

From *September 1th, 2021* to *September 1th, 2024*

Title: Structural dynamics of biofilms exposed to contaminants and effects on river functions

Thesis abstract:

Biofilms are communities of microorganisms (bacteria, algae, fungi, meiofauna) living on submerged substrata in aquatic ecosystems. These communities have the interesting feature of responding quickly and in a sensitive manner to changes in water quality, especially the presence of metals. Exposure to metals can have negative effects on biofilms at all levels of the biological organization. The consequences of such impacts could have repercussions on the functions of rivers since biofilms are involved in the biogeochemical cycles of major elements (C, N, S, O) and traces (metals), while they are at the bottom of the autotrophic food chain. This doctoral project aims to study the link between the composition of biofilms and the functions of rivers in order to evaluate which genomic biofilm-based indicators would be the best to assess river health. To that end, biofilms will be exposed to increasing concentrations of metals and will be studied at three genomic levels: (i) at the level of bacterial genes involved in the biogeochemical cycles (nitrification for example) and in the response to contaminants, (ii) at the level of specific species of bacteria, algae, fungi and meiofauna and (iii) at the level of the microorganism communities and relationships existing between these specific species. The biofilms will be colonized and exposed to metals in mesocosms (PERL facilities hosted by Total at Lacq, France). They will be analysed for abundance and diversity using molecular approaches. Interactions between microbial compartments of the biofilm communities as well as effect of contamination on those interactions will be investigated. The overall results will bring insights on the evaluation of metal toxicity towards aquatic communities and are expected to improve the use of genomic-based tools in environmental risk assessment.

Keywords: molecular microbiology, environmental genomics, ecotoxicology, limnology

Funding: Partnership research chair e2S-UPPA-Total-Rio Tinto

Working conditions:

Hosting laboratory: IPREM (UPPA)

Localisation address: 2 avenue du Président Angot,

Laboratory expertise: Ecotoxicology laboratory

Thesis Director: Dr Séverine Le Faucheur and Dr Marisol Goni-Urriza

Starting Date: *September 1th, 2020*

Duration: 3 years

Gross salary: 1 870 € / month (which includes extra gratification for teaching duties – 32h per year)

Mission - Main activities:

Scientific framework

Biofilms are communities of microorganisms (bacteria, algae, fungi, meiofauna) living on submerged substrates in aquatic ecosystems. These communities have the interesting feature of responding quickly and in a sensitive manner to changes in water quality, especially the presence of metals. Exposure to metals can have negative effects on biofilms at all levels of the biological organization. The consequences of such impacts could have repercussions on the functions of rivers since biofilms are involved in the biogeochemical cycles of major elements (C, N, S, O) and traces (metals), while they are part of the first link of the food chain. This doctoral project aims to study the link between the composition of biofilms and the functions of rivers to evaluate which genomic biofilm-based indicators are the best to assess river health.

Purpose(s)

The aim of this PhD thesis is to assess which genomic-based bioindicators are the best predictors of metal exposure and effects on river ecosystem health. To that end, biofilms will be exposed to increasing concentrations of metals and will be studied at three genomic levels: (i) at the level of bacterial genes involved in the biogeochemical cycle (nitrification for example) and in the response to contaminants, (ii) at the level of specific species of bacteria, algae, fungi and meiofauna and (iii) at the level of the microorganism communities and relationships existing between these specific species. The biofilms will be colonized and exposed to metals in mesocosms (PERL facilities hosted by Total at Lacq, France). They will be analysed for abundance and diversity using molecular approaches. Interactions between microbial compartments of the biofilm communities as well as effect of contamination on those interactions will be investigated.

Expected results

The overall results will bring insights on the evaluation of metal toxicity towards aquatic communities and are expected to improve the use of genomic-based tools in environmental risk assessment.

Research collaborations

TotalEnergies and Rio Tinto scientists

Applicant 's profile:

The candidate will work with molecular biology tools, develop rigorous ecotoxicological bioassays in mesocosms, and use computational techniques. The ideal candidate has a master's degree in microbial ecology, microbiology with a special interest in ecotoxicology or biogeochemistry or in environmental sciences with a strong background in environmental microbiology, statistics and molecular microbiology. He/She is passionate for environmental problematics, rigorous and highly motivated to be part of our scientific teams composed of ecotoxicologists, molecular biologists and biogeochemists. A previous experience with R coding would be a plus. The candidate must have a good English level and the capacity to work autonomously.

Application - Evaluation criteria:

Application file assessment: Selection committee

Candidates will first be selected based on their application file.

Those selected after this first step, will then be interviewed.

Application files will be evaluated based on the following criteria:

- Grades and ranking during your Master degree, steadiness in your academic background
- English language proficiency
- Candidate's ability to present her/his work and results

Work experience similar to an internship in a laboratory – or likewise; previously achieved research work (reports, publications).

Application will include: *(in a single pdf file)*

- CV
- Cover letter
- Master degree grade transcripts and ranking
- Reference letter
- Contact details of at least two people, from you work environment, who can be contacted for further reference

Application must be send to the following email address with the title "Doctoral application":
severine.le-faucheur@univ-pau.fr and **marisol.goni@univ-pau.fr**

For more details, please visit our websites: <http://e2s-uppa.eu/en/index.html> and <https://iprem.univ-pau.fr/fr/collaborations/chaieres/ecotox/presentation.html>

Application deadline:

June 25th, 2021