

Microplastics Definition

Plastic particles ranging in size from 5 mm to 1 nm^{1,2}

¹ California State Water Board 2020

² European Chemicals Agency 2019



Two General Steps

1. Extraction

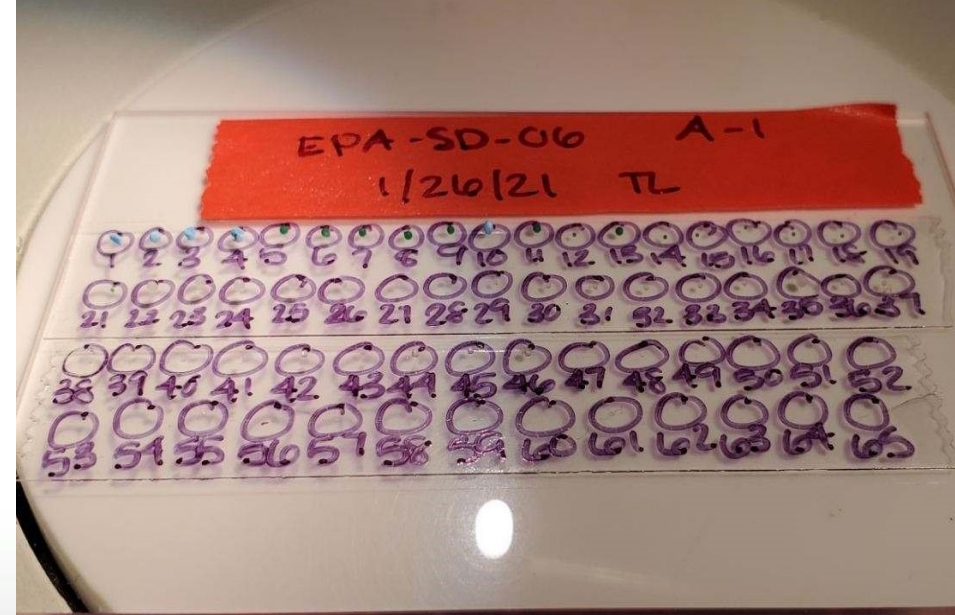
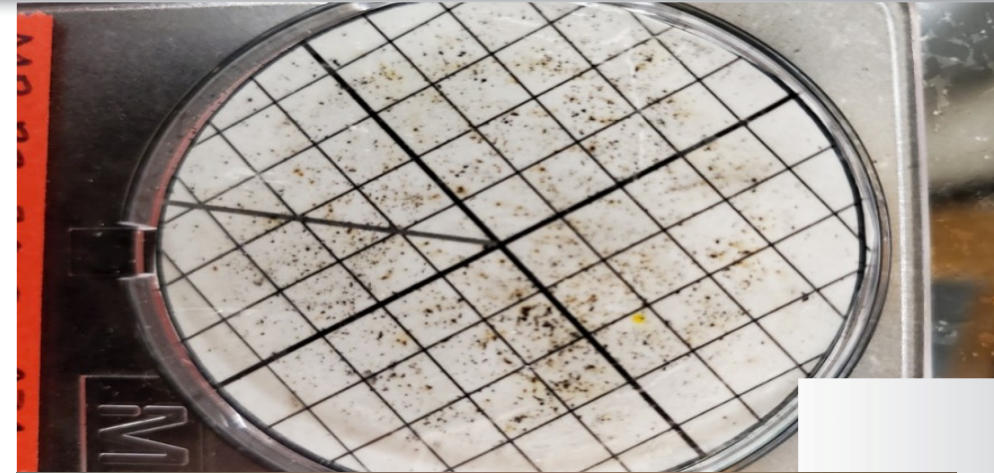
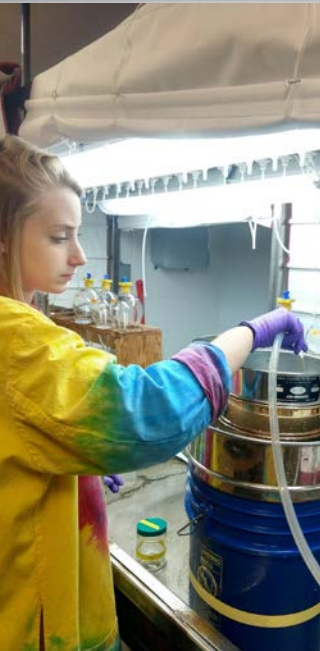
2. Identification

Extraction (complicated matrix):

- 💧 Sieving
- 💧 Density separation
- 💧 Oxidation

Identification

- 💧 Pick particles and scan filter for polymers



Identification: Common Analytical Instrumentation

FTIR



Raman



Pyrolysis GC/MS



Spectroscopic methods

Heat and mass of molecule

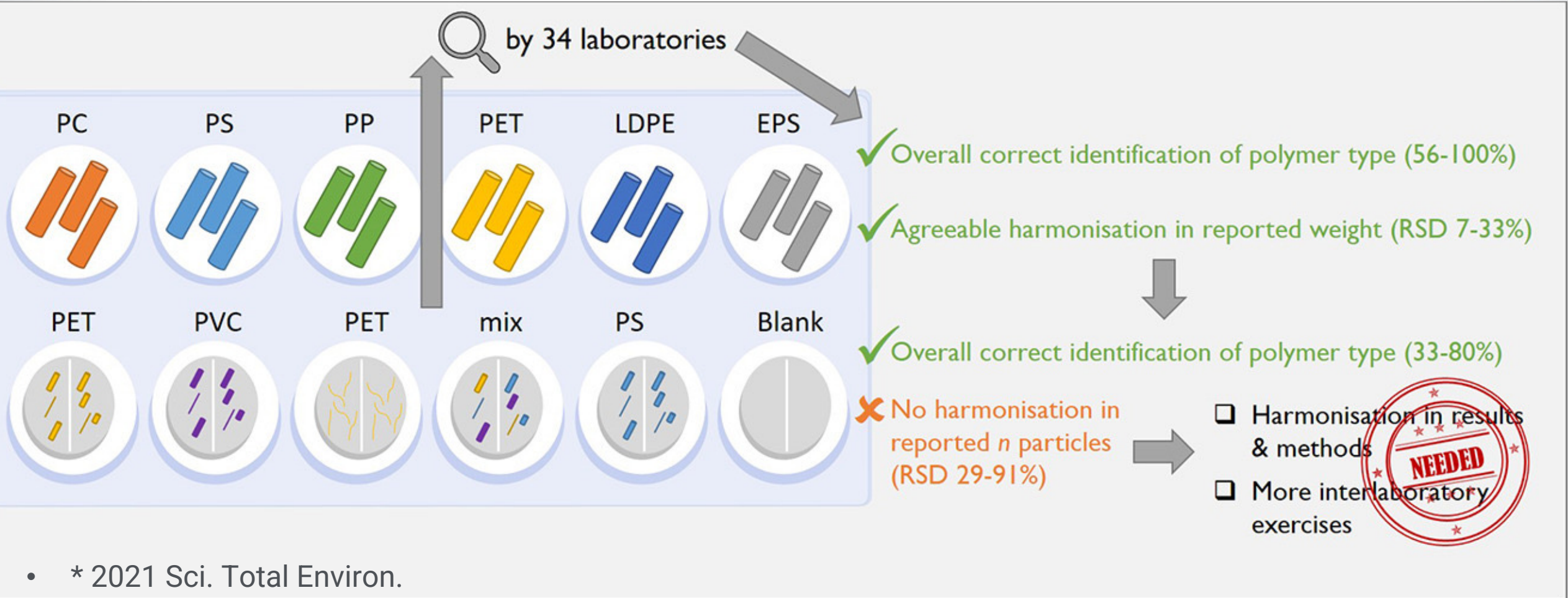
Inter-laboratory Comparisons of Methods

- 1) WEPAL-QUASIMEME/NORMANs* first global inter-laboratory study on microplastics in water (2018)
- 2) European Commission Joint Research Study- measure microplastics in water (2019)
- 3) Southern California Coastal Water Research Project (SCCWRP) inter-laboratory study (2019) clean water, dirty water, fish tissue and sediment.

*van Mourik et al. (2021). "Results of WEPAL-QUASIMEME/NORMANs first global inter-laboratory study on microplastics reveal urgent need for harmonization ." [Science of The Total Environment 772: 145071.](#)

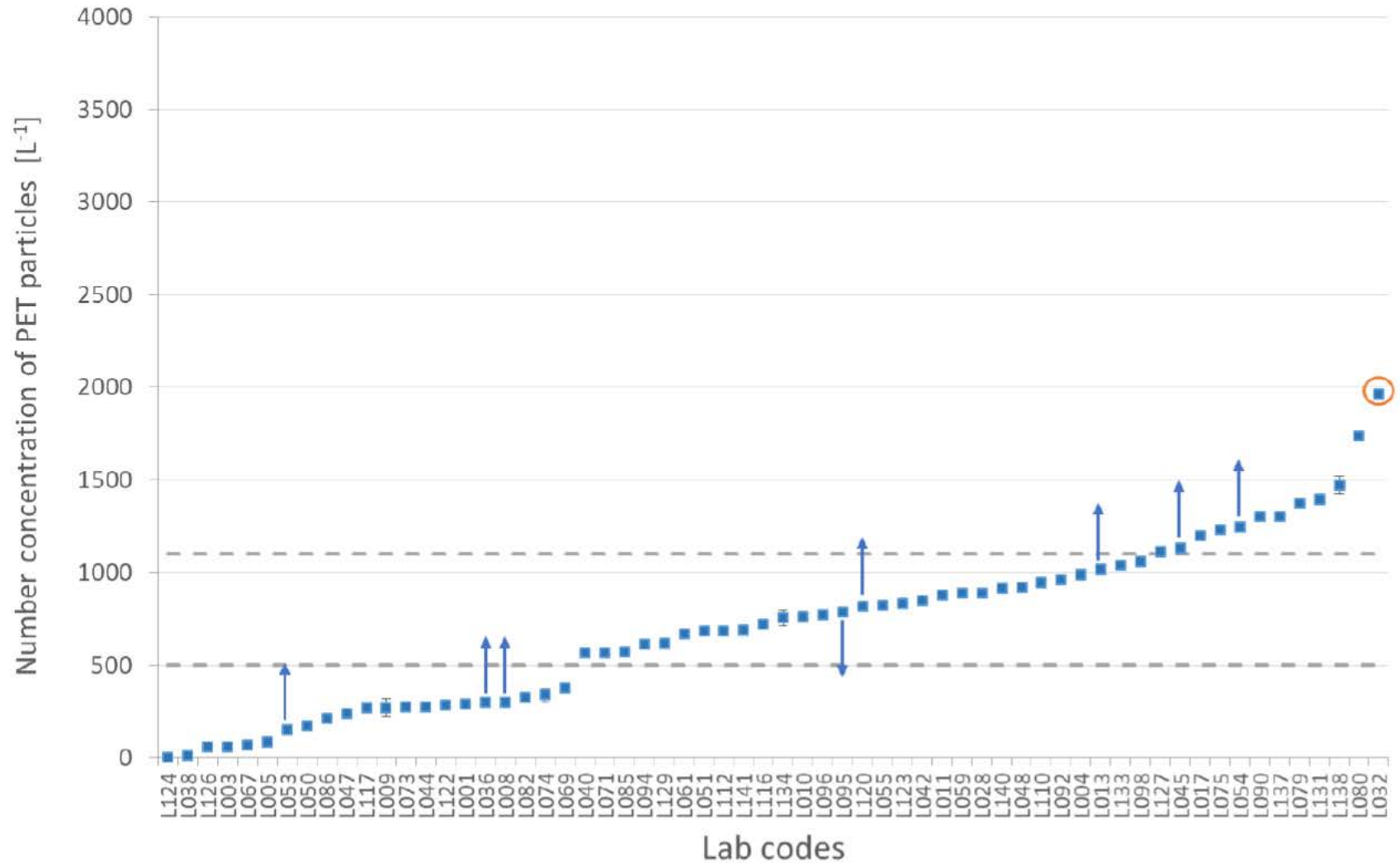
^Belz S. (2021). Current status of the quantification of microplastics in water – Results of a JRC/BAM inter-laboratory comparison study on PET in water. Luxembourg, EUR 30799 EN, Publications Office of the European Union, Luxembourg.

WEPAL-QUASIMEME / NORMANs Inter-laboratory Study

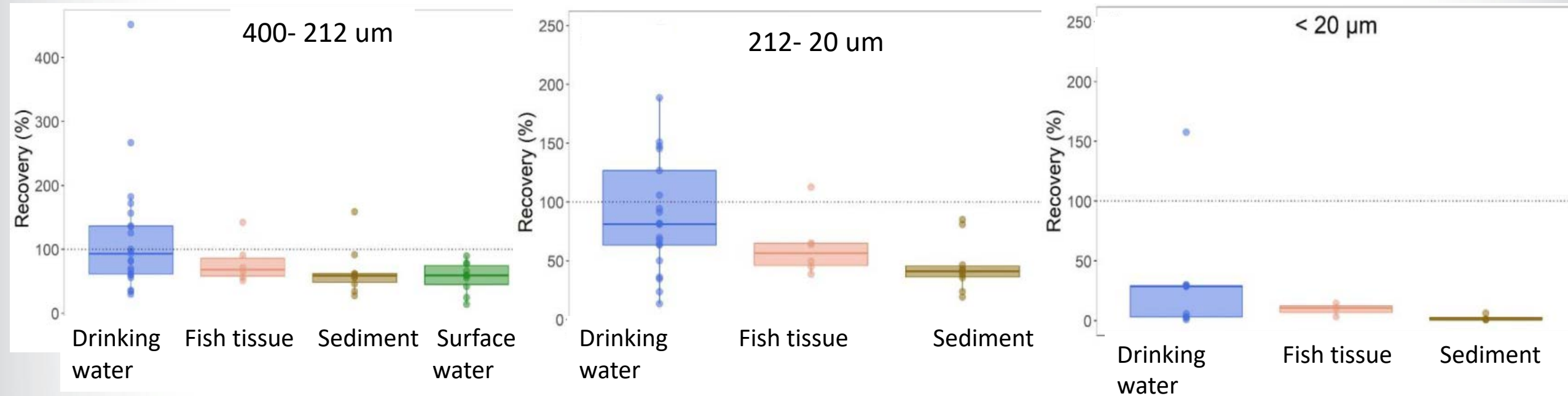


JRC Study of Inter-laboratory Comparison of PET in Water

Water Matrix
30 - 200µm
500 - 1000/ L



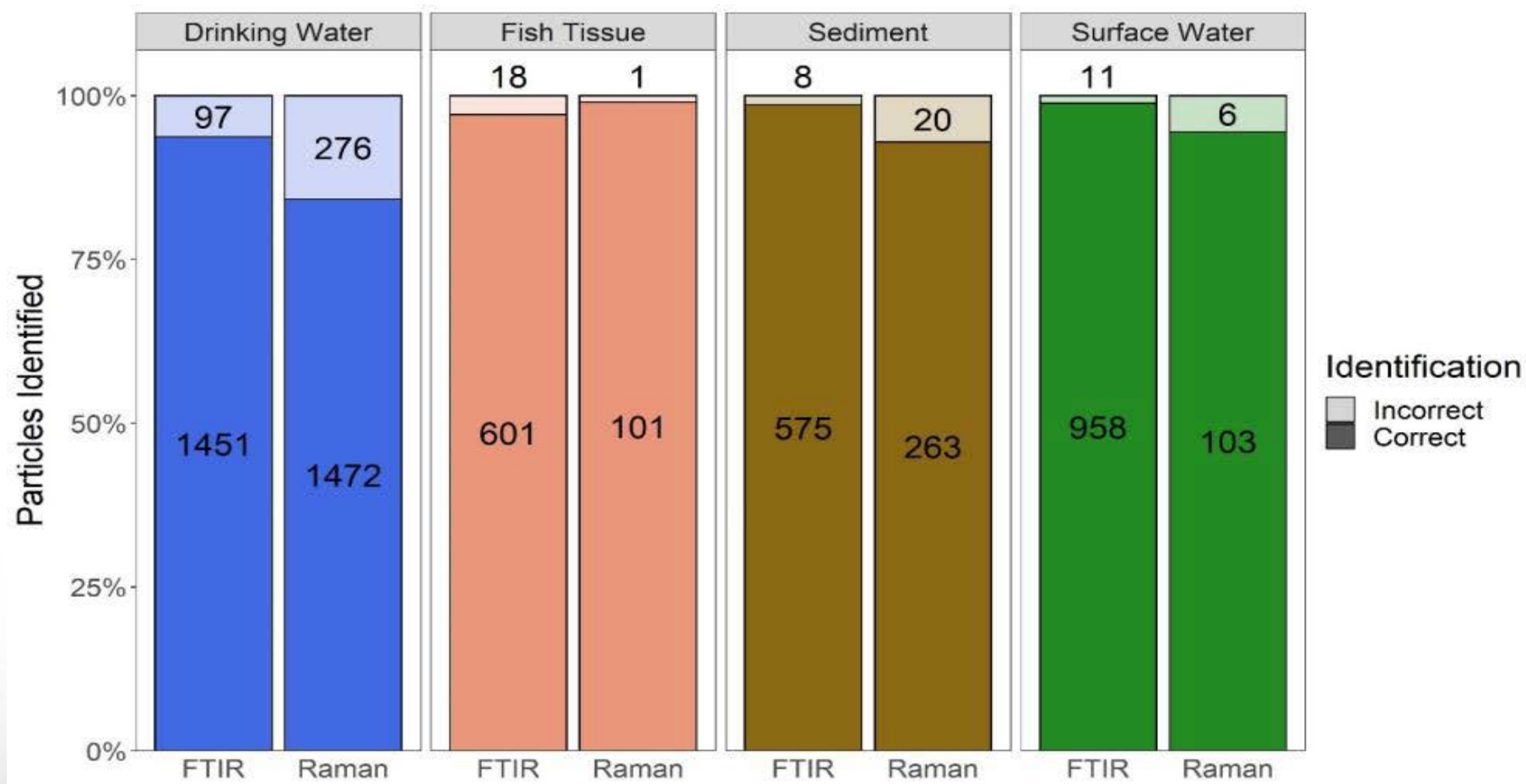
SCCWRP Study: Recovery and Precision within Labs



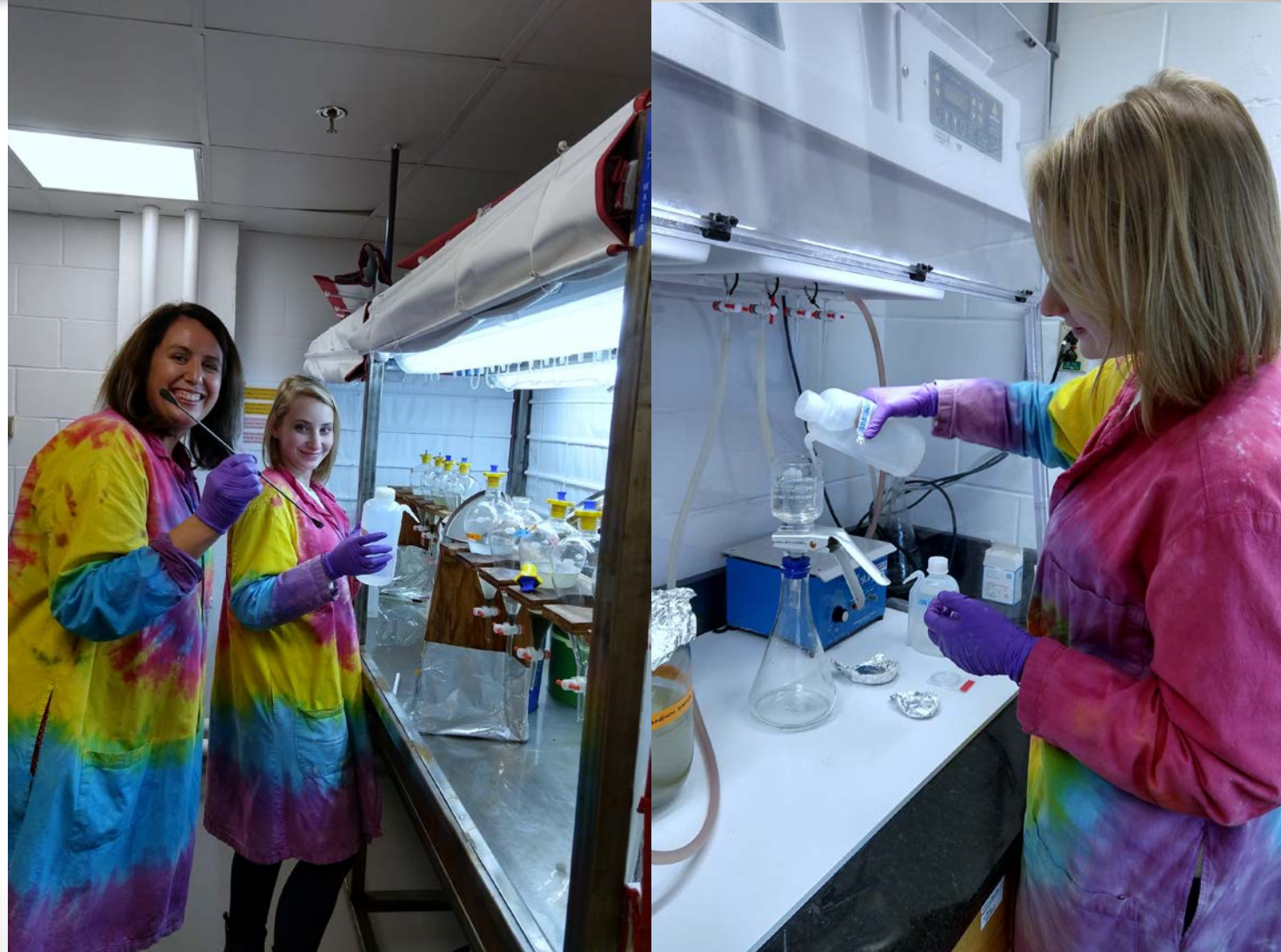
Thorton et al. accepted, Chemosphere.

Accuracy of FTIR and Raman

- Both FTIR (left) and Raman (right) accurately ID plastic particles for all matrices



- 💧 Plastics are ubiquitous
- 💧 Plastic clean room
- 💧 Air handling
- 💧 Clothing policy
- 💧 Procedural blanks
- 💧 Spiked blanks



Take Home From these Three Inter-laboratory Studies

- QA/ QC
- Smaller the particle, the more difficult the analysis
- Complex matrix, difficult analysis
- Proscribed methods may increase precision
- Common spectroscopic methods are accurate (once the particle has been extracted)
- There is still work to be done to develop reproducible methods across laboratories