

# E-Newsletter

## EPHEMARE Kick-off Meeting 2016

The EPHEMARE project kick-off meeting took place in San Pedro, Murcia, Spain on the 19th and 20th of January, 2016. The meeting brought experts from Spain, France, Italy, Portugal, Germany, Belgium, Sweden, Norway, Ireland and the UK together and allowed face to face meeting with project partners, facilitating great discussions about the EPHEMARE investigation into the toxic effects of microplastics on marine organisms.



EPHEMARE Kick-off meeting San Pedro, Spain, 2016

## EPHEMARE at the Teaching Laboratories



EPHEMARE at the Teaching Laboratories, Ancona, 2016

The laboratory of Ecotoxicology of Marche Polytechnic University (UPM) participated in the event "TIPICTÀ IN BLU", which was held in Ancona (19th-22nd of May 2016), to raise public awareness relating to: Blue economy and Blue growth, seafood safety and protection of the marine environment.

During this event, several teaching laboratories were organised for students, to disseminate information about the Adriatic Sea (ADRIATICOLAB). UPM presented a lab activity titled: A "SEA" OF PLASTIC. Several games and practical experiences relating to the presence of plastic and microplastics in the sea were carried out; moreover, through the use of microscopes, children and parents had the possibility to observe the microplastics in personal care products (exfoliants, nail varnishes, etc.) and small fragments of plastic found in marine organisms sampled in the Adriatic Sea.

# Italian Festival of Science

The National Research Council of Italy (CNR - ISMAR) and Marche Polytechnic University (UPM) participated in the Italian Festival of Science, held in Genoa (Italy) from October 27th to November 6th, 2016. Italian EPHEMARE partners organised an educational laboratory titled: "Can you tell me where plastics end up?" and the conference "An ocean of microplastics: invisible signs into sea future", to increase awareness of plastic presence, consequences and its impact in the marine environment. Both activities were located in the Aquarium of Genoa.

## Educational Laboratory: "Can you tell me where plastics end up?"

This lab presented an opportunity to think about daily problems which do not receive much attention. "Can you tell me where plastics end up?" focused on discovery through practical experiences allowing participants to understand how to monitor and select tools that are used to quantify and recognise microplastics in marine waters and sediment samples. The lab showed how field sampling activities are performed and offered the possibility to do some practical and scientific trials, simulating researchers' activities, such as the separation of plastics from different matrices.



CNR introducing "Can you tell me where plastic ends up?"

## Educational Laboratory: "Sea into a sea of plastics"



"Sea into a sea of plastics"

"Sea into a sea of plastics" highlighted problems associated with microplastics in marine environments, with particular attention to the research activities of the Regional Environmental Protection Agency of Liguria (ARPAL). The laboratory was carried out by scientific entertainers and Italian EPHEMARE partners who, through audio-video devices, engaged the visitors in different practical activities. The central focal point and setting of this lab was a specially designed tank, representing the marine ecosystem, containing plastics and marine organisms, simulating a "Sea into a Sea of Plastics". The lab represented an opportunity to address an issue of great relevance, raise questions and to find potential solutions.

## Conference: "An ocean of microplastics: Invisible Signs into the Sea Future"

Dr. Francesca Garaventa (CNR - ISMAR) organised this conference, inviting marine environmental monitoring and microplastics experts to share their knowledge.

Dr. Stefano Aliani (CNR - ISMAR) provided an overview on the presence and abundance of floating litter in the ocean, with a focus on how oceanographic patterns affect the distribution of marine plastic litter. Details of microplastics monitoring protocols, including collection within the water column and sediment as well as subsequent laboratory work, were illustrated by Dr. Rosella Bertolotto (ARPAL). Prof. Francesco Regoli (UPM) introduced the EPHEMARE project and highlighted effects of marine microplastics on marine vertebrates and invertebrates, and more specifically elaborated on the impact that chemical additives to plastic items may have on marine organisms. The "Can you tell me where plastics end up?" lab was introduced by Dr. Marco Faimali (CNR - ISMAR) utilising videos and pictures from the event highlighting the importance and relevance of "dissemination" in the work of a researcher.



An ocean of microplastics: Invisible signs into the seas future

# EPHEMARE – 2016

## Absorption and equilibrium partition of persistent pollutants to microplastics (MPs):

Led by the University of Örebro (ORU) this work included a final selection of model target contaminants proposed by the EPHEMARE consortium based on the most recent literature, essential pre-testing to investigate concentrations of compounds in solution and exposure time and establishing protocols for the preparation of microplastics (MPs) with BaP (Benzo(a)pyrene - a polycyclic aromatic hydrocarbon and is the result of incomplete combustion processes), Oxybenzone (a UV filter and used in sun creams but also as an additive in certain plastics and resins) and PFOS (Perfluorooctane sulfonate - a surface-active compound with a widespread use in industrial and commercial products, e.g. fire fighting foams and coatings for textiles and paper products).

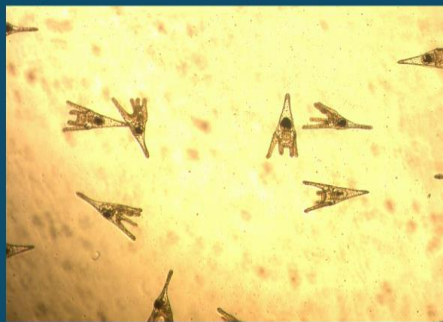
## Uptake and accumulation of MPs and associated persistent pollutants (PPs):

The Spanish Institute of Oceanography (IEO) in collaboration with the University of Antwerp (UAnt) measured the uptake, elimination and accumulation rates of small sized MPs in Mediterranean mussels to build a dynamic model for microplastic kinetics in mussels using the same environmental conditions as in biomarkers studies.

Over the course of the first year of the EPHEMARE project, researchers at UAnt characterised different MPs used within the EPHEMARE consortium under Environmental Scanning Electron Microscope (E-SEM) and performed pilot studies to determine best experimental set-up for uptake experiments with different MPs. The French Research Institute for Exploitation of the Sea (IFREMER) have also been involved in MPs ingestion monitoring in collaboration with UAnt. An MP counting method employing fluorescence, to determine number of MPs in tissues or faeces was established. The researchers participated in a sampling campaign in the Belgian North Sea and harvested more than 100 gastrointestinal tracts from fish of 11 species for MP analysis.

Ifremer collaborated with the University of Heidelberg (UHEI) to show trophic transfer of MPs into fish larvae using *artemia* and *paramecia*. Part of this work was presented at the 30th ESCPB Congress held in Barcelona (September 4th - 7th, 2016).

### Organism toxicity assessment:



*Pluteus Larvae of Paracentrotus lividus in a solution with Microplastics contaminated with 4-Nonylphenol. (UVigo)*

Two inter-laboratory comparison test were organised under the EPHEMARE Project. These activities represent an important step in order to verify that all results provided by the different laboratories use a common protocol and are comparable.

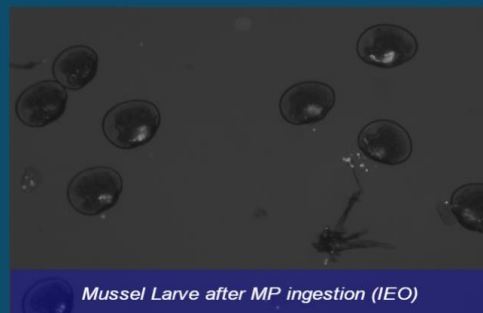
The National Research Council of Italy (CNR - ISMAR), the University of Vigo (UVigo) and the University of Algarve (UAIG) participated in the EPHEMARE Microtox test which was successfully completed. The Algae Inter-laboratory comparison was organized between ISMAR, IEO and the Interdisciplinary Centre of Marine and Environmental Research (CIIMAR – ICBAS) and it is pending for final results.

UVigo conducted preliminary tests with spiked plastics to see if the ingestion of MPs by marine zooplankton could increase the uptake of adsorbed non-polar organic toxins to plankton filter feeders. To date, preliminary test results suggest that MPs do not act as vectors of potentially harmful organic pollutants to zoo planktonic organisms.

UMur evaluated the effects of MPs (PVC - Polyvinyl chloride) on the immune system of European sea bass and gilthead seabream specimens as well as in the DLB-1 sea bass cell line. Only the highest dose of PVC produced significant changes in the sea bass, while failed to affect seabream. Researchers determined some metabolism parameters in the seabream serum and results indicate alterations of creatine kinase, albumin and globulin, which suggest potential liver damage.

The research team also examined the expression of genes related to oxidative stress, cellular stress and apoptosis in the seabream liver, head-kidney. Overall, preliminary results suggest that MPs did not have a severe impact on fish immunity but gene expression indicates oxidative and stress effects. In addition, metabolic alterations on liver were demonstrated. Further investigations are in progress to help understanding the effects of MPs in fish.

IEO examined the effects of microplastics on the embryonic and larval development of mussels. Preliminary experiments were conducted to establish a methodology to be used during the project and to determine the toxicity of different types of materials. No significant effects of the tested MPs were observed on the embryonic development of the Mediterranean mussel.



*Mussel Larve after MP ingestion (IEO)*

## Underlying mechanism of action – Mussel Biomarkers:

IEO, coordinated an experiment between IEO and UVigo. The experiment studied the exposure of mussels to virgin and spiked microplastics. Mussels from a reference site at the Mediterranean coast were acclimatised to laboratory conditions and exposed to MPs and MPs loaded with chlorpirifos (CPF). In addition, microalgae cells were also loaded with CPF and offered to the mussels. Experimental design was developed in coordination with the previously developed Mussel Model. Results of this experiment are pending.

## Field Validation:

The Polytechnic University of Marche (UPM) sampled different sections of the Adriatic Sea (North – Chioggia area, Central – Ancona area and South – Lecce area) to evaluate the presence, distribution and characterisation of MPs in wild species of commercial interest along food webs. So far the team have processed 62 fish, representing seven commercial species and 78 invertebrates belonging to nine species and found MP ingestion in 29% of fish and 15% of invertebrates. Data will be further processed with characterisation of the polymer typology through micro-FT-IR technologies.

## Communication, Dissemination and Stakeholder Engagement:

2016 saw the launch of the EPHEMARE website and Facebook page. The EPHEMARE Facebook page has gained a social reach of 300-400 people per post item with highlights reaching over 1,400 people on some articles. The lead partner University College Cork (UCC) has produced a project factsheet and E-Newsletter as well as designing banners and materials for workshops in collaboration with other EPHEMARE partners.

# Publications

Espinosa, C., Esteban, M.A. and Cuesta, A. (2016). Microplastics in Aquatic Environments and Their Toxicological Implications for Fish. In: S. Soloneski and M. Larramendy, ed., Toxicology - New Aspects to This Scientific Conundrum, 1st ed. InTech. Chapter 6.

Avio C.G., Gorb S., Regoli F., 2016. Plastics and microplastics in the oceans: from emerging pollutants to emerged threat. Marine Environmental Research, In press.

EPHEMARE scientists presented at numerous conferences throughout the year. All the presentations are available to view and download on the News and Events section of the EPHEMARE website, see: <http://www.jpi-oceans.eu/ephemare/news-0>.

## Next Steps for 2017

### Absorption and equilibrium partition of persistent pollutants to MPs

In early 2017 EPHEMARE partners will complete the extraction of absorbed compounds under simulated digestion conditions (using pepsin). The extract will then be chemically analysed and tested for endocrine disruption.

### MP Uptake Experiments

In 2017 further microplastic uptake experiments, involving different organisms and types of microplastics will be conducted. These will be carried out in collaboration with the University of Antwerp (UAnt), Spanish Institute of Oceanography (IEO), University of Vigo (UVigo), University of Algarve (UALg), Marche Polytechnic University (UPM) and the French Research Institute for Exploitation of the Sea (Ifremer).

### Survival and Growth

Within the next year of the project, Ifremer will lead experiments on 'survival and growth'. As part of this work in collaboration with other EPHEMARE partners, an analysis of survival and growth disruption in species occupying different levels of trophic webs following exposure to microplastics and persistent pollutants will be conducted.

An analysis of disruptions in early life stages in species occupying different levels of trophic webs following exposure to microplastics and persistent pollutants will also be conducted in 2017.

### Underlying mechanisms of action

Multiple experiments examining issues such as genotoxicity, endocrine disruption, gene expressions, proteomics and transcriptomics will be carried out in 2017. These experiments will be led by IEO in collaboration with UVigo, University of Murcia (UMur), University of Bordeaux (UBor), University of Heidelberg (UHEI), UALg, UPM, University of Örebro (ORU) and Ifremer.

### Extraction and characterisation of MPs in wild organisms

During 2017 partners involved in the extraction and characterisation of MPs in wild organisms will continue to sample and process organisms for microplastic extraction and characterisation. Experiments in controlled laboratory conditions will be performed to assess the uptake of microplastics by organisms, their compartmentalisation in tissues and the biological responses induced by microplastics and associated persistent pollutants.

### Communication, Dissemination and Stakeholder Engagement

University College Cork (UCC) will continue to support the dissemination and communication of project findings throughout 2017 through factsheets and E-newsletters.

2017 will see the kick off of the EPHEMARE IMPACT photo competition. Third level students are invited to submit an image conveying issues associated with microplastic pollution through the medium of photography. For more information, see the EPHEMARE website, our Facebook page or email [ellen.macmahon@ucc.ie](mailto:ellen.macmahon@ucc.ie).

EPHEMARE scientists will be joining forces with the "Race for Water" foundation to complement ongoing scientific and dissemination outreach work in 2017. Our scientists will take part in the 2017 expedition on board the "Race for Water" catamaran, which is 100% self-sufficient, harnessing both solar and hydrogen energy. Acting as an ambassador boat for the programme, "Race for Water" will serve as an educational platform, travelling laboratory and a working demonstration of Clean-tech innovations. For more information: check out <http://www.raceforwater.com/home> and for future updates visit the EPHEMARE website and like us on our Facebook page.

Contact us:



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