

Bridging the gap: synthesis of microplastic research from field and laboratory studies, facilitating a better understanding of microplastic impacts on freshwater biota

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Objective

To map-out the current knowledge regarding micro,-and nanoplastic interactions in freshwater biota (Figure 1) with focus on challenges and solutions

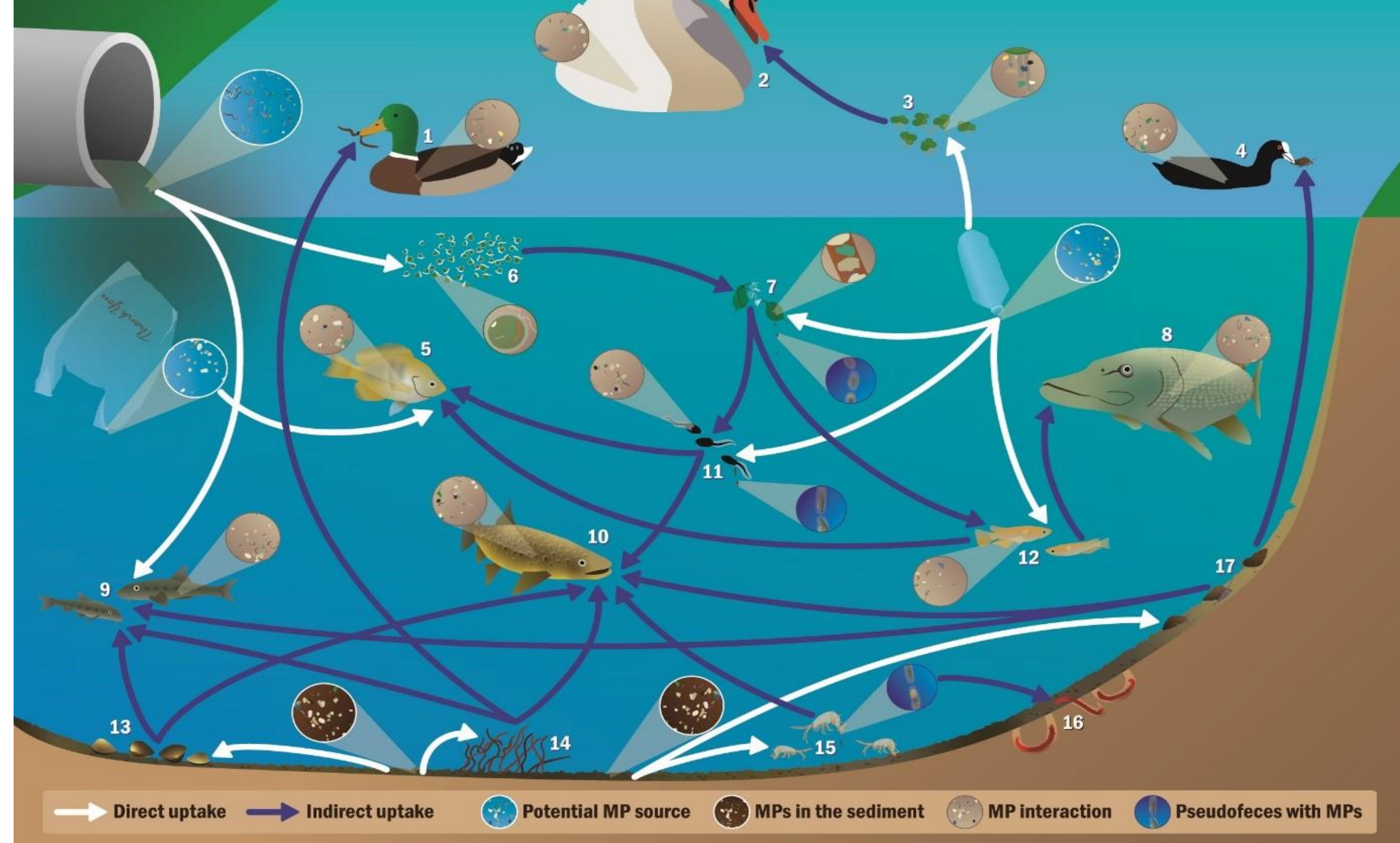


Figure 1. Conceptual model showing the proposed direct and indirect movement of microplastics in freshwater food-webs.

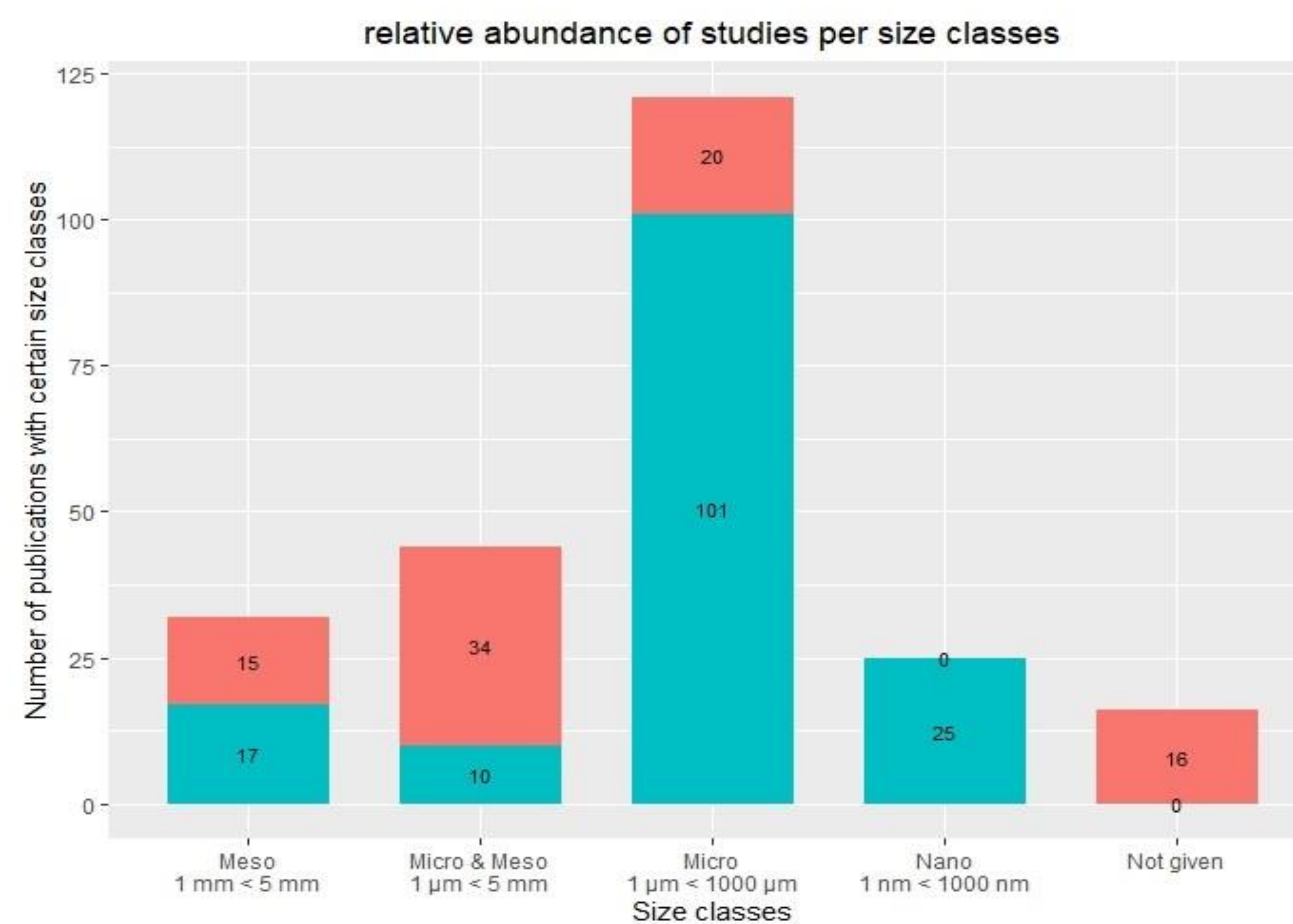


Figure 2. Relative abundance of the different plastic size categories

Recommendations for field sampling

- Collection of field samples in conjunction with biota samples
- Separation of organism to its constituents
- Usage of same digestion method
- Identification methods
- Recording physical characteristics of microplastics
- Reporting the smaller detection limit

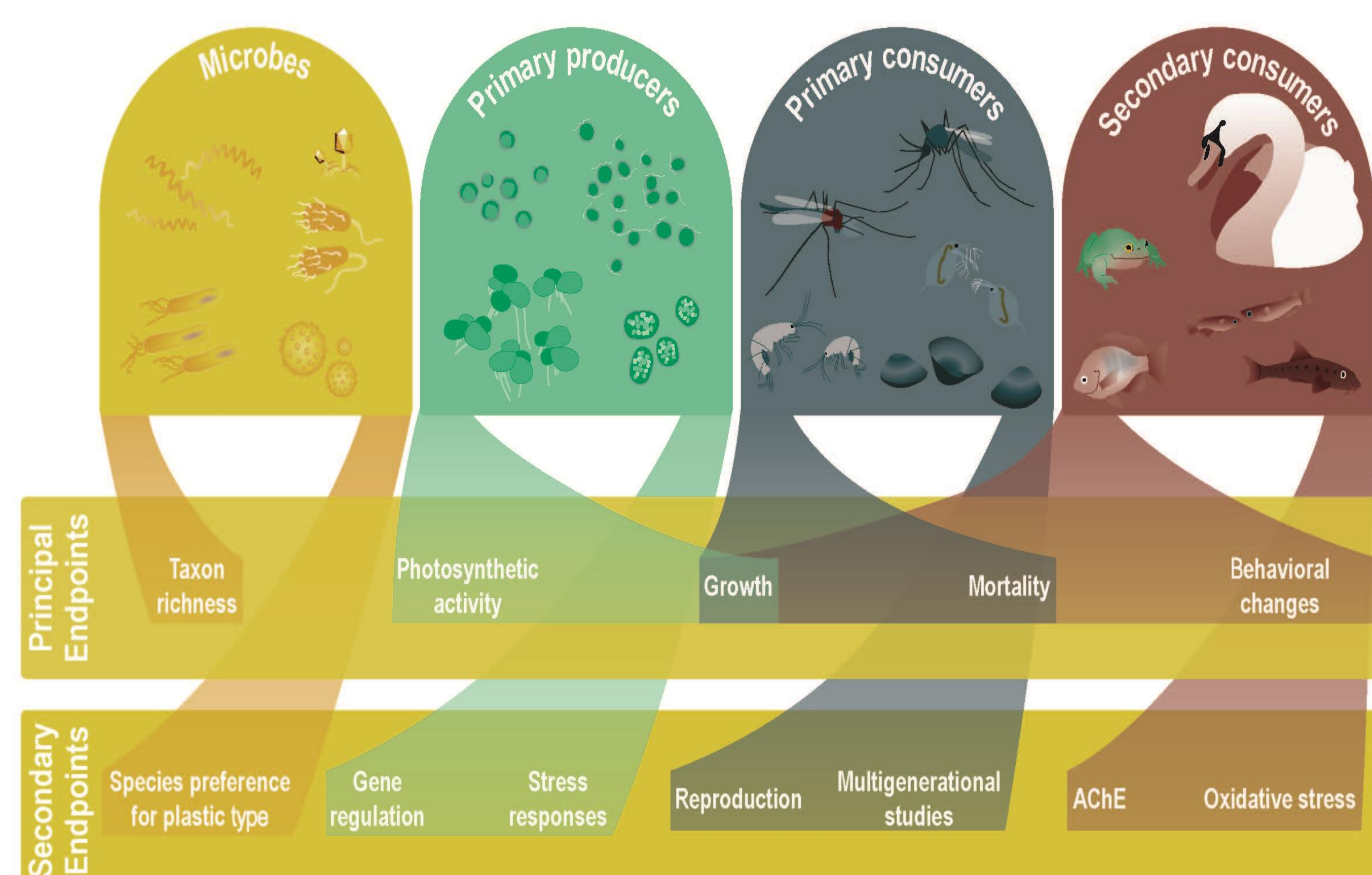


Figure 4. potential principal and secondary toxicity endpoints to be included in future studies.

Methods

Literature search was conducted on ISI Web of Knowledge with the advanced key search equation. Full text analysis of obtained studies was subsequently conducted and screened for four compulsory elements: 1) Original study, 2) Fresh water study 3) Biota interaction and 4) Microplastics < 5 mm.

Findings

There is difference in size and morphology categories used/reported (Figure 2, Table 1) with cladocerans and fish over presented (Figure 3)

Type of study	Number of studies	Most common morphology	Most prevalent plastic type
Field	44	Fibres	PE, PP, PS, PET and PA
Laboratory	102	Granules/spheres	PS, PE, PP, 'others' and PET

Table 1. Table showing key findings between field and laboratory studies

Number of published MP interaction studies with freshwater biota groups

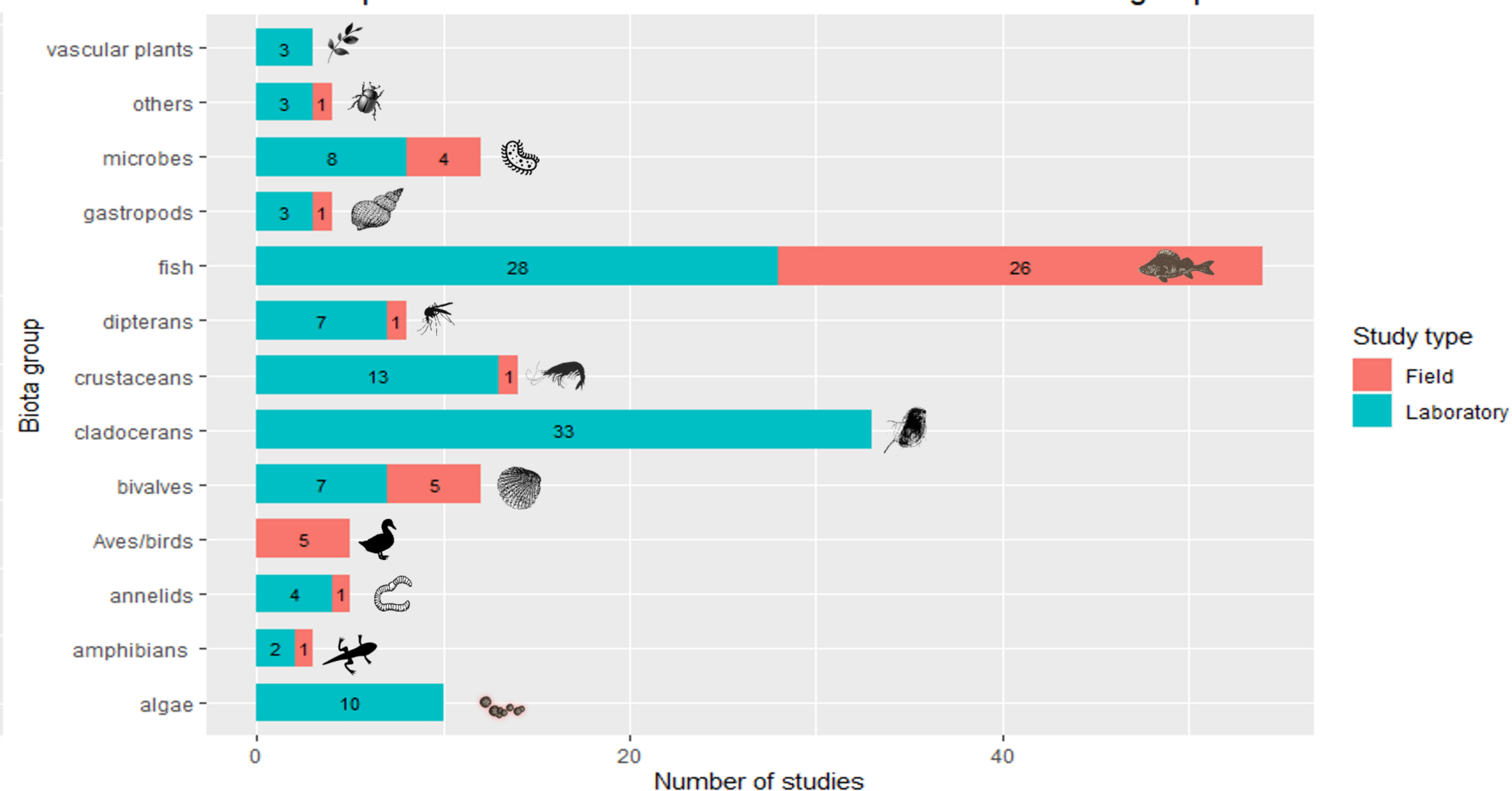


Figure 3. Number of published microplastic interaction studies in freshwater biota groups.

Recommendations for laboratory studies

- Environmentally relevant media (i.e. river water)
- Food provision

Setting baselines for:

- Effects of morphology
- Effects of chemical composition
- Effects of size

We recommend *principal endpoints* that should be included in each microplastics effects study in the future (Figure 4)

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