact beyond the sole group of participants and will inspire future generations from the area on ocean-related issues.

Addressing Ocean Literacy in a changing blue planet: the CIIMAR's outreach and educational programme.

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Abstract: The promotion of scientific education is increasingly relevant in today's society. However, most people are still unaware of the immense ocean's influence on mankind and mankind's influence on the ocean, which can be translated into a tight connection between ocean health and human health. There is thus an urgent need to develop ocean education and to empower citizens and future generations to take sustainable actions for ocean health and protection. CIIMAR is a scientific research and advanced training institution that plays an important role in translating Ocean's research and its tangible benefits for society through an extensive outreach programme aimed at all sectors of society. To encourage young students' curiosity for Marine and Environmental Sciences, and promote science education and Ocean Literacy, a specialized educational programme has been developed. CIIMAR's educational programme comprises various activities including scientific lectures, hands-on experimental activities, field trips, visits to CIIMAR, talks with scientists, and teachers' training actions, among others. The themes addressed in the various activities aim to alert to the need for sustainable exploitation of Ocean resources and increase awareness of the impacts that the Ocean is currently suffering, challenging the participants to positive changes in behaviour and attitudes. All the activities are related and inspired by the research held by the various CIIMAR groups and are adapted to the school curricula of the Portuguese education system, allowing not only the address of Ocean Literacy but also the knowledge transfer of scientific concepts. This work will present CIIMAR's educational programme as well as the results of evaluation questionnaires made to the participants of the educational visits, aiming to find out whether the activities developed allow the understanding of the Ocean's importance, the need to protect it and the importance of increasing Ocean Literacy.

The Thalassophile Project: Making marine science accessible

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Abstract: Thalassophile (n.) A lover of the seas and oceans. The Thalassophile Project is a partnership of organisations from the fields of accessible pedagogy and marine conservation and research. We identify a gap in available educational material in this field, particularly that tailored to a hearing or visually impaired audience. We aim to address this information gap because only by making information accessible to the widest number of people will we achieve a critical mass of citizens ready and able to change their behaviours for the better. The Thalassophile Project will work together to: 1. Agree theoretical and practical frameworks to make marine science and conservation material more accessible to more adult learners; 2. Create four original Thalassophile Project episodes in line with this framework and build networks of potential users to test accessibility; 3. Curate existing educational material in line with this framework, and make inspiring practice accessible to scientific outreach, adult education and conservation educators, via an online database searchable according to audience; 4. Consolidate this learning in four factsheets for adult educators; 5. Disseminate to cross-sector stakeholders and reinforce the importance of climate literacy for behavioural change. During this session we aim to outline an innovative way to approach a crucial – but little discussed - aspect of marine science. The Thalassophile Project team would like to present ways for other institutes, organisations and researchers to collaborate with us in this work, by inviting them to send us materials for dissemination and review according to an accessibility framework designed specifically for blue education materials. In turn, this will both support your organisation to reach a wider audience with more accessible resources and will help the Thalassophile Project to create a dynamic database of accessible resources for the future.

Socio-ecological factors and temporal comparison of Italians' knowledge and perceptions about Marine Protected Areas

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Abstract: In the last decades, the ocean has been suffering an increasing anthropic pressure and exploitation of its resources, exacerbating environmental challenges like climate change and loss of biodiversity. Italy represents a country with relevant elements, including its extensive coastline within the Mediterranean basin, historically considered a biodiversity hotspot that is experiencing a rapid change in terms of temperature, marine species density and distribution due to human activities. Marine protected areas represent an effective tool for marine conservation and restoration, but their success is highly linked to the general public's knowledge and support. This research aimed to investigate the correlated factors linked to environmental awareness, knowledge about Italian MPAs, individual behaviours and responsibility for marine protection, with a focus on proximity to the coast. A temporal comparison was also performed to assess whether these elements have evolved between 2014 and 2021, gaining an insight in to how ocean literacy is evolving, and reflecting on the best outreach tools that can be exploited to improve a fast engagement in the society. The identified factors can be used to enhance the support and involvement of the public towards MPAs and, more broadly, to shape marine citizenship and ocean-friendly behaviours.

BALANCE Sandy beaches and rocky pools: linkage lands to the sea in coastal cities.

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Abstract: The urgent need to protect and exploit our oceans in a sustainable way requires a multidisciplinary approach including both informal and formal education. A combination of scientific approaches, pedagogies, educational tools and communication strategies is necessary to engage the communities in fostering Ocean Literacy (OL) and to rediscover humans' connection with the marine environment. For most people, the marine environment is almost inaccessible and impossible to explore but still a source of endless fascination. Accessible coastal habitats placed between the land and the seashore —such as beaches and tide pools— represent ideal models to easily connect people to the sea world, playing a key role in broadening knowledge about the OL 7 principles, and creating a Mediterranean-Sea-literate society as well. Here, we present a Citizen Science protocol promoted by the association Reef Check Italia that aims to engage students and people at large to increase knowledge of the main dynamics of the seas and raise awareness about the importance of conservation and sustainable use of marine resources. The adopted protocol is focused on rockpools and beaches observation and monitoring, allowing to collect data into a structured common repository online. Although the protocol is strongly science-based, proper training will make it suitable for students and general volunteers. Change of consciousness will be assessed by surveying the participants before and after the activities (drawings for kindergarten and primary school children, questionnaires for middle school and high school, semi-structured face-to-face interviews for adults). Additionally, raising the public's attention to coastal environments will encourage decision-makers to take conservation and protection measures forward habitats and marine biodiversity.

IMBRSea module on Ocean Literacy and Marine Education - student perspectives and main outcomes

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Abstract: The world is changing at a faster pace than ever before. New scientific discoveries are made on a daily basis: new species found, whole ecosystems discovered, old theories disproven, etc. Yet this knowledge remains inaccessible to the majority of the general public. Often, breakthroughs in science remain in their bubbles, making their dissemination very difficult. If only there was a way to fix this problem, perhaps science would not be regarded as such a hard and obscure thing. Oh wait, there is: Science communication. Science communication is the way scientific knowledge is transmitted in an accessible manner, i.e. easy

to understand for the general public. It is a useful tool in bridging the gap between science and society. Nevertheless, not enough attention is given to this field. Scientists remain focused on publishing findings using overly complex vocabulary in peer reviewed journals not read by your average grandmother. As such, science communication remains a field with immense potential and room for growth. This is also reflected in study paths offered at universities, where science and communication are usually kept separate. The International Master of Science in Marine Biological Resources (IMBRSea) offers a module in which marine sciences and science communication are tightly interlinked. After foundational marine modules and further specialisations, students can choose to learn about science communication for the marine field. Not many programs in the world offer this, and for some students, the marine education track was their reason for joining IMBRSea. Across two months, students delved into communication techniques for numerous target audiences, such as children, teachers, journalists, politicians and science animators. They also developed educational challenges aimed at inspiring a sense of responsibility for the ocean. The big takeaway was the creation of an instagram account aimed at communicating marine science to everyone, including you.

Engaging with the public: the experience of MareDireFare a new science&art festival to promote the Ocean Decade

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Abstract: Seas and oceans are threatened by waste, pollution, indiscriminate use of resources, climate change and damage to the marine ecosystem, affecting human health, as it is closely linked to that of the sea. It is therefore necessary to raise awareness throughout the community with communication activities aimed at adopting good practices to protect our sea. At the beginning of the Ocean Decade, the National Institute of Oceanography and Applied Geophysics - OGS and the Miramare Marine Protected Area, launched MareDireFare, a new science and art festival dedicated to the seas and oceans. The 1st and the 2nd edition of MareDireFare (transl. "SeaSayDo") took place in Trieste (Italy) in late May 2021 and 2022. The concept of the Festival starts from "Sea", the main character that is guiding the entire event. "Say" represents the urgency of spreading information about seas and oceans in all their aspects and in different languages (of art, literature and science). The objective is to bring people to act urgently, "Do" something to protect its balance and functioning, to preserve the services and benefits it offers us every day and that make possible our own existence on this planet. The heart of the festival was the connection of art and science thanks to 2 artistic exhibitions deriving from the collaboration among scientists and artists who interpreted the microscopic world of the sea (in 2021) and the 7 topics of ocean literacy (in 2022) using different techniques and languages. For 15 days each year, a rich calendar of events was

presented, creating a diffused festival that, starting from the central hub of the exhibition, involved the entire city (and region) with activities in libraries, bookstores, literary cafes, museums, etc. The key to the success of the festival was the use of different languages to promote ocean literacy in an inclusive way and to raise awareness to adults, children and families gathered together, on the importance of oceans and seas.

Ocean Literacy and Pro-Environmental Behaviours amongst Blue Space Sport Enthusiasts – A Planetary Health Vision

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Abstract: 270 million recreational visits are made each year to the UK coast, with many acknowledging the calming and spiritual nature associated with blue spaces. Ocean Literacy is a movement founded in the United States, comprised of seven key principles considering the importance of the ocean to our planet, and culminating with the principle that oceans and human health are inextricably connected. A study of American Adult Ocean Literacy rates found significant gaps in understanding across many demographics, however highlighted an important association between ocean literacy rates and pro-environmental behaviours. In Europe, the 2020 Blue Health Project similarly acknowledged higher ocean literacy rates amongst recreational blue space users, and increased pro-social behaviours of this group towards sustainable action. This flash presentation outlines a pilot study using a questionnaire similar to the US Ocean Literacy study, to assess Ocean Literacy Rates of blue space sport enthusiasts in the UK; and aims to describe the relationship between Ocean Literacy, pro-environmental behaviours, and user demographics amongst this highly engaged sub-population. The information will then help inform the development of educational materials and understand effective pathways for dissemination to those most involved with blue spaces. The overall purpose is to foster pro-environmental behaviours, and increase awareness of the planetary and human health consequences, both positive and negative, from human activity on our ocean environments.

Whose mangrove is this? A serious game to foster participatory management of the land-sea interface

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Abstract: In order to achieve collaborative nature conservation and natural resources management, stakeholders ideally need to understand and acknowledge other stakeholders' interests, values and objectives. Fostering inclusive, participatory management requires everyone to look at the environment through the eyes of the other. Our team has developed a serious game which focuses on mangroves – as the quintessential tropical coastal system, which is undergoing increasing pressures from human-driven environmental change. Our 'Mangal Play' follows an experiential learning method to allow participants to adopt the role of a particular stakeholder in an imaginary mangrove forest social-ecological system. The Mangal Play is a serious game, more specifically a role-play, aimed at promoting dialogue between 20 ideal-typical stakeholders, who are involved in governance, fisheries, aquaculture, agriculture, forestry, tourism, transport, conservation or communication. By providing tools to lecturers and scientists to apply this game in a public or classroom setting, the Mangal Play simulates a decision-making process while accepting and fostering trade offs, and while distinguishing bottom-line issues from negotiable positions. It allows to reflect on real-world stakeholders' behavior and arguments in a safe learning environment. We exemplify how social network analysis can serve to visualise the outcome of the Mangal Play, and further improve its design and use. We aim to showcase this educational tool, and to obtain feedback from an audience of ocean education professionals, to continuously improve our mangrove-focused serious game.

Fighting marine pollution. Strategies to promote sustainable behavior for microplastics control.

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Abstract: One of the biggest threats for the oceans is the emerging microplastics pollution. Being produced in situ by breakage of larger plastics, or manufactured as constituents of cosmetics and cleansers, microplastics harm marine life and are very difficult to remove from the ocean. It is urgent to include plastic pollution control in the international agenda towards marine literacy. Objective: To investigate the relative efficiency of information about seafood, environmental and animal impacts for the enhancement of the intended control of microplastics. Methodology: 284 students participated in an experiment in which three conventional contaminant vectors of exposure to MP were manipulated (condition 1: fish with MP, n = 55; condition 2: sediment, n = 66; condition 3: seagull dead by MP, n = 63). As a control condition a garbage bag on a beach was used (n = 100). Results: In comparison to the remaining conditions, exposure to a fish containing MP increases behaviors oriented to consume eco-friendly, and pro-environmental engagement. Conclusions: Education and awareness-raising campaigns focused on the impact of microplastics on seafood resources would be encouraged for a higher impact on the audience. Public information about the importance of preserving clean ocean environments for the health of the whole planet would be also desirable.