

Division for Marine and Environmental Research
Ruđer Bošković Institute
Zagreb

The research team and objectives of the BeDIFFERENCE project

Zrinka Dragun

Kick-off meeting
of the BeDIFFERENCE project
Zagreb, January 2026

Full project title:

Diffuse riverine ecosystem pollution: from nano contamination to biological and ecological effects (BeDIFFERENCE)

1. main research subject of the project: various aspects of diffuse freshwater pollution

2. the pollution from diffuse sources is currently the leading cause of water quality impairment in the world, with negative impact on ecosystem health

3. because point sources of pollution are mainly under control, since they are easier to identify, quantify, and manage by policy approaches

… the selected freshwater ecosystem:

THE MURA RIVER WITHIN CROATIA

… impacted mainly by diffuse sources of pollution,
such as agricultural runoff, thermal waters, abandoned coal mines …

Few facts about the Mura River:

1. the Mura River rises in the western part of Austria, with a total length of 465 km
2. it flows into the Drava River near the town of Legrad in Croatia, being its most significant tributary
3. Mura flows through four countries: Austria, Slovenia, Hungary and Croatia
4. the length of the Mura River in Croatia is 83 km, of which 79 km represents the state border between Croatia and Hungary
5. the Mura river-flow within Croatia is a part of Regional park Mura-Drava – in 2011 proclaimed protected area by the Government of the Republic of Croatia

… it forms a part of world's first five country Transboundary UNESCO Biosphere Reserve "Mura-Drava-Danube", the so-called:

AMAZON OF EUROPE

… it hosts an amazing biological diversity and is a hotspot of rare natural habitats

Project team

Ruđer Bošković Institute

Division for Marine and Environmental Research – Laboratory for Biological Effects of Metals



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Project team

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- Department of Biology

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NASTAVNI ZAVOD ZA JAVNO ZDRAVSTVO DR. ANDRIJA ŠTAMPAR

Stvaramo zdraviju budućnost

Dr. Sonja Tolić

University of Zadar

Sveučilište u Zadru
Universitas Studiorum Jadertina | 1396 | 2002 |

Assoc. prof. dr. Krešimir Žganec



Project team

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Project team

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Oviedo, Spain

Prof. dr. Maria Montes-Bayón





Assist. prof. dr. Mario Corte Rodriguez

Université du Québec a Montréal

Environmental Metallomics Laboratory

Montréal, Canada

Dr. Maikel Rosabal Rodriguez

Main research questions

- the two main research questions:
  1. what degree of contamination could be expected in the major river as a result of typical diffuse sources?
  2. what consequences could be expected?

- two approaches:

1. to recognize main inorganic/organic pollutants (nutrients, metals, pesticides, antibiotics) in the river water/sediment, their short-term and long-term variability, and their dependence on hydrological regime

2. to perform detailed analyses of detrimental effects in selected aquatic organisms (at different levels of biological complexity: bacteria, gastropods, bivalves, crayfish, fishes; and with different habitats and feeding habits)

– focus on changes that occur from cellular to population level (metal bioaccumulation; metal intracellular fate, namely metal subcellular partitioning, metal-binding biomolecules, and nanoparticulate metals in tissues; molecular/cellular biomarkers in selected organs/tissues; fish biodiversity)

Pilot study - 2023



KeAi
CHINESE ROOTS GLOBAL IMPACT

Environmental Chemistry and Ecotoxicology
Volume 7, 2025, Pages 2043-2066

Research Paper

The problem of diffuse pollution of a major river running through predominantly rural area: the case of potentially detrimental levels of tungsten, silver, and manganese in the Mura River

Zrinka Dragun [1], Željka Fiket [1], Nataša Tepić, Zoran Kiralj, Tomislav Kralj, Zvjezdana Šoštarić Vulić, Dušica Ivanković, Mavro Lučić, Ana Puljko, Nikolina Udiković-Kolić, Damir Valić

- ❖ June and October, 2023
- ❖ nine sampling sites
- ❖ receiving waters of thermal baths,
- ❖ brown coal from Mursko Središće mine

- high total nitrogen and phosphorus levels pointed to agricultural water pollution
- coal mine drainage confirmed as probable source of high Mo and W in water/sediment, especially in the vicinity of Mursko Središće
- dissolved Ag, Mn, W levels, potentially toxic to biota, detected in the river-water
- high microbial intI1 and pbrT gene abundances indicated anthropogenic impact, and resistance to Pb near abandoned coal mines

❖ the follow-up project (May 2025): decrease of bacterial diversity in sediments from Mursko Središće to Goričan – the area with presumably higher water/sediment contamination

Education of young scientists

- educational aspect:
  contribute to transfer of knowledge and training of young scientists

- PhD student – HrZZ call expected in March 2026
  supervisor: dr. Zrinka Dragun

- Erasmus Laboratory trainings:

1. *Lore Graulus*
   – the study programme bachelor of Biomedical Laboratory Technology at Hogeschool Gent, University of Applied Sciences and Arts
   – Gent, Belgium
   – 9th February to 5th June 2026
2. *Nausicaä Falconnat*
   – bachelor's student in Assistant Engineering specializing in Biology, Biochemistry, and Biotechnology at the Catholic University of Lyon
   – Lyon, France
   – 27th April to 31st July 2026

- young researcher mobility encouraged between project partners within the existing mobility programmes


Thank you for your attention ☺