

## PROPUESTA DE ACTIVIDADES DE FORMACIÓN DOCTORAL ESPECÍFICA 2018

<b>Título de la actividad</b>
<b>Workshop and Conferences for PhD candidates in Environmental Sustainability INGURU-DOK 2018</b>
<b>Programa(s) de doctorado que proponen la actividad</b>
<ol style="list-style-type: none"> <li>1. Contaminación y Toxicología Ambientales/Environmental Contamination and Toxicology (CTA/ECT)</li> <li>2. Medio Ambiente y Recursos Marinos (MER)</li> <li>3. Estrategias científicas interdisciplinarias en Patrimonio y Paisaje (ECIPP)</li> </ol>
<b>Personas de contacto</b>
<ol style="list-style-type: none"> <li>1. Miren P Cajaraville Bereziartua (CTA/ECT)</li> <li>2. Ionan Marigómez Allende (MER)</li> <li>3. Juan Manuel Madariaga Mota (ECIPP)</li> </ol>
<b>Breve descripción de la actividad</b>
<p>Los tres programas de doctorado mencionados han elaborado esta propuesta de actividades de formación doctoral conjunta para los doctorandos y doctorandas matriculadas y matriculados en los tres programas de doctorado.</p> <p>Aunque desde perspectivas y enfoques distintos, los tres programas de doctorado incluyen líneas de investigación relacionadas con el medio ambiente y la sostenibilidad, que constituyen temas de investigación de interés común para los tres programas de doctorado.</p> <p>Además, los tres programas contemplan en sus propuestas originales una actividad de formación doctoral obligatoria denominada Workshop CTA/ECT, Workshop MER y Annual Meeting ECIPP, respectivamente. En los tres casos el objetivo de la actividad es que los doctorandos y doctorandas, tras uno o dos años del inicio de sus actividades, aprendan a comunicar y discutir sus resultados e ideas. Para ello los doctorandos y doctorandas presentarán sus respectivas líneas de investigación y el grado de desarrollo de sus tesis doctorales, con mención expresa a los avances, las perspectivas y los problemas relacionados con su investigación específica. El auditorio estará conformado por el profesorado de los tres programas de doctorado, así como por otros investigadores de gran prestigio en su área, que actuarán como moderadores y guías de las discusiones y que presentarán los avances más recientes y los puntos calientes en distintos ámbitos del Medio Ambiente y la sostenibilidad. También se invitará a participar al alumnado de los másteres relacionados "Contaminación y Toxicología Ambientales" (CTA), "Erasmus Mundus en Medio Ambiente y Recursos Marinos / Erasmus Mundus Master of Science in Marine Environment and Resources (MEREMMC)", "Erasmus Mundus International Master in Marine Biological Resources IMBRSea" y "Gestión del Paisaje. Patrimonio, Territorio y Ciudad".</p> <p>Por tanto, la actividad de formación conjunta que se presenta en esta propuesta tiene el formato de un taller abierto (workshops más conferencias) que se celebrará anualmente. Los doctorandos y doctorandas deben participar por lo menos en 2 ediciones de este taller a lo largo de su período de formación.</p>

**Resultados de aprendizaje:** Los doctorandos y doctorandas tendrán su primera inmersión pública en la comunidad científica como actores principales. Adquirirán experiencia en la comunicación y discusión de resultados y establecerán contactos de interés para la consecución de la investigación de su tesis doctoral y para la proyección de su carrera investigadora.

**Lenguas de impartición:** inglés, euskera y castellano

**Procedimientos de control de la actividad:** El grado de consecución de los objetivos de aprendizaje propuestos será evaluado por miembros de las comisiones académicas de los tres programas de doctorado que participan en la actividad.

## Calendario

### 29 Enero -2 de Febrero de 2018

- Conferencia Invitada del **Prof. A Del Valls** (Univ. Cádiz): "Environmental Quality in Sediments above Carbon Dioxide Storage Sub-seabed Geological Formations".
- Conferencia Invitada del **Dr. Mikel Becerro** (CSIC, Girona): "Diversity of Diversities in Marine Sponges: a Hidden Challenge".
- Conferencia Invitada del **Prof. Mathieu Poulicek** (Univ Liege): ""Hologenomic evolution and adaptation in corals: when Lamarck comes back to meet Darwin",
- **Mesa redonda:**"Conservation & Management of the Marine Environment: E Sainz de Murieta, A del Valls, A Borja, M Poulicek, M Becerro (Chair).
- **Seminario:** "Presentation of ongoing MER PhD Thesis Research Projects": Beatriz Sobradillo, Kemal Pinarbasi, Blanca Orue, Maria Isabel García-Barón, Sarai Pouso, Ivan Manso, Iraide Artetxe, Victoria Ortiz De Zarate, Ander Urrutia, Tamer Hafez, Kristina A Arranz, Ziortza Barroeta, Unai Aldalur, Denis Bilbao
- **Conferencia de clausura** de la **Dra Naiara Rodriguez-Ezpeleta** (AZTI): "DNA metabarcoding for biodiversity-based monitoring and assessment"

### 12 de Abril de 2018

-Conferencia Invitada de la **Prof. Maria Bebianno, University of Algarve**. Título: "Toxicity of metallic pollutants in relation with cellular accumulation and storage processes".

### 13 de Abril de 2018

-Conferencia Invitada de la **Prof. Maria Bebianno, University of Algarve**. Título: "Proteomics as a potent tool for discovery of new biomarkers".

### 19 de Junio de 2018

-Conferencia Invitada del **Dr. Drew R Peterson, City Univ A Hong Kong**. Título: "Omics of Marine Medaka and its Relevance to Marine Environmental Research".

### 20 de Junio de 2018

-Conferencia Invitada del **Dr. Drew R Peterson, City Univ A Hong Kong**. Título: "Gender-Specific Modulation of Fish Responses to Environmental Stress".



#### 1 de Octubre de 2018

- Conferencia Invitada del **Dr. Felipe Criado Boado**, (Director del Instituto de Ciencias del Patrimonio INCIPIT-CSIC, Santiago de Compostela, y Presidente de la Asociación Europea de Arqueología). Título: *¿Son las ciencias humanas la conciliación de epistemologías opuestas?*.

#### 4 de Octubre de 2018

- Conferencia Invitada del **Dr. Valentín García Baonza**, (Director del Instituto de Geociencias IGEO (Universidad Complutense de Madrid - CSIC, Madrid). Título: *¿La conservación del paisaje geológico con valor de escenario científico?*.

#### 19 de Octubre de 2018

-Conferencia Invitada del **Prof. David Amouroux, University of Pau et des Pays de l'Adour**. Título: "Mercury molecular and isotopic speciation in the environment".

-Seminario: Presentación de los doctorandos inscritos en el doctorado CTA/ECT:

-Conferencia Invitada de la **Prof. Lucia Guilhermino, University of Porto/CIMAR**. Título. "Impact of microplastics and mixtures with other contaminants on the environment and human health implications"

#### Lugar de impartición

Acuario de Donostia/San Sebastián, Estación Marina de Plentzia/Plentziako Itsas Estazioa PiE-UPV/EHU, Facultad de Ciencia y Tecnología UPV/EHU (Leioa)

## Workshop and Conferences for PhD candidates in Environmental Sustainability INGURU-DOK 2018



### 4<sup>th</sup> Workshop CTA/ECT 2018

19th October 2018

Research Centre for Experimental Marine Biology and Biotechnology  
Plentzia Marine Station PIE-UPV/EHU

Contact for information and registration: [olatz.angulo@ehu.eus](mailto:olatz.angulo@ehu.eus) (Secretariat)

### Presentation

The 4<sup>th</sup> Workshop CTA/ECT 2018 is part of the formative activities organized by the PhD programme "Contaminación y Toxicología Ambientales/Environmental Contamination and Toxicology" CTA/ECT within the wider context of the INGURU-DOK Workshop and Conferences for PhD candidates in Environmental Sustainability. It will take place on the 19th of October at the Plentzia Marine Station PIE-UPV/EHU. The workshop consists of an opening invited lecture, presentations of PhD candidates of first year (enrolled in 2017), second year (enrolled in 2016) or third year (enrolled in 2015), a round table and a closing invited lecture.

In addition to PhD candidates of the CTA/ECT PhD programme, PhD candidates of MER and ECIPP programmes, master students of CTA, MER and ECIPP masters and interested researchers and professors are invited to attend the workshop. The workshop is funded by the Master and Doctoral School of UPV/EHU.

### Objectives

The objectives of the workshop are two-fold. First objective is that PhD candidates learn to communicate and discuss their results and ideas. For this, PhD candidates will present their research lines and the progress of their PhD thesis, indicating advances, perspectives and problems faced during their research. A one-page abstract must be sent to the secretariat before the 15<sup>th</sup> of October. As a second objective, the academic commission of the CTA/ECT programme, in collaboration with invited experts, will evaluate the progress of presented PhD thesis. PhD candidates attending the Workshop will get a certificate of attendance that must be uploaded to the GAUR system.

### Programme

9:00-9:30. Welcome and introduction to the workshop. **Miren P. Cajaraville** (UPV/EHU).

9:30-10:20. Opening invited lecture: "*Mercury molecular and isotopic speciation in the environment*". Prof. **David Amouroux**, CNRS, Directeur de Recherche, Environmental Chemistry and Microbiology, Institute of Analytical Sciences and Physical-Chemistry for the Environment and Materials, IPREM UMR 5254 CNRS-UPPA, Pau France.

First session. Chairs: **Miren P. Cajaraville** (UPV/EHU), **Ibon Cancio** (UPV/EHU), **Lúcia Guilhermino** (U Porto & CIIMAR).

10:30-10:50. Presentation by PhD student (1<sup>st</sup> year): "*Assessment of the biological impacts of chemical dispersants and carbon nanotubes as oil spill response methods using the zebrafish model*". **Ada Esteban**.

11:00-11:20. Presentation by PhD student (1<sup>st</sup> year): "*The Mycobacterium tuberculosis complex at the wildlife-livestock interface in the Basque Country: deepening into the epidemiology of tuberculosis*". **Lucia Varela**.

Coffee break

**Second session.** Chairs: **Manu Soto** (UPV/EHU), **Nestor Etxebarria** (UPV/EHU), **Maria Jesus Belzunce** (AZTI)

12:00-12:20. Presentation by PhD student (2<sup>nd</sup> year): "*Determination of biomarker baselines and effects of latitude and seasonality on mussels from the North Atlantic and Baltic Sea*". **Denis Benito.**

12:30-12:50. Presentation by PhD student (2<sup>nd</sup> year) "*Influence of temperature on toxicity of different types of crude oil and remediation techniques using marine bioassays*". **Laura de Miguel.**

13:00-13:20. Presentation by PhD student (2<sup>nd</sup> year) "*Biota metal quality criteria for the protection of freshwater macroinvertebrate communities in the Cantabrian region*". **Iñigo Moreno.**

Lunch

**Third session.** Chairs: **Maren Ortiz** (UPV/EHU), **Belén González** (UPV/EHU), **David Amouroux** (UPPA)

15:00-15:20. Presentation by PhD student (3<sup>rd</sup> year): "*Remediation of the pollution derived from the deposition of sewage sludges in agricultural soils by using soft technologies*". **Erik Urionabarrenetxea.**

15:30-15:50. Presentation by PhD student (4<sup>th</sup> year): "*Integrative assessment of the occurrence of emerging compounds and their toxicological effects in estuaries of Biscay*". **Leire Mijangos.**

16:00-16:30. Round table about problems encountered during PhD progress and Career development in ECT. **Lucia Guilhermino** (U Porto & CIIMAR), **David Amouroux** (UPPA), **Maria Jesus Belzunce** (AZTI), **Ibon Cancio** (UPV/EHU), **Nestor Etxebarria** (UPV/EHU), **Miren P. Cajaraville** (UPV/EHU).

16:30-17:20. Closing invited lecture: "*Impact of microplastics and mixtures with other contaminants on the environment and human health implications*". Prof. **Lúcia Guilhermino**, Professora Catedrática, ICBAS – Instituto de Ciências Biomédicas de Abel Salazar, Universidade do Porto, Diretora do Laboratório de Ecotoxicologia e Ecologia (ECOTOX) and CIIMAR – Centro Interdisciplinar de Investigação Marinha e Ambiental, Investigadora Responsável (IR) pela Linha Alterações Globais e Serviços dos Ecossistemas, IR do Grupo de Investigação Vias de Contaminação e Mecanismos de Toxicidade, IR da Equipa de Investigação em Ecotoxicologia, Ecologia do Stresse e Saúde Ambiental.

## **4<sup>th</sup> CTA/ECT Workshop**

### **LIST OF PARTICIPANTS**

#### **Master students**

Ariadna Alcalde (CTA master)  
Iker Álvarez (CTA master)  
Marta Barros (CTA master)  
Pablo Irizar Merino (CTA master)  
Daniel Jiménez (CTA master)  
Naroa López (CTA master)  
Unai Martínez (CTA master)  
Maitane Pérez (CTA master)  
María Romero (CTA master)  
Eneko Trancho (CTA master)  
Alejandra Valle (CTA master)  
Cristina Zumarraga (CTA master)

#### **PhD candidates**

Denis Benito (CTA/ECT PhD programme; presentation)  
Laura de Miguel (CTA/ECT PhD programme; presentation)  
Erik Urionabarrenetxea (CTA/ECT PhD programme; presentation)  
Leire Mijangos (CTA/ECT PhD programme; presentation)  
Ada Esteban (CTA/ECT PhD programme; presentation)  
Lucía Varela (CTA/ECT PhD programme; presentation)  
Iñigo Moreno (CTA/ECT PhD programme; presentation)  
María Blázquez (CTA/ECT PhD programme)  
Nagore González (CTA/ECT PhD programme)  
Ainara Valencia (CTA/ECT PhD programme)  
Ane Galarza (CTA/ECT PhD programme)  
Anthony Mutua (MER PhD programme)

#### **Other participants**

Dr. David Amouroux (invited lecturer, UPPA)  
Dr. Lúcia Guihermino (invited lecturer, Univ Porto & CIIMAR)  
Dr. Miren P. Cajaraville (director CTA/ECT PhD programme, UPV/EHU)  
Dr. Ibon Cancio (academic commission CTA/ECT PhD programme, UPV/EHU)  
Dr. Manu Soto (academic commission CTA/ECT PhD programme, UPV/EHU)  
Dr. Nestor Etxebarria (member CTA/ECT PhD programme, UPV/EHU)  
Dr. Amaia Orbea (member CTA/ECT PhD programme, UPV/EHU)  
Dr. Maren Ortiz (member CTA/ECT PhD programme, UPV/EHU)  
Dr. Maria Jesus Belzunce (member CTA/ECT PhD programme, AZTI)  
Dr. Belén González (UPV/EHU)  
Dr. Nerea García Velasco (UPV/EHU)  
Dr. José María Lacave (UPV/EHU)

## **Assessment of the biological impacts of chemical dispersants and carbon nanotubes as oil spill response strategies using the zebrafish model**

Along with the progressive thaw of the Arctic region, new spaces appear for offshore oil exploitation as well as for boat circulation. The creation of new shipping routes across northern Atlantic Ocean and the Baltic Sea results in a real risk of oil spills associated with accidents, shipwrecks or the main labours of oil production and transportation.

Many factors are key in the magnitude of the biological impact of an oil spill. Oil composition, environmental factors such as temperature and salinity and the selected remediation strategies may influence the bioavailability of toxic compounds present in oil. The intervention strategies in these areas should consider their specific features in order to choose the most appropriate oil spill response methods.

Chemical dispersants and nanomaterials are amongst these response strategies, whether they are usual or upcoming methods, and their effectiveness, benefits and impacts resulting from their use needs to be evaluated. Thus, the main objective of this PhD thesis is to identify the toxic profile of oil spills in the environmental conditions of cold climate areas, such as the northern Atlantic Ocean and the Baltic sea, as well as to investigate the effects of using chemical dispersants and carbon nanotubes (CNT) as remediation strategies. For this purpose, the zebrafish model was chosen due to its multiples advantages: low cost, ease for maintenance and reproduction, quick development and transparency of the embryos. In addition, the use of zebrafish embryos up to 120 hours post fertilization is considered as an alternative method (Directive 2010/63/UE) and is a widely employed model in environmental toxicology and especially to assess oil spill toxicity.

Since the zebrafish is a freshwater fish of subtropical origin, silicone membranes of polydimethylsiloxane will be incubated in the water accommodated fraction of oil (WAF) produced at different environmental conditions in order to use them for passive dosing of the contaminant matrix previously created. With this approach, a battery of different acute toxicity tests will be carried out in the optimal physiological conditions for the zebrafish. Embryos will be exposed to PDMS incubated in the WAFs produced at a range of different temperatures and salinities of three different oil types alone or combined with a chemical dispersant. Effects on embryo developmental parameters along with the induction of the biotransformation metabolism (induction of the transcription of cytochrome P450 1A) will be studied. The impact of using chemical dispersants will be also investigated in adult zebrafish using several biochemical and molecular biomarkers and histopathological analysis. To complete the study of different oil spill response strategies a similar approach will be applied to evaluate the toxicity of CNT and the effect of its presence on the toxicity of WAF in embryos and adults of zebrafish.

Funded by: EU (GRACE Project H2020, Grant agreement 6799266), Ministry of Economy and Competitiveness (NACE Project CTM2016-81130-R), Basque Government (Consolidated Research Group GIC IT810-13) and Spanish Ministry of Education, Culture and Sports (FPU16/01837 PhD fellowship to A.E.).

## **The *Mycobacterium tuberculosis* Complex at the wildlife-livestock interface in the Basque Country: Deepening into the epidemiology of tuberculosis.**

Lucía Varela-Castro. NEIKER-Instituto Vasco de Investigación y Desarrollo Agrario. Animal Health Department. Bizkaia Science and Technology Park 812L. 48160. Derio (Bizkaia). Spain.

Animal tuberculosis (TB), caused mainly by *Mycobacterium bovis*, is a worldwide zoonotic disease that affects a wide range of domestic and wild species. The existence of wild reservoirs, among other factors, has prevented the complete eradication of TB in many countries. In The Iberian Peninsula, two wild reservoirs are described, the wild boar and the red deer, being most of the studies focused in Mediterranean regions, where artificial management of game species has increased their density and aggregation. Moreover, other wild species seem to play a role in the epidemiology of TB, either as spillovers, such as the roe deer, or as potential reservoirs, such as the fallow deer or the Eurasian badger. The aim of this doctoral thesis is to determine the role of wildlife in the epidemiology and transmission of TB in the Basque Country. More specifically, our objectives are (1) to determine the role of wild boar, badger, and (2) other wild species in the epidemiology and transmission of TB in the Basque Country and (3) to study the interactions between wild and domestic species in cattle farms in this region.

In order to determine the prevalence of *M. bovis*, lymph nodes from 301 animals (163 wild boar, 31 badgers, other wild ungulates (88) and carnivores (19)) were collected from hunted animals or individuals found dead since 2017. All samples were cultured for the isolation of mycobacteria. No *M. bovis* isolates were obtained but *M. avium* was isolated in 4.3% of the animals and other mycobacteria in 5.6%. Additionally, 1894 sera from hunted-harvested wild boar were analyzed with an in-house ELISA test. Overall, 17% of wild boars showed antibodies against *M. bovis*. The overall antibody prevalence detected is higher than previously reported in Northern Spain. Moreover, a higher seroprevalence was detected in regions with higher livestock density and with TB bovine outbreaks, suggesting a potential risk of transmission at the wild-domestic interface. On the other hand, badger trapping for sampling procedures was conducted from November 2017 to March 2018, with the aim to increase the numbers of studied badgers from three TB positive cattle farms. Up to ten cage traps baited with peanuts were placed in their surroundings and checked daily. Unfortunately no badgers were captured during this first attempt. A new badger trapping will be performed during a similar period. In addition, 100 traps for micromammals were placed in each farm and its surroundings once every season during one year (still ongoing in one farm). A total of 95 wild rodents were captured and euthanized. Necropsies were performed and a pool of lymph nodes per animal was cultured for mycobacteria isolation (Laboratory analyses are in progress).

For the third objective, 20 camera traps were placed in the same farms for 15 days per season during one year. Potential wildlife-livestock interaction points were selected to place the cameras, such as waterholes, troughs or natural wildlife corridors. All videos are being analyzed, but preliminary results reveal a high number of wildlife visits, being wild boar, roe deer, badgers, foxes and different species of birds the most frequently observed, suggesting a possible high interaction and risk of diseases transmission at the wildlife-livestock interface in the Basque Country.

Further details and future perspectives will be elaborately described at the workshop.



## CTA Workshop 2018

PhD candidate: Denis Benito

Supervisors: Manu Soto and Beñat Zaldibar

**Title: Determination of biomarker baselines and effects of latitude and seasonality on mussels from the North Atlantic and Baltic sea.**

Investigations on latitudinal and intrinsic biological (gender, age) variability in selected biological effects biomarkers have been performed in mussels (*Mytilus edulis*) from the northern Atlantic ocean. Mussels were collected in September-October 2016 and in September 2017 from various localities in the northern Atlantic ocean representing Arctic (Svalbard, Tromsø), Subarctic (Trondheim, Iceland) and temperate (Oslo, Edimburg, Hussum) geographical regimes. Final selection of localities was based on currently available data and the logistics requirements of local partners assisting in the field campaigns. In 2016, mussels were collected in early October from 2 localities Trondheim (63° N) and Tromsø (69° N). In Trondheim, 4 sites were selected (reference site, mussel farm, polluted site in the harbor and nearby a wastewater treatment plant). In addition, in Tromsø 2 sites were selected (reference site and polluted site in the harbor). Up-to 150 mussels were handpicked per locality and sampling time and processed for species identification, determination of condition parameters and selected biomarkers, analytical chemistry, molecular biology, and histology. Due to the limited mussel size range, mussel size classes were limited to two, small (S) and medium (M).

An experimental small-scale oil spill was carried out in a coastal arctic site in Greenland to test the effectiveness and environmental effects of using near-shore *in situ* burning. Blue mussels were sampled in the *in situ* burning experiments carried out in Greenland. From the on-shore *in situ* oil burning experiment, caged animals at different distances from the oil burning were sampled, in addition, the day after the burning mussels were sampled in 4 different stations at distances ranging from 50 to 150 m to the burning point. Field mussels were sampled also in a reference bay. From the off-shore *in situ* burning experiment mussels were sampled from cages. In addition, 2 days after the burning, mussels were sampled from the bay in 10 different sampling stations at distances ranging from 50 to 300 meters to the burning area. The samples are currently stored frozen at -80°.

Regarding Baltic Sea study:

For reliable mussel monitoring programs based on biomarkers regionally relevant baseline values and their natural variability need to be known. The Baltic Sea exhibits high inter-regional and seasonal variability in physical factors such as salinity, temperature and primary production. In this study, mussels were collected from selected reference sites in Kiel (Germany) and Tvärminne (Finland) in three different seasons: summer and autumn 2016, and spring/summer 2017. Different tissue-level biomarkers including changes in cell type composition in digestive gland epithelium (V<sub>VBAS</sub>), structural changes of digestive alveoli (MLR/MET) and integrity of the digestive gland tissue (CTD) were measured together with digestive gland histopathology and reproductive cycle alterations. Other measured biomarkers included accumulation of lipofuscins and neutral lipids, lysosomal responses in digestive cells, acetyl cholinesterase inhibition (neurotoxicity), enhanced catalase and glutathione reductase activities (oxidative stress), lipid peroxidation (oxidative damage), and glutathione-S-transferase induction (phase II detoxifying system). Chemical analysis of metals and PAHs were performed. Overall, V<sub>VBAS</sub>, MLR/MET, CTD and histopathological alterations showed low variability between seasons in both localities. Accumulation of lipofuscins and neutral lipid changed with season in mussels from Tvärminne (highest lipofuscin accumulation in spring and highest lipid accumulation in summer) but not in mussels from Kiel. Significant differences between regions were recorded for the majority of the remaining biomarkers investigated herein. It can be concluded that the differences between regions seem to exert a more marked effect on biomarker baselines than seasonality.

## CTA Workshop 2018

PhD candidate: Laura de Miguel Jiménez

Supervisors: Urtzi Izagirre and Ionan Marigómez

### **Title: Influence of temperature on toxicity of different types of crude oil and remediation techniques using marine bioassays**

Maritime traffic and oil platforms have been growing during the last years and thus oil spills are of increasing concern. Different factors such as the type of oil spilled, weather conditions and water temperature could modify the potential toxicity of spill products as well as their remediation by chemical dispersants. Up to now, toxicity of dispersants has been widely studied since these compounds may act as additional stressors; moreover, in order to remove the oil from the aquatic environment they make oil chemicals more available to biota. However, the influence of dispersants in crude oil water accommodated fraction (WAF) toxicity is not well-known. Dispersants decrease the residence time of the oil in the environment thus contributing to bioremediation, which depends on environmental factors such as temperature and on the type of crude oil; however, the increase of hydrocarbon concentrations throughout the water-column can intensify their toxicity.

In this context, as a part of a European project called GRACE, which has the objective of mitigate negative impacts of oil pollution and also to produce better decision support tools for oil spill response in different conditions, the goal of the PhD thesis is to collaborate on identify toxicity profile of crude oil spills and recovery treatments in extreme conditions of temperature and salinity using marine bioassays. A wide variety of environmental factors for surface sea temperature (SST) going from 5°C to 25°C have been selected to describe the subarctic and arctic areas and the extreme conditions that are predictable in the Bay of Biscay according to recent climate trends and climate models (IPCC 2013). To evaluate the status of marine water and sediments, marine bioassays using early life stages have been widely applied in ecotoxicology due to sensitivity and for being cost-effective methods. In this framework, larvae and embryos of animals, which are essential in macrozooplankton, such as mussels (*Mytilus edulis*, *M. galloprovincialis* y *M. trossulus*), sea urchin (*Paracentrotus lividus*) and stickleback fish (*Gasterosteus aculeatus*) are usually selected to obtain a complete characterization of toxicity of water pollutants that derive from oil and oil dispersants. Additionally, the sensitivity of each species will be analyse focusing on the development and growing variations of organisms. Another tool for observing changes and biological effects of pollutants established in different scenarios is the use of biomarkers of environmental stress, which can provide important information on toxicity mechanisms of crude oil. The results of this PhD thesis will help to gain deeper knowledge on oil spills toxicity and their potential effects on biota.

Funded by EU H2020-BG-2005-2 (GRACE 679266), Spanish Ministry of Education, Culture and Sport (PhD fellowship L.dM FPU15/05517 grant) and the Basque Government (Consolidated Research Group GIC IT810-13).

## CTA Workshop 2018

PhD candidate: Ifiigo Moreno

Supervisors: Pilar Rodriguez and Leire Méndez

**Title: Biota metal quality criteria for the protection of freshwater macroinvertebrate communities in the Cantabrian Region.**

Biota and sediment have been recently recognized as suitable matrices to monitor long-term changes in water quality of European water bodies (EC, 2013; Carère *et al.* 2012), but in practice, environmental quality standards (EQS) of chemical substances for these compartments have been developed only by some State Members. In Spain, contaminants in sediments and the biota are in fact evaluated based solely in the *stand still* principle, as proposed in the European Water Framework directive (WFD, EC/60/2000), i.e. priority substances in the sediments or biota should not significantly increase their concentration in long-term (Environmental Quality Standards Directive, EC/1057/2008). In the case of metals and metalloids (hereafter referred as metals), there are several features that can complicate their assessment, since metal accumulation is a metal specific, dynamic and time-dependent process, and its interpretation may be complicated since some metals are essential for the metabolism of the organism and their uptake is actively regulated. In an attempt to better understand the relationships between environmental chemical concentration and toxicity, an approach was proposed based on body residue of the chemical after exposure of the organisms and the toxic effects: the "Critical Body Residue" (CBR) approach (McCarty, 1986, 1991). The association of a tissue residue with effects of ecological relevance may help in developing tissue quality guidelines that can be used into ecological risk assessments (Sappington *et al.* 2011). The study area was located in two different regions. One affected by historical Zn-Pb mining activities (Arditurri mine, Basque Country) and the other affected by an active gold mine (Boinás mine, Asturias). The objectives of the study were to analyze the relationships between bioaccumulated metal tissue levels in 10 different taxa with the metal sediment concentrations, both in the field and in the laboratory experiments, to derive EQS<sub>biota</sub> and EQS<sub>sediment</sub> for selected metals (As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Se, Zn) based on a reference condition approach and a non-effect modelization approach using the relationships of in-situ macroinvertebrate community metrics (METI and NORTI) and indexes (NFAMEPT, NFAMPT, ABEPT and ABPT) with tissue metal concentrations and to assess the environmental risk through the Weight-of-Evidence procedure, using the results derived from the different Lines of Evidence (sediment metal pollution, metal bioaccumulation and benthic community alterations). The hypothesis that guides the present project is that the capacity of aquatic ecosystems to maintain a healthy macroinvertebrate community, measured in terms of composition, diversity and functional organization, can be hampered due to metal bioaccumulation in aquatic organisms. In areas subject to active gold mining activities, several taxa were identified as useful biomonitors for As, Cu and Se, although Hg could not be assessed with confidence. At the test sites, the tissue residues in macroinvertebrate taxa were more than twice the ER<sub>50</sub> estimated with the community assessment methods, thus the Cauxa River was evaluated at risk due to metal bioaccumulation. Sediments in Arditurri mining area were highly polluted by several metals, but field aquatic oligochaetes had limitations as field biomonitors for the Arditurri mining region, since they can be absent from the polluted sites. Metallothionein-like protein concentration or their genetic expression have been related to metal detoxification and regulation processes (Demuynck *et al.*, 2007). Thus, the integrated study of the CBRs related with physiological alterations and the field derived EQS<sub>biota</sub>, will be used to evaluate the limitations of each of the approaches and to propose metal critical tissue levels that are relevant in the Cantabrian Region.

## CTA Workshop 2018

PhD candidate: Erik Urionabarrenetxea

Supervisors: Manu Soto and Beñat Zaldibar

**Title: Remediation of the pollution derived from the deposition of sewage sludges in agricultural soils by using soft technologies**

Industrial activity, together with high population density and scarcity of useful land, has contributed to the proliferation of dumps, landfills and waste disposal points at different urban, peri-urban and natural areas in the Basque Country. According to the Basque Country Landfill Inventory (2005), the total number of landfills in this area is about 1,277 (including also small dumping points), being these one of the most important ground pollution sources. Among that inventoried landfills, the "Landfield 17" is located in Gernika-Lumo (43°19'28.9"N 2°40'30.9"W). This landfield, was employed as sewage sludge disposal point for at least two decades.

After several works testing the toxicity of Landfield 17 soils, a quantitative risk assessment considered that pollution on this site could suppose a risk for human/users health. In this framework Ihobe (Environmental department of the Basque government) in collaboration with the Gernika-Lumo city hall, funded the project "Remediación de la toxicidad derivada de la deposición de fangos de depuradora en suelos del vertedero 17 (Gernika-lumo)" in order to improve soil health by using innovative technologies.

Nowadays there are existing different soil decontamination technologies. In contrast to widely known chemical and physical technologies, biological technologies are respectful with soil functioning, but they need longer times to produce significant effects. Among these technologies bioaugmentation (bacteria), fitoremediation (plants) and vermiremediation (earthworms) must be remarked.

The aim of this project is to remediate the pollution derived from the deposition of sewage sludges in agricultural soils from "Landfield 17" by using a combination of the main biological remediation technologies. For that, the yield of the different technologies will be studied individually, in duets and trios, for later applying the best fitted one on a large scale.

Funded by: Basque government (Ihobe) and Gernika-Lumo city hall

## CTA WORKSHOP 2018

PhD candidate: Leire Mijangos Treviño

Supervisors: Nestor Etxebarria and Ailette Prieto

**Title: Integrative assessment of the occurrence of emerging compounds and their toxicological effects in estuaries of Bizcay**

The fate and distribution of emerging contaminants is a matter of growing interest since most of the chemicals considered are unregulated and the effects that might be attributed to many of them are missed or overlooked in many monitoring and surveillance programs (Ternes et al., 2015). Among these emerging contaminants we may find many different chemicals including personal care products and pharmaceuticals (PCPPs), consumption products (food additives, detergents, etc.), industrial compounds (perfluoroalkyl substances (PFASs), plasticizers, etc.), pesticides and engineered (nano)materials. Though we can find many of these contaminants in the effluents of wastewater treatment plants (WWTPs), in agriculture surface run-offs and in industrial discharges, the impact of the former ones from urban areas (i.e. WWTP effluents) is especially remarkable (Prasse et al., 2015). As a consequence, rivers, estuaries and coastal ecosystems are under the influence of chronic exposures to many emerging contaminants.

Environmental monitoring of special sensitive areas such as estuaries has become a challenge owing to the complexity of the analytical end-points (a growing amount of target candidates at trace level, a high physical and chemical dynamism in estuaries and coastal areas, an unknown number of transformation products, etc.) and the potential effects (antibiotic resistance, endocrine disruption, mutagenicity, etc.) (Maruya et al., 2016). Although the application of the current legal framework, i.e. the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD), is somewhat limited by the prioritized set of contaminants and the application of compliance methods, we can also widen those limits by a thorough application of screening and non-target methods and new effect-based (bio)analytical approaches (Busch et al., 2016).

In view of the complexity of the occurrence and toxicity of emerging contaminants in aquatic environments, we have designed a holistic PhD project to address some of the bioanalytical challenges that were feasible. The main aim was **to get a close insight about the impact of emerging contaminants in estuarine waters and the contribution of WWTP effluents in the observed effects.**