



## Understanding of the source, transport, fate, and effects of mercury (Hg) from fish to humans and the detoxification role of selenium (Se)

### Welcome

It's a pleasure to welcome you to the second issue of the MERFISH newsletter, aimed at providing you with updates and news of the project. As we are midway through 2023, you can read about the project's achievements over the past year.

MERFISH brings together international experts from a wide array of interdisciplinary research areas (analytical chemistry, fish nutrition, environmental science, communication, toxicology & aquaculture) from industry and academia from EU, Brazil, and Mauritius, with a long-term goal of furthering the understanding of the source, transport, fate, and effects of mercury from fish to humans and the detoxification role of selenium. MERFISH has emerged from a global demand, directly related to mercury, one of the top ten chemicals of major public health concern identified by the World Health Organization. Find out more on our website: [www.merfish.eu](http://www.merfish.eu)

### MERFISH Secondments

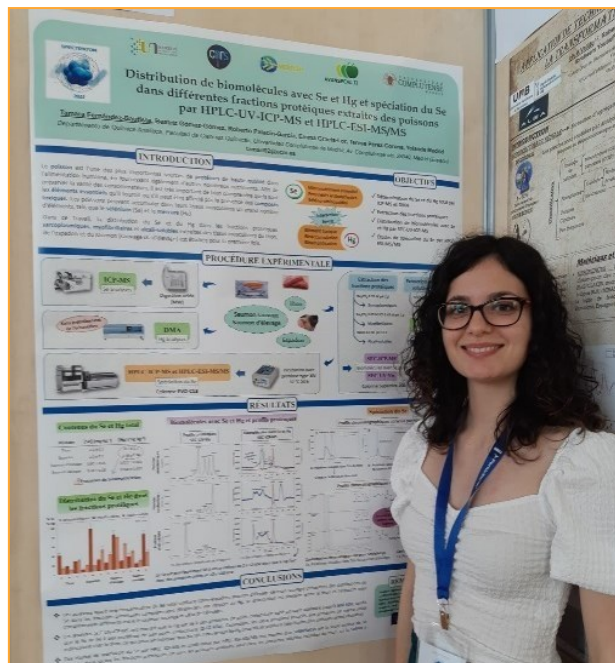
One of the project's main activities is the organisation of secondments across the partners' countries. In 2022, MERFISH implemented a first secondment at Universidade de São Paulo, Brazil with two representatives from the Université de Pau et des Pays de l'Adour, Institute of Analytical Sciences and Physico-Chemistry for Environment and Materials (UPPA, IPREM): Dr Zoyne Pedrero Zayas, the Project Coordinator of MERFISH; and Dr Laurent Ouerdane, the Project Coordinator of PREFALC. Professor Fernando Barbosa, Universidade de São Paulo, depicted in the two images (right), is a partner in both the MERFISH and PREFALC projects, thus strengthening the synergies between the two initiatives. Several secondments have taken place since and will be described in our next newsletter. The purpose of these secondments is to facilitate an exchange of research and knowledge transfer. The synergies of the participating institutions can thus be reinforced through the secondments of investigators who will bring to the table their expertise from previous and on-going projects and foster further upskilling. Moreover, the development of lasting research collaborations will help MERFISH to share its results and benefit EU academic, non-academic and Third Country partners.



## Successful three-month secondment of UCM PhD student at IPREM

MERFISH is proud to announce the successful completion of a three-month secondment at IPREM by Tamara Fernandez Bautista, PhD student at UCM. Tamara also participated in an international conference: [Spectratom 2022](#), where she presented a poster related to MERFISH.

Spectratom is the number one meeting place for French-speaking scientists and operators of atomic spectrometry (optics and mass), where scientific communities can share know-how and experiences, allowing participants to take stock of the state of the art of instrumental techniques and new frontiers of research.

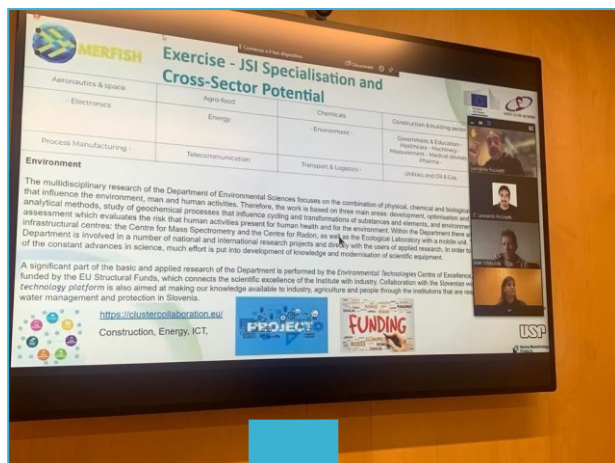


## Lessons learned for communication and stakeholder engagement

During a MERFISH secondment in the UK (under the aegis of Europe for Business) in the framework of the WP5 Communication, outreach and networking activities, Ms Tina Vrabec from the Institute Jozef Stefan, Slovenia, participated in learning sessions related to the following themes:

- General MERFISH communication and dissemination practices and creating synergies with other projects and initiatives
- A training workshop dedicated to new skills for dissemination tools, such as newsletter structure and planning
- The production of new communication tools, such as podcasts, audiovisual production, and science cafés
- A training workshop for stakeholder engagement theory, and mapping exercises with specific reference to fishery products
- Preparation for a Slovenian science café in the Spring

The feedback was positive and constructive and allowed both parties to exchange knowledge for the new techniques for communication outreach and engagement strategies.





## Successful PhD Defence

Gustavo Moreno Martin, seconded from [UCM](#) at AIA in the frame of MERFISH, has successfully defended his PhD thesis, titled: Characterization and transformation of metallic and metalloid nanoparticles in biological and environmental samples. His supervisors were Prof. Yolanda Madrid and Prof. Maria Eugenia de León González. Congratulations to Gustavo!



## IPREM Young Researchers Present at ICMGP

Three young researchers from Université de Pau et des Pays de l'Adour, Institute of Analytical Sciences and Physico-Chemistry for Environment and Materials (UPPA, IPREM) successfully delivered three oral presentations at The International Conference on Mercury as a Global Pollutant 2022, which took place online from 24th – 29th July 2022 during a special session 'Selenium-mercury interactions in aquatic food webs: The state of science & future research directions.' The presentations are:

- **Title:** First Time Identification of Selenoneine in Seabirds and its Potential Role in Mercury Detoxification.

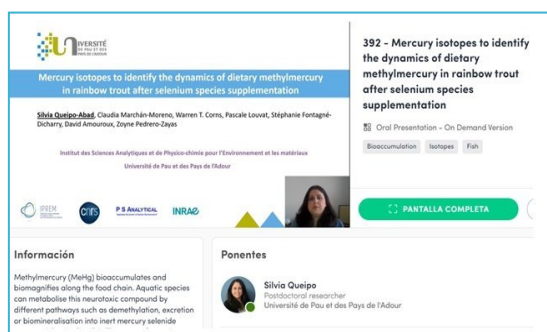
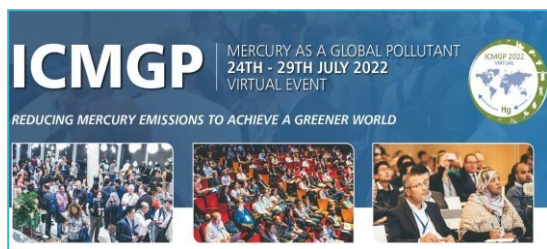
**Authors:** Khoulood El Hanafi, Zoyne Pedrero, Laurent Ouerdane, Claudia Marchán-Moreno, Silvia Queipo-Abad, Maite Bueno, Florence Pannier, Warren T Corns, Yves Cherel, Paco Bustamante, David Amouroux

- **Title:** Mercury isotopes to identify the dynamics of dietary methylmercury in rainbow trout after selenium species supplementation

**Authors:** Silvia Queipo-Abad, Claudia Marchán-Moreno, Warren T. Corns, Pascale Louvat, Stéphanie Fontagné-Dicharry, David Amouroux, Zoyne Pedrero-Zayas

- **Title:** Influence of Selenium on Fate of Mercury in Fish: An Aquaculture Study.

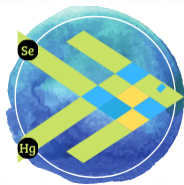
**Authors:** Claudia Marchán-Moreno; Silvia Queipo-Abad; Marius Bidon, Khoulood El Hanafi, Warren T. Corns, Maite Bueno, Florence Pannier, David Amouroux, Stéphanie Fontagné-Dicharry, Zoyne Pedrero-Zayas



## Three Presentations Given at Conference in Japan

Claudia Marchan Moreno (PhD student), Silvia Queipo (postdoc) and Dr Zoyne Pedrero Zayas, the MERFISH Project Coordinator, recently participated in the ISM-8: The 8th International Symposium on *Metalloids*, Kanazawa, Japan, where they delivered three oral presentations of multipartner scientific work carried out in the framework of the MERFISH project.





### IPREM PhD Student Delivers Seminar Based on New Publication.

Khouloud el Hanafi, a PhD student at IPREM (CNRS, UPPA) has delivered a ground-breaking seminar titled: "First time identification of selenoneine in seabirds and its potential role in mercury detoxification" based on her most recent scientific publication. The seminar was delivered remotely to 22 participants, all from IPREM.

The recently published paper is depicted on the right and links to the publication.



pubs.acs.org/est

Article

#### First Time Identification of Selenoneine in Seabirds and Its Potential Role in Mercury Detoxification

Khouloud El Hanafi, Zoyne Pedrero,\* Laurent Ouerdane, Claudia Marchán Moreno, Sílvia Queipo-Abad, Maite Bueno, Florence Pannier, Warren T. Corns, Yves Chérel, Paco Bustamante, and David Amouroux

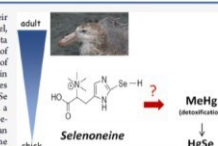
Cite This: *Environ. Sci. Technol.* 2022, 56, 1288–1298

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**ABSTRACT:** Birds are principally exposed to selenium (Se) through their diet. In long-lived and top predator seabirds, such as the giant petrel, extremely high concentrations of Se are found. Selenium speciation in biota has aroused great interest in recent years; however, there is a lack of information about the chemical form of Se in (sea)birds. The majority of publications focus on the growth performance and antioxidant status in broilers in relation to Se dietary supplementation. The present work combines elemental and molecular mass spectrometry for the characterization of Se species in wild (sea)birds. A set of eight giant petrels (*Macronectes* sp.) with a broad age range from the Southern Ocean were studied. Selenoneine, a Se-analogue of ergothioneine, was identified for the first time in wild avian species. This novel Se-compound, previously reported in fish, constitutes the major Se species in the water-soluble fraction of all of the internal tissues and blood samples analyzed. The levels of selenoneine found in giant petrels are the highest reported in animal tissues until now, supporting the trophic transfer in the marine food web. The characterization of selenoneine in the brain, representing between 78 and 88% of the total Se, suggests a crucial role in the nervous system. The dramatic decrease of selenoneine (from 68 to 3%) with an increase of Hg concentrations in the liver strongly supports the hypothesis of its key role in Hg detoxification.

**KEYWORDS:** selenoneine, procellariiform, petrel, mercury, selenium, brain, liver



### USP Hosts International Workshop in São Paulo

The University of São Paulo, a member of the MERFISH Project consortium, hosted an International Workshop in Environmental Metallomics in the framework of the project.

The workshop, which took place from 5th -11th August 2022, was attended by Project Coordinator Zoyne Pedrero Zayas from CNRS and Laurent Ouerdane from IPREM, who followed this up with a secondment at USP.

#### International Workshop in Environmental Metallomics

##### Lecture:

New insights into mercury fate in living organisms through speciation and stable isotopic analysis.



Scientific researcher at CNRS (French National Research Council) specifically at IPREM (Institute of Analytical Sciences and Physico-Chemistry for Environment and Materials), France.

Currently leads an international network of experts from cross-sectorial research areas (fish nutrition, analytical chemistry, environmental science, communication, toxicology & aquaculture) at industry and academia, with a long-term goal of furthering the understanding of the source, transport, fate and effects of mercury from fish to humans and the detoxification role of selenium.

Research on the use of natural isotopic fractionation and the development of analytical strategies by using MC-ICP-MS as a tool for the understanding of biogeochemical processes (metal/fields).



#### International Workshop in Environmental Metallomics

##### Lecture:

Metallomics: Integrating metals and metalloids in the biosystem



Assistant professor (maître de conférences) at IPREM (Institute of Analytical Sciences and Physico-Chemistry for Environment and Materials), University of Pau, France.

He is specialized in LC-MS coupling and in the use of high-resolution molecular MS instruments, as well as elemental MS instruments.

Research on metallomics (study of the fate of metal/metalloid species in living organisms). His studies particularly focus on metal complexes extraction, separation and identification by LC-MS in different biological matrices.



Local: Graduation Amphitheater 1

Support: FAPESP 60

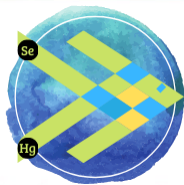
10 AM 05/08 Friday

### MERFISH Representatives from CNRS Visit PSA, UK

Two members of CNRS, a partner in the MERFISH Project, crossed the water to visit PSA, UK.

MERFISH partner PS Analytical is a leading company in the manufacture and supply of instrumentation for the analysis of Mercury (Hg), Arsenic (As), Selenium (Se), Antimony (Sb), Bismuth (Bi) and Tellurium (Te) in all matrices.





## Interview with Professor Michael Bank

In this highly informative interview with Prof. Michael Bank from the Institute of Marine Research, Bergen, Norway, he talks about his work in the MERFISH project, in which he is focused on wild fish, selenium isotopes and mercury concentrations. His team are considering the health and risk benefits of harvesting and consuming 'blue foods' or seafood, and he emphasizes the importance of a holistic, balanced and sustainable approach, especially against the backdrop of climate change. [Watch the full interview here](#)



## About the MERFISH Project

### Project aims:

MERFISH aims to develop our understanding of the source, transport, fate and effects of mercury (Hg) from fish to humans and the detoxification role of selenium (Se). The project will help establish new guidelines for aquaculture feeding practices to avoid fish contamination with Hg toxic forms and to insure proper bio-assimilation of its antagonist, Se.

The project brings together the knowledge and expertise of nine expert partners from research, business and industry:






  
**Project Coordinator**

  
**Advanced Isotopic Analysis**  
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