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Data Workshop I Part 3

Data Analysis

Towards a Scientific Output

Plastic Pirates – Go Europe!

General Assembly April 2025

2025-04-08

Flanders Marine Institute (VLIZ) – Ana Catarino

BETA Technological Center (UVIC-UCC) – Meritxell Abril

What Has Been Published So Far?

"Plastic Pirates sample litter at rivers in Germany - Riverside litter and litter sources estimated by schoolchildren”

Environmental Pollution 245 (2019) 545–557

Contents lists available at ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

Plastic Pirates sample litter at rivers in Germany – Riverside litter and litter sources estimated by schoolchildren☆

Tim Kiessling [a, b, *], Katrin Knickmeier [b], Katrin Kruse [b], Dennis Brennecke [b], Alice Nauendorf [b], Martin Thiel [a, c, d]

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[d] Centro de Estudios Avanzados en Zonas Áridas (CEAZA), Coquimbo, Chile

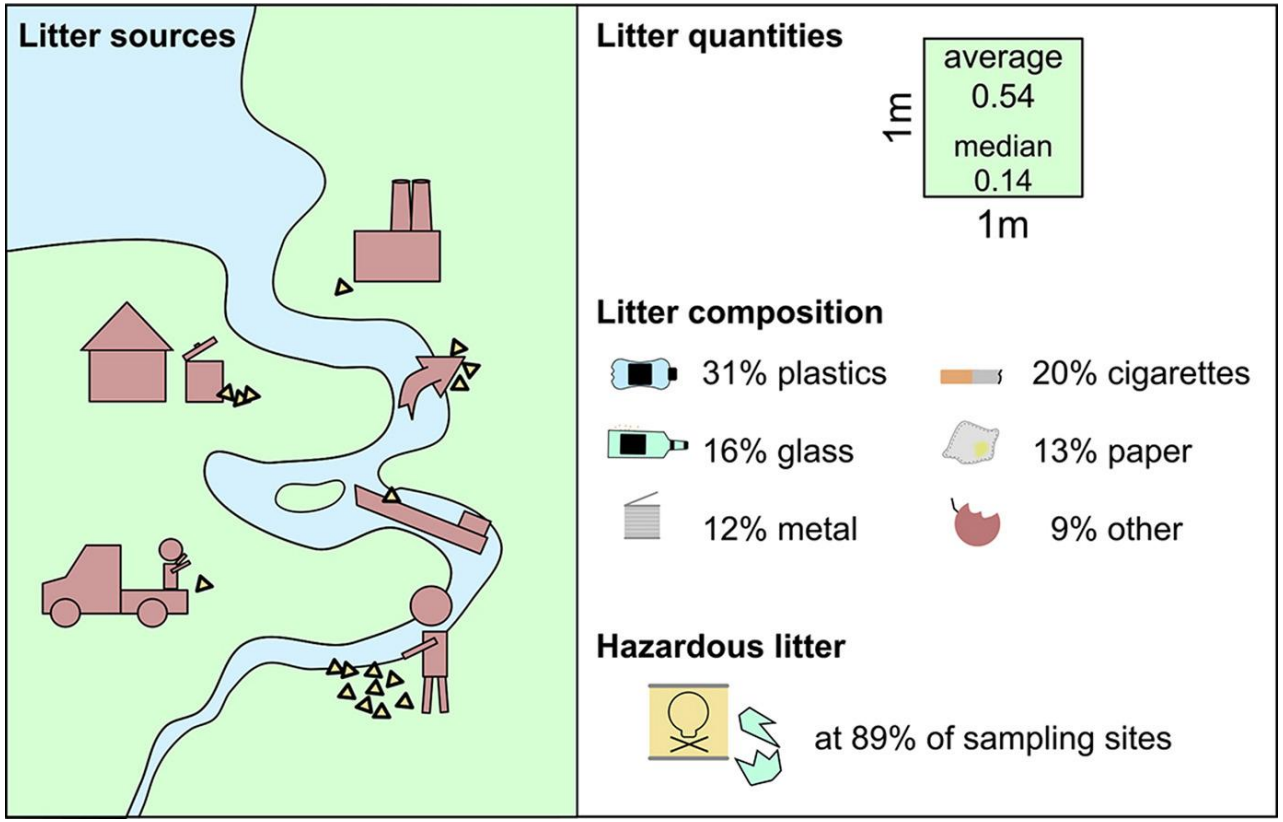
"Plastic Pirates sample litter at rivers in Germany - Riverside litter and litter sources estimated by schoolchildren"

Main objectives:

1. Estimate the **quantity and composition** of litter at rivers of various sizes.

2. Evaluate the presence of **hazardous litter** at riversides.

3. Determine the **litter sources** found at German riversides.

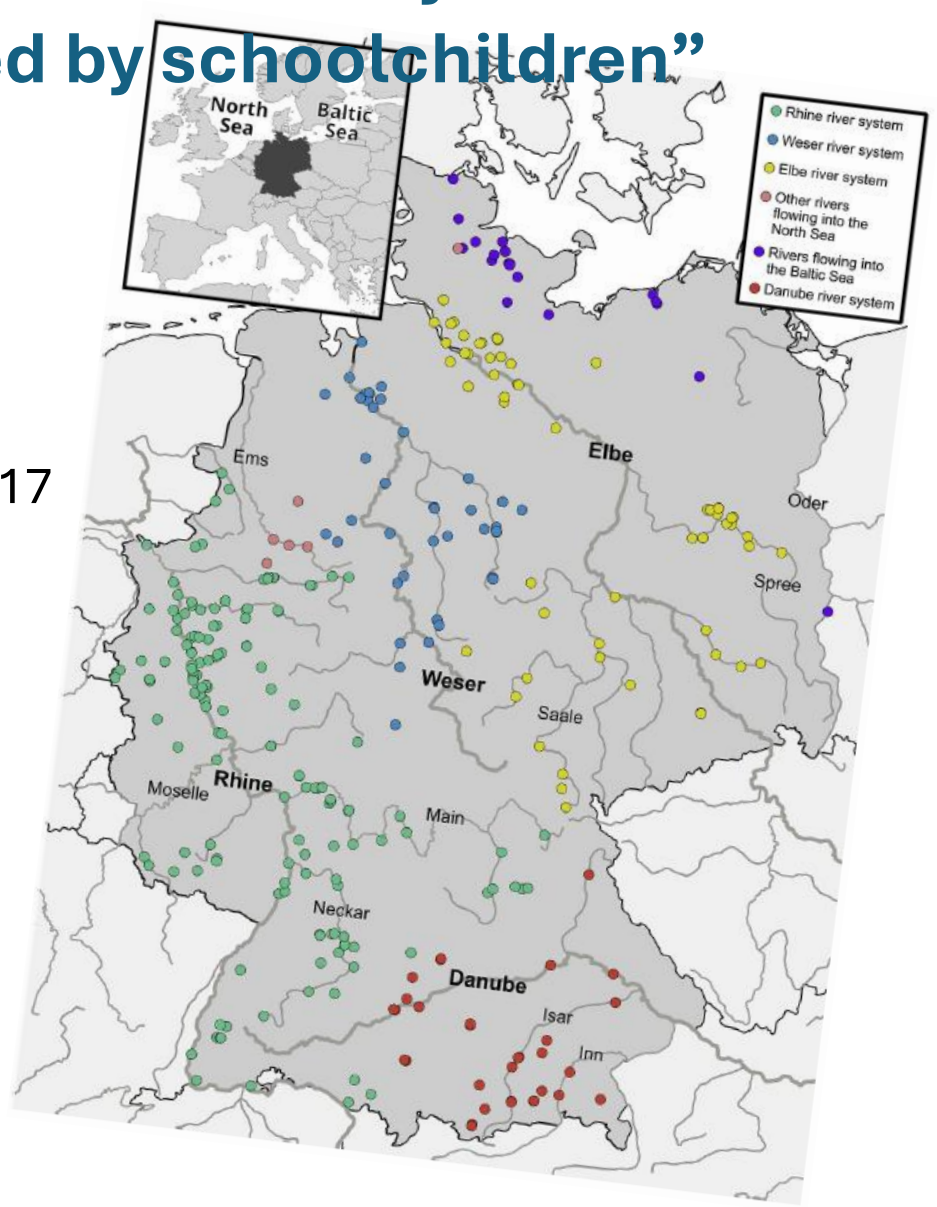


"Plastic Pirates sample litter at rivers in Germany - Riverside litter and litter sources estimated by schoolchildren"

Geographical scope: Germany

Sampling campaigns: Autumn 2016 and Spring 2017

Sampling groups: 408 → 179 groups accepted



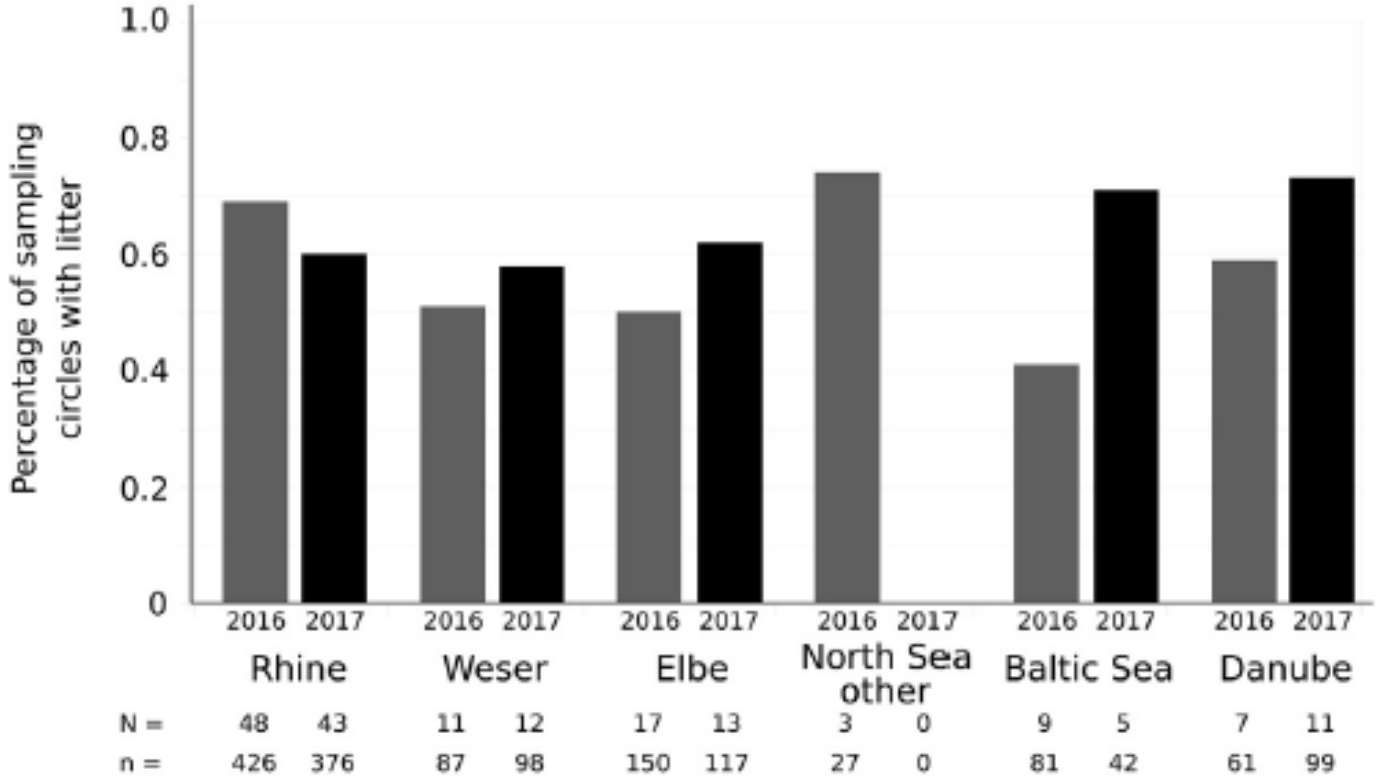
"Plastic Pirates sample litter at rivers in Germany - Riverside litter and litter sources estimated by schoolchildren"

Quantity of litter (*Group A*)

Variables: "river system"; "sampling year"; *"riverside zone"*

Main results:

- 0.54 ± 1.20 litter items m^2.
- The % of sampling circles with litter and nº of litter items differed between river system and sampling year.



Litter sources *(Group D)*

Recreational visitors were the principal litter source (90% in 2016 and 84% in 2017).

"Plastic Pirates sample litter at rivers in Germany - Riverside litter and litter sources estimated by schoolchildren"

Composition of litter (*Group A*)

Variables: *"river system"; "sampling year"*

Main results: The principal litter types were plastics (31%) and cigarette butts (20%), followed by glass, paper, and metal items.

"Differences between river systems, and years were small and not consistent."

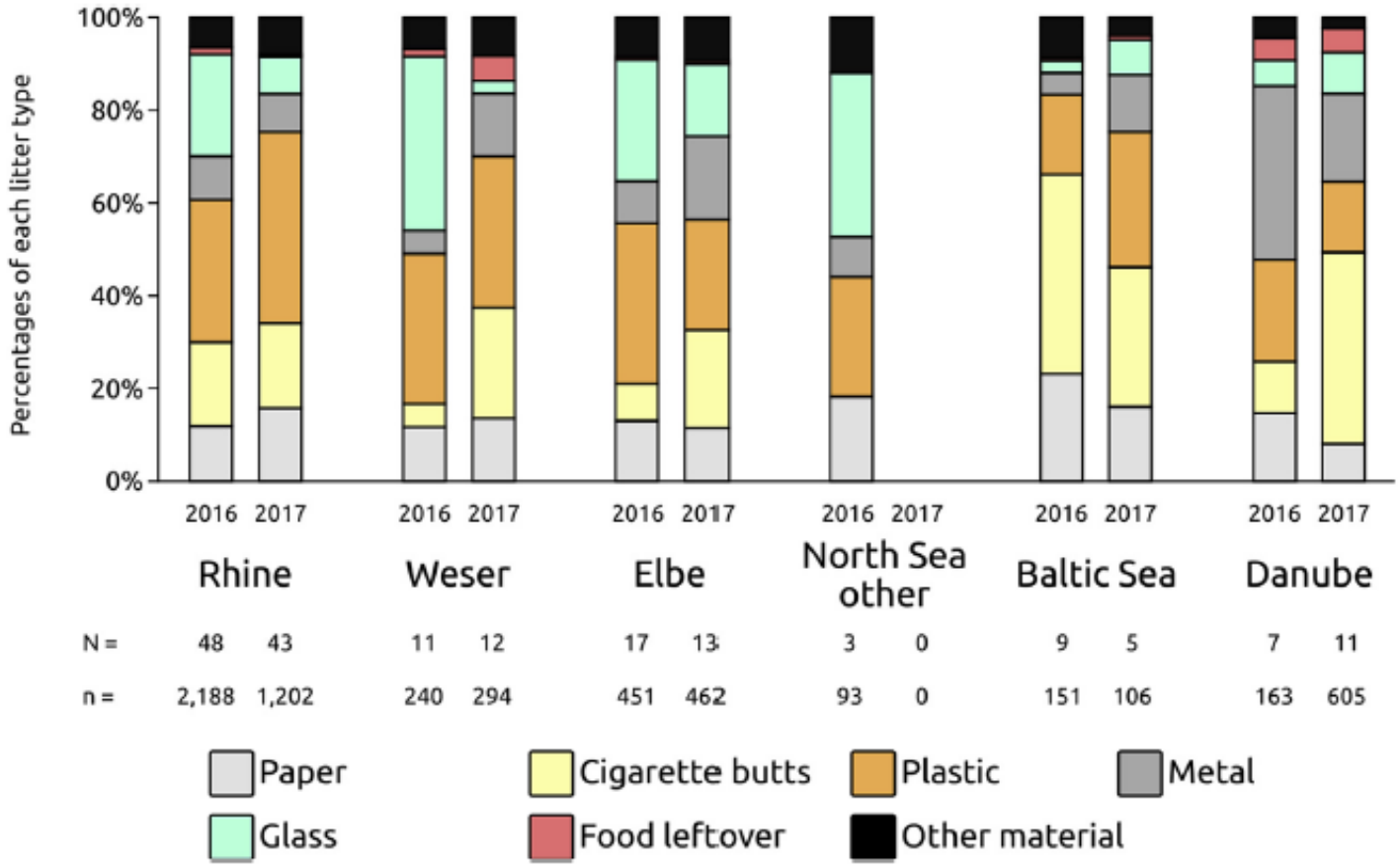


Fig. 6. Composition of riverside litter according to sampling year and river system. N = number of datasets considered, n = number of litter items found.

"Schoolchildren discover hotspots of floating plastic litter in rivers using a large-scale collaborative approach”

Science of the Total Environment 789 (2021) 147849

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Schoolchildren discover hotspots of floating plastic litter in rivers using a large-scale collaborative approach☆

Tim Kiessling [a,b,*], Katrin Knickmeier [a], Katrin Kruse [a], Magdalena Gatta-Rosemary [a], Alice Nauendorf [a], Dennis Brennecke [a], Laura Thiel [c], Antje Wichels [c], Ilka Parchmann [a], Arne Körtzinger [d,e], Martin Thiel [b,f,g]

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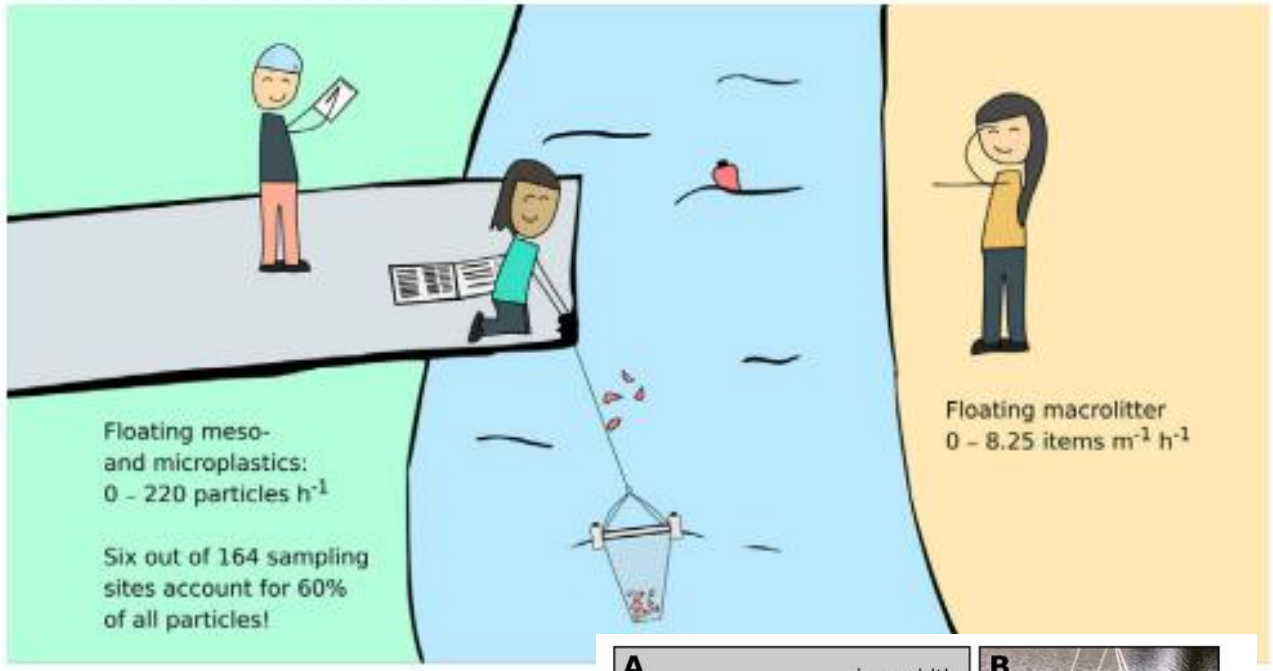
"Schoolchildren discover hotspots of floating plastic litter in rivers using a large-scale collaborative approach"

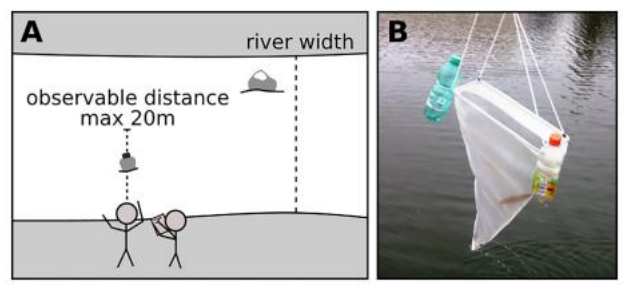
Main objectives:

1. Estimate the **quantity of floating macrolitter** and **meso-/microplastics** in German rivers.

2. Identify **hotspots of meso–/microplastic pollution**.

3. Relationship between floating macrolitter or meso–/ microplastics and macrolitter at the riversides.





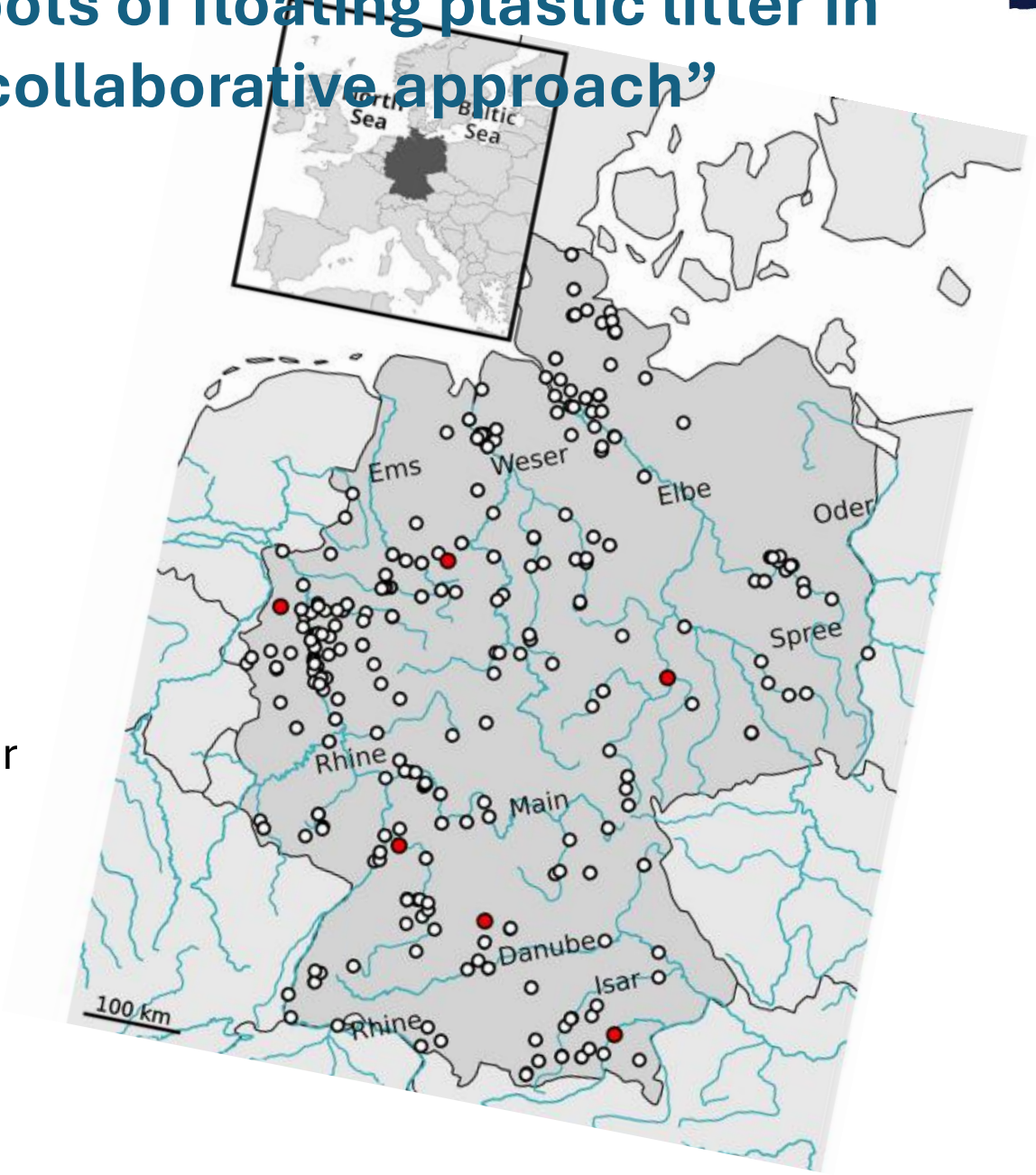
"Schoolchildren discover hotspots of floating plastic litter in rivers using a large-scale collaborative approach"

Geographical scope: Germany

Sampling campaigns: Autumn 2016 and Spring 2017

Sampling groups:

- Floating macrolitter: 347 →282 considered for analysis.
- Microplastics: 384 → 164 considered for analysis.



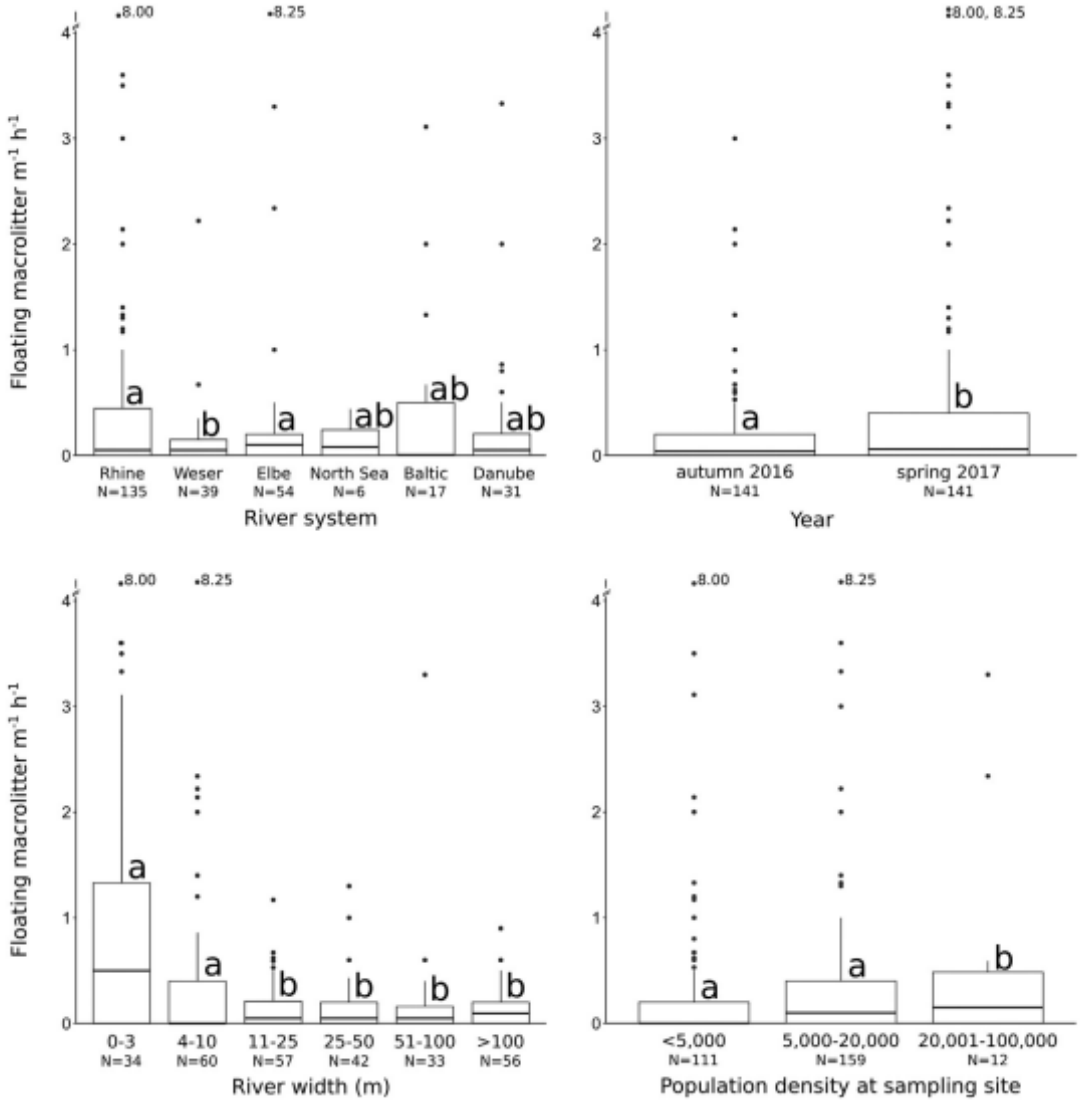
"Schoolchildren discover hotspots of floating plastic litter in rivers using a large-scale collaborative approach"

Floating macrolitter (*Group C*)

Variables: river system, sampling year, river width, population density (main predictors), *and presence of artificial barriers upstream*.

Main results:

- *Average*: 0.34 ± 0.89 litter items m^{-1} h^{-1}
- *Presence*: 54% of groups recorded at least one floating litter item.
- More floating litter in narrow rivers compared to wider ones.
- Densely populated areas had more floating litter than less populated areas.



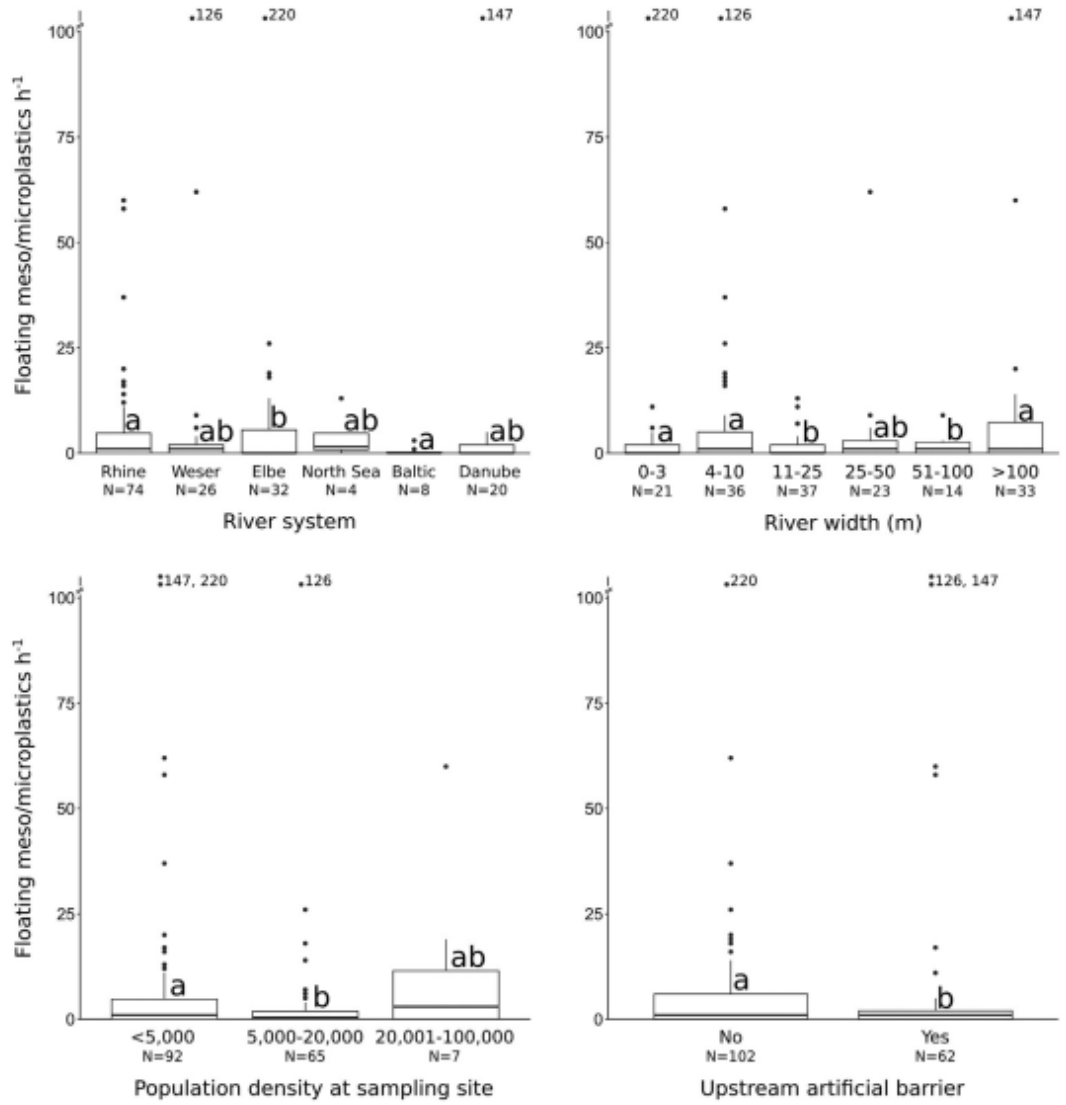
"Schoolchildren discover hotspots of floating plastic litter in rivers using a large-scale collaborative approach"

Microplastics (*Group C*)

Variables: river width, population density, and presence of artificial barriers upstream (main predictors fro microplastic quantities), *sampling year*.

Main results:

- *Average*: 6.86 ± 24.11 microplastics h^{-1} ; 0.18 ± 0.61 microplastics m^{-3} of river surface water (*if velocity available*)
- More microplastics in Elbe River system.
- Less and highly populated areas has higher quantities than mid-sized towns.
- Sites with upstream artificial barriers had fewer microplastics than those without.



"Schoolchildren discover hotspots of floating plastic litter in rivers using a large-scale collaborative approach"

Microplastics (*Group C*)

- *Microplastic hotspots* > 50 plastic particles: located close to a plastic-producing industry, a wastewater treatment plant, below weirs, or in residential areas.
- *Composition:* Pellets (13%); Films (9%); Monofilaments (7%)
- *Polymer type:* polystyrene (38%), polyethylene (31%), and polypropylene (26%).

Relationship with riverside litter (Kiessling et al. 2019): A few significant correlations with litter at the riverside.

"Exploring the abundance and characteristics of litter in Lithuanian riversides: a citizen science approach”

Environ Monit Assess (2024) 196:324
https://doi.org/10.1007/s10661-024-12503-7

RESEARCH

Check for updates

Exploring the abundance and characteristics of litter in Lithuanian riversides: a citizen science approach

Ieva Uogintė · Steigvilė Byčenkienė · Mehri Davtalab · Radvilė Markevičiūtė

Received: 26 October 2023 / Accepted: 24 February 2024 / Published online: 29 February 2024

"Exploring the abundance and characteristics of litter in Lithuanian riversides: a citizen science approach"

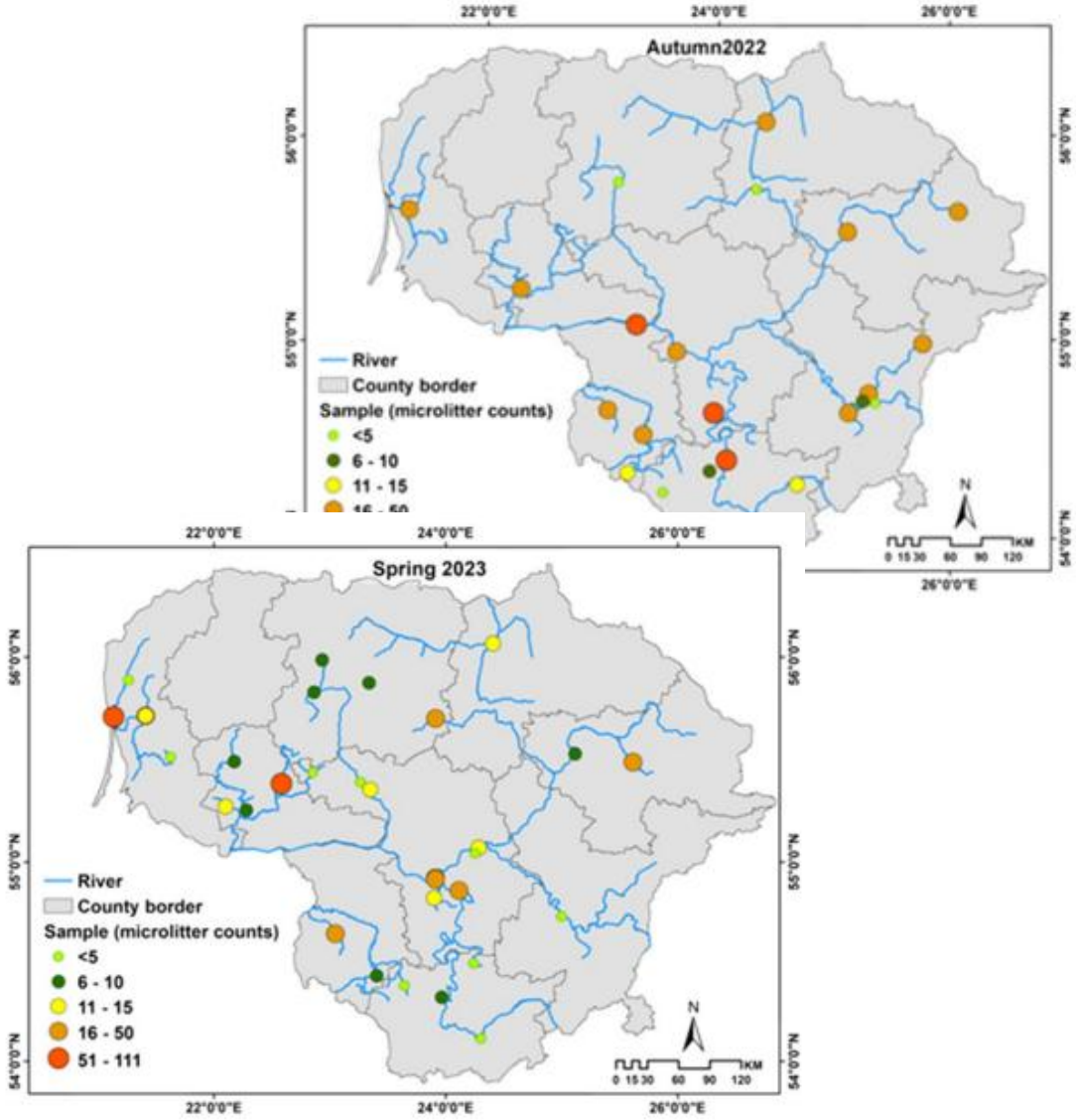
Main objectives: Estimate the abundance and types of litter along Lithuania's riversides.

Geographical scope: Lithuania

Sampling campaigns: Autumn 2022; Spring 2023.

Sampling groups: 56 sampling sites (24 Autumn; 32 Spring).

Variables: season; river zone (A, B, C)

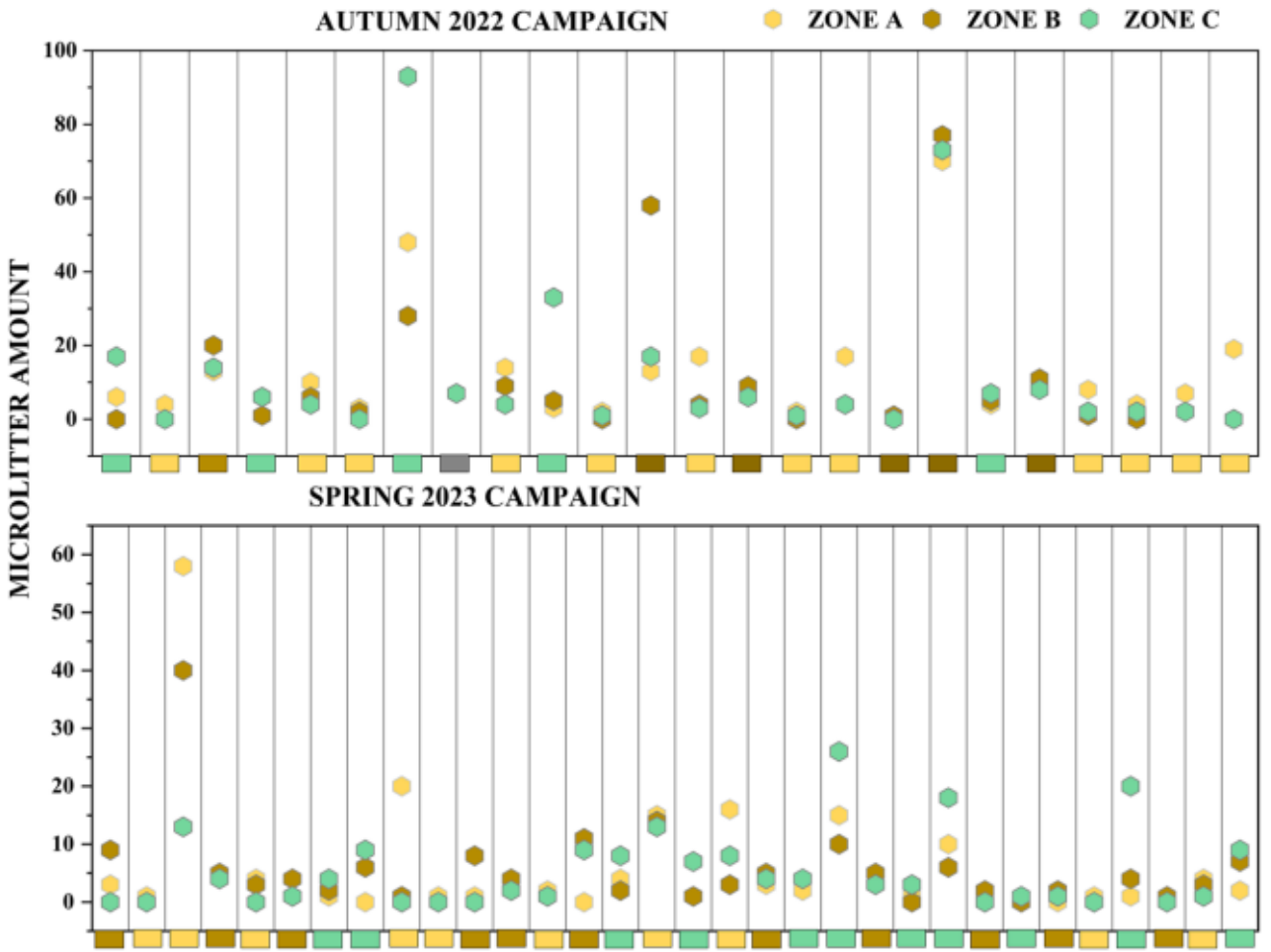


"Exploring the abundance and characteristics of litter in Lithuanian riversides: a citizen science approach"

Riverside litter *(Group A)*

Main results:

- *Density:* average of 5.02 items/m^2 per location
- *Distribution between the different zones* (A, B, C): No significant differences.
- *Seasonal variability:* no significant differences.
- *Comparison with Germany:* Lithuania > Germany (Kiessling et al. 2019)

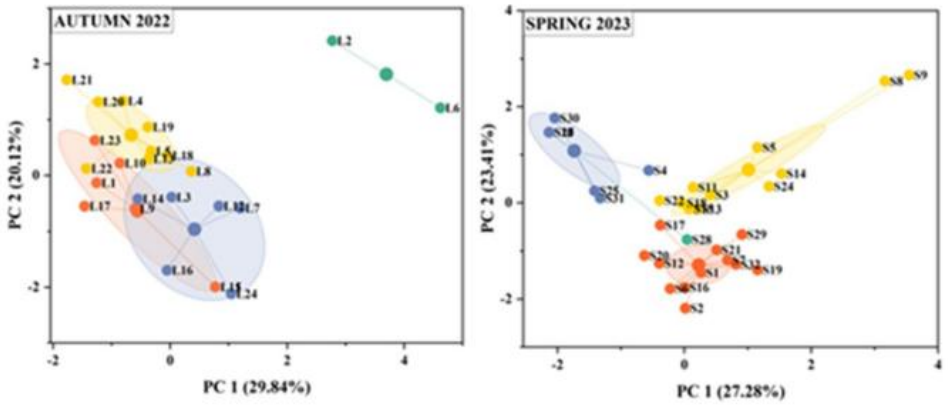


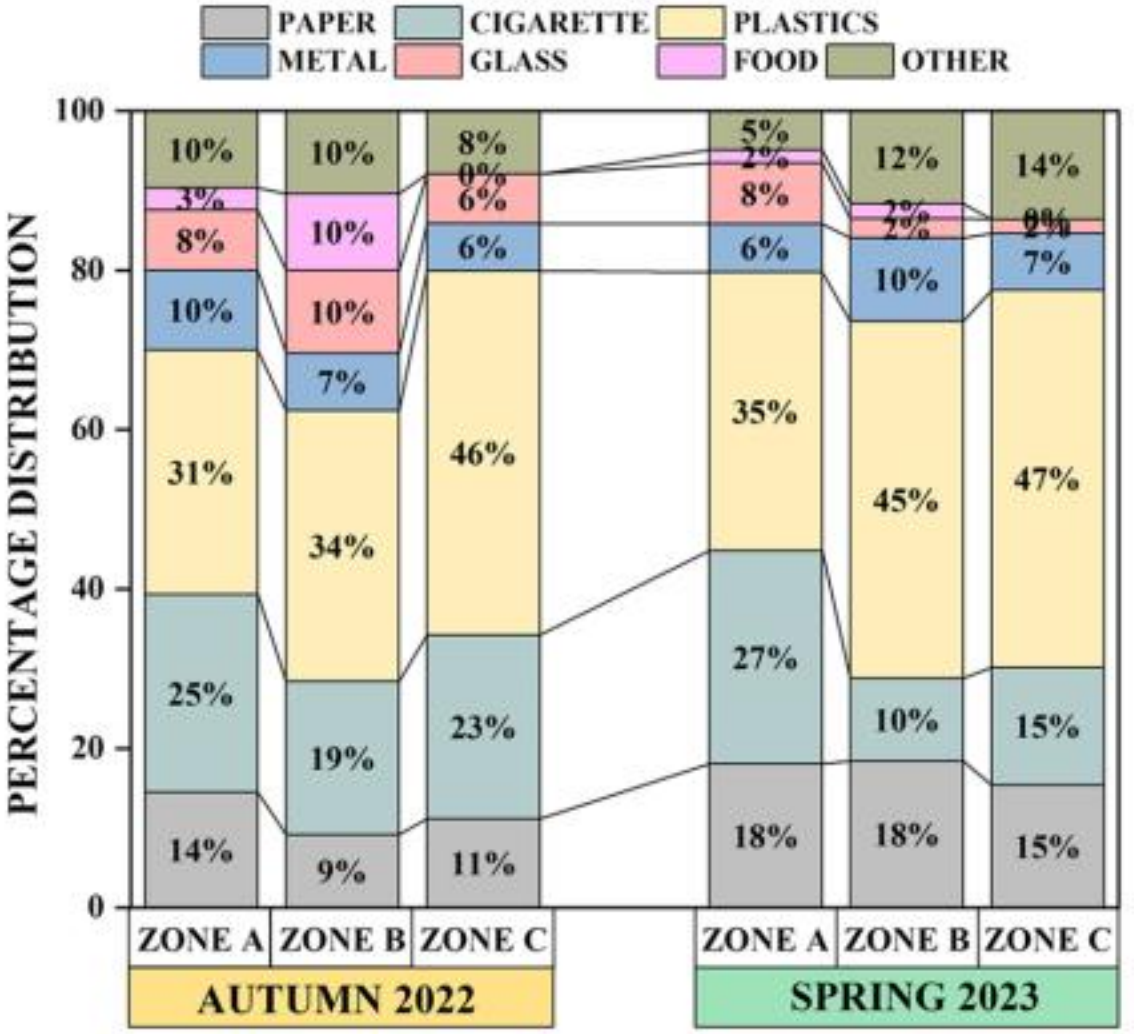
"Exploring the abundance and characteristics of litter in Lithuanian riversides: a citizen science approach"

Riverside litter *(Group A)*

- *Composition:* Plastic (34–42%) and cigarette butts (17–22%) were the most abundant. Seasonal variability.

- *K-means clustering analysis:* categorize locations based on their litter compositions.

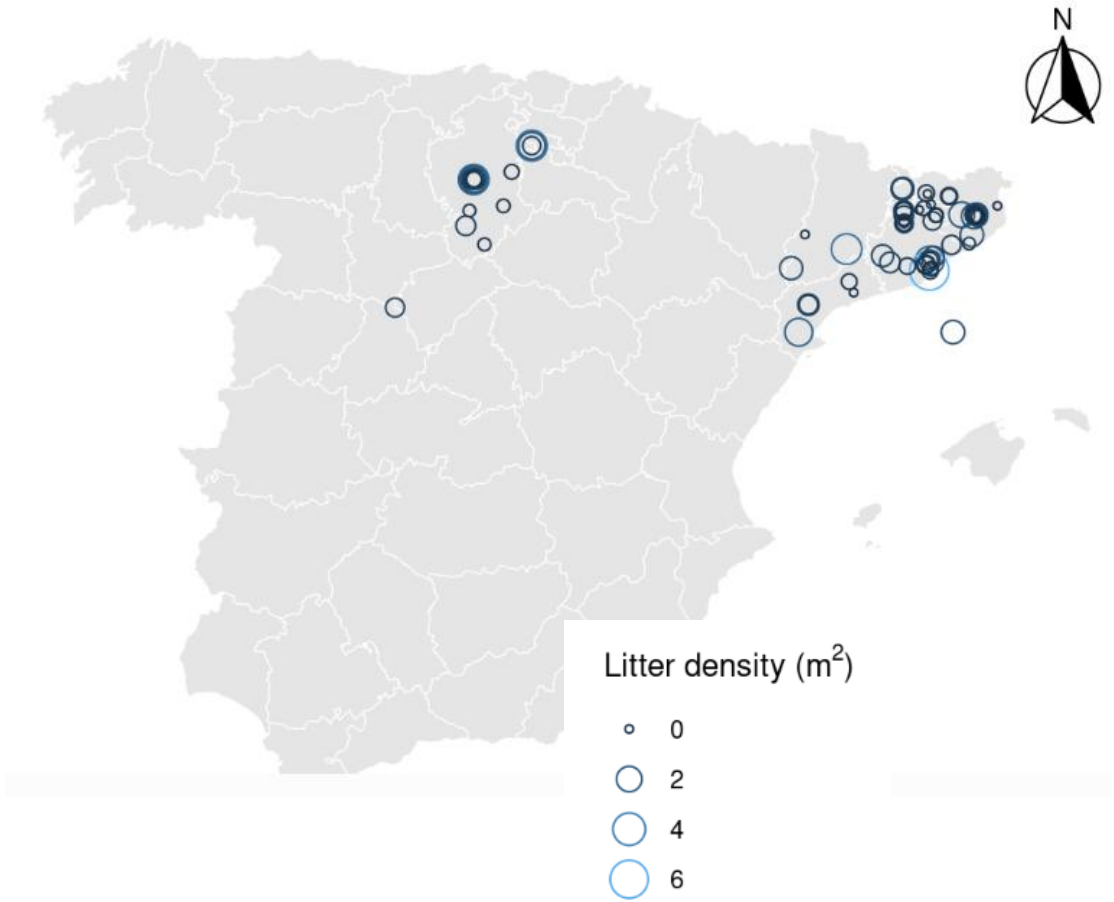


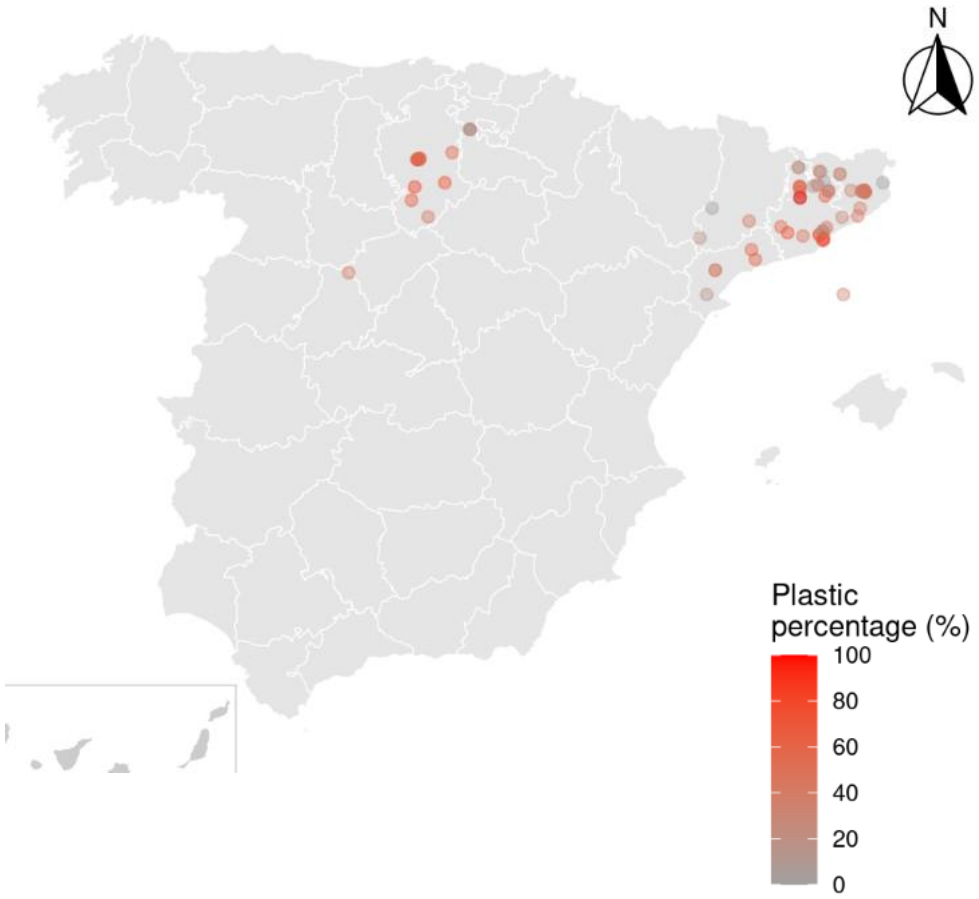


Other ideas...

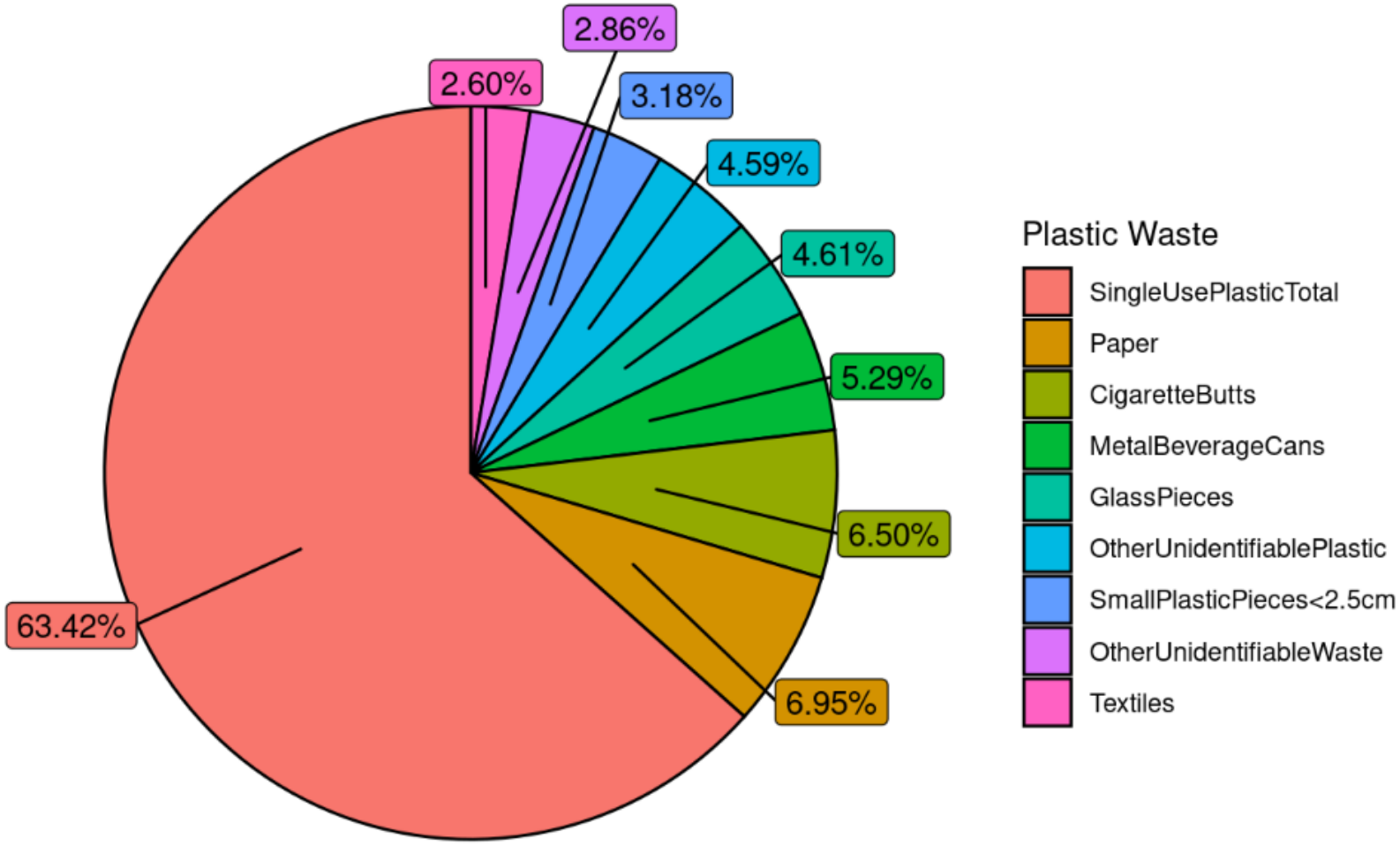
Analysis of the Spanish database 2022/23/24 *(under construction)*

Litter density and composition *(Group A)*

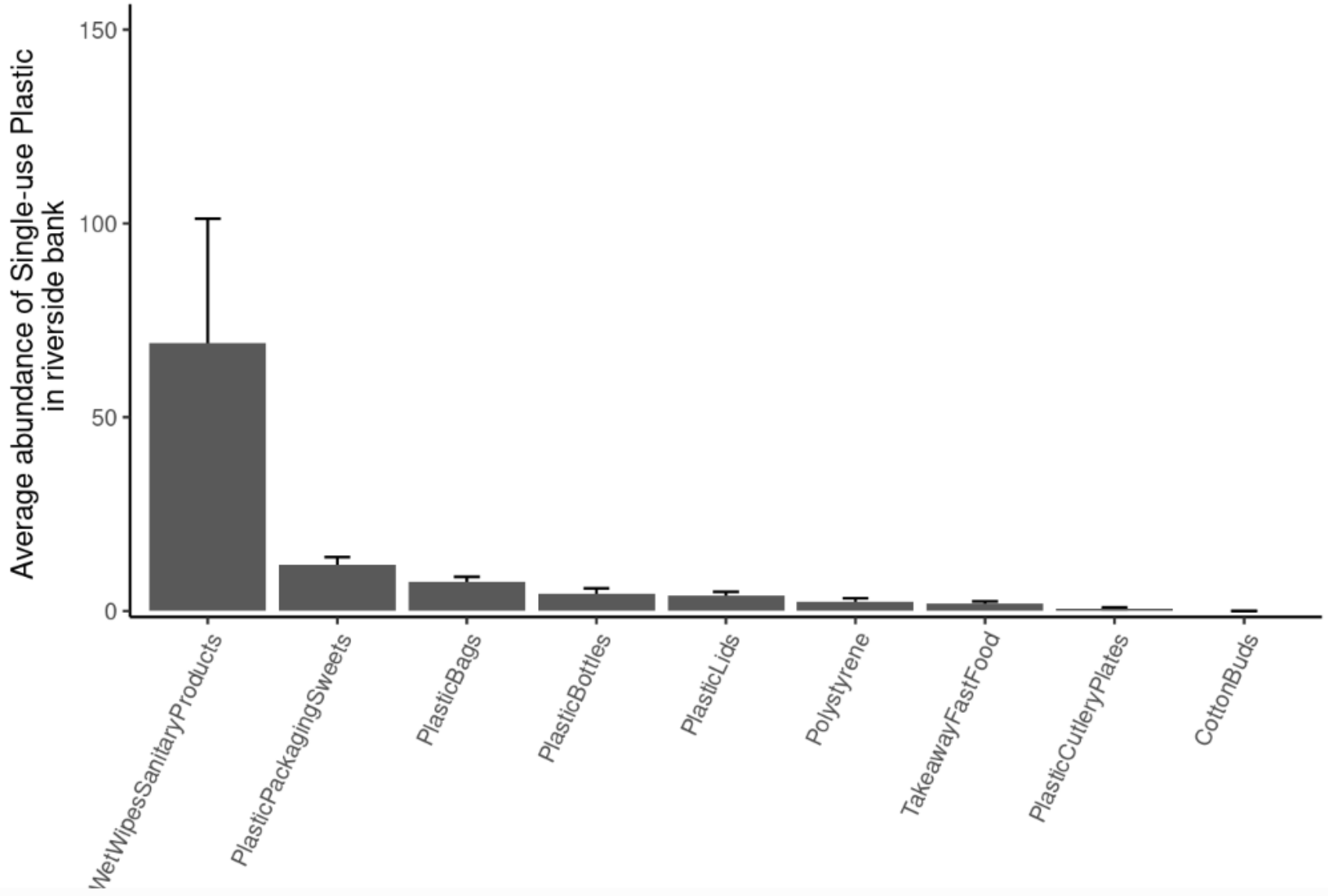




Litter composition *(Group B)* – Single-use plastics



Litter composition *(Group B)* – Single-use plastics



Open discussion:

Which key research questions should be addressed in our first European-level publication?