



## **Plastisphere**

**Microplastics in the environment/Environment on the microplastics**  
*a presentation for EUSDR Conference on microplastic in drinking water*  
*3 October, 2024, Budapest*



HUNGARIAN UNIVERSITY OF  
AGRICULTURE AND LIFE SCIENCES  
Institute for Aquaculture and  
Environmental Safety

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**István Szabó, PhD**

*head of department*

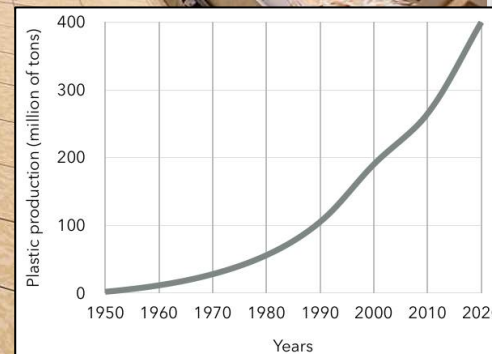
Department of Environmental Toxicology



Then/now...



**LIFE**



**Throwaway Living**  
DISPOSABLE ITEMS CUT DOWN HOUSEHOLD CHORES



# Macroplastic waste load of Hungarian rivers

Ljasuk Dimitry, 2021



Czeglédi Zsolt, 2019





# Effects on natural habitats

Róbert Molnár

Cleanourocean.com

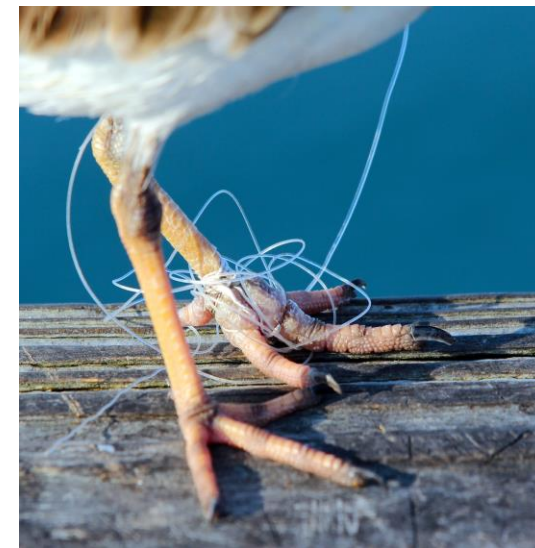


Adam Turnbull

Zöld Ellenállás



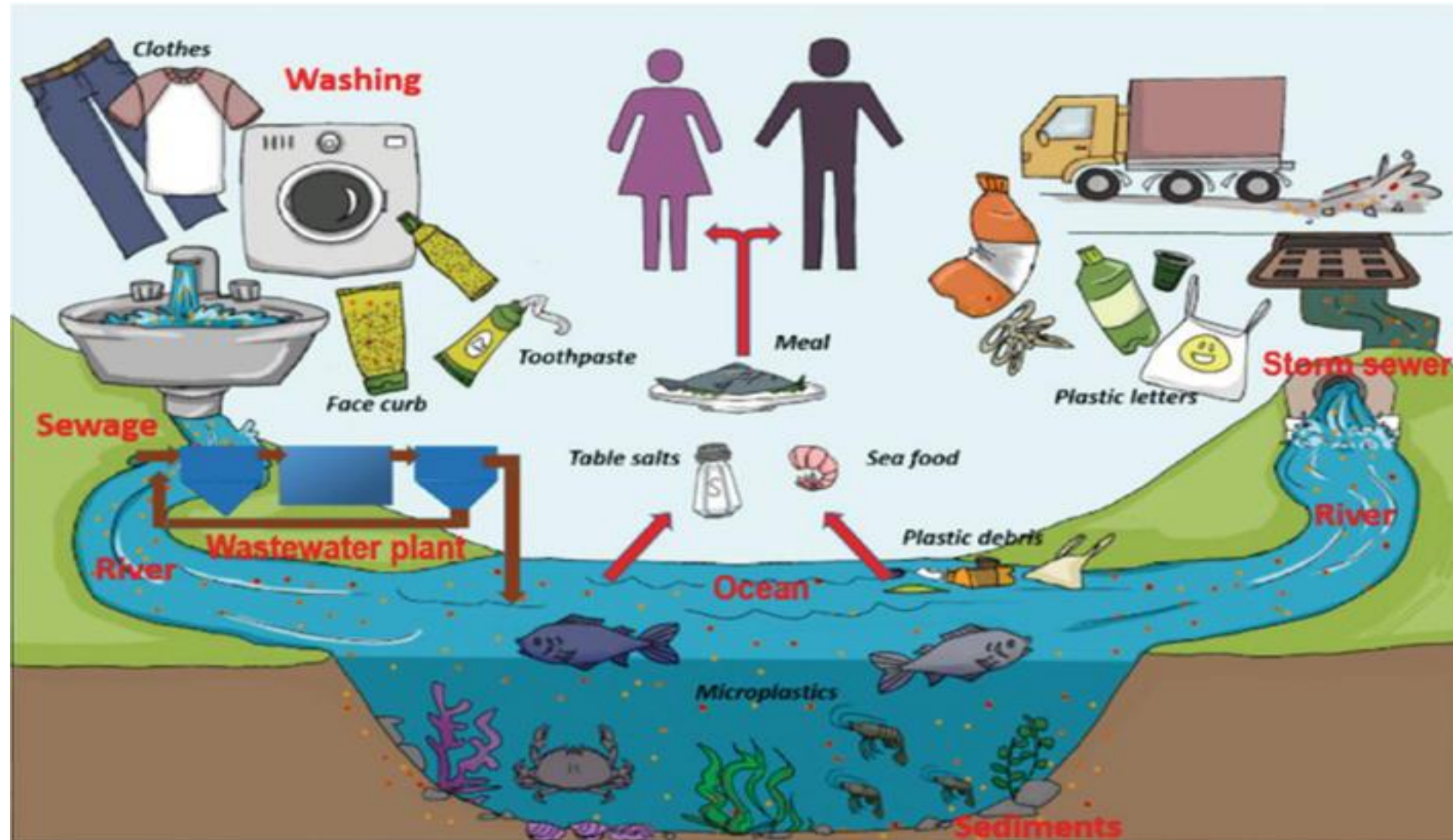
Sóstó Game Rescue Center



asri.org



# From table to water's table



## Microplastics revealed in the **placentas** of unborn babies

**Health impact is unknown but scientists say particles may cause long-term damage to foetuses**



## Microplastics found in **human blood** for first time

**Exclusive: The discovery shows the particles can travel around the body and may lodge in organs**

## Microplastics found deep in **lungs** of living people for first time

**Particles discovered in tissue of 11 out of 13 patients undergoing surgery, with polypropylene and PET most common**

## Microplastics found in every human **testicle** in study

**Scientists say discovery may be linked to decades-long decline in sperm counts in men around the world**

## Microplastics found in human **breast milk** for the first time

**Exclusive: Researchers concerned over potential health impacts of chemical contaminants on babies**

## Microplastics are infiltrating **brain** tissue, studies show: 'There's nowhere left untouched'



The NEW ENGLAND  
JOURNAL of MEDICINE

SPECIALTIES ▾

TOPICS ▾

MULTIMEDIA ▾

CURRENT ISSUE ▾

LEARNING/CME ▾

AUTHOR CENTER

PUBLICATIONS ▾

Human risk?

Additives?



Cocktail effect?

Ecotoxicity?

ORIGINAL ARTICLE



# Microplastics and Nanoplastics in Atheromas and Cardiovascular Events

**Authors:** Raffaele Marfella, M.D., Ph.D. , Francesco Prattichizzo, Ph.D., Celestino Sardu, M.D., Ph.D., Gianluca Fulgenzi, Ph.D., Laura Graciotti, Ph.D., Tatiana Spadoni, Ph.D., Nunzia D'Onofrio, Ph.D., 35, and Giuseppe Paolisso, M.D. [Author Info & Affiliations](#)

Published March 6, 2024 | N Engl J Med 2024;390:900-910 | DOI: 10.1056/NEJMoa2309822 | [VOL. 390 NO. 10](#)

„In this study, patients with carotid artery plaque in which MNPs were detected had a **higher risk of a composite of myocardial infarction, stroke, or death** from any cause at 34 months of follow-up than those in whom MNPs were not detected.”



# Plastic trojan horse



Lisa Woollett, 2020



Ryan Stalker, 2024



Journal of Hazardous Materials

Volume 462, 15 January 2024, 132741



## Bacterial pathogens associated with the plastisphere of surgical face masks and their dispersion potential in the coastal marine environment

Jingguang Cheng<sup>a</sup>, Pu Wang<sup>a</sup>, Jean-François Ghiglione<sup>b</sup>, Lu liu<sup>a</sup>, Zhonghua Cai<sup>a</sup>, Jin Zhou<sup>a</sup>

Xiaoshan Zhu<sup>a c</sup>



Science of The Total Environment

Volume 830, 15 July 2022, 154720



## Enrichment and dissemination of bacterial pathogens by microplastics in the aquatic environment

Muhammad Junaid<sup>a 1</sup>, Junaid Ali Siddiqui<sup>b 1</sup>, Mamona Sadaf<sup>d</sup>, Shulin Liu<sup>b</sup>, Jun Wang<sup>a c</sup>



Environmental Pollution

Volume 344, 1 March 2024, 123237



## Beach sand plastispheres are hotspots for antibiotic resistance genes and potentially pathogenic bacteria even in beaches with good water quality ☆

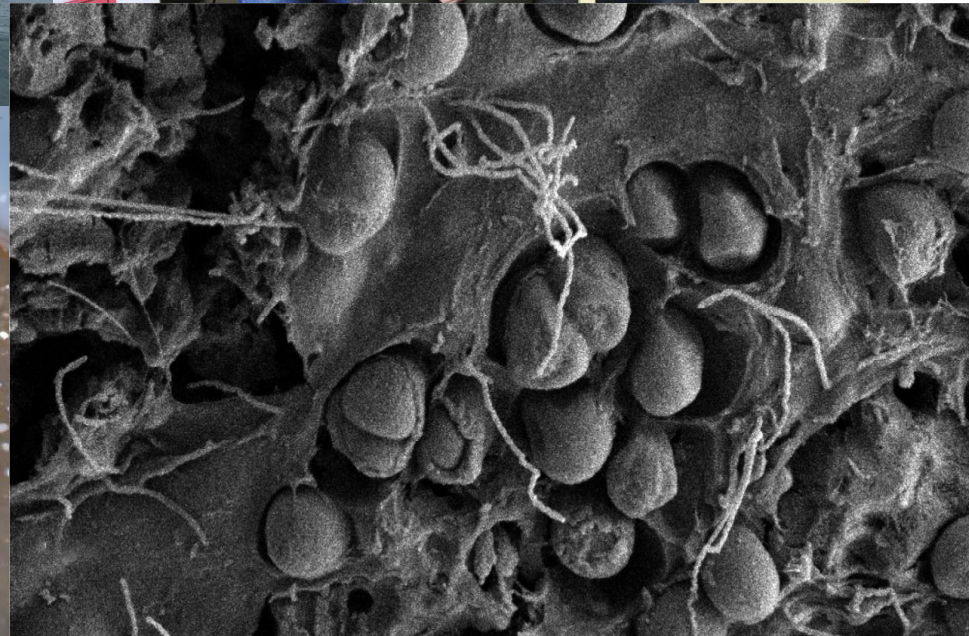
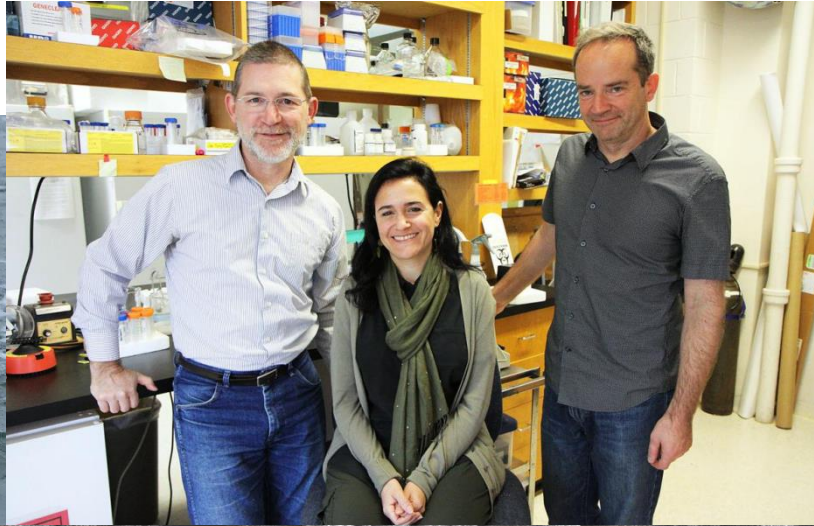
Emily Amorim Magalhães, Hugo Emiliano de Jesus, Pedro Henrique Freitas Pereira,

Abílio Soares Gomes, Henrique Fragoso dos Santos





# „Plastisphere”





# Bacteria from straws?

IDs	Bacterial species	16s rDNA Similarity	Problematic?
<b>ZS-1/1</b>	<i>Aeromonas ichthiosmia</i>	98.46%	1
<b>ZS-1/2</b>	<i>Halobacillus locisalis</i>	99.77%	2
<b>ZS-1/3</b>	<i>Parvularcula lutaonensis</i>	98.09%	1
<b>ZS-1/4</b>	<i>Halobacillus locisalis</i>	99.81%	2
<b>ZS-1/5</b>	<i>Idiomarina aestuarii</i>	99.77%	n/d

„Let's clean the sea Daddy!”



# *Parvularcula mediterranea*

- Novel bacterial species
- Isolated from plastic litter
- Polypropylene straws collected from marine environment

INTERNATIONAL  
JOURNAL OF SYSTEMATIC  
AND EVOLUTIONARY  
MICROBIOLOGY

TAXONOMIC DESCRIPTION  
Al-Omari et al., Int. J. Syst. Evol. Microbiol.  
DOI 10.1099/ijsem.0.004608



*Parvularcula mediterranea* sp. nov., isolated from marine plastic debris from Zakynthos Island, Greece

Jafar Al-Omari<sup>1</sup>, István Szabó<sup>1\*</sup>, Gábor Soma Szerdahelyi<sup>1</sup>, Júlia Radó<sup>1</sup>, Edit Kaszab<sup>1</sup>, Jeffrey Griffiths<sup>2</sup>, András Táncsics<sup>3</sup> and Sándor Szoboszlai<sup>1</sup>

NATIONAL  
GEOGRAPHIC

| SZAVAZÁS

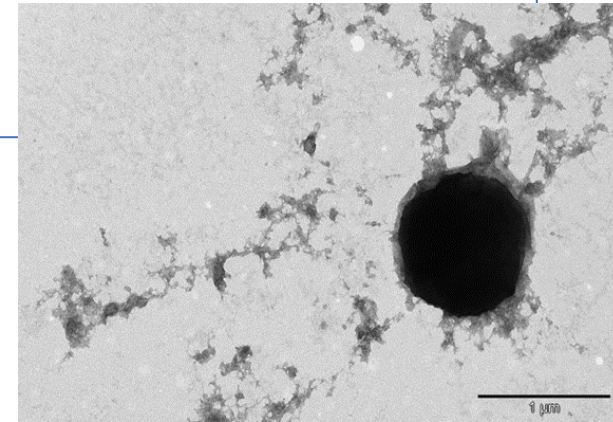
| MAGAZIN

| FOTÓ

TUDOMÁNY

## Családi nyaralásból egy új faj felfedezése

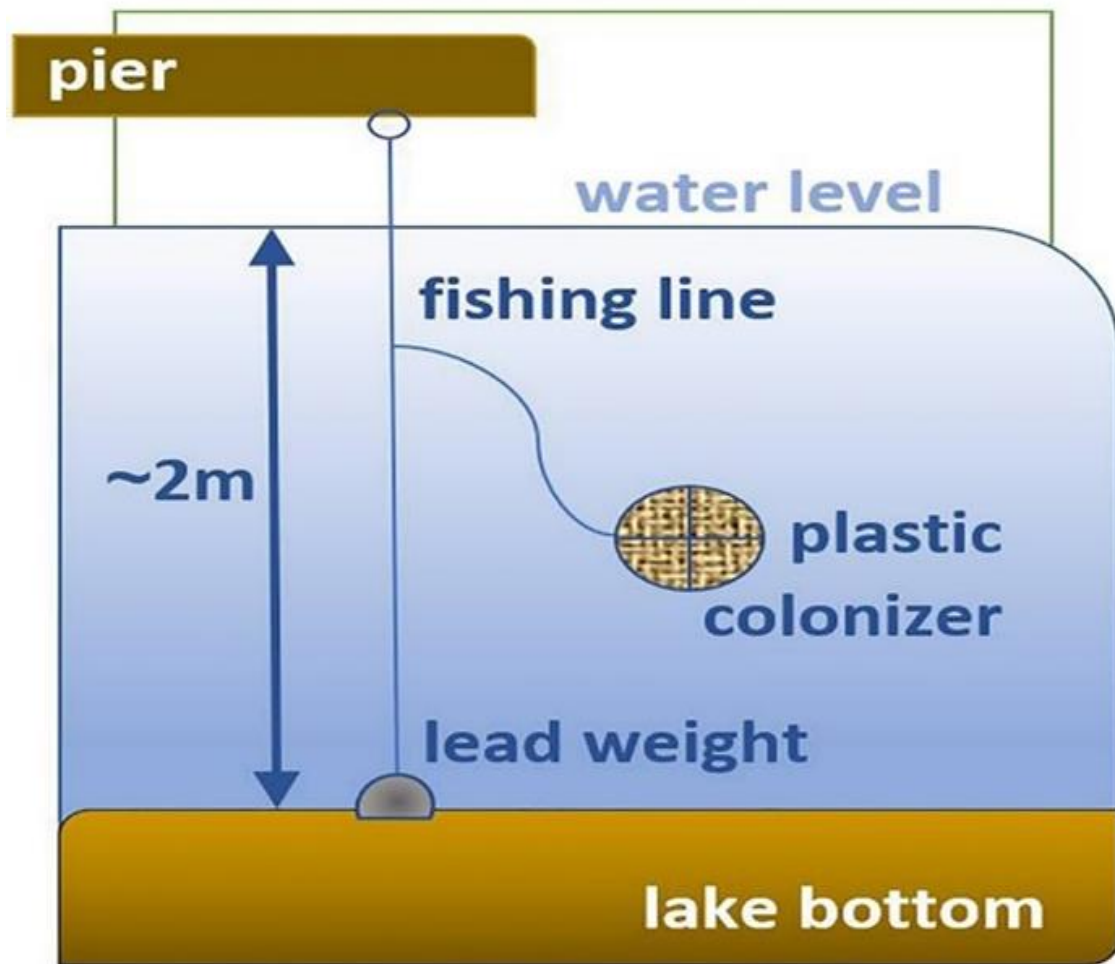
2021.01.31. | NG |



### Funding information

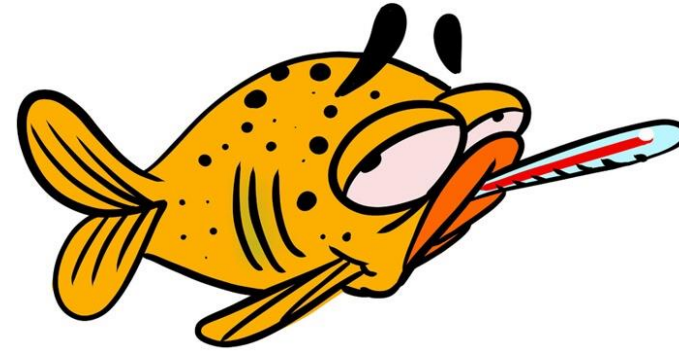
This research was supported by the Thematic Excellence Program (TKP) (NKFIH-831-10/2019) of Szent István University, awarded by the Ministry for Innovation and Technology of Hungary and by the UNKP-18-4-SZIE-18 new national Excellence Program of the Ministry of Human Capacities (I.S.). I.S. would like to thank his daughter, Júlia, for the initial idea.







# „Bad guys”



## ***Pseudomonas mandelii:***

*Isolated from bottled water (France)*

*Possible fish pathogen*

## ***Pseudomonas baetica:***

*Isolated from a sick liver of Wedge sole (*Dicologlossa cuneata*) flat fish – described as fish pathogen!*

## ***Pseudomonas mosselii:***

*Isolated from human clinical samples*

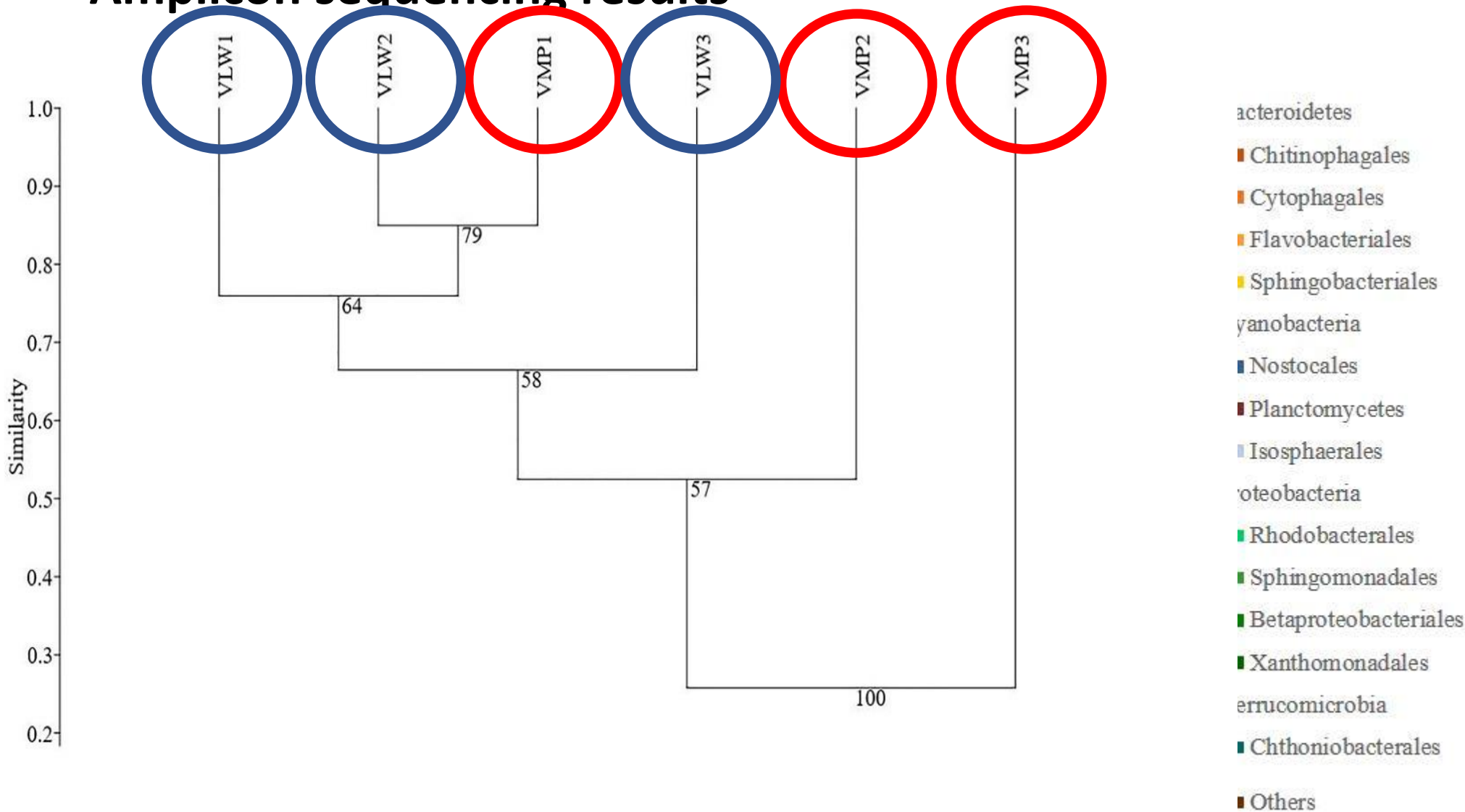
*Inflammatory effect!*





# Amplicon sequencing results

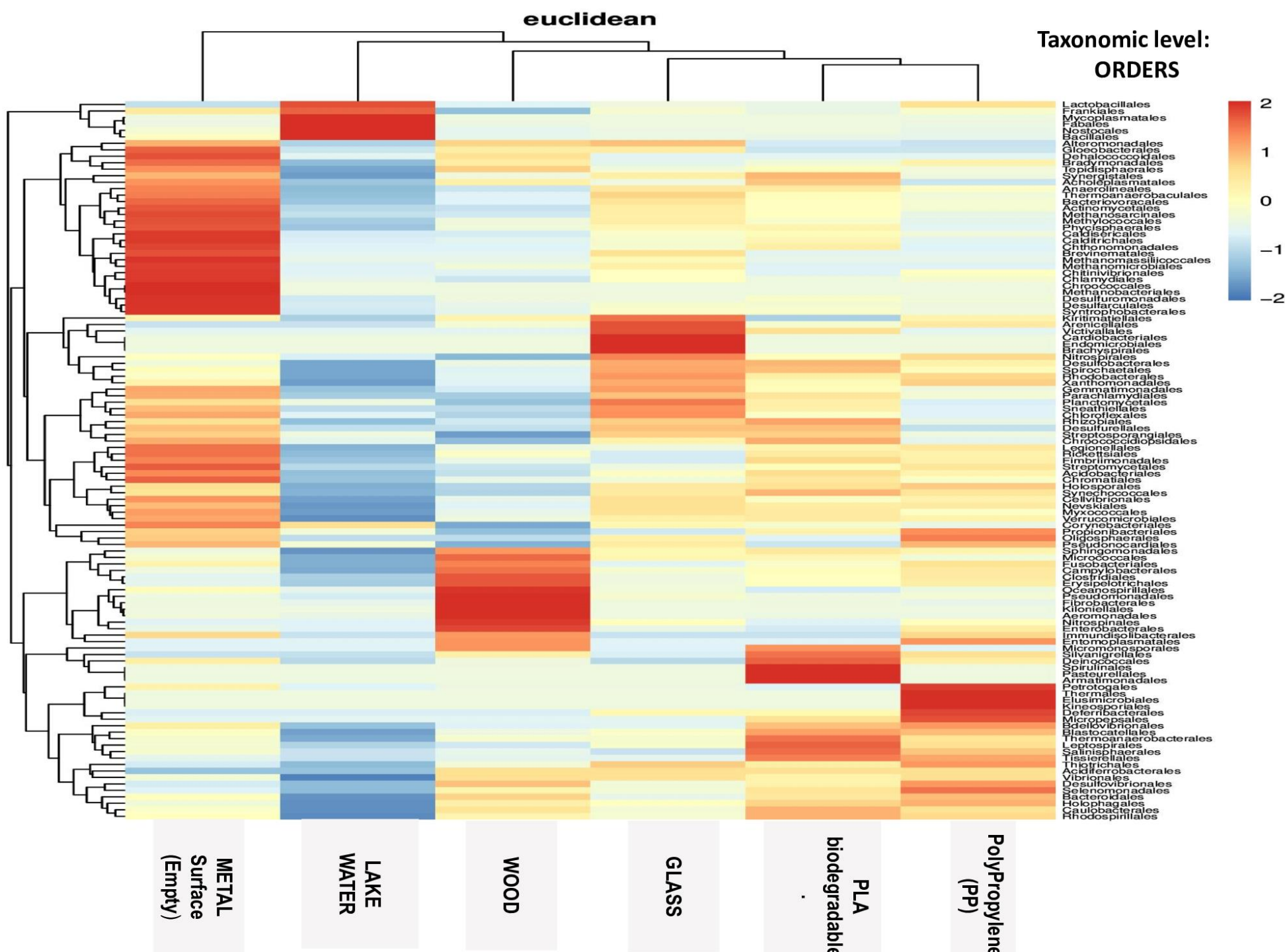
Results of first  
colonization test



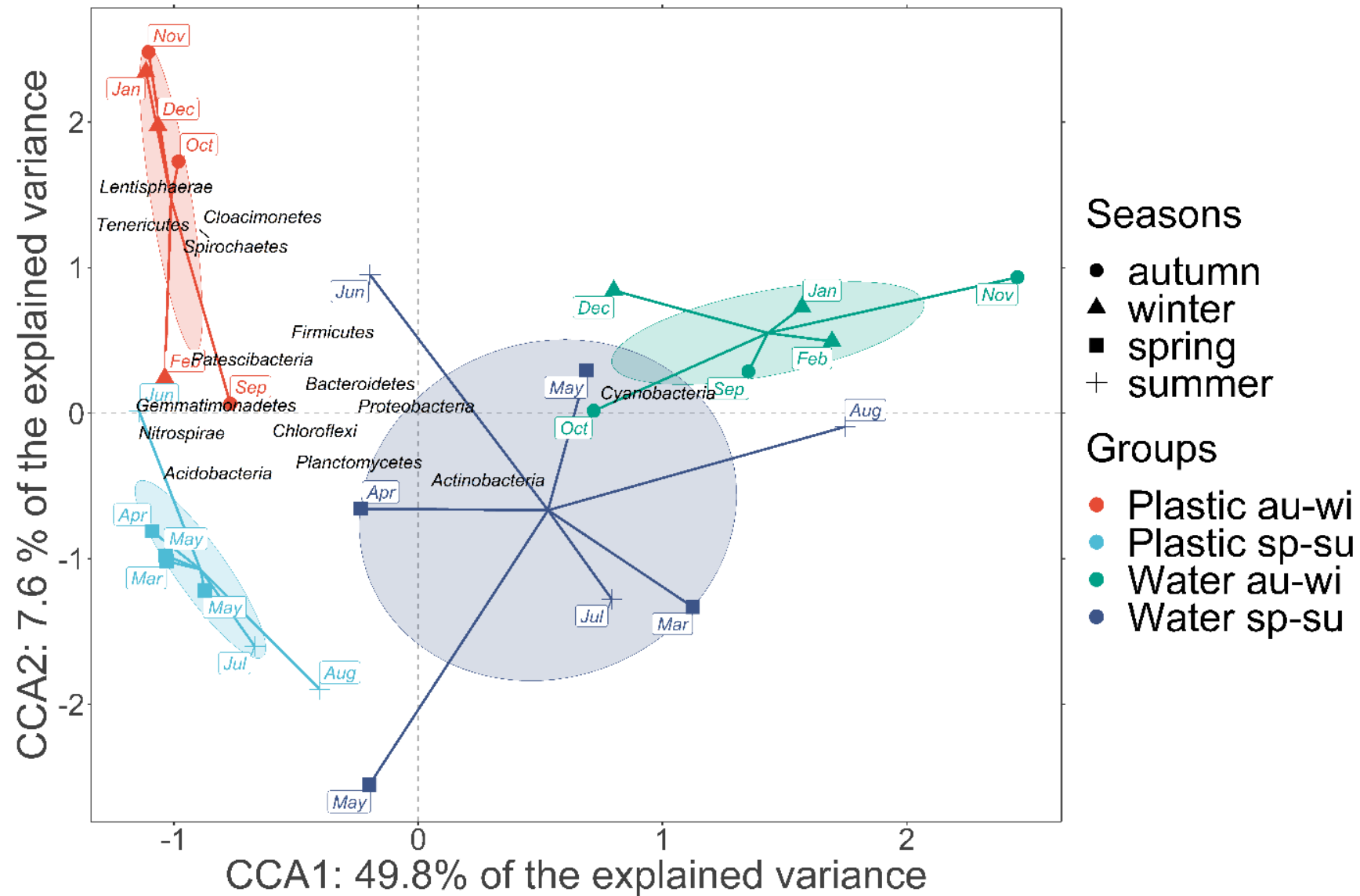
**VMP 1,2,3** : Microplastic associated community 1<sup>st</sup> , 2<sup>nd</sup> , and 3<sup>rd</sup> month respectively.  
**VLW 1,2,3** : lake water associated community 1<sup>st</sup> , 2<sup>nd</sup> , and 3<sup>rd</sup> month respectively.



Different  
surfaces



# One year study

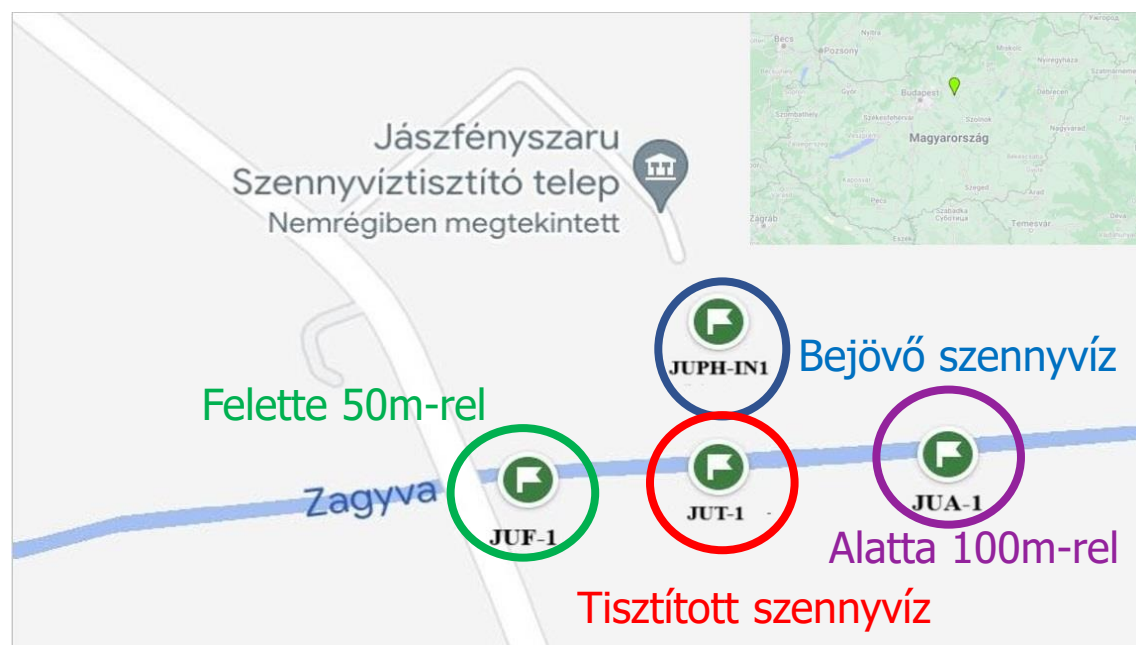




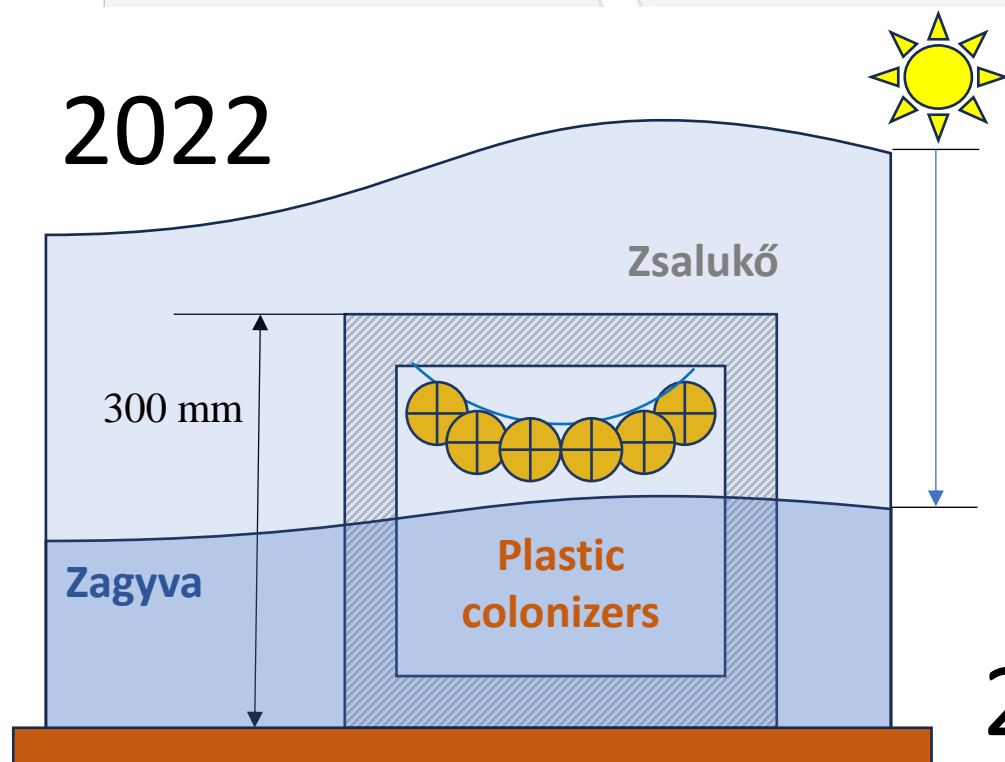
Where are we  
working now?







2022





# Discussion and conclusions

- Plastic originated isolates – **novel species**
- “**Plastic colonizer**” can be (reproducible and standardized) compared to other methods; (net, plastic particles collection, *in vitro* methods,...etc.).
- **Plastic associated communities notably differ** from surrounding freshwater and other type of surfaces.
- Aspects and **plastic types has notable effect** on developing plastispheric communities.
- Importance of biological risk assesment: **pathogens and resistants**
- Method need to be developed for river sampling – **new challenges**
- Results of chemical analyses and weather data need to be co-evaluated

# Thank you for your attention!

Horizon Europe founded ,**REPurpose**' project

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REPURPOSE