



# EMSEA CONFERENCE 2019

## BOOK OF ABSTRACTS



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# Contents

<b>ORAL PRESENTATIONS</b> .....	<b>5</b>
<b>Atlantic Seafloor Partnership for Integrated Research and Exploration (ASPIRE): A Multi-year Multi-national Campaign to Explore the Depths of the Atlantic</b> .....	<b>6</b>
<b>Mediterranean Middle School Students' Knowledge, Attitudes, and Behaviours Towards Ocean-related Topics: An EMSEA-Med Pilot Study</b> .....	<b>7</b>
<b>International Ocean Literacy Survey: Updates and New Directions</b> .....	<b>8</b>
<b>Marine Education through Visions of Research and Azorean Fishing Communities</b> .....	<b>9</b>
<b>Can Young People Really Help With Science? The Showcase Example of Operation Wallacea Project in the Adriatic Sea, Croatia</b> .....	<b>10</b>
<b>The MED Programme AMAre Project: Actions for the North East Marine Protected Area (Malta)</b> .....	<b>11</b>
<b>Marine Photography to Build Ocean Optimism</b> .....	<b>12</b>
<b>Nautical Charter Sector &amp; Ocean Literacy: The MedSkippers Project</b> .....	<b>13</b>
<b>ATLAS Outreach Educational Portfolio</b> .....	<b>14</b>
<b>The European Marine Observation and Data Network (EMODnet): Vision and Role of This Gateway to European Marine Data in Education and Outreach</b> .....	<b>15</b>
<b>Educating a Blue Generation</b> .....	<b>16</b>
<b>Ocean School: Digitally Fostering Ocean Literacy and Environmental Awareness</b> .....	<b>17</b>
<b>Blue School PT - From the School's Point of View</b> .....	<b>18</b>
<b>Bringing Real-life Context to the Curriculum Through Project-based Learning</b> .....	<b>19</b>
<b>From the Sea, up the River</b> .....	<b>20</b>
<b>POSTER PRESENTATIONS</b> .....	<b>22</b>
<b>In the Search of Effective Methods of Marine Litter Education – How to Make a Real Difference</b> .....	<b>23</b>
<b>Ocean Literacy Intervention Activities: A Case Study from a European Maritime Day Event (EMD) in Mainland Greece</b> .....	<b>24</b>
<b>Introducing Blue Carbon Concept in the Marine Conservation Sector – the Case of Croatia</b> .....	<b>25</b>
<b>Using the Deep-sea Environment as a Tool for Promoting Informal STEM Learning through Ocean Literacy Activities</b> .....	<b>26</b>
<b>With Our Collective Imaginations – an Invitation to Raw Together Complex Social Knowledge</b> .....	<b>27</b>
<b>Ocean Literacy in Sail Training (OLiST)</b> .....	<b>28</b>
<b>Ciguatera Fish Poisoning in the Canary Islands: a Contribution to Communication Strategies</b> .....	<b>29</b>
<b>The Deep-Water Sharks' Guide to the Azores</b> .....	<b>30</b>
<b>Hear the Baltic Sea – the Marine Educational Project Dedicated to Deaf People</b> .....	<b>31</b>

<b>An Explorers Education Programme™ Project Entitled ‘Our Ocean – Marine Legends, Fairy Tales and Folklore in Ireland’ Carried out in ten Coastal Counties Around Ireland, Supporting Primary School Education and Promoting Ocean Awareness and Action in Line with the Global Sustainability Development Goal 14</b> .....	32
<b>The Challenges of Communicating Research Findings to the General Public: Money, Conflict, Politics</b> .....	33
<b>Tools of the Trade: Resources to Achieve Ocean Literacy</b> .....	34
<b>Using Ocean Literacy and Marine Spatial Planning to Investigate Sustainable Energy Solutions in Second Level Education, Collaborating to Promote Awareness and Actions for Sustainable Development Goals 7, 13 and 14 through Experiential Public Engagement</b> .....	35
<b>Sharks Ahoy: Changing Elementary Students’ Perception on Sharks and Rays</b> .....	36
<b>Assessing the Effectiveness and Impact of the “Look at the fresh fish” Project</b> .....	37
<b>Linking Research, Fisheries and Society: the Role of the Shark Attract Project in Raising Awareness on Sharks and Rays Endangered Species</b> .....	38
<b>Communicating the Sea on an Island (with 15 thousand inhabitants) - the Advantages and the Challenges!</b> .....	39
<b>Marine Education for Environmental Awareness on Plastic Pollution</b> .....	40
<b>Travel Souvenirs and Ignorance of People - How to Protect Nature</b> .....	41
<b>Environmental Awareness Activities (Beach Money &amp; Turtle Spot) Happened in Xiao Liuqiu</b> .....	42
<b>The European Atlas of the Seas, Online Interactive Catalogue of Marine Maps for a more Ocean Literate Society</b> .....	43
<b>Urgency &amp; Efficiency: How do we Take Ocean Conservation out of the Aquarium?</b> .....	44
<b>MISSÃO_MAR: How to Engage Teachers and Students in Climate Changes Issues</b> .....	45
<b>Futurismo Azores Adventures: Raising Awareness and Enhancing Environmental Knowledge on the Local Community</b> .....	46
<b>A New Approach to Improve Local Environmental Awareness</b> .....	47
<b>National Marine Educators Association (NMEA)</b> .....	48
<b>Set Sail for Scientific Investigation Using Student Built Miniboats</b> .....	49
<b>Engaging Future Scientists through Multidisciplinary Investigations into the Biogeochemistry of our Changing Oceans</b> .....	50
<b>The Blue Team Project: I am a Citizen of the Ocean ... What About You?</b> .....	51
<b>LIFE Recreation ReMEDIES</b> .....	52
<b>Reducing and Mitigating Erosion and Disturbance Impacts affecting the Seabed</b> .....	52
<b>EMSEA EXPO ACTIVITIES</b> .....	53
<b>Fun with Marine Food Chains</b> .....	54
<b>Devoid of Dissolving Discussions: A Different Ocean Acidification Engagement Event</b> .....	55

<b>‘Coral Territory Wars’: Education Program on Coral Reef Ecosystems to Raise Awareness on the Importance of Conserving Them .....</b>	<b>56</b>
<b>Hands-on Ocean Literacy (OL): a Set of Practical Labs for Exploring the 7 OL Principles .....</b>	<b>57</b>
<b>How to ‘Rock’ a Rockpool .....</b>	<b>58</b>
<b>Mission across the Channel .....</b>	<b>59</b>
<b>Framing Knowledge in the Middle of the Atlantic Ocean .....</b>	<b>60</b>
<b>Atlantic Adventures with ATLAS .....</b>	<b>61</b>
<b>Deeply Engaged with Sea Life .....</b>	<b>62</b>
<b>Feel the Appeal of the Ocean: Experience a Virtual Whale Watching Tour with Futurismo .....</b>	<b>63</b>
<b>Sands and Gravels, My Sediments Exactly .....</b>	<b>64</b>



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## ORAL PRESENTATIONS



## Atlantic Seafloor Partnership for Integrated Research and Exploration (ASPIRE): A Multi-year Multi-national Campaign to Explore the Depths of the Atlantic

Haynes, S.<sup>1</sup>

<sup>1</sup> National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Exploration and Research (OER)/Collabralink Technologies

The Atlantic Seafloor Partnership for Integrated Research and Exploration (ASPIRE), is a major multi-year, multi-national collaborative ocean exploration program focused on providing publicly accessible data to raise knowledge and understanding of the North Atlantic Ocean.

Coordinated through NOAA's Office of Ocean Exploration and Research and working in support of the Galway Statement on Atlantic Ocean Cooperation, this campaign is broadening geographic focus to include more of the U.S. Atlantic and the high seas and the scope of national and international partnerships, including the European Union and Canada. ASPIRE fieldwork began in 2016-17. The NOAA Ship Okeanos Explorer is operating in the region 2018-2020, with plans for work in the central Atlantic.

This effort will provide critical information relevant to blue economy priorities, including sustainable fisheries, offshore energy and marine minerals, and coastal and offshore hazards. Specifically, results will improve knowledge of unexplored areas within the U.S. Exclusive Economic Zone (EEZ) and in deep-sea areas; characterize deep-sea coral, sponge, and chemosynthetic communities and water column habitats; enhance predictive capabilities for vulnerable marine habitats and submarine geohazards; extend bathymetric mapping coverage in the U.S. EEZ and international waters; increase understanding of deep-sea ecosystem connectivity across the Atlantic basin; improve international collaboration; and leverage international partnerships to conduct coordinated exploration of priority high-seas areas of the North Atlantic, including the Mid-Atlantic Ridge.

This presentation will share the expectations of the campaign, education and outreach efforts, and exciting recent findings, such as deep-sea coral mounds that extend farther than previously imagined – over 85 miles!

## **Mediterranean Middle School Students' Knowledge, Attitudes, and Behaviours Towards Ocean-related Topics: An EMSEA-Med Pilot Study**

Cheimonopoulou, M.<sup>1\*</sup>; Mogias, A.<sup>2</sup>; Realdon, G.<sup>3</sup>; Mokos, M.<sup>4</sup>; Koulouri, P.<sup>5</sup>; Previati, M.<sup>6</sup>; Boubonari, Th.<sup>2</sup>

<sup>1</sup> Hydrobiological Station of Pella, Ministry of Rural Development, and Food, Greece; <sup>2</sup> Democritus University of Thrace, Greece; <sup>3</sup> University of Camerino – UNICAM earth Group, Italy; <sup>4</sup> University of Zadar, Croatia; <sup>5</sup> Institute of Marine Biology, Biotechnology & Aquaculture, Hellenic Centre for Marine Research, Crete, Greece; <sup>6</sup> Underwater Bio-Cartography (U.BI.CA s.r.l.), Italy

Ocean Literacy (OL) is of paramount importance nowadays as the life-giving ocean is seriously under threat. Children who are considered to be the “living arrows sent forth” should have the opportunity to become citizens able to make informed and responsible decisions about the ocean. Members of the European Marine Science Educators Association from Greece, Italy, and Croatia performed a pilot study evaluating knowledge, attitudes, and behaviours towards ocean-related topics in middle schools of their respective countries. A structured questionnaire, comprised of three sub-scales namely knowledge, attitudes, and behaviours, was administered to 430 students (grades 7-9). Demographics such as gender, participation in school environmental education programs, and membership in non-governmental organizations (NGOs), were also taken into consideration. The results of the study revealed that the relative frequency of correct answers in the knowledge sub-scale was 52.4%, indicating moderate knowledge level, with the Croatian students slightly prevailing. On the contrary, students shared rather pro-environmental attitudes and behaviours with mean values of 3.81 and 3.39 respectively in a five-point Likert scale, with the Greeks prevailing in the former case and the Italians in the latter. Participation in environmental education programs and in NGOs appeared to influence all sub-scales. Mediterranean Sea has been inextricably connected to the life of the people living by its coasts and beyond for millennia, therefore, evaluating and comparing not just student's knowledge, but also attitudes and behaviours will help to better promote OL in the Mediterranean region, and contribute to its future sustainability.

\*The views and opinions in this abstract are the author's own and do not necessarily reflect those of her institution



## **International Ocean Literacy Survey: Updates and New Directions**

Cannady, M.<sup>1</sup>; Chen, Y.F.<sup>1</sup>; Fauville, G.<sup>1</sup>; Strange, C.<sup>1</sup>

<sup>1</sup> Lawrence Hall of Science, UC Berkeley; Stanford University

In 2015, many leaders from the Ocean Literacy community discussed the urgent need to measure progress in the development of Ocean Literacy in our respective countries, regions and even programs. The Lawrence Hall of Science at the University of California, Berkeley took the lead on this unfunded, grassroots project. Marine educators from Europe and the US generously shared their intellectual property for this community effort by contributing survey items from previous work. Since then, the survey has been tested three times, reviewed by an international advisory board and is currently in its fourth version. During this session, we would like to share with you the results of the Version 4 testing that took place in Early 2019. We launched Version 4 in 12 languages and with 11 partners and we ended the data collection two months later with 2 additional languages and twice as many partners! We also managed to gather more data than in the previous rounds of testing. We now have enough data in 12 languages (English, Portuguese, Dutch, Japanese, Korean, Italian, Catalan, Traditional Chinese, Thai, Polish, Chilean and Simplified Chinese) to make comparisons in efficacy of the survey across language groups. Join this session to learn about our findings. We will also invite participants to brainstorm with us the next steps for this large-scale, community-based project.

## **Marine Education through Visions of Research and Azorean Fishing Communities**

Neilson, A.L.<sup>1</sup>

<sup>1</sup> Centre for Social Studies, CES, University of Coimbra

Research with Azorean fishing communities dealing with declining fish populations, fleet reductions, and reduced fish quota uncovers the economic and political realities which threatens the human-wild fish relationship. Small-scale and artisanal fishing is understood via myths and stereotypes which limit what we learn about ocean systems. Scientists give advice for the survival of fish species, but assumptions about history and human behaviour limit the approach to management. Taken for granted ideas reinforce the “normal” idea of artisanal fishers as poor and helpless, and that the future of the oceans and wild fish is hopeless. The prevailing political direction for our shared oceans is toward economic growth of industrial activities. Wild fish and small-scale fishing are not priorities. Local interests are pushed aside by the pursuit of profit while fish stocks continue to disappear. This presentation will highlight a project which tells stories that frame fishers as important participants and leaders who can maintain sustainable and just relationships with all ocean life. The photo stories and narratives from this project ask us to look to the sea through new eyes, hear with new ears, and awaken to the possibility of knowing the sea in unfamiliar ways. It provides an opportunity to reflect on our own intellectual, physical, emotional and spiritual understandings by exploring the perspectives of people who have been born and raised in the sea.

## Can Young People Really Help With Science? The Showcase Example of Operation Wallacea Project in the Adriatic Sea, Croatia

Čižmek, H.<sup>1, 2</sup>; Drakulić, M.<sup>1, 2, 3</sup>

<sup>1</sup> Marine Explorers Society - 20000 leagues, Zadar, Croatia; <sup>2</sup> Operation Wallacea, Wallace House, Old Bolingbroke, UK; <sup>3</sup> Deep Blue Explorers, Martinšćica, Croatia

The importance of getting the scientific data widely recognized and accepted in the public lies in their understanding and simplicity. The involvement of young people in regular scientific activities is an excellent way to promote science within the non-scientific community. The Operation Wallacea project focuses on transferring scientific data to the local and international community by getting the young people involved in wildlife conservation. During the last two years, more than 350 young volunteers from 20 different countries took part in Operation Wallacea activities (*Posidonia oceanica* monitoring, *Pinna nobilis* monitoring and fish assemblage research) in the Adriatic Sea, Croatia, which is an excellent example of how citizen science can be attractive and useful for the scientific community but also for the general public on local and international level. The main success of this project relies on passionate young people wanting to stop the biodiversity loss, so when we ask ourselves; can young people help with science, the answer is yes. Sometimes they can directly measure, in many cases they can help scientist speed up the process or they can get involved in the new technologies used. In either case, sending young people out in the field does not only get data, but it also changes people making them educated marine conservation ambassadors.

## The MED Programme AMAre Project: Actions for the North East Marine Protected Area (Malta)

Drago, A.<sup>1</sup>; Previati, M.<sup>1</sup>; Said, A.<sup>1</sup>; Gauci, A.<sup>1</sup>; Deidun, A.<sup>1</sup>; Galea, A.<sup>1</sup>; Azzopardi, J.<sup>2</sup>; Frascetti, S.<sup>3</sup>; Laggini, M.<sup>4</sup>; La Marca, E.C.; Fogliani, F.<sup>4</sup>; Grande, V.<sup>4</sup>; Tyllianakis, E.<sup>6</sup>; Zammit, A.; Galea DeGiovanni, R.<sup>1</sup>

<sup>1</sup> Physical Oceanography Research Group, Dept. of Geosciences, University of Malta, Malta; <sup>2</sup> Department of Artificial Intelligence, Faculty of ICT, University of Malta, Malta; <sup>3</sup> Department of Biology, University of Naples Federico II, Naples, Italy; <sup>4</sup> CoNISMa - Consorzio Nazionale Interuniversitario per le Scienze del Mare, Roma, Italy; <sup>5</sup> Istituto di Scienze Marine-Consiglio Nazionale delle Ricerche, Bologna, Italy; <sup>6</sup> Centre for Environment, Fisheries and Aquaculture Science, UK

Funded under the Interreg MED Programme (2014 - 2020), the AMAre project (Actions for Marine Protected Areas) is conceived to aid Mediterranean countries in the conservation and management of designated marine areas by developing shared methodologies and geospatial tools for multiple stressors assessment, coordinated environmental monitoring, multi-criteria analyses and effective stakeholder engagements. Pilot actions in Malta target the North-East MPA.

A spatial GIS database for the four project MPAs (Sporades, Malta, Balearic Islands and Torre Guaceto) blends different data layers relevant for the management of the MPAs. Field surveys are conducted to: quantify the impact of anchoring activities on *Posidonia oceanica* meadows; collect geo-referenced information on the coastal distribution of the macroalgae *Cystoseira spp.*; assess seasonal accumulation areas of beached litter; and measure time series of sea temperature vertical profiles at two moored stations. Citizen science initiatives include a survey on the mass mortality phenomenon of *Pinna nobilis*.

A cumulative impact assessment identifies tension hotspots between different uses, and explores potential impacts on protected habitats. The economic valuation of ecosystem services provided by seagrass meadows and protected assemblages within the MPA is undertaken by interviews with stakeholders.

A tailor-made workshop aims to empower stakeholders in the appraisal of existing conflicts between conservation objectives and the effects of human activities in the MPA. The workshop networks stakeholders, and builds dialogue and awareness on common issues. A practical marine spatial planning exercise engages the participants to propose solutions to match essential economic activities and conservation objectives.

## **Marine Photography to Build Ocean Optimism**

Henley, J.<sup>1</sup>

<sup>1</sup> Falmouth University and the Galapagos National Park Directorate

Photography has the power to drive marine environmental and cultural conservation. Indeed, ethical and inspiring imagery is a powerful tool in preserving the marine environment, especially when produced in collaboration with communities of committed stakeholders. Furthermore, optimistic and engaging campaign imagery and documentary films, that focus of marine conservation challenges, have been found to play a significant role in promoting positive environmental and social behaviour change and increase ocean literacy, particularly in young people. The delicate marine reserve of the Galapagos archipelago is an icon of global marine conservation. For the last four years Marine and Natural History Photography students from Falmouth University have travelled Galapagos, in partnership with the Charles Darwin Foundation, the Galapagos Conservation Trust and the Galapagos National Park Directorate. By creating youthful and optimistic still and moving imagery, focusing on themes such as marine pollution, invasive species and ecosystem restoration, this collaboration has provided valuable evidence of the role photography can play in marine environmental education. Additional partnership working with ecological ethnicities in situ in Galapagos, such as the educational program of Ecology Project International, has provided a strong baseline from which to grow the possibilities of increasing inter-ocean literacy in a collaborative way, from the Atlantic to the Pacific.

## Nautical Charter Sector & Ocean Literacy: The MedSkippers Project

Papathanasiou, M.<sup>1</sup>; Bazigou, F.<sup>1</sup>; Cardona, F.<sup>2</sup>

<sup>1</sup> Indigo Med, Greece; <sup>2</sup> Dalula Marine, Spain

Nautical tourism strongly depends on environmental assets, however it also generates a range of pressures. Skippers are at the forefront of the sector and in close contact with the sea, therefore better trained skippers with regards to the environment and ocean literacy can mitigate some of the impacts arising from boating.

The MedSkippers project (co-funded by EASME/EMFF) aims to foster growth and exploit opportunities in the nautical charter sector, promoting public & private cooperation for the international harmonization of professional skippers for Small Commercial Vessels (SCV) training, while simultaneously raising awareness about charter tourism and maritime professions among youth by employing targeted communication, outreach and ocean literacy activities.

The project will help to create networks across the Mediterranean to improve training and recognition of professional skippers of SCV, ultimately aiming to boost charter and nautical tourism, an ideal channel to attract youth towards maritime professions. Furthermore, it will use ocean literacy as a vehicle to improve environmental sustainability, and promote complementary skills to reduce employment seasonality for skippers, thereby improving long-term careers and enriching tourist experiences. MedSkippers will raise awareness on challenges and opportunities, and build capacity across the Mediterranean, especially in non-EU countries, to foster sectoral growth and engage youth to attractive jobs with good prospects for versatile and life-long vocational careers.

Through pilot volunteer programs, workshops, roadshows and ocean literacy webinars, the project will foster marine environmental awareness in individuals and promote ocean literacy across both EU and non-EU countries.

## ATLAS Outreach Educational Portfolio

Walls, N. <sup>1</sup>

<sup>1</sup> Dynamic Earth, Edinburgh

ATLAS is a trans-Atlantic research project funded by the EU under the Horizon 2020 Blue Growth call. It aims to increase our understanding of deep Atlantic marine ecosystems and their connections with other areas. ATLAS will also improve our ability to predict how changing environmental conditions might affect them. The information gathered will allow ATLAS to inform scientists, governments and businesses on the best ways to protect these ecosystems from issues such as climate change, pollution and certain fishing techniques. This knowledge will support sustainable growth in the marine and maritime sectors. Engaging the public with the outcomes of ATLAS is a key part of the project.

Dynamic Earth, an Earth and Environmental Science educational charity based in Edinburgh, has created an Outreach Educational Portfolio for ATLAS. Here we describe various engagement tools and activities developed for this portfolio. These include new materials and innovative ideas for running family drop-in events and learning resources for Primary and Secondary school pupils, as well as concepts for an update to Dynamic Earth's Oceans gallery. The Portfolio forms the basis for Dynamic Earth's 2019 public engagement programme in Edinburgh and at regional science festivals across Scotland, typically reaching audiences of around 10,000 families and schoolchildren at the festivals while over 60,000 visitors to the centre will participate in ATLAS-related activities. The presentation will outline the resources that are available through the ATLAS website, how these can be used to increase ocean literacy of public audiences and support public engagement through marine education networks.



## The European Marine Observation and Data Network (EMODnet): Vision and Role of This Gateway to European Marine Data in Education and Outreach

Derycke, D.<sup>1</sup>; Marsan, A.A.<sup>1</sup>; Calewaert, J.B.<sup>1</sup>; Larkin, K.<sup>1</sup>

<sup>1</sup> EMODnet Secretariat

Marine data are necessary to achieve many purposes: from acquiring a better scientific understanding of the marine environment, to, increasingly, supporting decision-making with the best available and most updated knowledge, as well as to facilitating the development of sustainable and efficient blue economies and business opportunities. Despite the critical nature of marine observations, providing timely access to high-quality data proves challenging. Europe's marine data have traditionally been collected by a myriad of entities, resulting to scattered archives in unconnected databases and repositories.

To tackle those problems, the European Commission DG MARE initiated in 2007 the development of the European Marine Observation and Data Network (EMODnet). Today EMODnet is comprised of more than 150 organisations which gather marine data, metadata and data products and make them more accessible for a wider range of users. Since 2017, the EMODnet Secretariat has taken over the management of the European Atlas of the Seas, a Web mapping application which, in the context of ocean literacy and education, aims to present scientific data and information to the general public in an easy to digest and interactive way.

This presentation will present key EMODnet data products, also displayed in the European Atlas of the Seas, such as the new vessel density maps, the marine litter maps and the coastline migration map (erosion). It will also highlight the latest developments of the Atlas for experts: 'EMODnet data store', a proof of concept expanding the range of services and features and providing an easy access to EMODnet data.

## Educating a Blue Generation

Pina, T.<sup>1</sup>; Geraldés, D.<sup>1</sup>; Borges, R.<sup>2</sup>

<sup>1</sup>Oceanário de Lisboa; <sup>2</sup>Fundação Oceano Azul

This ambitious programme of Oceano Azul Foundation and Oceanário de Lisboa aims to bring up a “blue generation”, capable of understanding the reciprocal ocean-human influence, of making responsible decisions regarding the ocean, and of mobilizing and engaging the community to contribute to a sustainable planet. It will qualify Portuguese children, from 6 to 10 y/o, with differentiated and holistic knowledge about the ocean, beyond the traditional ocean literacy approach, and raise their awareness about the importance of ocean conservation. The programme consists of a 12h-training for elementary school teachers, providing them with skills on ocean literacy and with tools (handbook and activities’ kit) to include ocean-related subjects in curricular activities, in a multidisciplinary way, or to be explored under the national curricular flexibility project. Furthermore, it includes extra activities inside and outside the classroom, and opportunities for sharing experiences. The pilot stage started in September 2018, and expects to target 800 teachers and more than 16000 students in the 2019/2020 school year. The local municipalities and the scholar community are strongly committed to the project. This programme pretends to be a step forward to effectively shape a new blue generation, that will make the difference in the future of the ocean.

## Ocean School: Digitally Fostering Ocean Literacy and Environmental Awareness

Prelovec, L.<sup>1</sup>; Lee, S.<sup>2</sup>; Stalker, J.<sup>3</sup>

<sup>1</sup> Dalhousie University; <sup>2</sup> Ocean Frontier Institute; <sup>3</sup> National Film Board of Canada

Ocean School ([www.oceanschool.ca](http://www.oceanschool.ca)), a joint initiative of Dalhousie University, the Ocean Frontier Institute, and the National Film Board of Canada, is a free, inquiry-based learning experience meant to strengthen learners' personal connection to the ocean. Targeted at ages 11 to 15, but open to all life-long learners, Ocean School uses powerful storytelling, immersive technologies, and interactive media to advance environmental awareness and ocean literacy in classrooms around the world. Our online platform is integrated with Google Classroom, available in both French and English, and uses an inquiry-based learning model where the students' questions, ideas, and observations are put at the centre of the learning experience. This process builds students' critical thinking, collaboration and problem-solving skills, while also improving students' understanding of marine science, providing exposure to diverse marine career paths, and fostering a culture of ocean sustainability and environmental stewardship.

Our upcoming module, titled "Marine Migration", takes place at Cocos Island, Costa Rica and dives into oceanic islands and their importance to migrating animals. Created with financial support from the Ocean Frontier Institute and the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO), this module will be our first Spanish content, in addition to English and French. We have worked with IOC-UNESCO in developing and running workshops in Central America and the Caribbean for teachers to think about the best ways to use Ocean School in their classroom. We look forward to our first international module and working with teachers and organizations from around the world.

## Blue School PT - From the School's Point of View

Costa, R.<sup>1</sup>; Mata, B.<sup>1</sup>; Silva, F.<sup>1</sup>; Conceição, P.<sup>1</sup>; Pinto, S.<sup>2</sup>; Melo, A.<sup>2</sup>; Jeremias, M.<sup>2</sup>; Coelho, J.<sup>2</sup>  
Fernandes, C.<sup>3</sup>

<sup>1</sup> Portuguese Directorate General for Maritime Policy; <sup>2</sup> School Navegador Rodrigues Soromenho; <sup>3</sup> School Francisco Ferreira Drummond

For the last two school years, the Portuguese Ministry of Sea has been implementing the Blue School educational programme, aimed at Portuguese schools all over the country. Blue School distinguishes and guides schools working on Ocean issues. It promotes the development of an Ocean Literacy community that brings together schools, students, teachers, the sea sector, universities, municipalities and other entities with an active role in marine education. As of April 2019, we have distinguished 126 Blue Schools all over Portugal, with over 16000 students involved.

For the last two EMSEA conferences, this national programme has been the subject of oral presentations regarding its concept and its first year's evaluation. In 2019, in a conference that takes place precisely in Portugal, it's more than fitting that we give voice to the Blue Schools, who are actually developing a true ocean literate generation. In an open session intended to discuss this programme in particular and ocean literacy in general, the starting point will be on the experience of Blue School teachers and Blue School students. They will share their view on how this programme engages the school community on Ocean Literacy, and on how their school project is able to effectively stimulate attitudinal changes in the students, while involving the local community and different partnerships.

We invite everyone who is working on Ocean Literacy to join this conversation. There is potential for an international expansion of the Blue School programme and this could be a great moment to start building bridges.

## Bringing Real-life Context to the Curriculum Through Project-based Learning

Tojeiro, A.<sup>4</sup>; Olsson, M.<sup>1</sup>; Gotensparre, S.<sup>1</sup>; Soria-Dengg, S.<sup>3</sup>; Dengg, J.<sup>3</sup>; Adam Frederik, J.<sup>2</sup>; Chicote, C.A.<sup>4</sup>; Augustsson, D.<sup>5</sup>; Ågren, A.<sup>6</sup>; Engbom, A.<sup>6</sup>; Efler-Mikat, D.<sup>7</sup>; Teichgräber, J.<sup>7</sup>; Darilek, C.<sup>8</sup>; Solé, M.<sup>8</sup>

<sup>1</sup> Department of Biological and Environmental Sciences, University of Gothenburg, Sweden; <sup>2</sup> Maryland Sea Grant College, University of Maryland, College Park MD, USA; <sup>3</sup> GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany; <sup>4</sup> SUBMON, Barcelona, Spain; <sup>5</sup> Högskolan Väst, Trollhättan, Sweden; <sup>6</sup> Öckerö Seglande Gymnasieskola, Öckerö, Sweden; <sup>7</sup> Hebbelschule, Kiel, Germany; <sup>8</sup> Cooperativa d'ensenyament Daina Isard, Olesa de Montserrat, Spain

VIRTUE was established in 1997 as a joint research and educational project. Based on this initiative, the VIRTUE-s project (Virtual Interactive Resources and Tools in Universal Education-of the Sea) was initiated in 2017 with the aim of developing innovative, digital and practical tools to increase the quality of teaching natural sciences, with a simple and inexpensive methodology: discs for fouling experiments in the sea. VIRTUE-s has five scientific and three school partners from Sweden, Germany, Spain and USA.

The project expands classroom pedagogy, including project-based science, with integrated fieldwork where pupils can drive research inquiries by designing experiments on marine biodiversity. Using media productions to explore and communicate results, empowers teachers and students with a higher digital competence and can introduce innovative ocean-related elements and tools in the classroom across Europe.

The present work shows the results achieved to date. Innovative teaching resources with digital elements have been created and tested and teacher training courses with these materials have been carried out in all countries. The school partners have deployed more than 25 VIRTUE-s racks and more than 124 pupils have been involved. The project's website is being improved and the materials are being translated into five languages (English, Swedish, Catalan, Spanish and German) for free download. During the last year of the project a Massive Open Online Course on biofouling and Ocean Literacy will be designed and a 5-day summer school will be organised for school partners and their students in the summer of 2020 in Sweden.

## From the Sea, up the River

Lourenço, C.R.<sup>1</sup>; Noronha, A.<sup>1</sup>

<sup>1</sup> Ciência Viva - Agência Nacional para a Cultura Científica e Tecnológica

By engaging people with aquatic sciences we contribute to a more ocean literate society that shares environmental worries and contributes to ocean conservation and sustainability. Ocean literacy focuses mostly on marine ecosystems despite the utmost importance of freshwater environments. In this sense, RioAcima (Up the River) project highlighted the relevance of freshwater ecosystems by promoting non-formal educational activities such as geo/biodiversity trails, clean-ups, riverside sustainable debates while increasing environmental awareness and fostering a closer relationship between the public and nature, becoming an effective tool to engage inland communities with the topic of ocean literacy. Furthermore, the project offered training courses for teachers, providing tools and knowledge on how to conserve freshwater ecosystems.

The broad public, families and schools explored 51 rivers across mainland Portugal and Azores. Throughout the biodiversity trails the participants were accompanied by researchers and wildlife experts who assisted on the identification of 370 species along 240 km. The 31 river cleanups removed more than 2 tons of litter from 28 km of freshwater ecosystems, while highlighting the intimate link between rivers and the ocean. Moreover, the riverside debates brought the scientific community closer to society by joining scientists, experts and the public to discuss water quality, ecosystem services, aquatic pollution, climate change and use of resources.

The relevance of RioAcima extends beyond the duration of the project and the active participation of the 2500 people, as it set the basis for future environmental and ocean literacy actions to be replicated across the Ciência Viva Science Centres network.

## Communicating cutting-edge marine science through immersive virtual reality: contributions from I SEA project

Morais, C.; Paiva, J. C.; Moreira, L.; Aguiar, T.; Teixeira, A.

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The Atlantic International Research (AIR) Centre underlines the need for developing new communication strategies to bridge society with cutting-edge research and for educating stakeholders to generate awareness, understanding, engagement and critical support. The I SEA project focuses on the Azorean deep-sea, emphasizing some of the scientific areas of the AIR Center (deep ocean science and marine ecosystems valorization). It aims to develop a non-obtrusive, valid and replicable method to evaluate audience attitudes about science communication initiatives through an immersive virtual reality environment (VRE). The prototype will be hosted by Azores' Science Centers, namely the Expolab and the Fábrica da Baleia - Azorean Sea Observatory (OMA). This communication reflects on the process of selecting the ecosystems and the trade-off model between development and sustainability underlying the VRE narrative. The choice of ecosystems (water column, hydrothermal vents, and coral gardens) was based on an iterative process of reviewing recent literature, consulting stakeholders and experts, and promoting discussion within the multidisciplinary team. Corals are expected to be familiar, attractive and perceived as fragile. Hydrothermal vents hold a unique richness in scientific content (e.g., chemosynthesis). Navigation through the water column offers a chance to observe biodiversity, including bioluminescent species. The narrative of the VRE asks visitors to solve socio-scientific dilemmas, without offering shortcuts for perfect outcomes. Instead, it confronts visitors with mixed results on the ecosystems, society or both, triggering the need for further making sense of the relation between science and society. Results from the fieldwork in the science centers will be discussed.



## POSTER PRESENTATIONS

## **In the Search or Effective Methods of Marine Litter Education – How to Make a Real Difference**

Balicka, I.<sup>1</sup>

<sup>1</sup> Education Center of the Gdynia Aquarium

Plastic litter in the marine environment is a fast growing and global problem. Well known in the scientific world, more and more often shown in the media, the issue is still neglected in everyday decisions and choices of most of the society. For majority of people significant reduction of plastic use is problematic, time-consuming and considered as an ‘eco-exaggeration’. In fact, in the nowadays, one-use, plastic world, giving up this material is not so easy and does need a strong willingness of a consumer. As well as an awareness of what to do it for.

Several years of experience with different types of marine litter education might bring a question on the most effective ways of teaching about this issue. The type of education which hits the listeners’ hearths and does change the way they act. Searching for the best solutions, examples of projects and events based on different types of cooperation are presented, with an incentive of putting the topic into a discussion. How we, marine educators, can leave a real footprint on the ocean protection?

## Ocean Literacy Intervention Activities: A Case Study from a European Maritime Day Event (EMD) in Mainland Greece

Cheimonopoulou, M.<sup>1\*</sup>; Realdon, G.<sup>2</sup>; Mogias, A.<sup>3</sup>; Koulouri, P.<sup>4</sup>; Mokos, M.<sup>5</sup>; Previati, M.<sup>6</sup>; Boubonari, Th.<sup>3</sup>

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A European Maritime Day (EMD) 2019 event was held at a Greek mainland middle school in which twenty-two fifteen-years-old students participated. The event included a presentation, two hands-on labs (“Floating and non-floating plastics”, “The voyage of rubber ducks”), one drama activity (“How do sea food chains work?”) as well as one drawing and hand-craft activity. The intervention lasted five teaching hours. A structured questionnaire to investigate knowledge, attitudes and behaviours regarding ocean-related topics was administered to all students before and after the EMD event. Results, using non-parametric statistics, revealed a significant increase in students’ knowledge level and behaviours ( $p \leq 0.05$ ) after the intervention, and a tendency of increase in attitudes ( $p = 0.09$ ). In particular, a positive effect regarding knowledge content in all seven OL Principles was evident. Male students appeared to be more knowledgeable than females in both pre- and post-tests but with no significant difference, which was not the case in terms of the attitudes and the behaviours. Participation in environmental education programs seems to have an important role in students’ knowledge level, while the intervention appeared to influence mainly the ones with no such participation. Special caution is needed for the interpretation of the results, as the sample size was low. Nonetheless, results of the present study show that activities like an EMD event give the opportunity to bring Ocean Literacy into classrooms and affect what students learn, feel and are willing to do about the marine environment.

\*The views and opinions in this abstract are the author’s own and do not necessarily reflect those of her institution

## Introducing Blue Carbon Concept in the Marine Conservation Sector – the Case of Croatia

Mokos, M. <sup>1, 2</sup>; Zubak, I. <sup>1, 2</sup>; Čižmek, H. <sup>2</sup>; Čolić, B. <sup>2</sup>; Grbin, J. <sup>3</sup>

<sup>1</sup> Department of Ecology, Agronomy and Aquaculture, University of Zadar; <sup>2</sup> Marine Explorers Society 20000 Leagues; <sup>3</sup> Public Institution of Nature Park Telašćica

Coastal ecosystems such as seagrasses, tidal marshes, and mangroves contribute significantly to climate mitigation by sequestering and storing large quantities of carbon in the plant biomass and the sediments beneath them. These ecosystems are considered as one of the main nature based solutions for climate change mitigation. Carbon sequestered and stored by these marine ecosystems together with open sea ecosystems is known as 'blue' carbon. Conserving blue carbon ecosystems is an important strategy to maintain the stored and sequestered carbon found in their biomass and soils. Marine protected areas (MPAs) are an important and powerful tool to support the protection of blue carbon ecosystems, therefore help mitigate the climate change. In order to improve conservation of seagrass ecosystems in MPA Telašćica, Croatia, a project "Development of Guidelines for implementation of blue carbon in the MPA Telašćica Management Plan" was financed by MedPAN (Mediterranean Protected Areas Network). It aims at strengthening MPA management and society through blue carbon research, transfer of knowledge into marine conservation sector in Croatia and other Mediterranean countries as well as raising awareness by performing science-educational workshops for school children. Protecting seagrass meadows as an important carbon sink is a nature based solution for mitigation of climate change effects. This project directly connects to the two sustainable development goals: SDG 13 and SDG 14 and contributes to increase of ocean and climate literacy.

## Using the Deep-sea Environment as a Tool for Promoting Informal STEM Learning through Ocean Literacy Activities

Zubak, I.<sup>1, 2</sup>; Mokos, M.<sup>1, 2</sup>; Čižmek, H.<sup>2</sup>

<sup>1</sup> University of Zadar, Department of Ecology, Agronomy and Aquaculture; <sup>2</sup> Marine Explorers Society - 20000 leagues

Developing young people's understanding of science, technology, engineering, and mathematics with the addition of art - STE(a)M is an irreplaceable stepping stone in the process of creating both STEM-literate and ocean-literate society. In our aim to motivate and educate the new generations, we are taking advantage of the exciting new technologies and the investigation of the deep ocean to promote science and ocean literacy at the same time. During our regular annual activities in promoting ocean science at the University of Zadar, Croatia, various workshops were organized for elementary and high school children, where the secrets of the deep sea and its unique inhabitants were brought to life in the classrooms, inspiring children to think about vast, unexplored, yet endangered "inner space", therefore raising interest and awareness for the deep ocean. By using the examples of worldwide explorations of the deep sea and by demonstrating the potential use of cutting-edge technologies, ROVs and submersibles, we managed to provide an adventurous introduction to scientific learning. Children used Lego (r) blocks, maneuvered real ROVs, created paper models of deep-sea fish and produced amazing and creative artworks. This is an example of how it is possible to promote ocean literacy principles, raise ocean and environmental awareness and contribute to achieving sustainable development goal SDG14.

## **With Our Collective Imaginations – an Invitation to Raw Together Complex Social Knowledge**

Neilson, A.L.<sup>1</sup>; São Marcos, R.<sup>1</sup>

<sup>1</sup>Centre for Social Studies, CES, University of Coimbra

Literally and figuratively, we draw from the fields of education, sociology, political ecology, anthropology, and other critical social sciences to learn how to create more powerful images of multiparadigmatic ways to know the ocean, fish and fisheries. Part of this poster will juxtapose strong visual arguments used within positivistic natural sciences to promote the importance of this type of knowledge with the fewer and generally weaker attempts to communicate social science knowledge related to fisheries and oceans. The remaining portion of the poster will present examples of visual communications that have been developed outside of fisheries research, but which offer useful starting points for developing specific images which could help frame, know and dream coasts, oceans and the social-ecosystems which our collective research could better serve. It uncovers the ways that the fields of science communication and apolitical environmental and outdoor education create powerful lessons which continuously empower already too limited ways of knowing thereby also giving more power to increasingly effective exclusion of diverse and critical social sciences as well as fisher's knowledges.

## Ocean Literacy in Sail Training (OLiST)

Lyth, L. E.<sup>1</sup>

<sup>1</sup> Océanie Ltd

Since 2012, Océanie's director has been working internally to promote Ocean Literacy in Sail Training and externally highlighting Sail Training in Ocean Literacy. Following their EMSEA Malta 2017 presentation conference and supported by UK Sail Training, the forum "Ocean Literacy in Sail Training" (OLiST) was established in January 2018. Several operators have joined this collaboration to the promote Sail Training's Marine Education initiatives and opportunities. Current initiatives include:

- Identifying how the Sail Training experience promotes Environmental Awareness to young people
- Encourage more adoption of the FEE/ STI Blue Flag scheme
- Including more Citizen Science/ Marine Education activities focusing upon the Marine environment
- Encourage partnerships and collaborative working to achieve objectives with results with third party stakeholders
- Increasing public and media exposure to their own organisation, Sail Training and OLiST through event presentations, academic book collaborations, workshops, STEAM programmes
- Operators to Internally review websites, updating to identify of how SDG14 is achieved, as well as Océanie suggesting how all 17 SDGs could be achieved through the Sail Training Domain.

Océanie Ltd's latest initiative encourages operators to sign up to the UN Ocean Conference Voluntary Commitments, increasing the dedication and volume of Marine Education and Sustainable Management within the Sail Training domain.

This presentation highlights two Best Practice examples within Sail Training, that are committed to increasing environmental awareness and sustainable management to achieve SDG14.



## Ciguatera Fish Poisoning in the Canary Islands: a Contribution to Communication Strategies

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<sup>1</sup> Área de Pesca. División de Proyectos. GMR Canarias, S.A.U. Gran Canaria, Spain; <sup>2</sup> Departamento de Sociología y Antropología. Universidad de La Laguna (ULL), Tenerife, Spain; <sup>3</sup> EDEI Consultores S.A. Gran Canaria, Spain; <sup>4</sup> Dirección General de Pesca. Gobierno de Canarias, Gran Canaria, Spain

The Ciguatera Fish Poisoning (CFP) is one of the main seafood poisoning worldwide. In Europe no endemic cases were reported until 2004. In the Canary Islands (CI) one hundred eighteen persons have been diagnosed until 2017 and now the CFP is considered an emerging notifiable disease. Also in Madeira and the Savage Islands there have been cases. Projects related with this topic have been developing in the CI for ten years, outstanding the monitoring and certain restrictions in fisheries and a relevant scientific production but scarce outreach. Just about 5% of the population showed certain knowledge but 82% want to receive more information (in prep.). The objective of this work was to determine communication methods for a given target audiences (age, sex and educational level based) in the framework of CFP risk analysis. Telephone surveys (n 1825) were conducted in 2018 (July, August and September). Who must report (multiple responses) about CFP are health (79.6%) and fisheries authorities (51.8%). The preferred media (max. 3 responses) to be informed are television (TV) (60.8%), social networks (SN) (21.6%) and radio (19.2%). The preference increases for: TV with age, women and lower education level; SN at younger age, women and lower education level; radio increase with age but without relevant differences for sex and education level. This work was developed within the framework of the MIMAR Project (MAC/4.6d/066), with the support of the European Union (EU) and co-financed by the European Regional Development Fund (EDRF) and the INTERREG V-A Spain-Portugal MAC 2014-2020 (Madeira-Azores-Canarias).

## The Deep-Water Sharks' Guide to the Azores

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A scientific guide to the deep-water sharks of the northeast Atlantic, whose main aim is to help identify those species while educating local communities (and especially fishers) about the biodiversity and vulnerability of these elasmobranch species.

In the Azorean waters, deep-water sharks are captured as bycatch by longline fisheries, which could threaten them due to their high vulnerability. This guide's target audience is the regional fishing community. With the purpose of raising awareness, ecological and biological data of all known regional deep-sea sharks was collected and organized in order to help users to easily identify deep-water shark species. The guide also provides good handling and release practices of these animals on board longline fishing vessels, to help improve their survival, so the bycatch impacts can be mitigated. The guide consists of a flow chart for species identification, a key facts sheet for each of the 25 species, a set of comparative sheets for similar species, and a best handling practices manual.

This work was done in collaboration with scientists from the University of the Azores, representatives from the fishing associations and marine educators and communicators. The poster depicts the workflow and the collaboration between different sectors, as well as the layout and artworks chosen to better communicate about this important issue.

## Hear the Baltic Sea – the Marine Educational Project Dedicated to Deaf People

Borowiak-Dzwonkowska, K.<sup>1</sup>

<sup>1</sup> National Marine Fisheries Research Institute

‘Hear the Baltic Sea’ was the project dedicated to deaf people living in Pomerania region in the north part of Poland and aimed to increase their knowledge about fauna and flora species of the Baltic Sea.

The project involved four parts such as:

1. organising a meeting, in which was held a lecture translated into sign language, as well as a film show with subtitles and a microscopic workshop (80 participants),
2. releasing an educational folder in the quantity of 550 copies and distributing them to deaf high schools, foundations and other institutions,
3. organising an educational campaign on Facebook which consisted of five videos with subtitles; the campaign predated the meeting,
4. recording the advertising spot, in which the deaf were engaged.

The main goal of this project was to encourage deaf people to acquire knowledge about our local environment, and raise their awareness about the nature of the coastline as well as the Baltic underwater life. Additionally, we believe that crucial task for marine educators is to enable the disabled to learn more about environmental protection.

All four parts of this project were related to the fauna and flora species of the Baltic Sea such as birds, fish, crustaceans, mollusc etc. The film show, presented during the meeting, and videos on Facebook had been traced by the divers. What is more, the content of the folder incorporated the information about five groups of the marine organisms: phytoplankton zooplankton, phytobenthos, zoobenthos and nekton, which was enriched by the underwater pictures.

The project was founded by the National Marine Fisheries Research Institute and OtwartyIKM. The implementation of the project, as well as the folder, the videos and the advertising spot will be presented at the EMSEA during the poster presentation.

## **An Explorers Education Programme™ Project Entitled ‘Our Ocean – Marine Legends, Fairy Tales and Folklore in Ireland’ Carried out in ten Coastal Counties Around Ireland, Supporting Primary School Education and Promoting Ocean Awareness and Action in Line with the Global Sustainability Development Goal 14**

Dromgool-Regan, C.<sup>1</sup>; Quinn, A.<sup>2</sup>; Burke, N.<sup>2</sup>; Lyons, M.<sup>3</sup>; Horgan, M.<sup>4</sup>; Hunt, L.<sup>5</sup>; Madigan, C.<sup>6</sup>

<sup>1</sup> Explorers Education Programme Strategic Planning and Development, Camden Education Trust, Galway, Marine Institute Galway; <sup>2</sup> Galway Atlantaquaria, Salthill, Galway; <sup>3</sup> Leave No Trace, Mayo, Sligo and Donegal; <sup>4</sup> Old Cork Waterworks, Cork; <sup>5</sup> Sea Synergy, Waterville, Kerry; <sup>6</sup> Loop Head Summer Hedge School, Clare

The Explorers Education Programme™ aims to build on Ireland's marine and maritime heritage by increasing awareness of the value, opportunities and social benefits of our ocean wealth and identity. A core element of its work is to promote ocean literacy by supporting the formal primary school education system through outreach and training. In 2019, over 450 primary school children and 11 teachers lead by the Explorers team around Ireland took part in a project, called Our Ocean – Marine Legends, Fairy Tales and Folklore in Ireland. The students and teachers engaged in learning about a selection of well-loved Irish marine legends, fairy tales and folklore from each coastal county in Ireland. Following this, the students developed original pieces of artwork, storytelling and created poems about their local stories. As an island nation, this provided a unique opportunity where children learned more about their local maritime heritage and identity. By sharing the stories, the students have been inspired to harness their connection with the ocean, which further strengthens their engagement with the marine environment, as well as learn about native Irish marine species and ecosystems. This connection is vital in enabling the students to foster a sense of ownership and responsibility for the long-term care of our ocean and a commitment to promoting the sustainable use of ocean resources.

Engaging with the wider public, a book, postcards and an art exhibition entitled ‘Our Ocean – Marine Legends, Fairy Tales and Folklore in Ireland,’ were created by the Explorers Education team. The art exhibition featured at SeaFest 2019, Ireland’s largest maritime festival reaching an audience of over 100,000 people. Copies of the book were presented to over 700 national and international delegates at Ireland’s Our Ocean Wealth Summit – shared voices from small island nations.

The Explorers Education Programme™ is supported by the Marine Institute, Ireland’s national agency for marine research and development and is funded under the Marine Research Programme by the Irish Government.

## **The Challenges of Communicating Research Findings to the General Public: Money, Conflict, Politics**

Wojcieszek, D.<sup>1</sup>

<sup>1</sup> National Marine Fisheries Research Institute, Gdynia Aquarium, Poland

Communication of marine research findings to the general public is crucial for development of ocean literate and environmentally aware society. Most research projects, especially those funded by public agencies, such as European Union Commission or agencies on a national level, require an outreach program that will follow or complement the research, as a way to ensure that the results will be transferred to the public realm. Gdynia Aquarium, as a part of the National Marine Fisheries Research Institute (NMFRI), is often in charge of outreach programs on different scales. However, the transfer of knowledge from a laboratory to a classroom is not always as straight forward as one could expect. Outreach programs are often restricted by available funds and by requirements of the outreach extent that force educators to put quantity over quality. Additionally, education tailored to a specific research may cause or deepen conflicts between institutions that disagree on some data interpretation. Last but not least, both research and outreach conducted by public institutions that come under national administration may be affected by changes in environmental protection and conservation laws that depend on the government's policy. This talk will present some of the challenges that the Gdynia Aquarium faces as a liaison between science and general public.

## Tools of the Trade: Resources to Achieve Ocean Literacy

Payne, D. L.<sup>1, 2</sup>; Marrero, M. E.<sup>1, 3</sup>; Achilles, K.<sup>1, 4</sup>

NOAA Fisheries, United States

<sup>1</sup> National Marine Educators Association, NMEA; <sup>2</sup> Connecticut Sea Grant, University of Connecticut, USA; <sup>3</sup> Mercy College Centre for STEM Education, Mercy College, Dobbs Ferry, New York, USA; <sup>4</sup> NOAA Fisheries, United States

The ocean is the defining feature of our blue planet. All life, including our own, exists because of the ocean. If our most critical goal as an international ocean literacy community is to empower people to care about the ocean's influence on us and our influence on the ocean, we need the tools to help us do so. In this session, we will highlight multiple resources to help you foster Ocean Literacy in your own community. We will then take a closer look at a new website featuring the Essential Principles and Fundamental Concepts. The site provides access to resources to teach Ocean Literacy, offer an Ocean Literacy workshop, and understand the impact of global Ocean Literacy across time and space. These resources can be incorporated into your current programming or as a part of a workshop or conference. Utilize the tools as the cornerstone of your broader impacts for education and outreach of research, to inspire a youth group, or as the basis of your efforts to encourage people to communicate about the ocean and make informed and responsible decisions about the ocean and its resources. Without a solid foundation in Ocean Literacy, it will be challenging to persuade citizens, resource managers, and decision makers to conserve ocean resources, combat climate change and ocean acidification, manage fisheries, or support marine protected areas or ocean science research. Join us and add these tools to your toolbox to help achieve the collective vision of an ocean literate global society.

## Using Ocean Literacy and Marine Spatial Planning to Investigate Sustainable Energy Solutions in Second Level Education, Collaborating to Promote Awareness and Actions for Sustainable Development Goals 7, 13 and 14 through Experiential Public Engagement

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<sup>1</sup> Galway Atlantaquaria, Salthill, Galway; <sup>2</sup> Sustainable Energy Authority Ireland, Wilton Park House, Wilton Pl, Dublin; <sup>3</sup> Brigits Garden, Pollagh, Rosscahill, Co. Galway; <sup>4</sup> National University of Ireland Galway, University Road, Galway

Galway Atlantaquaria, the National Aquarium of Ireland, is Ireland's largest native species aquarium. A core element of its work is to highlight native Irish species and ecosystems and promote Ocean Literacy through both formal and informal education. In 2019, the aquarium, alongside the Sustainable Energy Authority Ireland and Brigits Garden developed a workshop for students in second level education. This workshop focused on educating students in the areas of Ocean Literacy and Marine Spatial Planning (MSP) with the goal of using this knowledge to design a programme for Ireland's future energy needs through purely sustainable means. The student's goals were also to be in line with the sustainable development goal (SDG) 7 'Affordable and Clean Energy', SDG 13 'Climate Action' and SDG 14 'Life Below Water'. Post participation feedback was positive and showed the students felt a significant increase in their knowledge, attitudes and values (the largest increase recorded was in their knowledge). Following on from this an international group of experts participated in an evening workshop to discuss how MSP is used to balance the different demands for using our ocean. The International Council for the Exploration of the Seas (ICES) Working Group on Marine Planning and Coastal Zone Management brought experts from a range of disciplines to discuss the implementation of marine spatial planning and related research using the MSP challenge game. This has led to plans for a version of the game to be used with the general public and in secondary schools in the future.

## Sharks Ahoy: Changing Elementary Students' Perception on Sharks and Rays

Sequeira, V.<sup>1</sup>; Aurélio, M.L.<sup>1</sup>; França, S.<sup>1</sup>

<sup>1</sup> MARE-UL- Marine and Environmental Sciences Centre, Faculdade de Ciências, Universidade de Lisboa, Portugal

How do you feel about sharks and rays? This was the question that triggered Sharks Ahoy scholar project aiming to demystify the scary image associated with these animals, improve knowledge and raise awareness on their threats and conservation needs. During the 2018/2019 scholar year, 225 elementary students from ten classes of eight schools from the greater metropolitan Lisbon area, Portugal, participated in two interactive classroom sessions developed by MARE marine researchers. "Meet the family of sharks and rays" was the name of the first one, where students set off on a journey and learned about this fish group, their distinctive characteristics and their role in the ocean. "Sharks and rays in danger" was the name of the second session focusing on the main threats that these species face worldwide. Interactive experiences were used, and emotions were put to test while touching a shark, grabbing ray eggs, playing our Sharks Ahoy bingo or even diving with sharks using 3D virtual glasses. After taking all these in, a final challenge was proposed: to create a tale about sharks and rays calling for their conservation. The winners will have the opportunity to publicly present their stories in Oceanário de Lisboa and participate in one of the 25 educational activities of this public aquarium.

Sharks Ahoy is the educative component of the Shark Attract project that aims to provide the status and trends on sharks and rays fisheries in Portugal and tackle these species conservation through awareness and knowledge.



## Assessing the Effectiveness and Impact of the “Look at the fresh fish” Project

Aurélio, M.L.<sup>1</sup>; Sequeira, V.<sup>1</sup>; França, S.<sup>1</sup>; Ferreira, S.A.<sup>1</sup>; Boaventura, D.<sup>1,3</sup>; Cardoso, I.<sup>1</sup>; Amorim, A.<sup>1,2</sup>; Cabral, H.N.<sup>1,4</sup>

<sup>1</sup> MARE-UL- Marine and Environmental Sciences Centre, Faculdade de Ciências, Universidade de Lisboa, Portugal; <sup>2</sup> FCUL – Faculdade de Ciências da Universidade de Lisboa, Campo Grande, Lisboa, Portugal; <sup>3</sup> Escola Superior de Educação João de Deus, Lisboa, Portugal; <sup>4</sup> Irstea, UR EABX, Centre de Bordeaux, 50 avenue de Verdun, 33612 Cestas, France

“Look at the fresh fish!” was a project carried out by Marine and Environmental Sciences Centre (MARE) researchers, which having the traditional fish market as a set, engaged 200 students with ages between 9 and 14 years old from four schools of a Lisbon neighbourhood (Portugal). Students participated in guided visits to the fresh fish area of a traditional market, learning about species ecological, commercial and social importance, and in inquiry hands-on laboratorial activity of fish biological sampling in the classroom, exploring aspects related to fish ecology and understanding the importance of this work in marine research.

To assess the effectiveness and impact of the project, several evaluation tools were used: after laboratorial sessions, evaluation questionnaires targeting teachers and students were performed; at the end of the project, open self-questionnaires, targeting teachers, and interviews targeting market sellers and supervisors were conducted. Information on the design of these tools and the considered criteria regarding the different audiences and objectives will be presented.

Answers revealed that most of the students were very satisfied with the fish biological sampling session highlighting the opportunity of dissecting and exploring these animals. The majority of teachers pointed out how it helped to better understand school subjects and market collaborators valued the contact with the students and the possibility to enrich their knowledge, promote the market and keep customers informed.

Overall the evaluation performed allowed to conclude on project’s importance to promote ocean literacy, enrich the school curricula and to motivate the scholar and the local community.

## Linking Research, Fisheries and Society: the Role of the Shark Attract Project in Raising Awareness on Sharks and Rays Endangered Species

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Sharks and rays are an extremely diverse group of fishes, with more than 1200 species, present in all marine ecosystems. Recently, they have been under increasingly fishing pressure, with worldwide populations affected. Their life-history characteristics, such as low fecundity, late sexual maturity and reduced number of offspring, make them a fragile resource, highly vulnerable to overfishing. The Shark Attract project aims at providing the status and trends regarding sharks and rays fisheries in Portugal and tackles these species conservation through increasing awareness and knowledge within fishermen and society. Official data on sharks and rays national fisheries landings were obtained from Portuguese institutions, and a time series for the last 20 years was built. Landings per species, fishing port and fishing fleet were analyzed and trends explored. On the basis of this information, several actions have been outlined and prepared accordingly, for specific targeted groups: an educational program was established to be developed in schools; workshops and meetings will be implemented between researchers and fishermen to provide knowledge on sharks and rays biology and ecology and discuss ways of conserving their populations; and public awareness will be promoted through initiatives targeting society and a citizen science project. The delineation of these actions will be presented and outcomes discussed. It is expected that the project generates scientific knowledge regarding sharks and rays population trends in Portugal, and that the implemented actions will increase the knowledge and awareness of society about these endangered species, changing attitudes and ultimately contributing to their conservation.

## Communicating the Sea on an Island (with 15 thousand inhabitants) - the Advantages and the Challenges!

Dâmaso, C.<sup>1</sup>; Cascon, M.; Cruz, M.J.; Ribeiro, A.

<sup>1</sup> Sea Observatory of the Azores

Sea Observatory of the Azores (OMA) is based at Porto Pim Whaling Station, in Faial Island. Since 2012, people in the activities promoted by its Science Center is growing steadily from year to year, registering in 2018 more than 11 000 participants. Porto Pim Whaling Station Museum focuses on Whaling and Biology and Conservation of its target species – The Sperm whale - and targets general public and tourists. OMA's pedagogical offer targeting schools, addresses 6 themes - Marine Life, Oceanography, Maritime History, Sustainable Fishing, Marine Litter and From Whaling to Science - worked in a pedagogical, artistic and creative way. The size of the island facilitates the development of our activity. It is possible, for instance, to follow the same students from preschool to high school, or reach the entire school community. However, it also works as a difficulty, since the target audience for a certain activity quickly depletes.

And that's the great challenge - the creation of new content and activities very frequently, responding to the increasing requests from different target audiences. How do we respond to this challenge? Researching a lot about what is currently being done around the world. Hosting temporary exhibitions that allow us to diversify not only the activities but the themes addressed. With a lot of work. With partnerships with a variety of partners, including the scientific community so we can transmit the most recent knowledge. But above all, with lots of dedication, lots of imagination, lots of new ideas and lots of recycled ideas!

## Marine Education for Environmental Awareness on Plastic Pollution

Canuto, S.<sup>1</sup>; Borgogno, F.<sup>1</sup>; Forioso, I.<sup>1</sup>; Stocchino, A.<sup>2</sup>; Besio, G.<sup>2</sup>; Capello, M.<sup>2</sup>; Cutroneo, L.<sup>2</sup>;  
Mounier, S.<sup>3</sup>; Lenoble, V.<sup>3</sup>; Tesán, J.<sup>3</sup>

<sup>1</sup> European Research Institute, Italy; <sup>2</sup> University of Genoa, Italy; <sup>3</sup> University of Toulon, France

Marine education is a key component in plastic pollution awareness and solution. Marine litter in the ocean is one of the biggest problems which affects human life. Within the framework of Interreg SPLasH! project, which aims at studying the dynamics and characterization of microplastics in three ports of Mediterranean Sea, dissemination activities were carried out. More than 2000 students were involved, in primary, middle and high schools and during public events, in two Italian Regions: Sardinia and Liguria. Activities aimed to communicate the importance of the ocean in our lives and to make people understand why is important to deal with the amount of plastic entering the ocean, threatening not only marine life but also human life. Make people aware of the problem of an uncontrolled use of plastic is crucial to induce behavioural change. Initiative included a theoretical part in the classroom and a practical session on the beach, with the approach: 'learn to look and look to learn'. A survey on general knowledge about plastic was used before and after the activities, with a total of 834 students participating in it. The aim of the survey is to evaluate which is the Mediterranean population perception about plastic in our everyday life and convey a correct scientific information on it. Comparison between previous and consequent questionnaires demonstrated a visible improvement of students' knowledge of this topic. Furthermore, younger students showed a more optimistic view than older students about plastic production projection in the next years.

## Travel Souvenirs and Ignorance of People - How to Protect Nature

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<sup>1</sup>Gdynia Aquarium, National Marine Fisheries Research Institute, Poland

The number of Poles traveling abroad for holidays been growing for about 14 years. In 2017, the borders exceeded 32.7 million people, i.e. 5.1% more than in 2016. Unfortunately among souvenirs brought back from vacation are not only photos or memories but also items made of parts of endangered species. Travellers are also often unaware that they are treated as smugglers when transporting such souvenirs. They are subject to the same penalties, regardless of their knowledge and contribute unconsciously to the species extinction and destruction of habitats of many animals and plants. Therefore, the Education Centre of the Gdynia Aquarium NMFRI, seeing the need for education of Poles, in June 2018 conducted an event aimed at bringing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) closer to the general public.

We used the collection of the Gdynia Aquarium for the "CITES, or what not to bring from holidays as souvenirs" event. We also invited the Customs Service in Gdansk, which lent us various confiscated items and told stories that helped to make our guests aware of the problem of souvenirs. The second part of the event was a photographic competition (summer 2018). The participants had to photograph the CITES species or an item souvenir made of it. In September 2018, the best works were awarded during the vernissage and an exhibition was created on the grounds of the Gdynia Aquarium.

## **Environmental Awareness Activities (Beach Money & Turtle Spot) Happened in Xiao Liuqiu**

Hsieh, Y.J.<sup>1</sup>

<sup>1</sup> Hiin Studio

Xiao Liuqiu, a small island known for its clear water, white beach and sea turtles. Due to the magnificent nature sights and the convenient transportation, more than 43million visitors pour into the small island with only 6.8 square kilometre each year. Visitors not only boost the economy of local but also bring a lot of waste to the island. Hiin Studio and Turtle Spot solve it through marine education and environmental awareness activities such as Beach Money and Turtle Spot Project.

## The European Atlas of the Seas, Online Interactive Catalogue of Marine Maps for a more Ocean Literate Society

Marsan, A.A.<sup>1</sup>; Derycke, D.<sup>1</sup>; Larkin, K.<sup>1</sup>; Calewaert, J.B.<sup>1</sup>

<sup>1</sup> EMODnet Secretariat

To achieve an ocean literate society, we need to communicate marine data and information in an attractive, easy to digest and playful way to connect people to our blue planet. The European Atlas of the Seas (EAS) is an open data Web mapping application for the general public, with the aim to raise awareness about Europe's seas and coasts, and the sustainable management of marine resources.

A revamped version of the EAS has been released in 2018, offering a wealth of easily accessible maps, new features and at-a-glance metrics on diverse marine topics such as nature, tourism, security, energy, fish consumption, and much more. Users can explore an enriched catalogue, with more than 250 map layers, to create their own maps that can be printed, shared and embedded in presentations or social media. More than half of the diverse map layers are derived from data supplied by the European Marine Observation Data Network (EMODnet), with other providers including the European Commission, the European Environment Agency and Eurostat.

The EAS is an important tool for ocean literacy and education, for use by schools, researchers and non-expert professionals as a way to increase environmental awareness. This presentation will outline the added value of using the EAS in marine education and will present future plans to extend the education outreach, including a teachers' corner and a partnership with Nausicaà, the French National Sea Centre in Boulogne-sur-Mer and member of the World Ocean Network, as well as a new collaboration with Escola Azul (Portugal).

## Urgency & Efficiency: How do we Take Ocean Conservation out of the Aquarium?

Santos, T.<sup>1</sup>; Pina, T.<sup>1</sup>

<sup>1</sup>Oceanário de Lisboa, Portugal

A deeper understanding of what is currently happening to the planet is at the forefront of all environmental related institutions, non-governmental organizations, governments and policy makers. Aquariums and zoos are already focused on education and awareness about conservation issues in their facilities. Oceanário de Lisboa believes it is urgent to go beyond its educational programmes and amplify this message in a more efficient way.

Therefore, Oceanário de Lisboa created an environmental education outreach project with low investment in time and financial resources that is able to have a massive impact from a qualitative and quantitative point of view. The program informs, inspires, and mobilizes the general public to act towards the sustainability of the planet. A 60-minute free talk, 'Planet Ocean' challenges the participants to reflect on their perception about ocean issues. In a dynamic and interactive way, this talk unveils the role of the ocean within the planet's balance, the magnificence of its biodiversity, our influence on its sustainability and our crucial role in its conservation. To assure the success of this project, a partnership with Portuguese municipalities and schools was established in order to engage all students, from 6 to 18 y/o. By the end of the year, Oceanário de Lisboa wants to actively involve 50 000 students in ocean conservation, connecting them emotionally, and enabling them to make conscious and responsible decisions regarding a sustainable future. The planet and the ocean need immediate mobilization and urgent action.



## MISSÃO\_MAR: How to Engage Teachers and Students in Climate Changes Issues

Geraldes, D.<sup>1</sup>; Pina, T.<sup>1</sup>

<sup>1</sup> Oceanário de Lisboa, Portugal

Nowadays, there is a scientific consensus about the influence of human activities on climate change, especially since the latter part of the 20th century. The recent Global Climate Strike, which took place in over 2000 cities worldwide with more than 1.4 million students protesting against climate policy makers, shows an increasing interest in youngsters in issues related to climate change and the environment. In the school year 2019/2020, Oceanário de Lisboa will launch a new educational programme focused on climate change and the role of the ocean as a major influence on the weather and climate. MISSÃO\_MAR aims to raise awareness about climate change in Portuguese students, from 12 to 18 years old, and to train their teachers in how to include this issue in their lessons. The program will have three different phases: 1. A free 3h-training for teachers on climate change; 2. A digital manual for teachers, which addresses this theme and challenges the teachers to develop with their students, a project that involves the community on the subject of climate change and the role of the ocean; 3. A presentation of the project in a conference at Oceanário de Lisboa. With the support of the municipalities, Oceanário de Lisboa aims to engage 8 000 students in climate change projects, and equip 600 teachers with the knowledge and experience to promote environmental awareness and sustainability.

## **Futurismo Azores Adventures: Raising Awareness and Enhancing Environmental Knowledge on the Local Community**

van der Linde, M.<sup>1</sup>; Gardoki, M.; Martins, R.; Al Abbar, F.; Ojeda, V.; González García, L.

<sup>1</sup> Futurismo Azores Adventures, Ponta Delgada, São Miguel (Azores)

Since the beginning of the Futurismo's project in the early 90's, the relation between tourism, conservation, science, education, culture and heritage has been one of the most important pillars of the company. In order to support our sustainability commitment, both regarding socio-economics and environmental perspectives, Futurismo never ceased to support schools, social institutions, environmental centres, colleges and other organizations related to science and education. Over time, we have carried out a vast number of workshops, internships, boat trips for research and leisure, and other forms to spread education and knowledge, including our daily tourism activities. We have received interns, volunteers, students, researchers, photographers from so many countries, nationalities, ages and different academic backgrounds. Nevertheless, it is our children that we most cherish and this generations that we most try to reach in order to make them grow in a different mindset. Therefore, we frequently work with local schools (and international also), whenever they ask or under scheduled programs, being on a sea trip, in a classroom or in our office with lectures. Creativity is always key in order to teach them using different games that promote learning. This is how we educate the young members of our community: teaching them about our environment and its conservation, using different games, thus making them have fun while learning.

## A New Approach to Improve Local Environmental Awareness

Pavão, M.I.<sup>1</sup>; Silva, M.; Sousa, R.; Cabo Ibarzábal, I.; Fonseca, M.R.; Soares, M.; González García, L.

<sup>1</sup> Futurismo Azores Adventures (Ponta Delgada, São Miguel, Azores)

Futurismo has been always linked, since the very first beginning, to environmental education and social awareness, both among tourists and locals. Whale watching in the Azores has progressively gained importance from an economic point of view as one of the most important incomes on the region's tourism; and as an effective tool to enhance and increase the value of the cultural, natural and historical patrimony. Local business and its development have grown alongside with whale watching in the Azores, and handcraft related to the ocean is one of the evidences. Knowledge about biodiversity, particularly about the presence of cetaceans around the islands is now obvious for everyone.

Local institutions usually contact Futurismo in order to organize some events or educational sessions. However, in the last couple of years we have begun to talk with schools to integrate our participation in the curricular school program. Our staff cooperate with the teachers in order to complement the scheduled lessons with interactive educational sessions carried out by Futurismo team. This year we are already working with one school in Ponta Delgada; and things are being aligned with another for next year.

From all the schools, reference to Rabo de Peixe, where is a greater need to encourage children to continue studying to have a future other than fishing. This way, alongside other partnerships and support we give on that village, we try, through education, to raise environmental awareness and to show them that tourism can be a future for them.

## National Marine Educators Association (NMEA)

Achilles, K.<sup>1, 2</sup>; Marrero, M.<sup>1, 3</sup>; and Haynes, S.<sup>1, 4</sup>

<sup>1</sup> National Marine Educators Association; <sup>2</sup> NOAA Fisheries, United States; <sup>3</sup> Mercy College, United States;

<sup>4</sup> NOAA Office of Ocean Exploration and Research / Contractor with Collabralink Technologies, United States

The National Marine Educators Association (NMEA) is a dedicated, influential member-based organization of classroom teachers, informal educators, university professors, scientists, agency staff, and others from around the world working together to advance the understanding and protection of our freshwater and marine ecosystems. NMEA members are working on multiple national and international initiatives to further our mission of making known the world of water, including ocean literacy, international marine education, student engagement, traditional knowledge, expanding audiences, youth engagement and conservation. We also host an annual marine education conference in the United States, offer conference scholarship opportunities, and publish a peer-reviewed journal entitled *Current: The Journal of Marine Education*. Please join us to learn more about NMEA!

## Set Sail for Scientific Investigation Using Student Built Miniboats

Stymiest, C.<sup>1</sup>

<sup>1</sup> Educational Passages

Explore real world phenomenon through building, launching, and tracking miniboats. As they sail, dive into tools and activities that explore their maps and stories. Miniboats (five-foot long unmanned sailboats) connect earth, physical, and marine science with geography and international relations. Students prepare, deploy, and track miniboats while learning about ocean currents, weather, technology, and more. When the boats land, students create transoceanic classrooms, connecting with different nations and cultures and learn about ocean careers.

In this session we will show participants how they can engage their students, school, and community throughout the year and connect with people all around the world by integrating miniboats into their programs. We will highlight the work of the Columbia River Maritime Museum which has launched two dozen miniboats in two years, connecting students across the Pacific from Oregon to Japan. We will also highlight the work of partners around the Atlantic as well. We will share stories of ocean crossings and scientific findings and show how to download and use the free data available at [www.educationalpassages.org](http://www.educationalpassages.org) of all student-built miniboat tracks. We will also explore how to use the Path Analysis Tool to access oceanographic information and predict and follow miniboat paths across oceans all over the world.

## Engaging Future Scientists through Multidisciplinary Investigations into the Biogeochemistry of our Changing Oceans

Harrison, I.<sup>1</sup>

<sup>1</sup> Jacobs Well Environmental Education Centre (JWEEC), Queensland Government, Australia

High school environmental investigation can sometimes be limited by data collection that occurs at a single point in time, hence the evaluation of that data may be considered limited in its scope. Jacobs Well Environmental Education Centre (JWEEC) have developed a program of study that investigates the physical and chemical parameters of ocean water at two separate sites within the confines of the Gold Coast's Broadwater. This data is then used by students to investigate the settlement and growth of sessile planktonic organisms. The data collection process utilises long term monitoring processes that can increase the validity of the investigation. These new programmes successfully interpret the new Queensland Curriculum and Assessment Authority (QCAA) senior science syllabuses for Biology, Marine Science and Earth and Environmental Science. At JWEEC we place scientific investigations into a context that can be considered at a global, regional and local level. These "real world" investigations draw upon knowledge that includes the science of biology, chemistry, geology and oceanography. We believe that this multidisciplinary approach prepares students for a realistic future in the science arena. JWEEC provides students the opportunity to develop their scientific technique by drawing upon a multidisciplinary approach in order to hypothesise, test and find answers to their own questions. This presentation hopes to provide an insight into the scientific processes that help to prepare our future scientists. Discover the ethos behind our logo "Live the Learning at Jacobs Well Environmental Education Centre".

## The Blue Team Project: I am a Citizen of the Ocean ... What About You?

Hatin, T.<sup>1</sup>, Chiroutre, E.<sup>1</sup>, Montier, M.<sup>1</sup>, Mormentyn, S.<sup>1</sup>

<sup>1</sup> Nausicaa, National Sea Centre

Heirs of the world of tomorrow, the younger generations play a key role in building a fairer society and in the development of a sustainable world. In this context, NAUSICAA, the French National Sea Center, is willing to commit itself for and with young people by giving them the means to become responsible Citizens of the Ocean, able to concretize in actions their projects for the Planet. To be a Citizen of the Ocean is to take part in an international solidarity organized around a sharing of responsibilities. Established by the World Ocean Network (WON), Ocean citizenship is a movement in which the public is committed to adopt new habits and change behaviors in order to restore the ocean and its balance. It is also a way to ensure that future generations will be able to enjoy the benefits of the Ocean. In collaboration with the educational actors of the WON Hauts-de-France, the National Education and the urban community of Boulogne s/mer, NAUSICAA invites young citizens in schools to mobilize for the sustainable management of the Ocean and his resources by joining the Blue Team. The objective of the Blue Team is to facilitate the emergence of citizen actions and invent alternative scientific education processes based on the cooperation of educational, cultural, social, economic and scientific actors, around a common project. This project, driven by Nausicaa, will be reinforced in its expertise thanks to training times, the design of shared tools as well as the sharing of knowledge and skills. The Blue Team will be established following a call for projects. A jury will select 20 citizen ambitious and realistic initiatives. These initiatives will be valued during and after the project to inspire new ones. Each year will be 20 classes that will be involved. That is potentially 400 participants, from primary to high school, taking with them their teachers, coaches, friends, colleagues and families towards responSEAbLe citizenship.

## LIFE Recreation ReMEDIES

### Reducing and Mitigating Erosion and Disturbance Impacts affecting the Seabed

Crouch, F.<sup>1</sup>

<sup>1</sup> Plymouth City Council

LIFE Recreation ReMEDIES is a four year project that will improve the condition of four marine habitats of European importance in five key Special Areas of Conservation (SACs) in the UK. Special Areas of Conservation are protected sites designated under the EC Habitats Directive for habitats and species considered to be most in need of conservation at a European Level. Unfortunately over time a number of habitats within the 5 SAC's chosen for this project are now considered to be in 'unfavourable' status. Recreational pressures are a key cause of the unfavourable condition of habitats such as seagrass meadows (*Zostera marina*) and Maerl beds (*Phymatolithion calcareum*).

The ReMEDIES Project will:

- Demonstrate habitat restoration and management techniques including seagrass restoration
- Protect and improve the condition of key intertidal and subtidal habitats
- Raise awareness and actively inspire better care of habitats by key users
- Monitor, record and evaluate the project to maximise public benefits, conservation impact and repeatability across Europe.

A number of techniques will be used to restore the seabed habitats. However, key to the long-term success of the project is raising awareness (ocean literate users of the marine environment) and behaviour change of those who seek to enjoy the wonders of our ocean but have little or no understanding of the impact their actions have on key habitat and species within UK and European SAC's.

LIFE Recreation ReMEDIES Project is a partnership between: Natural England, Marine Conservation Society, Royal Yachting Association, National Marine Aquarium and Plymouth City Council (Tamar Estuaries Consultative Forum).



## **EMSEA EXPO ACTIVITIES**

## **Fun with Marine Food Chains**

Rocha, R.<sup>1</sup>

<sup>1</sup> New Bedford Whaling Museum, US

Because there is such a huge variety of organisms living in the global ocean, including our own mid-Atlantic, it is easy to use some of these living things to teach food chains, food webs and related ocean concepts. This ocean expo station will host three different hands-on activities to teach basic marine food webs. One benefits from direct involvement from a teacher/facilitator. One requires minimal to no supervision, making it useful for a busy classroom (or informal education venue) with multiple learning stations. The third does well with some initial coaching, and a periodic check-in, but can be student directed otherwise. All feature animals that will be familiar to many students.

## Devoid of Dissolving Discussions: A Different Ocean Acidification Engagement Event

Wheatley, C.<sup>1</sup>

<sup>1</sup> Incredible Oceans, UK

At a recent NERC-funded marine science communication workshop insights from neuroscience and psychology into understanding audiences were shared and discussed. The workshop culminated in a participant-designed and run engagement event drawing from discussion at the workshop. The engagement event was designed around the theme of ocean acidification – while public awareness of climate change is growing, awareness of ocean acidification and its importance remains low. The aim of the event was to make this topic more relatable and less technical than historic public engagement in this area, which has focussed on scientific changes in ocean chemistry and dissolving shells and corals.

The engagement event focussed on a lesser-known research area: the effects of ocean acidification on animal behaviour. At its centre was a hands-on activity requiring participants to match colourful cartoons of observed behavioural changes with their description. The activity fuelled conversations about memorable observed effects such as sharks “losing their sense of smell”.

A drawing challenge was also designed for the engagement event, for which participants wore augmented-reality goggles. This activity fostered discussions about how sensory disruption can make simple tasks more energy and time-consuming, and can subsequently be detrimental to animal fitness. The interactive, entertaining, and technological nature of this activity resulted in eager participation across a wide age range.

By applying the training provided at the NERC-funded science communication workshop, and by approaching an established topic from an unconventional angle, an effective, engaging ocean acidification event was created. It will be exciting to share this experience of developing and running this event at EMSEA.

## **‘Coral Territory Wars’: Education Program on Coral Reef Ecosystems to Raise Awareness on the Importance of Conserving Them**

Imamiya, N.<sup>1</sup>; Tsuduki, A.<sup>1</sup>

<sup>1</sup> Marine Learning Center, Japan

Coral reef ecosystems are shrinking and being destroyed in the oceans around the world with human behaviour being the main cause. Although coral reefs make up less than 0.1% of the ocean surface, about a quarter of all marine species live there. No matter which sea you live near, promoting education is crucial in raising awareness which would lead to conservation measures. Such program also leads to SDGs 14 ‘Life below water’ directly, and in particular it is highly relevant for Target 14.1 and 14.2, which aim to reduce marine pollution of all kinds and to sustainably manage and protect marine and coastal ecosystems in order to avoid significant adverse impacts.

Okinawa's seas, where the Marine Learning Center mainly operates its educational activities, have been blessed with one of the most diverse coral reef ecosystem in the world. However, nowadays, the destruction and contraction of coral reefs is progressing due to bleaching and the inflow of red soil caused by farmland development. For these reasons, we developed a hands-on educational program to learn about various factors that inhibit the growth of corals and how much impact these factors have on the coral reef ecosystems.

In this presentation, we will show the actual materials on site. We will also introduce the background of this program’s development, the characteristics of the program’s design, its learning flow, and its implementations in various educational opportunities.

## Hands-on Ocean Literacy (OL): a Set of Practical Labs for Exploring the 7 OL Principles

Realdon, G.<sup>1,2</sup>; Cheimonopoulou, M.<sup>3\*</sup>; Fabris, S.<sup>2</sup>; Candussio, G.<sup>2</sup>; Invernizzi, M.C.<sup>1</sup>; Paris, E.<sup>1</sup>

<sup>1</sup> University of Camerino, Italy – UNICAMearth Group; <sup>2</sup> Associazione Scienza Under 18 Isontina, Fogliano Redipuglia, Italy; <sup>3</sup> Hydrobiological Station of Pella, Ministry of Rural Development and Food, Greece

The ocean, through water cycle, energy transfer, oxygen production and CO<sub>2</sub> absorption, made and makes life possible on Earth. Even if this delicate balance is endangered by human activities, ocean related topics are often neglected in school curricula of many European countries (Mogias et al. 2015; Hartley et al. 2015; Squarcina & Pecorelli 2017; Gough 2017; Dromgool et al 2017; Mogias et al. 2019).

To help addressing this problem, we developed a series of practical labs aimed at introducing each of the 7 OL Principles to primary and middle school students. Some of the activities were built from the scratch, others were adapted from existing literature: all are feasible in the classroom by means of simple and cheap equipment built with common household materials.

In this conference we are presenting the following activities:

- Discovering ocean currents by following 29.000 rubber ducks lost at sea
- Modeling water circulation across straits with the “Marsili’s Tank”
- From marine fossils to mountain building
- Water cycle in a plastic bag
- Water acidification and pH buffering in sea water
- Food chains in the Mediterranean Sea
- Beach litter and marine micro-plastics
- Modeling sea-bottom topography studying methods (sounding-box and 3D imaging)

Fieldwork experiences in coastal environment are invaluable for learning about the ocean, but they are often difficult to manage, especially for schools on inland areas: we propose this contribution to help filling, at least partly, this gap.

\* The author's views and opinions do not necessarily reflect those of her institution.

## How to 'Rock' a Rockpool

Lamport, E.<sup>1</sup>

Each year, searching hands and trampling feet descend onto beaches around the Welsh coast in search of a Rockpool. There is much information to be found on what lives in a Rockpool and where to find them, but not much information on HOW to do it and CARE for them.

The 'How to Rockpool' education programme by Beach Academy is essential for those wishing to explore these wondrous wildlife worlds available to us. With years of experience Beach Academy has shared tips, tricks and knowledge to make the most out of one of the best free activities in nature - Rockpooling. 'How to Rockpool' is suitable for all age groups and focuses on increasing ocean literacy levels. Through engaging interactive activities, the program teaches how to:

- \* Limit the impact on Rockpool biodiversity that keeps the ecosystem in balance;
- \* Search, capture and release in a sensitive way;
- \* Avoid the destruction of these vital habitats and other marine environments in accessing them.
- \* Generate care, awareness, respect and understanding life under water in intertidal areas.

'How to Rockpool' focuses on maximising the marine wildlife experience on the coast sustainably and safely with great ideas and step by step guidance on the dos and the don'ts. The 'How to Rockpool' education programme includes:

- \* Public Rockpooling sessions for local families and tourists.
- \* Educational Rockpooling sessions for schools, home educators and uniformed groups.
- \* 'Educating the educators' workshops
- \* Innovative up-cycling marine litter and plastic pollution to make equipment suitable for Rockpooling
- \* Outreach sessions, supporting learning in the classroom and in libraries.

EMSEA workshop participants will have the opportunity to engage in 'How to Rockpool' activities, try out 'tips and techniques' and make eco-Rockpooling equipment.

## Mission across the Channel

Domanoski, L.<sup>1</sup>

<sup>1</sup> Observatório do Mar dos Açores

A board game to learn in a funny way about the great variety of fish species that exist around the Azores Islands. The setting of this game is the channel between the islands of Pico and Faial. This channel is a strait of approximately 8 km that reaches abyssal depths. There is a considerable diversity of benthic and pelagic fish species coexisting in the channel, from the coast to the deep sea. Each player has to cross the channel by one of three possible ways, answering questions about the fish species that can be found along the way:

1. On the line boat “Gilberto Mariano” by the surface: to reach the end, the player will have to demonstrate his/her knowledge of pelagic fish such as tuna, blue shark, flying fish and sunfish.
2. In the submarine “Lula 1000”, through the depths: the player will have to demonstrate his/her knowledge of deep-sea fish such as the roosterfish, the lowfin gulper shark, the anglerfish and the deep sea ray.
3. Diving for the coastal waters: the player will have to demonstrate his/her knowledge of coastal fish such as the seahorse, a flatfish, European finless eel and Cleaver wrasse.

## **Framing Knowledge in the Middle of the Atlantic Ocean**

Neilson, A.L.<sup>1</sup>; São Marcos, R.<sup>1</sup>; Canha, C.<sup>2</sup>

<sup>1</sup> Centre for Social Studies, CES, University of Coimbra; <sup>2</sup> UMAR-Açores – Associação para a Igualdade e Direitos das Mulheres

Using various materials from the outreach activities of multiple community and fishing associations from the Azores Islands, we will engage participants in activities to explore how they construct and frame their knowledge of small-scale and artisanal fishing. Our focus will primarily be on the social aspects of Azorean fisheries, but our expo table also will include such things as demonstration of preparing artisanal fishing gear such as games which are used to set long-lines. We will share information about the current reality of fishing across the 9 islands, as well as the traditional crafts made from fish scales and the more recent innovations of fishing tourism in which tourists go onboard and experience artisanal fishing. Conference participants will also get a chance to view some of the photo narratives from the upcoming book 'Visions from fishing communities of the Azores Islands'.



## **Atlantic Adventures with ATLAS**

Walls, N.<sup>1</sup>

<sup>1</sup>Dynamic Earth, Edinburgh

ATLAS is a trans-Atlantic research project funded by the EU under the Horizon 2020 Blue Growth call. It aims to increase our understanding of deep Atlantic marine ecosystems and their connections with other areas. ATLAS will also improve our ability to predict how changing environmental conditions might affect them. The information gathered will allow ATLAS to inform scientists, governments and businesses on the best ways to protect these ecosystems from issues such as climate change, pollution and certain fishing techniques. This knowledge will support sustainable growth in the marine and maritime sectors. Engaging the public with the outcomes of ATLAS is a key part of the project.

Dynamic Earth, an Earth science and public engagement centre in Edinburgh, has created an Outreach Educational Portfolio for ATLAS. Science engagement staff will present some of our family drop-in activities such as an ROV simulator, biodiversity survey mat and deep-sea themed augmented reality colouring sheets. Activities are hands-on, engaging and explain the ATLAS science themes to the wider public. All resources and activities have been made open access to allow other marine education centres to use them to increase ocean literacy of their local communities while highlighting current Atlantic marine research.

## Deeply Engaged with Sea Life

Ovelheira, A.R.<sup>1</sup>, Lourenço, C.R.<sup>1</sup>

<sup>1</sup> Ciência Viva - Agência Nacional para a Cultura Científica e Tecnológica

The deep ocean comprises 95% of the ocean volume and is the largest and the least explored biome on Earth. Only 5-10% of marine habitats have been mapped with a resolution comparable to the terrestrial areas, and less than 0.0001% of the deep-sea's area has been investigated. The deep-sea environment is characterized by high pressure, low temperatures, high concentration of toxic compounds and reduced or absent sunlight, encompassing diverse habitats such as cold-seeps, abyssal soft sediments, hard bottoms, seamounts and hydrothermal vents. These habitats are home to an incredible variety of life forms, strategically adapted to survive to such harsh conditions. Unsurprisingly, public engagement with deep-sea topics is still reduced, providing a great opportunity to promote unique deep-sea awareness.

Inspired by the Azores deep-sea ecosystems, we developed a hands-on activity ("Who Am I?") to explore deep-sea creatures, their adaptations and habitats. On a first approach, participants are exposed to simulated deep-sea environmental conditions and discuss how they could adapt to the environment. On a second phase, the game begins: Am I a cephalopod? Do I inhabit hydrothermal vents? Do I host bioluminescent bacteria? This activity was designed to fit a broad range of publics, as questions can be adapted to different ages and scholar levels. The activity was tested with 90 teachers is presently being replicated across several Portuguese schools.

By coupling scientific content with a board game we developed a successful approach to disseminate and raise awareness on the diversity of deep-sea ecosystems.

## Feel the Appeal of the Ocean: Experience a Virtual Whale Watching Tour with Futurismo

Silva, M.<sup>1</sup>; van der Linde, M.; Cabo Ibarzábal, I.; Ojeda, V.; González García, L.

<sup>1</sup> Futurismo Azores Adventures, São Miguel, Azores (Portugal)

Futurismo is one of the first companies that started the whale watching activity in the Azores. During almost its 30 years of experience, the company has developed high quality programs of tourism to observe whales and dolphins in their natural environment. Futurismo provides specific information about the marine life we encounter on each trip, not only whales and dolphins, but as well seabirds, turtles or sharks among others. On this EMSEA Expo we would like to offer the possibility of trying a virtual whale watching trip, where our biologists will show the large biodiversity of the Azorean ocean. Additionally we will provide hands on experiences on specific topics such as photo-identification of cetaceans, a non-invasive technic to study whales and dolphins through photographs; we will offer the possibility to listen the sounds of whales and dolphins; and of course, we won't forget about one of the most important worldwide concerns for nature and the oceans, pollution and nowadays, plastic. Furthermore, we will share our most recent research results on some of the sighted species of cetaceans around São Miguel.

## Sands and Gravels, My Sediments Exactly

Levin, D.<sup>1</sup>

<sup>1</sup>Washington College CES, Chestertown, Md, USA

For this workshop, you are asked to bring a sand sample from home, or one will be provided for you (free of charge). Angular sands broke off near to where they were deposited. Smooth, rounded sands may have been shaped by wind. White, "quartzic" sands are mature and have travelled a great distance from where they originated. White sands from the tropic may be biogenic. Black, obsidian sands may have been deposited by waves quenching an outflow of magma from a lava tube. Red sands may be undergoing oxidization in a desert environment. We will learn how to analyze sands and learn how their shape, size, and color can tell you a lot of where they came from and how they've travelled. A magnifying glass and some fizzy chemicals will be provided for the lab work. You will be able to bring sand into any classroom and have your students analyze the sample as a "Forensic Geologist". This exercise has been practiced in classrooms from age 6 and up.

## **Marine Plasticology**

Oceanario Lisboa

The “Marine Plasticology” program aims to raise awareness about the marine litter issue, particularly plastic pollution. The program includes facts and information around this issue, including several practical activities that define the problem, identify solutions and promote behavioural changes.