



SECOND EUROPEAN MARINE SCIENCE EDUCATORS ASSOCIATION CONFERENCE

1st – 3rd OCTOBER 2014

UNIVERSITY OF GOTHENBURG, SWEDEN



UNIVERSITY OF GOTHENBURG

WELCOME TO EMSEA14

Dear delegates,

The University of Gothenburg and EMSEA welcome you to the city of Gothenburg for the *Second European Marine Science Educators Association conference*. We are very grateful that you and all of our guest speakers travelled all the way to Sweden. Each of you makes a unique contribution to this conference. And together we speed the transition to a more *ocean literate* society.

The EMSEA conference is a remarkable forum for all marine education professionals and enthusiasts from across Europe and around the Atlantic Ocean. Once a year EMSEA provides a platform for exchanging successful practices and experiences, for discussions, and furthermore for meeting new colleagues and old friends. This sense of community is one of the major bases of marine education in terms of feeling engaged. As the EMSEA network grows, so do long term connections between all who participate.

When organizing this conference, we have attempted to replicate the spirit of EMSEA's inauguration conference in Plymouth and are happy that the number of abstracts submitted, delegates and countries participating have increased. It is essential to give a voice to all marine education stakeholders, from teachers, educators, project managers to marine scientists. Beyond the fields of education and science, leaders of funding agencies as well as research institutions have also expressed a commitment to marine education. We are very pleased and heartened to see many delegates holding leadership positions attending this conference.

The conference focuses this year on three core areas:

- Marine education & outreach
- Marine education in the school curriculum
- Marine education in museum, aquarium and science centers

The spectrum of presentations is very current and broad. An impressive programme of expert speakers has been assembled for the plenary sessions and workshops. We are delighted that Dr. Lisa Emelia Svensson, Sweden's Ambassador for Oceans, Seas and Fresh Water, is our keynote speaker. Furthermore, we warmly invite you to join us at the field trips and our evening events at the Maritime Museum & Aquarium and one of the best seafood restaurants in town, Fiskekrogen, where cooking with fresh fish is an art.

We look forward to a fruitful and stimulating conference, and moreover wish you a pleasant stay in Gothenburg.

Géraldine Fauville, on behalf of the organizing EMSEA14 committee.



THANK YOU TO THE SPONSORS

The European Marine Science Educators Association Conference organising committee would like to thank all of the sponsors for their support and generosity. This conference would not have been possible without it, and it is a pleasure to acknowledge the sponsorship from the following organisations:



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The second EMSEA conference is organized in collaboration by the Department of Education, Communication and Learning and the Department of Biological and Environmental Sciences, University of Gothenburg.

Organizing committee

Géraldine Fauville – University of Gothenburg, Sweden

Doris Gustafson – University of Gothenburg, Sweden

Susan Gotensparre – University of Gothenburg, Sweden

Eva Wennberg – University of Gothenburg, Sweden

Roger Säljö – University of Gothenburg, Sweden

Ingela Dahllöf – University of Gothenburg, Sweden

Fiona Crouch – Marine Biological Association, UK

Evy Copejans – Flanders Marine Institute, Belgium

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Sam Dupont – University of Gothenburg, Sweden

Jens Bjelvenmark – Gullmargymnasiet High school, Sweden

Fiona Crouch – Marine Biological Association, UK

Angela Wulff – University of Gothenburg, Sweden



KEYNOTE SPEAKER

Dr. Lisa Emelia Svensson

Dr. Lisa Emelia Svensson is a diplomat by training, currently Sweden's Ambassador for Oceans, Seas and Fresh Water, providing advice and expert guidance to the Minister for the Environment on the action needed to move forward on Sweden's international ocean and water agenda. Prior posts include Ambassador for Corporate Social Responsibility and Sweden's national expert to European Commission Directorial General for Trade, where she led negotiations on sustainable development chapters in EU Free Trade Agreements and Economic Partnership Agreements. Dr. Svensson has been a Diplomat in Residence at Johns Hopkins University-SAIS, Washington D.C., where she carried out research on climate, energy and environmental issues and published the book "Combating Climate Change – A Transatlantic Approach to Common Solutions" published in August 2008.

Dr. Svensson has been posted in New York, Washington D.C. and Brussels. She holds a PhD in Business Management, focusing on policies and action programmes to stimulate economic growth and innovation.



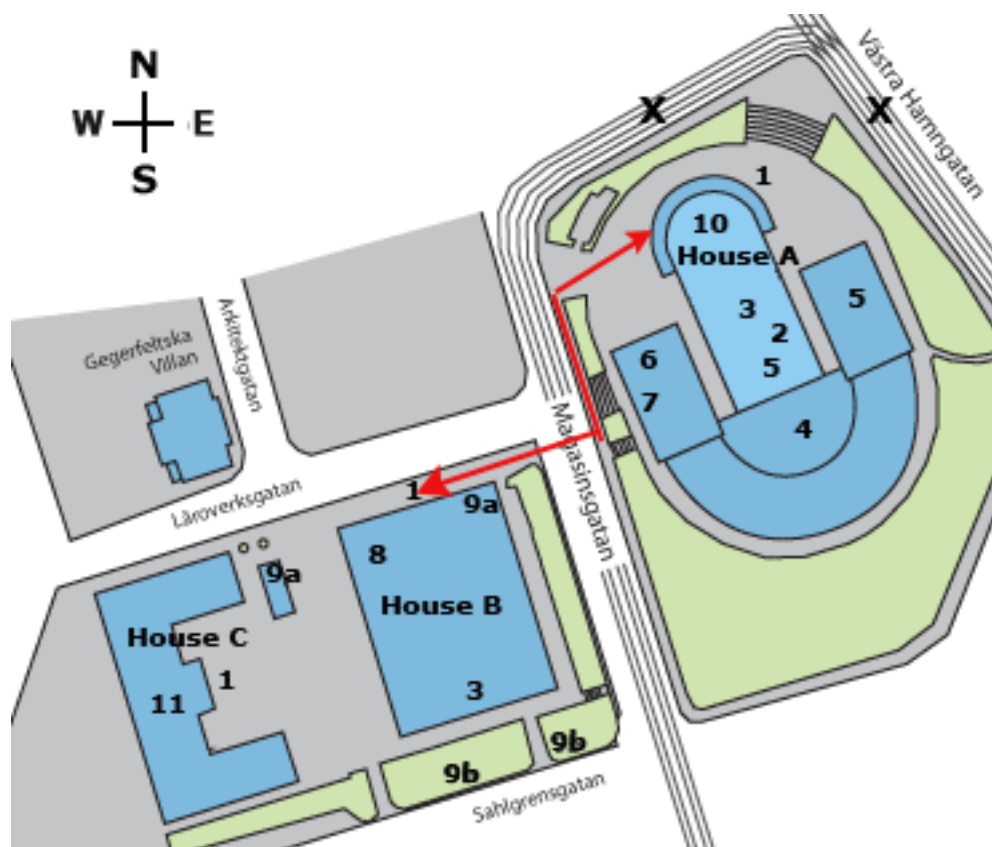


PRACTICAL INFORMATION



Buildings

The conference will take place in two buildings; house A (Västra Hamngatan, 25) and house B (Läroverksgatan, 15). To find out in which house each session is conducted, please check the programme.



Find your way to the venue « Pedagogen »

Public transport

There are several trams and buses that stop at "Grönsakstorget" next to Pedagogen.

The public transport in Gothenburg is operated by Västtrafik. You can find information about tickets and fares on their website:

<http://www.vasttrafik.se/#!/en/tickets-and-prices/>

From Landvetter airport directly to the venue

Take the airport bus to "Korsvägen". Change to tram 2, destination Högsbotorp, to "Grönsakstorget". The journey takes about 45 minutes.

For timetables, tickets (for the airport buses), visit this website:

<http://www.flygbussarna.se/en>

From Gothenburg City Airport

The times of the airport buses fit in with the timetables of all regular flights. The airport bus leaves the airport for "Nils Ericson Terminal" 50 min after the scheduled flight arrival. The journey takes about 30 minutes.

From Nils Ericson Terminal: walk to Central station and catch a tram (see below).

From Centralstationen (Central station)

Trams from stop "Centralstationen" to the stop "Grönsakstorget":

- Tram 1, destination Tynnered
- Tram 2, destination Högsbotorp
- Tram 9, destination Kungssten
- Tram 11, destination Saltholmen

The journey takes about 6 minutes.

Parking

There are 200 chargeable parking spaces for private cars in a garage under Pedagogen house B. Entrance/exit Sahlgrensatan.





SOCIAL EVENTS

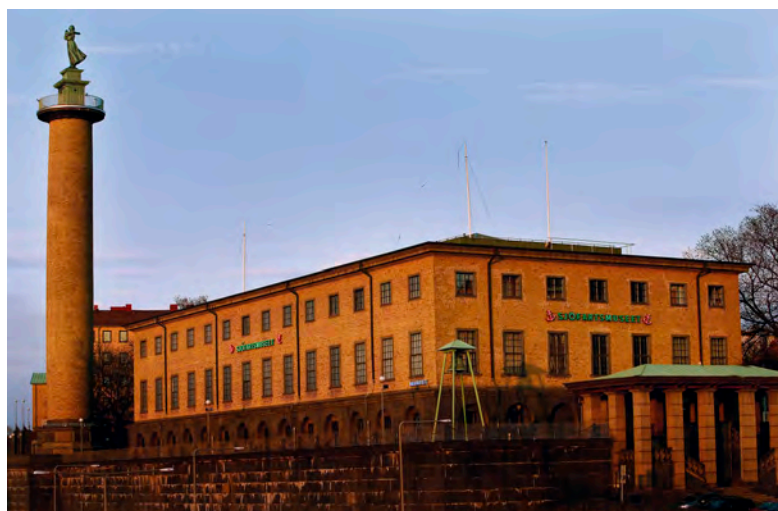


Welcome reception at the Maritime Museum & Aquarium

The Maritime Museum & Aquarium welcomes all participants at EMSEA 2014 to the conference wine reception. We will be offering something to drink and a taste of locally grown blue mussels. During the evening our guests will be able to mingle with other conference attendees and wander around the museum and aquarium on their own to discover our exhibitions. There will be several activities and guided tours to comply with, including our newly opened exhibition "Hello Fish!". For those interested, there will be opportunities to make a backstage visit in the aquarium and the research labs.

The Maritime Museum & Aquarium, which is one of the oldest and most popular museums in Gothenburg, is proud to welcome you all to this evening!

All conference attendees get free entrance to the Maritime Museum & Aquarium during EMSEA 2014 (1-5 October) by showing the conference name badge.



Conference dinner at Fiskekrogen

The EMSEA14 conference dinner will take place at the restaurant Fiskekrogen (Lilla torget 1), located close to the conference venue.

Fiskekrogen is the natural place to enjoy the treasures of the sea. Be enchanted by the fresh fish – straight from the sea, lobsters, langoustines, shrimps, mussels and oysters. We combine top-class cooking with advanced knowledge about fish and shellfish, we also have one of the most initiated wine menus in Sweden. With a love for our product we enjoy serving a simple shellfish plateau as well as a sophisticated tasting menu. At Fiskekrogen you will go on a journey of flavours that will last in your memory, because here we always serve “The best the sea has to offer”.





PROGRAMME





October 1st

08:00 – 09:00 **Registration (A)**

09:00 – 09:30 **Opening address (A)**

Géraldine Fauville
Ingela Dahllöf
Roger Säljö
Gaëlle Le Boulter

09:30 – 10:30 **Keynote (A)**

Lisa Emelia Svensson

10:30 – 11:00 **Coffee break (A)**

11:00 – 12:15 **Marine education & outreach Part 1 (A)**

- School Outreach in Marine Research: welcome addition or extra effort?
- Can Facebook be used to increase scientific literacy? A case study of the Monterey Bay Aquarium Research Institute Facebook page and ocean literacy.
- Setting up an ocean literacy hub in the southern Mediterranean
- Creative teaching: How to create global coastal guardians?

Chair: Jon Parr

Joachim Dengg
Sam Dupont

Alan Deidun
Annie Russell &
Susan Gebbels

12:15 – 12:45 **Flash poster presentation Part 1 (A)**

Chair: Sam Dupont

12:45 – 13:30 **Lunch (B)**

13:30 – 14:00 **Workshop Round 1 (B)**

- Sea for Society (group 1, room 214)
- The use of GIS to improve ocean literacy (group 2, room 215)
- Conducting oceanography experiments in a conventional classroom (group 3, room 216)

Manuel Cira
Luc Zwartjes
Mirjam Glessmer

14:10 – 15:25 **Marine education & outreach Part 2 (A)**

Chair: Angela Wulff

- JUMP and CRAM-Q: diving into marine science!
- The Nautilus Exploration programme: using telepresence technology to inspire the next generation through real-time
- Mr. Goodfish, a programme on sustainable seafood addressing consumption patterns to educate society at large
- The future of online learning: an online workshop to advance transatlantic ocean science literacy

Ana Lúcia Silva
Nia Hâf Jones

Manuel Cira

Susan Gebbels &
Annie Russell

15:25 – 15:45 **Coffee break (B)**

15:45 – 16:15 **Workshop Round 2 (B)**

- Sea for society (group 3, room 214)
- The use of GIS to improve ocean literacy (group 1, room 215)
- Conducting oceanography experiments in a conventional classroom (group 2, room 216)

Manuel Cira
Luc Zwartjes
Mirjam Glessmer

16:20 – 16:45 **Flash poster presentation Part 2 (A)**

Chair: Sam Dupont

16:50 – 18:00 **Marine education & outreach Part 3 (A)**

Chair: Fiona Crouch

- Promoting Ocean Literacy through intergovernmental programmes
- Ocean literacy in the United States: current status of educational research and next steps
- The science of underwater sound: merging research, education, and policy
- OceanTeacher Global Academy: OceanTeacher goes global

Francesca Santoro
Meghan Marrero &
Diana Payne
Gail Scowcroft
Francesca Santoro

18:30 – 21:00 **Wine reception at the Maritime Museum & Aquarium.**

Meeting point: Magasinsgatan 30, between buildings A and B. The bus leaves at 18:30. There is no bus hired for the return journey as people may want to have dinner in the area (own arrangement).



October 2nd

08:00 – 08:45 **Registration (A)**

08:45 – 10:15 **Marine education in the school curriculum Part 1 (A)**

- Bring the ocean to the classroom
- Baseline survey of 'ocean literacy' awareness in UK school students
- Map "Portugal É Mar": communicating a new maritime territorial reality to schools all around the country
- How to use CD's as a tool to explore marine biodiversity
- Marine Science Education for Primary schoolchildren – "I know and protect my seas"

Chair: Diana Payne
Angela Wulff
Mark Ward
Raquel Costa

Michael Olsson &
Susan Gotensparre
Ahmet Kideys &
Alison Kideys

10:15 – 10:45 **Coffee break (B)**

10:45 – 11:15 **Workshop Round 3 (B)**

- Sea for society (group 2, room 214)
- The use of GIS to improve ocean literacy (group 3, room 215)
- Conducting oceanography experiments in a conventional classroom (group 1, room 216)

Manuel Cira
Luc Zwartjes
Mirjam Glessmer

11:15 – 12:00 **Poster Session (B)**

12:00 – 13:00 **Lunch (B)**

13:00 – 14:30 **Marine education in the school curriculum Part 2 (A)**

- The island of students, Faafu Atoll, Republic of Maldives
- Bridges between school and blue science
- Ocean acidification in the upper secondary school chemistry curriculum
- Life around the turbines
- Comenius The Sea

Chair: Evy Copejans
Paolo Galli
Diogo Gerales
Viveca Johansson
Jack Sewell
Hervé Gigaroff

14:30 – 15:00 **Coffee break (A)**

15:00 – 17:00 **Marine education in museum, aquarium and science center (A)**

- From prawns to the iPods – education in the NMFRI Gdynia Aquarium
- Research, tourism and education: a turbulent but successful marriage
- Sea science zone: exploring the potential for public engagement with marine science through a university-museum partnership
- Aquarium design with a strong educational storytelling: arguments and examples
- Ocean literacy and marine mammals: the role of zoological parks
- Bringing research to the Aquarium and turning our visitors into marine citizen scientist
- Make an impact on the future now!

Chair: Susan Haynes
Grażyna Niedożytko
Carsten Fomsgaard
Sarah Knight

Leon Green

Mats Amundin
Björn Källström

Dorotea Blank

17:10 – 17:30 **Closing Ceremony (A)**

19:00 – ... **Conference dinner at Fiskekrogen**

- Meeting point: Restaurant Fiskekrogen (Lilla torget 1) at 19.00.



October 3rd

- **The Sven Lovén Centre for Marine Science at Kristineberg**
 - Meeting point: Magasinsgatan 30, between building A and B.
 - The bus leaves at 08:30 and returns ~17:00
 - Travel guide: Sam Dupont
- **Universeum, Scandinavia's largest science centre**
 - Meeting point: outside building B at 09:30
 - The visit ends around 15:00 (there is no organised return journey to building B, unless specifically requested – talk to the travel guide)
 - Transportation: public transport (EMSEA14 will provide tram tickets)
 - Travel guide: Mikael Olsson
- **The Öckerö sailing upper secondary school**
 - Meeting point: outside building B at 09:00. Return to building B around 15:00
 - Transportation: minibuss
 - Travel guide: Susan Gotensparre

A large, abstract graphic with a deep blue background. It features several glowing, white, wavy lines that sweep across the frame, creating a sense of motion and depth. Scattered throughout are numerous small, white, circular particles of varying sizes, some of which appear to be in motion, creating a starry or nebula-like effect.

**ABSTRACTS:
WORKSHOPS**



Workshop groups

The delegates are divided in three groups during the workshops. The group' numbers are represented by the stickers 1, 2 or 3 on the name badge.

- Group 1 will attend the workshops in this order:
 - “Sea for society” in room 214 during workshop round 1 (Oct 1st, 13.30-14.00).
 - “The use of GIS to improve ocean literacy” in room 215 during workshop round 2 (Oct 1st, 15.45-16.15).
 - “Conducting oceanography experiments in a conventional classroom” in room 216 during workshop round 3 (Oct 2nd, 10.45-11.15).

- Group 2 will attend the workshops in this order:
 - “Sea for society” in room 214 during workshop round 3 (Oct 2nd, 10.45-11.15).
 - “The use of GIS to improve ocean literacy” in room 215 during workshop round 1 (Oct 1st, 13.30-14.00).
 - “Conducting oceanography experiments in a conventional classroom” in room 216 during workshop round 2 (Oct 1st, 15.45-16.15).

- Group 3 will attend the workshops in this order:
 - “Sea for society” in room 214 during workshop round 2 (Oct 1st, 15.45-16.15).
 - “The use of GIS to improve ocean literacy” in room 215 during workshop round 3 (Oct 2nd, 10.45-11.15).
 - “Conducting oceanography experiments in a conventional classroom” in room 216 during workshop round 1 (Oct 1st, 13.30-14.00).



Sea for Society

Cira M.^a, and Sea for Society Consortium¹

^aNausicaá, France

The Sea for Society is a MMLAP that brings together economic and societal stakeholders, research sector and organisations addressing the general public. Together they develop Blue Society, an integrated vision of society that will benefit from marine resources and ecosystem services in a sustainable way. The Blue Society is an attempt towards improved governance of the world's oceans and "smart, sustainable and inclusive growth." It relies on research, innovative products and technologies that will bring new marine-based solutions to the challenges that the society is facing today in terms of economic, social, cultural and technological development. To this end, in 2013, partners in nine European states (France, Greece, Ireland, Italy, Norway, Poland, Portugal, Spain and Sweden) in the maritime regions of the Baltic, the North and the Mediterranean Seas, and the Atlantic Ocean, held citizen, youth and stakeholder consultations on the opportunities that the oceans offer to humankind. Participants discussed how to change human vision and relation to the sea in the framework of six themes linking marine environment to different aspects of their everyday life: Human Health, Energy, Leisure and Tourism, Transport, A Place to Live and Food Supply. They extracted cross-cutting issues and proposed challenge-driven solutions for ensuring a sustainable management of marine ecosystem services. The outcomes of the consultation have enabled to identify a cross-cutting challenge and to develop a European-wide mobilization campaign in 2014. The campaign will roll out knowledge transfer activities, participatory techniques and promote best practice of engaging with multiple publics. It will aim at empowering stakeholders, scientists and citizens to develop innovative joint ocean-based solutions to face the global crisis and head for the Blue Society. It will endeavour to help to identify future research themes, new modes of governance of the marine environment and foster partnerships and investments at regional, national and European levels.

The objective of the session is to involve participants in the mobilization campaign and especially in the development of tools and activities that will be presented to the SFS consortium at the Sea Academy event in November 2015.

The SFS project assembles 28 partners in Europe and it is funded by the EC' DG Research & Innovation.

¹ Nausicaá - National Sea Centre (France); EurOcean (Portugal); Institute of Oceanology of the Polish Academy of Sciences (Poland); AquaTT (Ireland); The Sven Lovén Centre for Marine Sciences of the University of Gothenburg (Sweden); National Agency for Scientific and Technological Culture - Ciência Viva (Portugal); Spanish Institute of Oceanography (Spain); Costa Edutainment (Italy); Aquarium Finisterrae (Spain); Marine Institute (Ireland); Hellenic Centre for Marine Research (Greece); Institute of Marine Research (Norway); Maretec of Instituto Superior Técnico (Portugal); The European Network of Science Centres and Museums – Ecsite (Belgium); International Union for Conservation of Nature – European Regional Office (Belgium); European Business & Innovation Centre Network – EBN (Belgium); National University of Ireland, Galway (Ireland); World Ocean Network (Belgium); French Research Institute for Exploration of the Sea – Ifremer (France); Opixido-Studio K (France)

IUCN - French committee (France); IUCN – Spanish committee (Spain); Israel National Museum of Science, Technology and Space Daniel and Matilde Recanati Center (Israel); Royal Belgian Institute of Natural Sciences (Belgium); National Natural History Museum (France); Natural History Museum of London (UK); Whowhatwherewhenwhy – W5 (Northern Ireland); Flanders Marine Institute – VLIZ (Belgium).



The use of GIS to improve ocean literacy

Zwartjes L.

Geography Department, Ghent University, Belgium

In the last 10 years the rise of GIS (geographic information systems, today also referred to as geographic information science) has been spectacular. Every sector that deals with geospatial data – this means data with a spatial component – is nowadays using it.

This evokes two important consequences:

- GIS can improve the spatial literacy among people – adults as well as students
- the number of students graduating with the necessary GIS skills is much lower than the demand on the work floor.

To tackle this last problem we should motivate youngsters to choose for a study encompassing GIS. And therefore it is crucial to start with GIS at secondary – or even primary – school level.

A lot of progress has been made to facilitate this:

- free light weight or web based GIS tools are now available (e.g. ArcGIS Online, QuantumGIS) lowering the threshold for using GIS in the classroom
- more and more datasets are becoming freely available, thus enabling scientific research in the classroom and during field studies
- in teacher training programme GIS becomes more and more an obligatory course
- in some countries there's a small start-up phase of creating a learning line in the use of GIS as tool to improve spatial thinking.

To further improve the use of GIS the link with ocean literacy can very easily be made. When analysing the curricula geography is the most common course where items of ocean study – as described in the ocean literacy framework (<http://oceanliteracy.wp2.coexploration.org/ocean-literacy-framework/>) - are taught. And geography is the subject that uses GIS most often and where it is most promoted. So using examples on ocean study by using GIS is a win-win operation: more knowledge of GIS will improve the study of oceans and thus increase ocean literacy. This workshop will show some elaborated examples of ocean literacy fundamental concepts that can be thought with the use of GIS.



Conducting oceanography experiments in a conventional classroom

Glessmer M.S.¹, and Richter K.²

¹*Center for Teaching and Learning, Hamburg University of Technology, Hamburg, Germany*

²*Institute of Meteorology and Geophysics, University of Innsbruck, Innsbruck, Austria*

Most science educators agree that students benefit from complementing theoretical lectures with watching and conducting experiments, as they provide many different learning opportunities. Watching something happen in an experiment facilitates the visualization of abstract processes, motivates inquiry, sparks curiosity and encourages interaction between students, and students and educators. Students learn to carefully observe, and document observations. Conducting experiments is an essential part of the scientific method, and forming, testing and accepting or rejecting hypotheses can be trained directly in the classroom.

However, conventional classrooms often seem prohibitive of hands-on experiences both due to the layout of the room (e.g. seats in rows in a lecture hall-style) and the lack of laboratory equipment (e.g. sinks, lab benches). From the educator's point of view, conducting experiments with students, especially if students work hands-on in small groups, is often perceived as a difficult, chaotic and expensive experience. Additionally, adding experiments to an already tightly filled class schedule without dropping other content from the syllabus can seem daunting.

Here we present experiments that introduce students to basic properties of water, ice and ocean circulation. All experiments are conducted with minimal household equipment like plastic cups or Tupper ware containers, fresh or salt water, ice cubes or cooling pads, food dye etc. The experiments presented here have been successfully used in teaching at all levels ranging from primary school to Master's courses as well as in public outreach. We present the experiments in a form suitable for one specific level and discuss how modifications make them suitable for different contexts. We point out potential pitfalls and give practical tips on how to implement the experiments into pre-existing courses without delaying an already tightly packed course schedule, or how to present them as stand-alone units in public outreach.

For more information, please refer to “adventures in teaching and oceanography” at <http://mirjamsophiaglessmer.wordpress.com>.



The background of the abstract section is a deep blue gradient. It features several glowing, white, wavy lines that sweep across the frame. Scattered throughout are numerous small white dots and larger, semi-transparent white spheres, creating a sense of depth and movement, reminiscent of a starry night sky or a microscopic view of particles.

**ABSTRACTS:
MARINE EDUCATION & OUTREACH**



School Outreach in Marine Research: welcome addition or extra effort?

Dengg J.¹, Soria-Dengg S.², and Behrens M.³

¹*School Cooperations, GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany.*

²*SFB-Outreach, GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany.*

³*School Outreach, Kiel-Earth-Institute, Kiel, Germany*

Researchers generally agree that there is a need to engage in public outreach, in particular with respect to the education of the next generation. However, their personal commitment to outreach may vary considerably, depending on publication pressure, time requirements and inclination. Thus, in many research projects competent support for dedicated education and outreach activities is highly appreciated. At GEOMAR in Kiel, Germany, an infrastructure for school outreach has been created over the last 10 years into which marine scientists can link from their research proposals. A network with schools was established which involves teachers from different disciplines interested in marine topics and with experience in adapting them to their lesson plans. School projects, visits at the research centre, summer courses and teacher training events are organised by staff employed by GEOMAR or hired in outreach components of research grants (e.g. in the Collaborative Research Center SFB 754 or the Priority Program SPP 1689). In collaboration with teachers, the scientific background of the centre's research is incorporated into experiments for schools, presentations, teaching materials and other formats of communication. While this approach does not attempt to cover the complete scope of marine education, it particularly fosters the communication of authentic and up-to-date science to schools by focussing on the topics relevant to the researchers themselves. Scientists are encouraged to contribute to these activities in various ways without being faced with the burden of organizing them or writing funding applications and reports.



Can Facebook be used to increase scientific literacy? A case study of the Monterey Bay Aquarium Research Institute Facebook page and ocean literacy.

Fauville G.¹, Dupont S.², von Thun S.³, and Lundin J.⁴

¹*Department of Education, Communication and Learning, University of Gothenburg, Sweden*

²*Department of Biological and Environmental Science, University of Gothenburg, Sweden*

³*The Monterey Bay Aquarium Research Institute, Moss Landing, California, USA*

⁴*Department of Applied IT, University of Gothenburg, Sweden*

The oceans are under threat as a consequence of human activity. These threats cannot only be considered on a governmental level, but are dependent upon the knowledgeable actions of an ocean literate public. Since knowledge of ocean science is mainly held by scientists, it is critical to bring lay people together with scientific experts. The Internet provides a unique opportunity for scientists to be in direct contact with the public in order to promote citizens' ocean literacy. Recently, Internet users have started to spend most of their online time on social networking sites (SNS). Knowledge of how these SNSs work as an arena for interaction, as well as for the development of scientific literacy, is important to guide scientists' activities online, and to be able to understand how people develop knowledge of science.

By using mixed-method and scrutinizing the Facebook page of the Monterey Bay Aquarium Research Institute, this study aims to shed light on the interaction between marine scientists and the public through SNSs and the consequences for users' ocean literacy.

We first investigated which practices could increase the number of Facebook users reached by a Facebook story. We observed that (1) videos or images get a better reach than texts or links. Along with it we observed (2) a correlation between the amount of words composing a story and the reach. We also argued that (3) the frequency of posting is important to enhance the reach while for (4) a given frequency, the days of posting do not have any impact.

The second step of this study was to investigate how people make use of the marine-related content that reaches them. Through interviews and discourse analysis, we observed that Facebook pages do not offer the appropriate social context to foster participation (e.g. discussion, debate) since it has only a few of the features of an arena where such practices could develop. However, the context seems to be more favorable for participation when the fans share MBARI's stories with their own friends.



Setting up an ocean literacy hub in the southern Mediterranean

Deidun A.¹, Drago A.¹, Behnam A.², Virapat C.², and Vassallo, A.²

¹*IOI-Malta Operational Centre, University of Malta, Msida, Malta*

²*IOI Headquarters, University of Malta, Msida, Malta*

As an international non-governmental body with special consultative status at the United Nations, the International Ocean Institute (IOI) has, since its inception in 1972, promoted the need for a better governance of our oceans pursuant to achieving the ‘common heritage’ status for the same oceans as envisioned by Arvid Pardo in his landmark speech at the United Nations in 1969. One of the cornerstones at the basis of ocean governance is ocean literacy.

Through its participation within a number of ERDF, ENPI and other EU funding mechanisms, the IOI regional centre in Malta (the IOI-MOC) has embarked on a number of ocean literacy projects on the island of Malta, including the opening of the first ever marine environmental education centre, the shooting of three highly popular underwater documentaries focusing on Maltese Marine Protected Areas (MPA’s) and the publication of informative material on Mediterranean marine ecosystems and species for schoolchildren. Through participation in the IOI’s Women, Youth and the Sea Programme, the IOI-MOC has also administered an online marine educational portal – IOI-Kids – which is a repository for lectures, clips, games and other material of educational value related to the sea. Within the same initiative, the Institute has also coordinated, since June 2010, the implementation of a citizen science jellyfish-spotting initiative known as Spot the Jellyfish (www.ioikids.net/jellyfish). The IOI also organises, on an annual basis a 5-week international course on ocean governance and, as of October 2013, has initiated an international Masters course in Ocean Governance, in conjunction with the University of Malta, and the IOI-MOC is initiating an inter-disciplinary Masters in Applied Oceanography as of October 2014.

In conclusion, the IOI is well-placed for the establishment of an ocean literacy hub and centre of excellence on the island of Malta, strategically located to act as a spring board for the mutual transfer of knowledge in such a field along north-south and west-east axes, with northern African and Middle East countries being the main beneficiaries.



Creative teaching: How to create global coastal guardians

Gebbels S., and Russell A.

Dove Marine Laboratory, School of Marine Science & Technology, Newcastle University, UK

There is concern that children are disengaged with the natural environment around them. The Dove Marine Laboratory has run a plethora of engagement projects focussing on nurturing individuals connection with the natural marine environment. The team prides themselves on taking a creative approach to teaching young people about the marine environment via a hands-on/interactive approach. In 2012 we ran a 5-week project which focussed on the issue of marine pollution. The aim of the project was twofold; primarily we wished to raise awareness of how marine pollution is a major threat to global biodiversity of marine species and secondly we wanted to empower the children to be coastal guardians at both a global and local level.

We created five workshops which were designed to provide a variety of formats for children to learn in a novel way whilst learning the fundamental issues of marine pollution as an anthropogenic threat to the ocean. The children investigated different forms of marine pollution, they carried out a strandline survey, they learnt about the variety and importance of the local animals they were aiming to protect, they used either poetry, art or song to share their views on marine pollution, they made a bag a life, and the children took part in a World Oceans Celebration Day. By inspiring the children in a creative way, the children gained confidence and were empowered to be the environmental guardians of the future, as they had a strong appreciation of the wider consequences of their daily actions. The legacy of the project was the children become the teacher. The project inspired the children to make a difference by changing their own behaviour, and by influencing their families and carers to reduce their use of plastic and to recycle more.



JUMP and CRAM-Q: diving into marine science!

Silva A.L.^{1&2}, Panta Ferreira B.^{2&3}, Alves F.^{3&2}, Silva J.², and Ferreira M.²

¹*Aveiro University, Portugal*

²*Portuguese Wildlife Society, Portugal*

³*Minho University, Portugal*

The Portuguese Wildlife Society (SPVS) is an NGO formally constituted in 2003, with a strong focus in rehabilitation of marine animals, nature conservation and environmental education (EE). Responsible for the Marine Animals Rehabilitation Center of Quiaios (Figueira da Foz, Portugal) and for the implementation, along with other partners, of European projects (ex.: SafeSea and MarPro), regarding research on marine issues (e.g. impacts of fisheries on populations of cetaceans, cetaceans and marine birds monitorization), SPVS has gathered a vast knowledge and experience in these areas. SPVS has also been strengthening the development of EE activities directed to all publics but with a strong focus in schools. In 2013, two projects – JUMP and CRAM-Q – financed by *Ciência Viva* and in partnership with Minho and Aveiro Universities, regarding oceans and marine species rehabilitation, started to be implemented in high schools of Aveiro and Figueira da Foz, counting with the participation of 21 teachers and 805 students. Aiming to increase participants' knowledge and skills regarding marine research and conservation, as well as to promote awareness to the protection of marine ecosystems and biodiversity, both projects included several hands-on and outdoor activities. An evaluation plan was also implemented, allowing for the collection of relevant data. Most participants showed interest in the covered topics and found the activities useful for their future, also showing interest in continuing to participate in similar activities. A preference for practical and outdoor activities, for the transmission of information with scientific data and predominance of visual stimuli was shown by the majority of participants. One of the major difficulties in engaging participation was the low availability of students and teachers, especially due the long and extremely time-consuming school curricula. Adapting the activities to the specific goals of the students' curricula has proven to be a productive way to minimize this issue.



The Nautilus Exploration Programme: Using Telepresence Technology to Inspire the Next Generation through Real-Time Access to Ocean Exploration

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Founded in 2008 by Dr. Robert Ballard the Ocean Exploration Trust (OET) aims to increase ocean literacy and inspire the next generation to pursue careers in science, technology, engineering and mathematics (STEM) through several Exploration Programmes. These programmes include Science Communication Fellowships, Internships and Honours Research Programmes which allow for hands-on experiences in ocean exploration, research and communications aboard our 64m research vessel, the *E/V Nautilus*.

Together, we are an international Corps of Exploration consisting of marine scientists, engineers, communicators, educators and students which bring scientific exploration of the seafloor to life into classrooms, homes, theatres, science centres and museums. Our story is shared world-wide with the use of live telepresence technology. The *Nautilus Live* digital experience provides virtual explorers around the globe with immediate online and mobile access to live audio and video feeds of scientific research. Many of the upwards of 35,000 questions submitted in any one season may be answered in real time via live audio feed using the “participate” feature on the *Nautilus Live* platform whilst several thousand people of all ages interact live during shows facilitated by the Exploration Now team between our partner venues and the *E/V Nautilus*.

This presentation will provide a background of *Nautilus’ Exploration Programmes*, in particular that of the Science Communication Fellowship (SCF), which immerses formal and informal educators from all around the world in the Corps of Exploration and empowers them to bring ocean exploration to a global audience. Following their time aboard Fellows bring their expedition experience back to their own classrooms, organisations and communities in the form of engaging lesson plans and activities centred on their time at sea aboard the *E/V Nautilus*.



Mr.Goodfish, a programme on sustainable seafood addressing consumption patterns to educate society at large

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²*The Acquario Di Genova, Italy*

³*The Finisterrae Aquarium, Spain*

⁴*Nausicaá – Centre National de la Mer, France*

Mr.Goodfish was first launched in 2010 in France, Spain and Italy. The global design and strategy of the programme was framed on lessons learned from similar initiatives implemented in World Oceans Network's North American partners. This led us to create a programme structured around a central idea: a positive message, some recommendations but no interdiction. The programme's message consists in an invitation to "choose the right fish": right season, minimal size, and healthy stock. The programme addresses fishery sector as a whole, from fishermen to consumers not to mention fishmonger, restaurants or school canteens. All of them are considered as possible vectors to disseminate the message to a larger audience. 4 years after the programme started we observe this strategy's efficiency regarding resources committed.

One of the positive impacts we'd like to present is how marine education can be addressed through daily consumption and daily people's life. We would focus on a specific audience: youth at school but outside the classroom. Indeed, Mr.Goodfish is being testing several actions with school canteens' chefs who joined the programme and propose Mr.Goodfish species in their menus. By doing so they communicate with children and educators on Mr.Goodfish message. This action shows positive results on children daily choices at school but at home also, as they used to bring that message back home. Others related actions have good feedbacks such as Mr.Goodfish educational activities in aquariums or cooking lessons for children in Italy and Spain.

The presentation will detail education activities within Mr.Goodfish programme and will demonstrate how daily life contexts and consumption patterns can support marine education and outreach.



The Future of e-learning: An Online Workshop to Advance Transatlantic Ocean Science Literacy

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Associate members of EMSEA and NMEA believe there is a need for marine scientists and educators to create a global Ocean Literacy Networking Forum where professionals can share ideas with the public about how to increase lay people's awareness about global marine issues. In an attempt to overcome the problems of distance and time zones The College of Exploration invited scientists and educators to take part in a five week, online, interactive workshop to advance Transatlantic Ocean Science Literacy. The workshop brought together marine scientists and educators from both sides of the Atlantic. Five professionals from marine organisations in Canada, US, Portugal and UK acted as facilitators to encourage conversations and debate.

There were three components to the project: firstly Deep Sea Scientists from NOAA and US academic institutions gave presentations about their work and findings from a recent voyage upon *The Okeanos Explorer*. Secondly, two weeks were set aside to discuss the idea of transatlantic Ocean Literacy and thirdly the team explored the latest communication technologies to test various formats of presenting and communicating ideas with other interested partners. Over the five week period, the workshop attracted 640 Participants from 29 different countries.

Future hopes. This initiative has a huge potential to link organisations, scientists and educators in their common goal to create a marine literate public. Looking to the future we aim to continue developing this model with a wider range of participants and a more diverse content.

The organisers would like to express their thanks to NOAA, NOAA's Office of Ocean Exploration and Research and The National Marine Sanctuary Foundation for funding and supporting this initiative.



Promoting Ocean Literacy through intergovernmental programmes

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Intergovernmental Oceanographic Commission of UNESCO, France

UNESCO's Intergovernmental Oceanographic Commission (IOC) promotes international cooperation and coordinates programmes in marine research, services, observation systems, hazard mitigation, and capacity development in order to understand and effectively manage the resources of the ocean and coastal areas. By applying this knowledge, the Commission aims to improve the governance, management, institutional capacity, and decision-making processes of its Member States with respect to marine resources and to foster sustainable development of the marine environment, in particular in developing countries.

IOC coordinates ocean observation and monitoring through the Global Ocean Observing System (GOOS) which aims to develop a unified network providing information and data exchange on the physical, chemical, and biological aspects of the ocean. Governments, industry, scientists, and the public use this information to act on marine issues.

IOC's work in ocean observation and science contributes to building the knowledge base of the science of climate change. IOC also coordinates and fosters the establishment of regional intergovernmental coordinating tsunami warning and mitigation systems in the Pacific and Indian Oceans, in the North East Atlantic, Mediterranean and Caribbean seas.

The support to its Member States in the implementation of the IOC's intergovernmental programmes is also implemented through educational activities. This paper will present some of the most successful of these activities, in particular those related to tsunami and other sea-level related hazards, and ocean observation. Moreover, the experience of Ocean Teacher, a comprehensive web-based training system developed as a training system for ocean data managers (working in ocean data centres), marine information managers (marine librarians) as well as for marine researchers will be presented as well.

It will be shown how through international cooperation and collaboration it is possible to promote educational programmes for different sectors of the society, schools, general public and governmental officers.



Ocean Literacy in the United States: current status of educational research and next steps

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Good educational programming is underpinned by research. Educational research can illuminate effective instructional techniques, student and public misconceptions, and gaps in the knowledge base. Research adds to what is known about a field, can influence policy, and helps us to improve our practice as educators. In this presentation, we will address the following questions: What does the research in marine education and ocean literacy tell us? What do we still need to find out?

While there have been studies in marine education since the 1960's, the research base in topics related to ocean literacy is quite sparse (Payne & Zimmerman, 2010; Tran, Payne, & Whitley, 2010). Many studies have been evaluations of the effectiveness of small-scale, local programs (Fortner, 1991). In the late 1990's and 2000's, there were several studies of public understanding about the ocean (AAAS, 2004; Ballantyne, 2004; Belden, Russonello, & Stewart, 1999; Pew Oceans Commission, 2003; Steel, Court Smith, Curiel, & Warner-Stell, 2005; The Ocean Project, 1999a, 1999b, 2009). These studies established that, in general, public ocean literacy is low. Hoffman and Barstow (2007) studied science standards in the 50 United States and found that most states' standards do not cover the Essential Principles and Fundamental Concepts of Ocean Literacy, at least in the earth sciences. Another report cited the lack of teacher education in marine sciences to be part of the problem (NOAA, 1999). Some studies, however, show promise in improving ocean literacy and helping students to study and respond to socioscientific issues (Greely, 2008; Marrero & Mensah, 2011; Plankis & Marrero, 2010). Other studies find that studying ocean science can help students to understand large-scale, complex systems (Lambert, 2006).

To truly develop the most effective means of delivering ocean literacy content in marine education and outreach, we must utilize and expand the educational research base.



The Science of underwater sound: merging research, education, and policy

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Research related to underwater sound is necessary to further our understanding about the impacts of anthropogenic sound on marine life. As a complex scientific topic, underwater sound can be challenging for non-scientists. Research results often reach the public through popular media, possibly presenting misinformation and misinterpretation of results. Widely held myths related to the effects of sonar on marine mammals exemplify how “bad” science reaches the public. To provide a sound scientific resource on underwater sound, a team from the University of Rhode Island Graduate School of Oceanography in partnership with Marine Acoustic, Inc. and scientific advisors has produced the *Discovery of Sound in the Sea* (DOSITS) website (<http://www.dosits.org>). The site has been developed as an international, comprehensive, scientific resource, providing a synthesis of the latest science in a form that is accessible for everyone, from students and educators, to reporters, the public, and natural resource regulators. With over 400 pages, the site is updated twice annually with new and revised peer reviewed content. This popular resource has received nearly 68 million hits since its launch in 2002, with visitors from across the globe. In addition to science content, the site also has four galleries, which focus on underwater sounds, research tools, acoustics related research, and related careers. There are several educational resources, including structured tutorials, activities, and downloadable documents. A pamphlet is available in English, Spanish, Italian, and French, and a 15-page booklet is available in English and Spanish. This presentation will focus on the DOSITS project’s strategies for merging research, education and regulatory activities related to this fascinating topic. In addition, current research related to the effects of underwater sound on marine life will be discussed. Support for DOSITS has been provided by the U.S. Office of Naval Research, National Science Foundation, and National Oceanic and Atmospheric Administration.



OceanTeacher global academy: OceanTeacher goes global

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UNESCO/IOC Project Office for IODE, Oostende, BELGIUM

In the last decade the OceanTeacher initiative of IOC/IODE has contributed to increase the ocean sciences capacity all over the world, with a focus on technical/professional training targeting – although not exclusively – developing countries. During this period, over 1300 students from over 120 countries benefited from training and were able to disseminate the knowledge to colleagues and peers, thus contributing to the sustainable use of coastal areas in their countries and oceanic resources in general.

After a successful phase, OceanTeacher wants to expand and overcome some of the limitations encountered, and will become the OceanTeacher Global Academy (OTGA).

The OTGA will develop a global network of training centres and utilize this network to increase national capacity in coastal and marine knowledge and management. It will do so by (i) promoting the establishment of Regional Training Centres (RTCs) and their close collaboration through advanced information technology; and (ii) further developing the OceanTeacher Learning System.

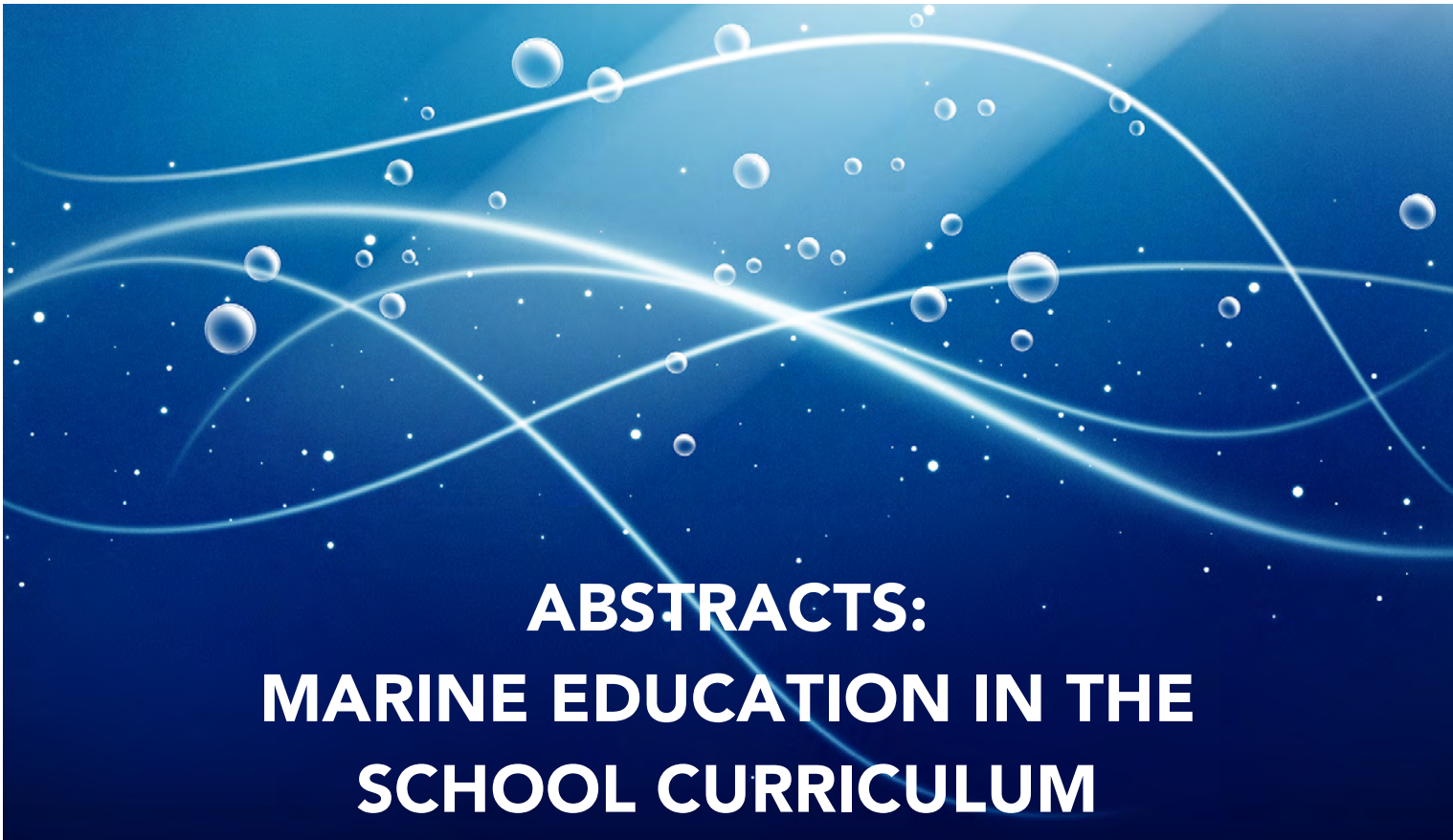
Furthermore, the OTGA will change training from a “north to south” culture to north-south, south-south, and south-north model. Whereas training has traditionally been based on experts from developed regions teaching developing country students, the OTGA will promote the expertise available in many developing regions.

Specifically, the OTGA will:

- Promote the establishment of RTCs that will organize training courses that are of relevance and serve needs within their region;
- Promote the use of local experts as lecturers and training assistants by the RTCs;
- Promote the collaboration between the RTCs by enabling lecturers from multiple regions to contribute lectures;
- Further develop the OceanTeacher Learning Management System to cover multiple IOC and associate programmes.

The new OTGA will build upon and expand the existing OceanTeacher Academy based at the IOC Project Office for IODE in Oostende, Belgium, to a truly worldwide training facility which will provide a programme of training courses related to IOC programmes. It will further promote collaboration and expertise exchange through new internet-based technologies such as video conferencing, video streaming, etc. between the RTCs.





**ABSTRACTS:
MARINE EDUCATION IN THE
SCHOOL CURRICULUM**



Bring the Ocean to the Classroom

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Despite the long Swedish coastline, the ocean and the marine coastal environment are very superficially, if at all, discussed in Swedish educational material for comprehensive school as well as high school (*swe* gymnasium). Therefore, we designed a continuing professional development course for teachers and students in teacher education programs (all school subjects, from nursery school to high school). The overall aims are to increase scientific literacy and to increase students' interest in natural science in general and in marine science in particular. Through an experimental approach and scientific methods, we want to encourage teachers to stimulate their students to formulate hypotheses and design small experiments (in theory and / or practice). We also want to encourage and inspire teachers to try an experimental approach when they do not have control over the outcome, that is, to know the "right" answer. The course run over a year, it is web based and the teachers' work with their own students. The course should be suitable to combine with fulltime teaching. At the beginning and the end of the course we meet at a marine field station for face-to-face discussions and to explore the marine life on the Swedish west coast. As a start, we provide the participants with ca 50 ready-to-use experiments ranging from very easy experiments for nursery school to more complex activities for high school. However, all activities can be adapted to the respective level. During the conference we will share our experience and show some results and examples from the seven years we have been teaching this course. We believe our concept is successful and can be easily adopted elsewhere.



Baseline survey of ‘ocean literacy’ awareness in UK school students

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The Field Studies Council is a national environmental education charity based in the UK. It currently runs 19 day and residential field study centres across the British Isles, catering for students from of all levels and backgrounds. At least 6 of these field centres are based in or near coastal locations and at least 3 of them deliver a substantial amount of marine-based field courses to thousands of students each year. As an organisation we are well placed, therefore, to collate data from students on their current level of awareness of marine issues and to assess how taking part in courses with a focus on marine ecosystems and processes might raise levels of ocean literacy.

Within this presentation we will discuss the results of some preliminary evaluation exercises with students attending day and residential courses at the Field Studies Council’s two field centres in Pembrokeshire, Wales (Dale Fort and Orielton). We will explore different ways in which these evaluations can be conducted depending on the backgrounds and ages of the group. We will discuss how these initial studies can begin to highlight if and how students’ perceptions of human impact on the marine environment can be improved through attending field courses. We will also suggest how conventional field courses, with their focus on covering current curriculum requirements and assessment criteria, can be enhanced by explicitly introducing the idea of an ‘ocean literate’ citizenship.



Map “Portugal É Mar”: Communicating a new maritime territorial reality to schools all around the country

*Costa R., Mata, B., Geraldès, D., Silva, F., and EMEPC team
Task Group for the Extension of the Continental Shelf (EMEPC) - Portugal*

Historically perceived as a country with great maritime tradition, Portugal has been working to extend the continental shelf under its jurisdiction within the scope of the United Nations Convention on the Law of the Sea. That has been the main goal of the Task Group for the Extension of the Continental Shelf (EMEPC), and in May 2009 the Portuguese proposal was submitted to the United Nations in order to enlarge the Portuguese territory through the sea, thus providing a total area with over 3 800 000 km² where the maritime territory is forty times larger than the terrestrial.

But Portugal cannot become a true maritime country if people aren't truly engaged with this new reality. So, in order to get the message through the younger generations, EMEPC and the Lisbon Oceanario developed a partnership to create the map “Portugal É Mar” which means “Portugal is sea”. This map presents the new territorial image of Portugal, where the seafloor constitutes 97 % of its total area. With the support from the Ministry of Education and Science, 44 thousand maps were distributed and affixed in classrooms all around the country. Children of all ages can now have easy access to a map that represents the Portuguese territory in all its dimensions: land and sea.

This is not, however, but the first step. Schools, teachers and students must be properly engaged and this new definition of continental shelf, mixing geoscientific and legal concepts, represents quite a complex message to communicate. That's why EMEPC has prepared a set of online educational resources, that includes videos, photos, texts, presentations and inquiry activities (<http://kitdomar.emepc.pt/outros-mares/mapa-portugal-e-mar>) to explore the map in classrooms. All resources were adapted to the national curriculum of different subjects, from basic education to high school, and correlated with the ocean literacy principles and concepts.



How to use CDs as a tool to explore marine biodiversity

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Virtue is a school project with the purpose of inspiring students and making them interested in natural science and scientific questions. The idea behind Virtue is simple: a number of CDs are mounted on a plastic rack and placed in different underwater environments during different seasons. The racks can easily be assembled by the students themselves, who in this way receive practice in reading technical drawings. Analysing the growth of organisms on discs and registering the findings in a database enables the students to compare and discuss their results. In this way, it is also easy to compare results over time and from other sites. In marine water, the greater the salinity of the water, the more species there can be expected to be found on the CDs, and the organisms will also be larger in size. Use of a stereo microscope to study fouling is generally considered good enough. An alternative is a USB microscope, which is a kind of webcam connected to a computer, allowing images and film to be easily saved straight on the computer or else displayed directly on iPads.

Virtue can be used with students of any age, from pre-school to adults. It's easy to adapt to different students' needs. Younger children are fascinated by what they see and want to learn more about life under the surface. For older students, Virtue can be used in several school subjects, including biology, mathematics, environmental science and physics. The project is cheap and easy to set up, and it works year-round. All the necessary material is provided without cost to Swedish schools. This autumn Virtue will embark on a European harbour tour together with students from Öckerö Sailing Upper Secondary School and their 50-meter-long three-mast barque T/S Gunilla to demonstrate marine biodiversity in countries, such as Spain and the UK.



Marine science education for primary schoolchildren –“I know and protect my seas”

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Scientific research shows that unrecoverable damage has been caused to marine ecosystems from anthropogenic sources such as solid and liquid waste materials, unsustainable exploitation of marine resources and habitat destruction. These damages degrade the ecological quality of the seas, lead to a decrease in species diversity and biomass and even leave some marine life forms close to extinction.

The recognition of the need to protect our marine ecosystems by future generations is crucial if we are to achieve and sustain a good environmental status (GES) in Turkish seas. With this incentive, the Institute of Marine Sciences (IMS) of the Middle East Technical University (METU), began an educational project aimed at initiating environmental awareness in the young generations and instilling a sense of responsibility towards protection of their marine environment as Turkish citizens. This training, continuing since September 2012, has so far been given to over 700 students from the immediate or nearby vicinities.

Educational training is given within the scope of the project entitled “I Know and Protect my Seas”. Participants attend an interactive introductory course “I Know My Seas” which focuses on the roles and importance of marine science and marine ecosystems, the significance of biodiversity in the marine ecosystem and how marine research is undertaken. Underwater photography techniques are also demonstrated to introduce underwater life to the students.

In the section “I Protect My Seas”, the consequences of anthropogenic activities and pressures such as liquid and solid waste deposition into the marine environment, overfishing, the unrestricted exploitation of coastal zones leading to habitat degradation and loss and how we, as individuals in society, can make a difference to these negative impacts are explained to the students through visual presentations, video streams, educational games and hands-on workshops and observations. Students complete questionnaires for evaluation purposes specifically regarding feedback on their assessment of the course value.

We strongly believe that such educational training is vital by targeting school students as a highly influential group and the future generations. We aim to inspire them to become “natural volunteers for environmental protection”.



The island of students, Faafu Atoll, Republic of Maldives

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MaRHE Center (Marine Research and High Education Center) is a researching and teaching station situated on Magoodhoo Island, Faafu Atoll, Republic of Maldives, in the middle of the Indian ocean. The center, surrounded by amazing coral reefs, with its labs and its facilities is the perfect place for all kinds of environmental research on pristine tropical ecosystems.

MaRHE Center was officially inaugurated on January 28th, 2009. Purpose of the Center is to carry out research and teaching activities in the fields of environmental sciences and marine biology, to teach how to protect this fragile environment and its biodiversity, how to use and manage its resources in a responsible way.

The project has been cofounded by the University of Milano-Bicocca, the Government of the Republic of Maldives, the Italian Ministry of Research and Education, the Municipality of Milan and EXPO 2015. Ocean water and coral reefs are vital for the economy of the Maldives. The two major industries – fisheries and tourism – directly rely on the health of the marine ecosystem. Population growth, tourism upsurge, over-fishing and other environmental problems are all having an increasing and dramatic impact on the marine environment. The Maldives have an ecosystem characterized by high biodiversity but extremely delicate and subject to deep modifications due to global climatic changes and local anthropic pressures, such as fishing overexploitation and mass tourism in addition to the twin spectres of higher temperatures and ocean acidification. The Marine Research and High Education Center, in collaboration with the Maldivian Ministry of Fisheries, aims at blending technology, development and sustainability for the protection of the natural environment and the enhancement of human resources.



Bridges between school and blue science: real engagement of high school students in ocean literacy

Geraldes D.¹, Mata B.¹, Silva F.², Costa R.² and IPMA team

¹*Portuguese Institute for Sea and Atmosphere (IPMA), Portugal*

²*Task Group for the Extension of the Continental Shelf (EMEPC), Portugal*

Nowadays, science apprenticeship should be focused in the development of skills that go beyond the simple acquisition of concepts. Based on this assumption, the Portuguese Institute for Sea and Atmosphere (IPMA) and the Task Group for the Extension of the Continental Shelf (EMEPC) created a pilot project called “Bridges between school and blue science”.

The goal is to promote scientific and ocean literacy and to raise youngsters’ awareness for the importance of the ocean knowledge for Portugal. It was implemented in seven high school classes from different regions and all its hands-on and minds-on activities were designed according to the national curriculum guidelines and competences expected at the end of high school.

After an initial stage in which students were encouraged to reflect about the nature of science and inquiry, the participants were engaged in real marine investigation context (marine biology and geology), working under the guidance of scientists in IPMA’s labs. In third stage students has worked the scientific data, with investigators, to write a scientific paper or poster. At the end students have presented and shared their results in a national scientific congress.

The implementation of inquiry-based science education, the immersion in real science investigation environments, and the scientific guidance by the investigators provided high school students with an understanding of marine sciences, inquiry and nature of science that suppress gaps, extend and complement the scientific knowledge acquired through the school curriculum. All this strategies kept students genuinely interested, motivated and involved throughout the project. This success can be perceived in that some of the participants applied the experiences they had in the labs to other classes showing the acquisition of other soft skills such as communicating, sharing, and acting.

Online educational resources were developed to serve as guidelines for other teacher and students.



Ocean acidification in the upper secondary school chemistry curriculum

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As a teacher in chemistry, ocean acidification is not the first thing one thinks about when planning the school year for the students, but the Swedish curriculum in Chemistry 1 and 2 in upper secondary school states:

Teaching should also help students develop their understanding of the importance of chemistry for climate, the environment and the human body, knowledge of different applications of chemistry in areas such as the development of new medicines, new materials and new technologies.

It is therefore important to find ways to implement environmental issues in the teaching. At Mikael Elias Gymnasium, an upper secondary school in Gothenburg (Sweden), I have found it natural to connect acid and bases together with equilibrium chemistry with the important issue of ocean acidification. The students have been using the virtual teaching tool Virtual Marine Scientist, www.virtualmarinescientist.com, both to learn about how to plan a research project as well as to understand consequences of disturbing chemical equilibrium systems in the environment. We also discuss buffering systems and the difference between acidification of the oceans relatively acidification of sweet water lakes, which has been and is at the west coast of Sweden. When using virtual teaching tool it is also important to go into the laboratory and make experiments that makes the students aware that the acid and base processes really exists. Some of these experiments can be seen as really simple, but can really give understanding as it is possible to see changes with color indicators.





Life Around The Turbines

Sewell J., Smith C., Gibb N., Higgs S., and Parr J.

The Marine Biological Association, UK

Life around the Turbines is an outreach project developed by the Marine Biological Association of the UK (MBA) funded by COWRIE (Collaborative Offshore Wind Research into the Environment). The project was designed to promote the need for renewable energy, raise awareness of marine biodiversity and generate discussions about offshore wind farms particularly with school children around Great Britain.

The project has run from 2008 – 2014 and has involved workshops with schools all around Great Britain; production of online resources and a series of training events and tools for marine educators. All of the resources and workshops were developed to correlate with the national curricula for England, Scotland and Wales and cover a range of topics including science, citizenship and technology. Combining charismatic marine wildlife with technology and interactive, hands-on workshop activities has proved a successful and popular combination, received well by students and teachers. We present the methods of engagement used and some of the information received through a basic activity evaluation process. We will also share information about how conference participants can obtain and utilise free resources to support their own outreach and teaching at www.mba.ac.uk/education.



“Comenius The Sea”: a cross multicultural and oceanic pedagogical actions about local area’s maritime identity realized by vocational high-school students living in 4 coastal areas of Europe

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⁵*I.P.S.A.A. “ENRICO FERMI” college, Catania, Italy*

Our European educational project, “The Sea”, is a cooperation between 5 vocational high-schools in 4 european countries aiming to enhance both mutual intercultural understanding and ocean literacy of young students.

The project has been led through the European exchange program “Comenius”, from 2012 to 2014. It involves students in vocational cursus, in various fields such as fish-farming, agriculture, shipbuilding, or environmental management. It was led through students’s investigations about their local coastal areas and through 4 one-week periods of meeting and field trips in each of the participating coastal countries (Aarhus, Denmark; Marennes-Oléron bay, France; Catania’s Sicily coast, Italy; Malta).

“The Sea” project is summarized as the sea represents a source of tradition, culture, and economy activities for coastal areas, as well as source of threats, offering traditional and new job opportunities..

A cultural part, “The sea and its legends”, lets the student investigate through local legends how the Ocean influences culture of men living on the seashore.

A technical part, dealing with “The sea and its resources”, reveals how human activities are dependent on the Ocean.

Achievements of the actions of “The Sea” project will be presented, as :

Local Sea legends; sunken cities, wreckers, ...

Ocean Biodiversity: catalogue of local fishes ...


Human Sea activities: Fisheries, - with an collaborative computer game-, fish & shellfish-farming (net cage in Malta, oysters beds in France), aquariums, nautic sports,...

Sea cultural heritage: Stone tidal weir (traditional fish traps), old traditional tuna fishing (“tunaria”),...

Threats from the ocean to men and opposite: tempest & coastal risks and its management, sea-pollution from land and how to resolve it.

Pedagogical and intercultural impacts of “The Sea” project will be presented as being part of the buiding of a maritime identity” of 4 coastal areas.



The background of the title section is a deep blue gradient with several glowing, white, wavy lines that sweep across the frame. Scattered throughout are numerous small white dots and larger, semi-transparent white spheres, creating a sense of depth and movement, reminiscent of a starry sky or a dynamic underwater scene.

**ABSTRACTS:
MARINE EDUCATION IN AQUARIUM,
MUSEUM & SCIENCE CENTER**



From prawns to the iPods – education in the NMFRI Gdynia Aquarium

Podlesińska W., and Niedoszytko G.

Gdynia Aquarium National Marine Fisheries Research Institute, Poland

The Gdynia Aquarium is a unique place in the center of the Gdynia city. It belongs to the National Marine Fisheries Research Institute, which is the oldest unit dedicated to the sea research in Poland. The Gdynia Aquarium presents interesting aquatic fauna in aim to educate and delight visitors with underwater world's beauty and remind of the need for protection of this amazing source of life. Exhibition animals come from various habitats like coral reefs, ocean depths, dense Amazonian tropics or the Baltic Sea.

Designed to disperse knowledge on aquatic organisms, the Gdynia Aquarium developed the oldest and equally most modern marine education centre in Poland. Groups that benefit from our educational offer, gain knowledge through practical and unconventional lessons taught by the specialists in the field of oceanography, biology and the environmental protection. Financial support from numerous projects allowed preparing educational infrastructure with modern equipment. Lessons are modified according to the age and abilities of the participants and therefore are diverse. Educators present the specific nature of the aquatic environments and still so little known oceans as endless source of fascinating knowledge – their diversity, curiosities and threats.

To reach even wider number of recipients, the Gdynia Aquarium carries out *education through entertainment* events for children - indoors as well as outdoors. Educators are often invited to various educational establishments or urban events to lead workshops or give lectures on aquatic environment.

As the demand for easily absorbed information increases, the Gdynia Aquarium recently introduced electronic system of guidance, so called eGuides. Devices provide more interesting knowledge on the organisms presented in the aquaria, in three languages. The educational path is prepared for adults as well as small children. Our motto is - touch, see, hear and experience.



Research, Tourism and Education: A turbulent but successful marriage

Fomsgaard C.¹, Canal-Vergés P.¹, Tørring D.^{1,2}, Gommesen M.¹, and Kjerulf Petersen J.¹

¹ Danish Shellfish Centre, DTU Aqua, Nykøbing Mors, Denmark

² Orbicon, Aalborg, Denmark

Merging research, education and tourism can be challenging, however when the correct balance is achieved, it can become an asset for science, public education and environmental awareness. The Danish Shellfish Centre, Technical University of Denmark (DSC), is a research facility localized in the Limfjorden, with a key focus on shellfish aquaculture, fisheries and estuarine ecology. DSC is staffed by researchers, biologists and technicians involved in and financed by scientific projects. In 2013 DSC created a Dissemination Center (DC) coupled to the research and development activities (R&D). The DC provides education and eco-tourism services, enabling visitors to learn about the Limfjorden ecosystem and DSC key research fields. The DC targets three groups: i) schools (all levels), ii) national and international tourists and iii) companies and associations. Dissemination activities are carried out by DSC staff and are viewed as an additional activity complementing R&D. There is thus a close connection between R&D and dissemination securing that the disseminated information is updated and that researchers can get feedback from the visitors. The DC offers a vast array of activities: 1) Guided tours through the DSC facilities including visits to the hatcheries and sailing trip to a mussel farm; 2) guided boat trips on the Limfjorden, guided snorkeling or beach tours etc.; 3) one-day events that can include field, laboratory and/or cooking activities with a specific topic e.g. shellfish or macroalgae; 4) one week/day courses for secondary or high school students, in which a selected topic already present in their curriculum is enriched and expanded through field and laboratory experiments. To supplement all activities, an e-learning and information system has been developed. The crossing between research, education and tourism together with the applied science provided by DSC is very engaging and makes it a unique facility embracing the whole spectrum of the population.



Sea Science Zone: Exploring the Potential for Public Engagement with Marine Science through a University-Museum Partnership

Knight S.¹, Verling E.², Reynolds J.², Brown C.¹, and Kirk B.³

1 Ryan Institute, NUI Galway, Galway, Ireland

2 Galway City Museum, Galway, Ireland

3 Galway Education Centre, Wellpark, Galway, Ireland

Sea Science is the result of a collaboration between the Galway City Museum, the Galway Education Centre, and researchers with the Ryan Institute at National University of Ireland, Galway (NUI Galway). The goal was to create a space that would invite visitors to learn and discover a little bit more about everyday marine science topics, and how research at NUI Galway feeds in to these.

Working together, we have created 5 interactive exhibits in an 8 m x 8 m area of the Museum, on topics including:

- Phytoplankton and phosphorescence
- Marine Litter and Ocean Circulation
- Electricity and Renewable Power Generation
- Galway Bay Bathymetry and Points of Interest (Scientific and Heritage)
- Underwater Acoustics

At the time of writing, Sea Science is due to be launched in June 2014, with visitor numbers expected at 160,000 + per year. With these kinds of visitor numbers and with the very central city-centre location, the potential for the University to engage members of the general public with critical topics through such a partnership is enormous. For the Museum, such an area adds a dynamic element that is often missing in typical museological approaches, thus increasing their appeal and the potential for an improved and more successful schools programme.

This presentation will explore the possibilities and compromises of such a partnership, with a look at the evolution of the design and all of the various practical elements that had to be considered along the way.



Aquarium design with a strong educational storytelling – arguments and examples

Green L.

University of Gothenburg, Sweden

Science Centres, Public Aquariums and Museums offer exciting and innovative learning environments for young students and adults. The facilities often have resources to exhibit living animals, plants and environments that the general public have little access to by other means. This opportunity of a receptive audience and relatively large resources is highly valuable in regards of teaching marine related subjects. To increase the possibility of learning, good storytelling and interesting information need to be combined, but also tailored towards the environment or animals displayed. The general procedure is just this; to tailor the information in regards to what is displayed and not the other way around. By instead designing aquariums based on an extensive and detailed storytelling background, interest and learning can increase. This is done today to some extent at the majority of institutions, but not often to the available extreme, which is arguably more resource efficient and better serves the mission of education for which the institution likely exists. By combining knowledge of aquarium husbandry and experiences from educational work, ideal aquarium setups can be designed with a captivating story in mind. Organisms that represent various stories can be chosen to be displayed together in an aquarium to emphasize a greater depth of facts or information. Even the aquarium life-support system and technology used can be chosen and presented from an educational standpoint. In this talk, several key points and arguments for designing displays of living marine organisms with a thorough educational purpose are dissected. Examples of functioning displays designed with a strong educational purpose and storytelling aspect are also presented. Organisms which are easy to keep but deliver interesting stories are introduced and examples of their combined storytelling potential shown.



Ocean Literacy and Marine Mammals: The role of zoological parks

Amundin M.¹, van der Meer L.²

¹*Kolmården wildlife Park*

²*European Association of Aquatic Mammals*

Founded in 1972, the European Association for Aquatic Mammals (EAAM) is a non-profit organisation devoted to marine mammal conservation through public engagement, scientific research, rescue and reproduction. The EAAM brings together zoological parks and individuals devoted to the conservation and welfare of aquatic mammals, both in human care and in the wild. EAAM's zoological park members include 21 zoological parks based in 11 Member States of the European Union. Visited by over 21 million people each year, EAAM parks connect people with animals. They invoke curiosity of the natural world and its inhabitants through formal and informal education, spark conservation-minded behaviour, and motivate tomorrow's environmentalists, animal caretakers, scientists and researchers.

Inspired by the work of the EMSEA to activate the Ocean Literacy Campaign in Europe, the EAAM is undertaking actions to support the Campaign. Its first action was to initiate the organisation of a meeting of the European Parliament Intergroup on Climate Change, Biodiversity and Sustainable Development chaired by MEP Maria do Céu Patrão Neves on Ocean Literacy. The objective was to raise policy-makers' awareness about "Ocean Literacy" as a way to educate the public about oceans, conservation issues and human impact on nature, and to facilitate improved cooperation among governments and stakeholders.

As a second step toward increasing collaboration among stakeholders, the EAAM proposes to present information about its member parks' implementation of the Campaign. EAAM focuses on Principle 5 (The ocean supports great diversity of life and ecosystems) and 6 (The ocean and humans are inextricably interconnected). The three key messages of the EAAM Ocean Literacy Campaign concern the dangers of human interactions with marine mammals in the wild; that marine debris can injure and kill marine mammals; and how marine mammals use and are affected by sound.



Bringing research to the Aquarium – and turning our visitors into marine citizen scientists

Källström B^{1,2}, Gamfeldt L², and Dahlgren T³

¹*Maritime Museum & Aquarium, Gothenburg, Sweden,*

²*University of Gothenburg, Gothenburg, Sweden,*

³*Uni Environment, Bergen, Norway*

At the Maritime Museum & Aquarium we want to work together with our visitors to help preserve the ocean to future generations. To reach this goal we work in many different ways. With fascinating and educational exhibitions, programs and school activities we want to inspire, teach and engage our visitors about the marine environment. We also help school children and the public to come in contact with marine scientists and take part in ongoing research projects. By doing this we believe that our visitors will get the knowledge and motivation to help us achieve our goal to save the ocean.

This talk will present different examples how we bring marine research to our exhibitions and educational programs; *Virtue* is an educational material, in collaboration with the University of Gothenburg, in which school children do their own research on marine bio-fouling. In *Research in progress* we put up real scientific experiments in our exhibitions and let our visitors follow them over time and make help us with the measurements. *The Underwater Observatory*, in collaboration with the University of Gothenburg and Uni Environment, brings the marine environment directly into our exhibitions with live underwater cameras at the Swedish west coast, allowing our visitors to follow marine scientist and their experiments in the field in real time. In *Meet the scientist* marine researchers comes to the Aquarium to give lectures and arrange workshops about their research projects and to discuss with the visitors. And in *Rock pooling* we turn school children and the public into citizen scientist to help us and other researchers to make investigations and collect data from rock pools at the Swedish coast.



Make an impact on the future now - with Young Minds!

Blank D.

Universeum Discovery & Science Centre, Sweden

The Young Minds project aims to increase teenagers' interest in future science and technology in a changing world. The method was co-jointly developed by six Swedish museums and science centres by sharing their expertise, experience and other resources. Technology, ethics and future are the keywords in Young Minds. Using them, pupils can get insight in the development of technology and what role it plays in everyday life.

Young people want to be involved in their future and they are interested in making a change for a sustainable lifestyle.

The approach of Young Minds with seminars, presentation and dialogues between pupils, researches and other adults in the museums and science centres, enable the pupils to create their own views. The idea is to encourage them to look at technology from a critical point of view, to seek more information, reflect, discuss and form opinions, and finally to create their own visions. The project has a focus on young peoples' positive future perspectives and emphasises the importance of discussing challenges to achieve a sustainable society.

I will focus on:

- How Universeum is dealing with a challenging target group – young people between ages of 13 – 16.
- Exemplify good collaboration between next generation and industry, academy, politicians, etc.





**ABSTRACTS:
POSTERS**



Education and Outreach Activities Enabled by Telepresence Technology: Inspiring the Next Generation Through Real-Time Access to Ocean Exploration

Jones N. H.^{1 & 2}, Fundis A.², and Garson S.²

¹*North Wales Wildlife Trust (UK)*

²*Ocean Exploration Trust (USA)*

Founded in 2008 by Dr. Robert Ballard the Ocean Exploration Trust (OET) aims to increase ocean literacy and inspire the next generation to pursue careers in science, technology, engineering and mathematics (STEM) through several Exploration Programmes. These programmes include Science Communication Fellowships, Internships and Honours Research Programmes which allow for hands-on experiences in ocean exploration, research and communications aboard our 64m research vessel, the *E/V Nautilus*.

Together, we are an international Corps of Exploration consisting of marine scientists, engineers, communicators, educators and students which bring scientific exploration of the seafloor to life into classrooms, homes, theatres, science centres and museums. Our story is shared worldwide with the use of live telepresence technology. The *Nautilus Live* digital experience provides virtual explorers around the globe with immediate online and mobile access to live audio and video feeds of scientific research. Many of the upwards of 35,000 questions submitted in any one season may be answered in real time via live audio feed using the “participate” feature on the *Nautilus Live* platform whilst several thousand people of all ages interact live during shows facilitated by the Exploration Now team between our partner venues and the *E/V Nautilus*.



Ocean science in film: hosting a filmmaker-in-residence at a marine research laboratory

Miller A.¹, and Crabb A.²

¹*Scottish Association for Marine Science, UK*

²*freelance filmmaker, UK*

Film is one of the most powerful communication tools available that uses a variety of senses and emotions to transfer both intellectual and emotional messages. Although it is ‘one-way’ communication, film is how an ever increasing number of people like to find out about the world. Because of its power, it is used widely both in formal education and for informal learning.

Recognising the power of film, we decided to ‘test’ how a filmmaker could be integrated into the life of a marine research organisation. Creative Scotland, as a national agency that supports the arts, screen and creative industries across Scotland, invested in the artistic and skill development of a filmmaker and contributed to the cost of embedding filmmaker Andy Crabb for two days a week over a period of two years into the Scottish Association for Marine Science (SAMS).

The project called ‘Songs of the Scottish Sea’ generated three short, word-less documentaries of very different styles covering the topics of the shape of the sea, power from the sea and food from the sea. A secondary component of the residency project was to transfer filmmaking skills to a range of audiences: primary and secondary school children learnt about storylines and animations; undergraduate students learnt about interviewing and making a documentary; while research scientists learnt about being interviewed and making time-lapse films.

Initially the scientists were curious about having a filmmaker around them, some considered this a nuisance and waste of resources, some found it threatening but the vast majority very quickly realized the huge potential to utilize film for communicating the excitement of their work to funders, users of their research, students, the media, general audiences and even peers. Projects wanted the filmmaker to produce films for them and began to write film production into new project proposals. A flurry of scientists began to produce time-lapse films themselves and staff soon became so engaged that the filmmaker had to begin to turn requests down. The success of the residency is best portrait by the fact that a month after the end of the project the filmmaker was taken on as a member of staff continuing his two days a week at SAMS, but now with less artistic freedom than he had as a resident artist.



The BEAST! (Baboró: Environment, Arts, Science and Technology)

Project: How Science and Art go Hand-In-Hand

Sarah Knight S.¹, Morris L.², Cunningham T.², Ratcliff, J.J.³, and Soler-Vila A.³

¹*Ryan Institute, NUI Galway, Galway, Ireland*

²*Baboró International Arts Festival for Children, Galway, Ireland*

³*Irish Seaweed Research Group, Ryan Institute, NUI Galway, Galway, Ireland*

BEAST! (Baboró: Environment, Arts, Science and Technology) is a multi-generational partnership between scientists, artists, teachers, and primary school children, aimed at exploring issues of climate change and sustainable living in a unique and effective way.

The 3-year project, led by the Baboró International Arts Festival for Children, began in 2012. Environmental Scientists and Engineers from the Ryan Institute at the National University of Ireland, Galway provided the facts of environmental and marine change to the schools, through a series of interactive workshops and field trips. The students were left to digest and reflect, and a team of artists then worked with the children to interpret their learning on the environmental issues, and help them to define the key messages that they wanted to convey to the larger community. The creative endeavours were incorporated into artist- and scientist-curated exhibitions, featuring art and science workshops for schools, and demonstrations and interactive exhibits and activities for families as part of the annual Baboró festival, visited by 16,000 people +. The project has been monitored by a team of social scientists, and a very comprehensive report produced. This report, along with a tremendous amount of feedback from all of the participants, has help us to draw some conclusions about the potential for collaboration between artists and scientists in this area.

After 3 years the project is reaching its end, and will have involved over 20 researchers, 10 artists, 8 schools, and at least one SciArtist! This presentation will look at how incorporating practical art activities and non-linear modes of teaching can embed scientific learning in the classroom, from the point of view of a trained scientist/hobby artist who worked with Baboró to deliver the creative components of one of the issues specifically related to marine ecosystems, seafood, and personal choice.



Promoting marine education in the Mediterranean & Black Seas: The PERSEUS project

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¹ *Hellenic Centre for Marine Research, Anavyssos, Greece*

² *Environmental Education Department of the 1st Directorate of Secondary Education of Athens, Greece*

PERSEUS is an FP7 research project studying the ecosystem changes in the Mediterranean and the Black Sea, funded under the “Ocean of Tomorrow” and coordinated by the Hellenic Centre for Marine Research (HCMR). Within its wide range of public engagement activities, PERSEUS created an international environmental education network called PERSEUS@School and a specific thematic under the network, called “My school voyages with PERSEUS”.

The PERSEUS@School Network, tested as a pilot scheme in Greece in 2014, planned to expand to Mediterranean and Black Sea partners, is an initiative for teachers and students participating in Environmental Education Programmes. The network has designed specific educational activities for secondary education, based on the PERSEUS key thematic areas, like biodiversity, overfishing and marine litter. Two web-monitoring tools will also be used by the network, namely the Jellyfish Spotting campaign and the Marine LitterWatch (MLW) application, developed by the EEA.

As part of the network’s activities, 20 students from 10 schools participated in 2014 in the oceanographic expedition 'Andromeda I', onboard the HCMR's R/V AEGAEO. The aim of the expedition was to involve students in marine scientific research and allocate them specific "scientific tasks" both onboard and in the laboratory, working in teams, alongside their teachers and HCMR researchers.

Finally, in order to captivate the interest of the general public, the PERSEUS@ART initiative was born, aimed at raising awareness on maintaining clean seas while introducing the dimension of art in the science world and vice versa. A 20-day long art exhibition, named “Images of the Sea”, with 140 art works among graduates and post-graduates of the Athens School of Fine Arts (ASFA) opened to the public. Three top prizes were awarded in an exclusive Awards Ceremony.



Marine Education in The Field Studies Council – past, present and future

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¹*Dale Fort Field Centre, Field Studies Council, Pembrokeshire, Wales, UK*

²*Orielton Field Centre, Field Studies Council, Pembrokeshire, Wales, UK*

³*FSC Millport, Field Studies Council, Isle of Cumbrae, Scotland, UK*

The Field Studies Council is a national environmental education charity based in the UK, which celebrated its 70th anniversary last year. It currently runs 19 day and residential field study centres across the British Isles, catering for students of all levels and backgrounds. At least 6 of these field centres are based in or near coastal locations and 3 of them deliver a substantial amount of marine-based field courses to thousands of students each year.

As well as owning Field Centres like Dale Fort in Pembrokeshire, which was one of the first marine-based Field Centres in the World (opening its doors in 1947), the organisation has recently taken ownership of the globally recognized Millport Marine Station on the Isle of Cumbrae in Scotland which it is now running as FSC Millport. This poster will celebrate how, over the decades, the FSC has been at the forefront of marine education in the UK. It will review some of the whole class and individual investigations it has developed to teach key ecological processes and concepts and will explain how it tailors them to the requirements of school examining bodies and national curricula.

The Field Studies Council is always looking for more innovative ways of delivering marine based field courses. It is integrating the use of ITC both in the field and in post-fieldwork follow up and is also considering how lab sessions can be better integrated with and used to support outdoor learning with students of different ages.

The poster will signpost the many opportunities for better promoting marine ecosystems and processes to teachers and will show how marine and coastal environments can be an excellent resource for teaching many aspects of biology, ecology, environmental science and geography from Key Stage 1 through to Universities, Life Long Learners and professionals.





Mobidic – inviting the public to survey marine life

Rocha I., Albergaria C., and Sousa Pinto I.

¹*CIIMAR, Portugal*

Mobidic is a marine biodiversity citizen science project from CIIMAR. Since 2005 Mobidic has been involving several Portuguese schools in field trips to rocky shores. The students make a transect survey, using the same methodology from site to site and from year to year in order to ensure that the results are comparable. In 2013 CIIMAR started the development of an app that will allow a wider public to take part in marine life surveys. The app will assist citizens to identify the intertidal species through an online guide and to compare site and time species' dynamics data. In this communication, we will present the Mobidic app demonstrating how citizens can access, participate, submit and visualize the data.



Introduction of the Ocean Literacy principles and concepts in Basic Education teacher training in Brazil: articulating a new culture related to the Sea

Santos R.C.G.¹, Calazans D.K.², and Costalunga A.L.O.³

¹*Institute of Education of the Federal University of Rio Grande, Brazil.*

²*Institute of Oceanography of the Federal University of Rio Grande, Brazil.*

³*Officer of the Brazilian Navy, Brazil*

Everyday events highlight the need for understanding the processes of interdependence and interaction among the subjects and the educational and social processes present in the current life complexity. There seems to be a consensus among distinct communities and scientists that globalizing and, until recently, hegemonic paradigms of the modern science can no longer explain situations that involve different contexts and social values. It is therefore necessary to move towards the establishment of new social practices regarding educational processes. Brazil is a country with continental dimensions, where 26.6% of the 200 million residents live nearby its 8.500 km long coastline, thus has an undeniable vocation to the sea. In this context, there is an increasing awareness for the need to qualify educators to foster a culture that breaks away from the paradigm of purely economic and touristic aspects of the ocean. Taking into account that qualification and building capacity for educators, may pave the way to future citizen rising awareness regarding ocean issues, the Committee for Human Resources Training (PPG-Mar), an advisory body of the Interministerial Commission for Sea Resources (CIRM), has established a Working Group (WG) to adapt Ocean Literacy principles and concepts to a Brazilian reality, in order to include them in training courses for Basic Education teachers in Brazil. The initiative of the WG will be presented in a poster to promote discussion, comments and identification of opportunities for experience exchange.



Two examples of outreach at work at Marine Scotland Science

Dunn J.

Marine Scotland Science, Aberdeen, Scotland

In 2005 the laboratory hosted its first Nuffield student, which turned out to be very successful for both the student and the laboratory.

Over the next five years a series of students completed projects at the laboratory with increasing success, each one of them being awarded a British Association for science gold award for their projects. In 2010 the Nuffield sponsored student came a very creditable third in the Big Bang competition in London and subsequently won the Tomorrow's water competition for Great Britain, going on to represent the country in Sweden at the International event coming a very acceptable third. The following student, in 2011 won the Big Bang event held in Manchester and came second in the Tomorrow's water competition.

In 2011 the laboratory started an unlikely relationship with Glasgow school of Art. Product Development Engineers are based there, A product development engineering student was having problems with the design and function of a sediment trap. As a result of the mentoring Program she produced a unique design of highly portable sediment trap and actually built a prototype. This design is now about to be taken up by a French company which specialises in this type of equipment.

A succession of students have completed a series of developments including a miniature plankton sampler, marine retrieval system, and a containment and closure system for Ta Dic (Total Alkalinity, Dissolved Inorganic Carbon) samples.

These outreach activities with the laboratory have meant that a whole range of school pupils, engineering and art students have become much more aware of some of the unique and challenging problems faced in the marine environment and marine research.



The Shore Thing Project - Citizen Science and marine monitoring

Crouch F.

The Marine Biological Association of the UK, Citadel Hill, Plymouth, UK

Citizen science (also known as crowd science, crowd-sourced science, civic science, or networked science) is scientific research conducted, in whole or in part, by amateur or nonprofessional scientists. The role of volunteers in collecting scientific information is not a new one; Charles Darwin was a citizen scientist as he was not connected to an academic institution.

The marine environment is not the easiest habitat to study. We still have so much to learn about the Ocean and as only a small percentage of the population can experience first-hand what lays beneath the waves it's vital for the health of the Ocean that we raise awareness of our impact on the marine environment.

The Shore Thing Project run by the Marine Biological Association (MBA) was one of the first Citizen Science projects to focus on the marine environment. The project began in 2006 with the aim *'To generate records of marine wildlife by facilitating intertidal biological surveys at sites around the British Isles, and to make the results available to all on the Internet. In addition we aim to raise awareness of marine conservation amongst the participants and the wider community.'* Students and community groups have undertaken over 300 surveys around the coast of the British Isles from NW Scotland to the Channel Islands. The data from a 20 minute effort based search for 22 climate change indicators and non-native species is made available to the wider community via the National Biodiversity Network (NBN). The dissemination of this robust data makes Shore Thing a unique project with citizen scientists contributing to our wider knowledge of the impacts of warming seas on rocky shore species; 'REAL' science.





BlueB-debrisFree

Valongo B., Mesquita R., Batista F., and Rocha R.

¹*Colégio Luso-Francês, Portugal*

The project "BlueB-debrisFree" aimed to study the marine plastic debris from the coastal sediments of Praia de Matosinhos, a beach located in the North of Portugal. The study was carried out by a group of secondary education students attending Colégio Luso-Francês, a private school in Oporto, from September 2013 to June 2014. We will present the methodology used for the quantification and classification of micro-, meso- and macroplastics and the results obtained so far, with the collaboration of the Biotechnology School of the Universidade Católica in Oporto.



Anam Mara - A vision for flourishing coastal communities

Britton E., and Britton N.C.

¹*Too Big To Ignore project, Ireland*

²*Letterkenny Women's Centre, Ireland*

Anam Mara means 'sea soul' in Irish and is a holistic platform for promoting the health and wellbeing of coastal communities, helping to connect and build relationships for change within a community and between communities, leading to the creation of sustainable communities-of-practice. There is widespread decline in coastal regions, in particular in Ireland, and globally coastal communities are struggling with rapid change to their way of life and the ecosystems on which they depend. The social impacts and needs of coastal communities have been particularly neglected and poorly understood in Northern Europe. Coastal fishing communities in Ireland typically have a strong sense of place and identity with associated social and cultural values which are being eroded resulting in a loss of connection. These communities experience high levels of loss and there is a real sense of frustration and disempowerment that their needs are not understood. Lack of voice, especially for women and children, a sense of disempowerment, loss of way of life, the culture of silence and the social normalisation of violent behaviour, especially domestic violence and alcoholism, are just some of the big social issues facing these communities.

Focusing directly on big societal issues tends to alienate people, especially in tight-knit coastal communities. Anam Mara is a different way of working with health and wellbeing. It offers a model where participants are their own experts, unlocking their potential, and deeper needs are uncovered. It highlights that the most powerful and effective way to impact on big issues is through a wellbeing framework. Wellbeing doesn't discriminate and is relevant across all ages and backgrounds, so by organising around a purpose that transcends the interests of every stakeholder and providing a positive reframe on issues, a more inclusive space is created for sharing and self-exploration, trust-building and awareness and understanding of the bigger issues as they arise.





Plain Language during courses in the MARUM Schoollab

M. Pätzold, and S. Amedebhar

MARUM, Center of Marine Environmental Sciences, Bremen - Germany

The MARUM UNISchoollab is an initiative of the center of marine environmental science at university of Bremen. We offer courses for school classes on different levels. The main focus is on marine sciences and renewable energies.

During the last two years we try to extend the cooperation between schools, preferential the so called “Oberschulen” where the mixture of school kids can be amazing. This mixture leads us to some problems in understanding and reading the instructions in the labs and we had big problems with frustration. We start to introduce the plain language concept in the lab. That helps a lot and makes it much easier for every kid.

In January 2014 were started to improve the courses dealing with renewable energies in the plain language concept.



Shore Shapers: Introducing children and the general public to biogeomorphological processes and geodiversity

Naylor L.¹, Lovell R.², Coombes M.³, Sewell J.⁴, and White A.⁵

¹*University of Glasgow, School of Geographical and Earth Sciences, UK*

²*European Centre for Human Health and Environment University of Exeter, UK*

³*University of Oxford, Oxford University Centre for the Environment, South Parks Road, Oxford, UK*

⁴*Marine Biological Association of the UK, Citadel Hill, the Hoe, Plymouth, UK*

⁵*School of Biological Sciences, Faculty of Science and Environment, University of Plymouth, Plymouth, UK*

Coastal processes and wildlife shape the coast into a variety of eye-catching and enticing landforms that attract people to marvel at, relax and enjoy coastal geomorphology. These landforms also influence biological communities by providing habitat and refuge. There are very few field guides to explain these processes to the general public and children. In contrast, there is a relative wealth of resources and organised activities introducing people to coastal wildlife, especially on rocky shores. These biological resources typically focus on the biology and climatic controls on their distribution, rather than how the biology interacts with its physical habitat.

As an outcome of two recent rock coast biogeomorphology projects (detailed at: www.biogeomorph.org/coastal) a multi disciplinary team produced the first known guide to understanding how biogeomorphological processes help create coastal landforms. The ‘Shore Shapers’ guide (shoreshapers.org) is designed to: a. bring biotic geomorphic interactions (how animals, algae and microorganisms protect and shape rock) to life and b. introduce some of the geomorphological and geological controls on biogeomorphic processes and landform development. The guide provides scientific information in an accessible and interactive way – to help sustain children’s interest and extend their learning. We tested a draft version of the guide with children, the general public and volunteers on rocky shore rambles using social science techniques and present the findings, alongside initial results of an evaluation of a newer version of the guide and interactive workshops taking place throughout 2014.



Marine litter and clean up campaigns – Perspectives from the Keep Sweden Tidy Foundation

Bildberg, E.

Keep Sweden Tidy, Sweden

Marine litter is turning into one of the greatest environmental threats to the oceans and is found all over the world, also in remote areas far from human contact. Our modern lifestyle with increasing consumption and waste production is directly reflected in the oceans, which are slowly turning into the planets underwater landfills. A small fraction of the marine litter ends up on our beaches. It is a tangible environmental problem posing a threat not only to wildlife but also to human wellbeing. But marine litter also has a strong visible message and gives us an opportunity to learn more and do something about it. We can all be part of the solution by picking it up and we can learn more about our seas and how the environmental status of our oceans are directly linked to activities on land. Last year the Keep Sweden Tidy campaign “Coastal Rescuers” gathered more than 1400 volunteers that cleaned the Swedish west coast from 11 tons of marine litter, mostly plastic.

The Keep Sweden Tidy Foundation is a creator of public opinion that promotes recycling and combats litter through public awareness campaigns, awards and environmental education. The Foundation strives to influence people's attitudes and behavior in order to encourage a sustainable development. We are one of the market leaders within environmental education, providing courses, environmental teaching methods and educational material to public schools via our Eco school network. Keep Sweden Tidy belongs to the European Litter Prevention Association Network with members all over Europe with similar working programs.



Driving Ocean Literacy at Titanic Belfast's Ocean Exploration Centre

Heaney S., and Clarkin E.
Titanic Belfast, Northern Ireland

Museums, aquaria and visitor attractions are uniquely favourable platforms through which to engage visitors, thereby providing excellent opportunities to raise public awareness of the principles of ocean literacy.

Titanic Belfast is the world's largest Titanic visitor attraction which uses a variety of interactive technology to tell the story of the ill-fated liner, RMS Titanic, from Belfast in the 1900s, through building the famous liner, to her subsequent place in history and the discovery of the wreck in 1985 by Dr. Robert Ballard.

The final gallery in this multi-award winning visitor experience is the newly redesigned Ocean Exploration Centre which brings the story right up to modern day and lifts the lid on the mysterious undersea world.

This new Ocean Exploration Centre provides a unique learning environment which is the perfect complement to the exciting array of formal and informal workshops for schools, which meet the national curriculum requirements in core STEM subjects for the UK and Republic of Ireland.

This presentation will provide an insight into and update on some of the methods which Titanic Belfast's Ocean Exploration Centre uses to promote core ocean values to schools and guests, both through the state-of-the-art visitor attraction and also through the various elements of the learning strategy, including a brand new roadshow which is due to go live in May 2014.



A Brief History of the Ocean Literacy Campaign: Challenges, Successes and Global Influence

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This presentation will provide a brief overview of how the Ocean Literacy campaign in the United States began, matured, and has been the momentum behind international efforts to advance ocean literacy. The presentation will address the following questions: What is Ocean Literacy? How did the Ocean Literacy campaign begin? How has it influenced global Ocean Literacy efforts, specifically in Europe?

Ocean literacy, as defined by the US-based developers of the *Essential Principles and Fundamental Concepts*, is an understanding of the ocean's influence on you and your influence on the ocean. Furthermore, an ocean literate person understands the essential principles and fundamental concepts, can communicate about the ocean in a meaningful way, and is able to make informed and responsible decisions regarding the ocean and its resources.

Since its humble beginnings 2003 through the efforts of individuals associated with National Marine Educators Association (NMEA), National Oceanic and Atmospheric Administration (NOAA), the Centers for Ocean Science Education Excellence (COSEE) and others, the Ocean Literacy campaign has influenced how we think and teach about the ocean. Tangible results include encouraging the inclusion of ocean science content in US national standards, and inspiring the formation of like-minded groups, including the International Pacific Marine Educators Network (IPMEN), the Canadian Network for Ocean Education (CaNOE), and the European Marine Science Educators Association (EMSEA). The influence of the Ocean Literacy campaign in the EU is clear - ocean Literacy was emphasized in the 2013 Galway Statement on Atlantic Ocean cooperation (transatlantic ocean literacy), and is the foundation of the EU Horizon 2020 BG-13 proposal.

The presentation will include a discussion of current efforts to promote ocean literacy, including websites, webinars, online workshops, as well as results of recent meetings and potential upcoming events on how we can continue to foster global efforts in Ocean Literacy.



Marine science and education at Runde Miljøsen-ter- how to communicate scientific knowledge

Hareide N.R., and Llopis Giménez L.

RundeMiljøsen-ter. Norway

The Runde Miljøsen-ter is an environmental research center on the island of Runde, in Herøy, Norway. The island is the most southern bird cliff in Norway, and is located in a highly productive area.

At Runde Miljøsen-ter, the scientific team develop numerous research projects, related to fisheries management, marine pollution, wave power or the climate change and its impact on the marine ecosystem. Concurrently, educational and awareness activities take place, in order to share the acquired knowledge with visitors and public.

On 14 January 2014, the exhibition “Kald Hav (Hete spørsmål)- Cold Ocean (Hot questions)”, coordinated by the Runde Miljøsen-ter, was opened in Fosnavåg, Herøy. The exhibition aims to show how important have been the ocean resources for the development of Norway as a country, and also brings up many questions regarding the biggest challenges for marine science in the near future. With those objectives, the exhibition will go all over the country during 2014. The schedule for this year includes school and general public guided visits and diverse conferences and seminars in Oslo and Bergen. In 2015 the exhibition will travel to North America and finally it will return to Runde to settle.

Besides, and as a tourist point of interest, the RundeMiljøsen-ter attempt to approach the real situation for some marine resources and its relation with the bird species in the island using its spacious auditorium to show the documentary film “Havets Sølv- The silver of the Sea”, winner of several awards from its premiere.

These and other activities developed at Runde Miljøsen-ter demonstrate how a recognised marine science center can also become a model for marine environmental education by considering the importance of communicating science to a general audience.



Teaching and learning marine science in virtual environment

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University of Turku, Finland

Marine science is not learned as a discipline in Finnish schools, however subjects related to marine science (e.g. biological, chemical and sustainable development topics) are taught in Finnish Basic Education and Upper Secondary School (National Core Curricula, NCC 2003, 2004). The Science Learning for Future Schools (SciLes) –project was established recently. This study aims to increase upper secondary school students’ interest and knowledge in science subjects as well as to study scientific approach to learning. The aim is also to increase the use of virtual simulations and virtual laboratories to study these phenomena, complemented with “hands on activities” in collaborative and engaged learning environment.

In SciLes -project the marine virtual laboratory, originally developed by the University of Gothenburg (Fauville 2011, 2012), will be modified in line with the new Finnish NCC. At this moment, the draft of the NCC for pre-primary and Basic Education imposes the strong role of information technology. The virtual student exam at the end of Upper Secondary School has also been announced in whole Finland, starting in 2016 (biology and chemistry in 2018). The Finnish National Board of Education has also published a snapshot of the educational use of information technology in 2011.

A group of students who studied according to the NCC and a group of International Bacchlaureate (IB) students participated this study. The main preliminary results were connected to several matters: 1) how to develop the virtual environment (in learning multifaceted marine science phenomena; in using inquiry based collaborative learning, e.g. evaluation of collaborative learning or using social media as a learning tool), 2) how to study using scientific approach (e.g. to generate a hypotheses). The results of the pilot SciLes study will be presented in relation to IB and NCC curricula.



Enhancing marine science learning using local web technologies

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This poster will outline some of the challenges and benefits of using mobile and web technologies for enhancing student learning within school groups at marine science field centres. Shoreline environments around the UK typically have little or no Internet connectivity¹. Therefore, we use a battery-powered WiFi network router to provide local connectivity between mobile devices and a web-server application running on a laptop computer. A content management system is used to author an activity-specific website, which provides web forms for data recording, and automatically collates group data into summary tables, charts and graphs. The resulting 'field-network system' provides immediate and frequent feedback to students and enables school groups to begin analysing, interpreting and discussing their findings at the shore. The impact on the learning experience is that: less time is spent on off-task activities (i.e. data transcribing and processing); student progress can be more easily monitored by the tutor, in order to correct mistakes or misconceptions as they arise; and the students can be prompted to review their findings while they are collecting their data in order to actively develop their understanding.

¹ See OFCOM's UK Mobile Services Map (2013) for levels of 3G coverage
<http://maps.ofcom.org.uk/mobile-services/>



Establishing a marine research visitor centre

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Science centres are fantastic places, where the public can learn about the highlights in science in non-threatening and entertaining ways. But they do not often showcase the work of any actual research organization and do not allow for individual scientists and projects to provide public accountability.

At the Scottish Association for Marine Science (SAMS) we developed a small visitor and outreach centre to showcase the breadth of the institutional research and to provide a public space for learning, engagement and discussion. The underlying rationale for the development was to do justice to the organizational mission to deliver our science to help society develop a more sustainable relationship with the marine environment and to respond to the EU wide growing impact agenda.

The challenge was to develop a facility in a compact space that could be exciting and meaningful for a very diverse range of audiences ranging from visiting scientists to visiting school groups and tourists to the area.

The Ocean Explorer Centre opened in Oban on the Scottish west coast in the autumn of 2013. It includes an underwater observatory, interactive displays, a small cinema and a café with shop. Edu-tainment displays about the marine system range from the outside of the building to the toilets and the café tables. The garden offers significant space for further developments.

This poster presentation looks at at the ingredients of developing a successful marine research visitor centre: building internal buy-in; securing capital funding; defining the site and size; developing engaging and easily updateable displays; growing your audiences and marketing; developing a constant stream of events and school engagement activities; integrating public science projects; and sustainability issues.



Informal education program at the Aquarium of Messina, Italy

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Marine Coastal Environment Institute - National Council of Research (NCR), Messina, Italy

Since 2010, the Marine Coastal Environment Institute of the National Council of Research (IAMC NCR) unit of Messina is developing an informal education program at the Aquarium of Messina (Sicily, Italy).

The Aquarium of Messina is an historic aquarium and museum, located in the city center of Messina since 60'. Together with the Napoli Aquarium, The Aquarium of Messina became, in the last years, in a unique marine leisure and education centre of the South of Italy, concerning Mediterranean creatures. IAMC-NCR is responsible for the Aquarium educational program and research with the aim of develop ocean and science literacies using games, hands-on activities and workshops that can be implemented in scientific centres, museums and local and national scientific events. The program target pupils from pre-school and support several core elements of the national curriculum by using and interdisciplinary approach.

Marine biology topics are presented to pupils offering a different and systemic point of view on sea life, trying to stimulate open discussion and debate during the workshops with the educator, in the classroom, as well as, in the family. The methodology aimed at development of positive emotions and personal scientific discovery to encourage excitement, curiosity and lead to better learning outcome and development of long-term memories. In particular, in the workshops for schools, devised for diverse level of sophistication, help pupils to be protagonist of their own learning with inquiry-based procedures and find out about the work of marine biologist researchers.

This presentation will present these activities and summarize the outcome of the participation of more than 3000 pupils per year.



A toolkit to educate pupils on marine biodiversity, or how to capitalize on educational activities in aquaria

Cira M.

Nausicaa, France

The educational team has been developing tools, activities and disseminating practical knowledge of marine sciences at Nausicaá for more than 15 years. These materials have been used in in situ workshops for school classes and shared with partners in the region to support extra curriculum activities. After the experimentation period and in response to educators' expressed needs, Nausicaá has started to capitalize on this experience and developed a new toolkit.

The toolkit contains 58 educational activities supported by multiple tools. Ten thematic activities are displayed with a set of 163 illustrated cards, 14 large format pictures and a leaflet about sustainable seafood consumption. A guide book provides information on how to organize each educational activity and it suggests a scenario to frame them.

The toolkit activities target 3 groups of pupils between 4 and 14 years old. The activities for the 5-8 year-old children present marine biodiversity in a playful and creative way such as songs, outside walks, drawing... The activities developed for the 9-12 year old explore relationships between living creatures (food web, adaptation patterns, reproduction schemes...). They present the ocean as a productive ecosystem and suggest how to make a sustainable use of it. The activities designed for 12-14 year old pupils present the biodiversity concept and demonstrate its role in the climate and environmental balance on earth.

We'd like to present this toolkit and its results since we have started the distribution. We would also like to exchange on the collective process that has led to this development.



Students and the sea: A survey of ocean literacy in Nova Scotia

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Improving ocean literacy in Canada is important for social, economic, and environmental reasons; yet current education curricula in Canada do not adequately incorporate ocean science concepts. While this has improved in recent years, there has been little investigation as to what knowledge gaps currently exist among students. Furthermore, it is essential to understand young peoples' relationship with the ocean in order to better design education programs. This is imperative for establishing a baseline by which to measure success of implemented curricula in the future. To accomplish this, we distributed surveys to students in 11 public schools across the province of Nova Scotia, Canada. Over 700 students participated in the 4-page quiz and survey in November and December of 2013. The quiz questions were designed with regard for the 'Ocean Literacy: Essential Principles and Fundamental Concepts' developed by groups in the United States over the past 10 years. Questions on ocean threats, marine protection, and activities near the ocean were incorporated to fully comprehend how young people situate the ocean in their worldview. The findings suggest a generally low level of ocean science knowledge, yet moderate to high levels of value for the ocean, as well as a strong interest to protect and learn more about the marine environment. This research confirms that Atlantic Canadian students believe the ocean to be of importance in their lives, yet lack the scientific understanding of critical ocean science concepts. Moving forward, this study provides educators with valuable knowledge for designing and implementing effective ocean science education programs.



How biofilm communities can be used to examine biodiversity and nutrient uptake in aquatic ecosystems.

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³*Maryland Sea Grant Extension Program, USA*

The primary goal of the research was to understand how water quality affects biodiversity and nutrient uptake by biofilm communities. The experiments conducted required the assembly of six racks, each containing ten acrylic disks, 10 cm in diameter, to be suspended vertically under water in the Baltimore harbor for a period of six weeks. During this time, daily water quality testing was conducted to help in understanding the development of the biofilm disks and how abiotic factors impact the biotic factors in aquatic environments.

While studying biodiversity, random sampling techniques were used to select two disks from the racks twice a week and qualitative and quantitative measurements were collected. Using a stereoscope, the disks were examined and organisms were counted. The total area of the disk was broken into equal sections and two were randomly selected for the count. Using a magnification of 1.5x on the stereoscope, as well as digital imaging equipment, measurements, including a description of the species and the total number of each were collected. After the biodiversity counts were conducted, the racks were reassembled and returned to their original location for further growth.

The second experiment conducted looked at nutrient uptake by biofilm communities. Two racks of biofilm discs were collected for testing twice a week. An artificial seawater solution was mixed to model the salinity of the harbor water and was created for the control group and experimental group. In the control solution, discs were exposed to only the artificial seawater. In the experimental solution, discs were exposed to a pulse of ammonia mixed into the solution. In twenty-minute increments, for a total of three hours, the control and experimental racks were tested for ammonia levels. The purpose for incremental testing was to determine if there was an uptake of ammonia by the biofilm communities.



SeaForSociety – Portuguese consultations early results

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Sea for Society (SFS) has brought together a multidisciplinary partnership of 21 partners from 11 countries representing marine research institutes, funding agencies, science museums and aquaria, CSO's, NGO's, higher education institutes, business networks, to implement a MMLAP to address Specific Challenge 3: Marine Resources, inland activities and sustainable development. SFS mobilizes researchers, marine and terrestrial actors, CSO's and individual citizens and youth in a mutual learning, open dialogue and joint action to consider key questions, extract cross-cutting issues and propose challenge-driven solutions and ensure sustainable management of marine eco-system services by European citizens.

The project engages stakeholders with conflicting perspectives in a face-to-face and web-based participatory dialogue with science and research. Ten 'geographical forums' across Europe convenes economic stakeholders, environmental organizations, local authorities, the public-at-large, and youth to identify challenges and barriers of coastal and marine ecosystem services vis-à-vis societal needs.

Collective reasoning dialogues will bring about co-authored recommendations for facing up to the challenge. Key questions will be considered in the context of 'ocean ecosystem services' with an emphasis on relating complex biodiversity to 'lived experiences' in order to bridge how everyday human behavior interplays with science. Open dialogue process will lead to further empowerment of stakeholders and citizens to take action at local, national and European levels to tackle marine societal challenges.

Public Engagement in Research (PER) as it relates to European maritime policy is at the core of the process. Sustaining the MMLAP will be important in designing the SFS mechanisms: for partnership, interaction, PER, empowerment and redressing marine societal challenges.

In Portugal there were 2 consultations phases regarding the two kinds of audiences, citizens and youth, and stakeholders. The first's results are already available and will be presented.





Sea for Society Summer dissemination activities

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The sustainable use of marine and maritime resources is one of the priority strategic issues in Europe Blue Growth. Sea for Society is a European project aimed at developing a new vision for a society in harmony with the ocean, the **Blue Society**. A European Action Plan for Mobilization is under development with contributions from 28 partners in 12 countries.

Science in Summer (Ciência Viva no Verão) is a large Ciência Viva dissemination campaign organized since 1996 in partnership with scientific institutions and associations, museums, Ciência Viva science centers and companies, involving thousands of people across the country. The actions are free, open to everyone and lead by specialists. In the last year the program had about 35 000 participants.

This year Ciência Viva intensified the dissemination of marine science and technology in the program, particularly in the areas of biology, geology and engineering. These activities address topics that have been of main concern in our country, from coastal erosion to the economic growth generated by maritime activities and to the seafood consumption.

In this poster we will present the most significant activities related with the Sea for Society project and their impact within Science in Summer.



Seas and Oceans Gymkhana

Gili J.-M., Vendrell-Simón B., Peral L., and Zapata-Guardiola R.
Institut de Ciències del Mar (ICM-CSIC), Barcelona, Spain

Planet earth is commonly known as the blue planet. Seas and oceans cover more than two thirds of its surface, and play a key role in climate regulation and making life possible, as we understand it today. The oceans are an interconnected global system, meaning that for a proper functioning all of its parts are necessary. The great mechanisms of connection between oceanic areas, regions or basins are ocean currents. A very intuitive and easy way to visualize this whole oceanic system is self-experiencing the currents system in our terrestrial habitat. Therefore, we proposed transforming our city into the global ocean.

To achieve this, more than 300 students from eight schools made a trip through different ocean currents, walking or "surfing" in the streets, learning about marine ecosystems and converging at a final place where some extra activities were carried out in order to visualize the overall functioning of the oceans and the planet. Each group of students "sailed" along a current, where they had to stop at different places to develop hands-on and relational activities and perform experiments all of which were related to some of the marine ecosystems, which they could find along each of the ocean currents.



Oceans

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Institut de Ciències del Mar (ICM-CSIC), Barcelona, Spain

The Institute of Marine Sciences (ICM-CSIC) in Barcelona and Obra Social “la Caixa” present the board game *Oceans*, as part of their joint programme El mar a fons (www.elmarafons.com). *Oceans* is meant to learn about the importance of seawater masses and the need to preserve them while playing. The game encourages participants to explore and make their own personal discoveries about the oceans.

Oceans revives a virtual exploration voyage around the globe. While “sailing” the board, players will learn about oceans and seas in a holistic way, as they will read and will have to think about environmental features, biodiversity, marine ecosystems functioning, history and geography of ocean exploration and discoveries and the human footprint on the oceans, among others.

The contents of the game are completely free and can be downloaded from the project website in a format that can be easily printed. The game comes in two versions, one for children (primary school level) and one for youth and adults (secondary school levels), which differ in their functioning and contents.

Through *Oceans*, the programme "El mar a fons" aims to take a step further and let knowledge pass from classrooms to families and society. It's time that students share their knowledge of the oceans with their families and friends. Playing together is the best way to learn about the oceans, and the knowledge participants will achieve is essential not only for loving the oceans, but also for promoting their protection and for working together for their conservation.





FIELD TRIPS



Sven Lovén Centre for Marine Science at Kristineberg

The Sven Lovén Centre for Marine Sciences at the University of Gothenburg offers a comprehensive marine infrastructure, with several research vessels and smaller boats as well as two stations for research and education. Both stations are located in unique environments on the West Coast of Sweden: Kristineberg by the Gullmar fjord and Tjärnö by the Koster fjord. The Lovén Centre brings together groups of researchers both from the University of Gothenburg and other Swedish universities. Both stations have a well-developed running sea-water system, scientific laboratories of high international standard, high-tech instrumentation as well as accommodation and a restaurant. The Lovén Centre's research vessels and remotely operated vehicles enable to study and collect material from the deepest parts of the Swedish waters. Kristineberg is located at the mouth of the Gullmar Fjord, the only true fjord of Sweden. The station has easy access to coastal habitats and open sea. It was founded in 1877, as one of the oldest marine stations for education and research in the world.

During our visit at the Lovén Centre Kristineberg we will have a presentation of the station and its activities and guided tour of the station to look at some of the ongoing research projects. We will also do a boat excursion with research vessel Oscar von Sydow. Guided by a marine biologist, we will spend 1½ hours looking at the fauna and flora from the bottom of the Gullmar fjord.



Universeum

Universeum is a non-profit science discovery centre. Since the opening 2001 we have had well over 500 000 visitors yearly and reached 615.000 in 2012. The Universeum's activities are intended to awaken interest in science and technology and arouse ecological awareness among the general public. The goal is to encourage more young people to choose further education – particularly within these disciplines. We aim to achieve this by creating a unique “aha” discovery and learning experience, which will be a source of inspiration, leading to innovative ideas and questions. We also strive to enhance the visitors' ecological awareness by giving good examples of our own and others conservation efforts. Our main target groups are children and young adults, teachers and the general public.

The Universeum comprises two main sections: Living Environments and a Science Centre. Water is the common theme throughout the Living Environments. Visitors follow a watercourse through a living model of Sweden – from the rain in the Swedish Alps in the north, south along streams, rivers and lakes and via the Baltic Sea out into the North Sea. The journey continues through the vast ocean all the way to, and then through, a South American rainforest, which acts as a counterpart to the Swedish countryside.

During the visit we will learn how Universeum works to fulfill its mission to enhance children's and young people's interest in technique and the natural sciences. We will also hear about the challenges in keeping aquatic animals in a public science centre and we will of course get a guided tour through Universeums living exhibitions – meet pedagogues, guides and technicians and see the feeding of the sharks.



The sailing upper secondary school

Öckerö Gymnasieskola (an upper secondary school for students aged 16-19) is a municipal school, financed by the Swedish state. The school is located in the archipelago of Gothenburg. The school has four different programs, all of which are three years long. Two of the programs aim at further studies at a university and the other two aim to make pupils ready for work on different sea vessels. Apart from the ordinary school work, three of the programs spend as much as a total of six months on our school ship T/S Gunilla. The pupils in our fourth program do their training in the Swedish merchant fleet.

Life onboard T/S Gunilla offers a unique combination of theory and practice for the pupils. When sailing the pupils are given incomparable experiences from different marine environments.

On the field trip to Öckerö you will meet teachers and third year students from the science program. They will tell you, and show you, about their experiences from our classroom at sea.

- Introduction by the teachers
- Students show short films and read diaries from their two trips. *The first trip for our science pupils is sailed in the Mediterranean and takes them from Cadiz to Cartagena, Barcelona, Palma (Mallorca), Gibraltar and Safi. In their second year they sail from Florida to Öckerö (Sweden), via South Carolina, Bermuda, the Azores and France.*
- Lunch
- Exhibition: the students exhibit posters made from experiences from their trips showing different marine phenomena
- Local marine biology: the students show specimens from the sea surrounding the school on Öckerö

