

Prospective study on macroplastics and microplastics in dredging sediments

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on Sediment Management*



IMT Lille Douai
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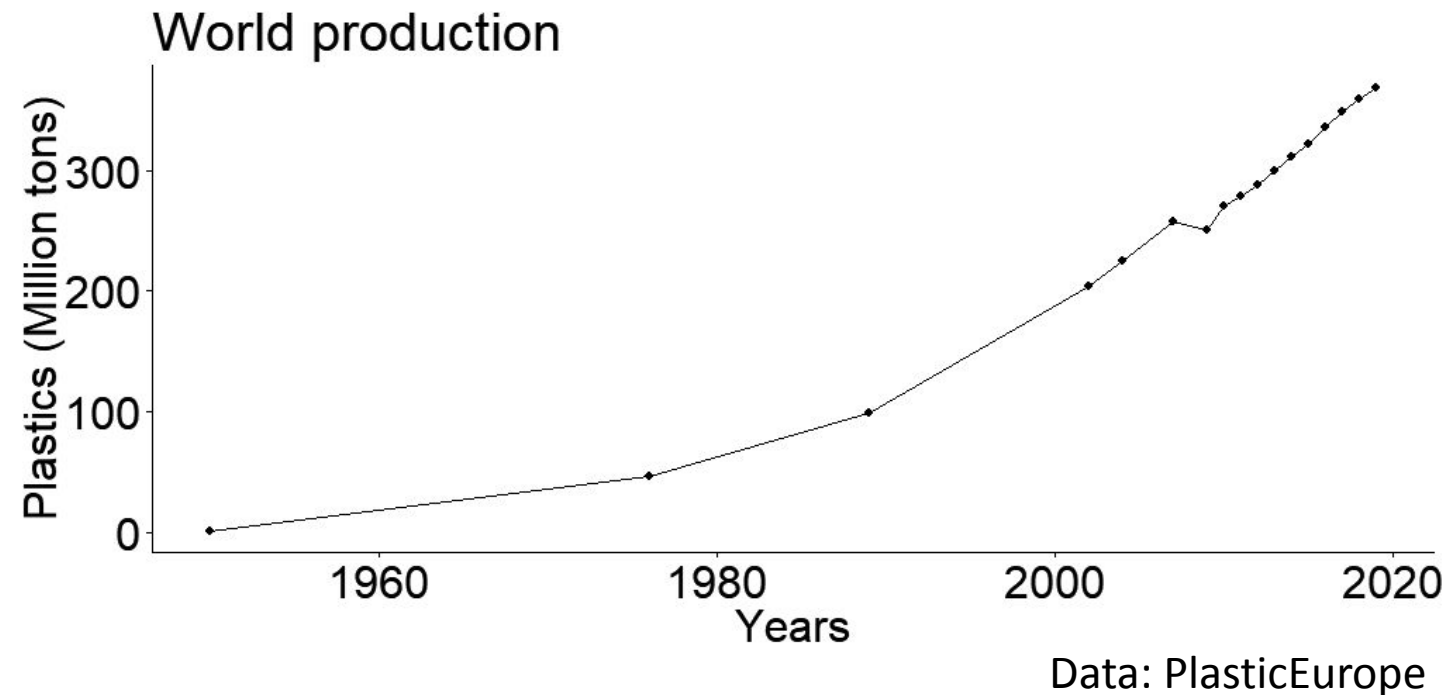


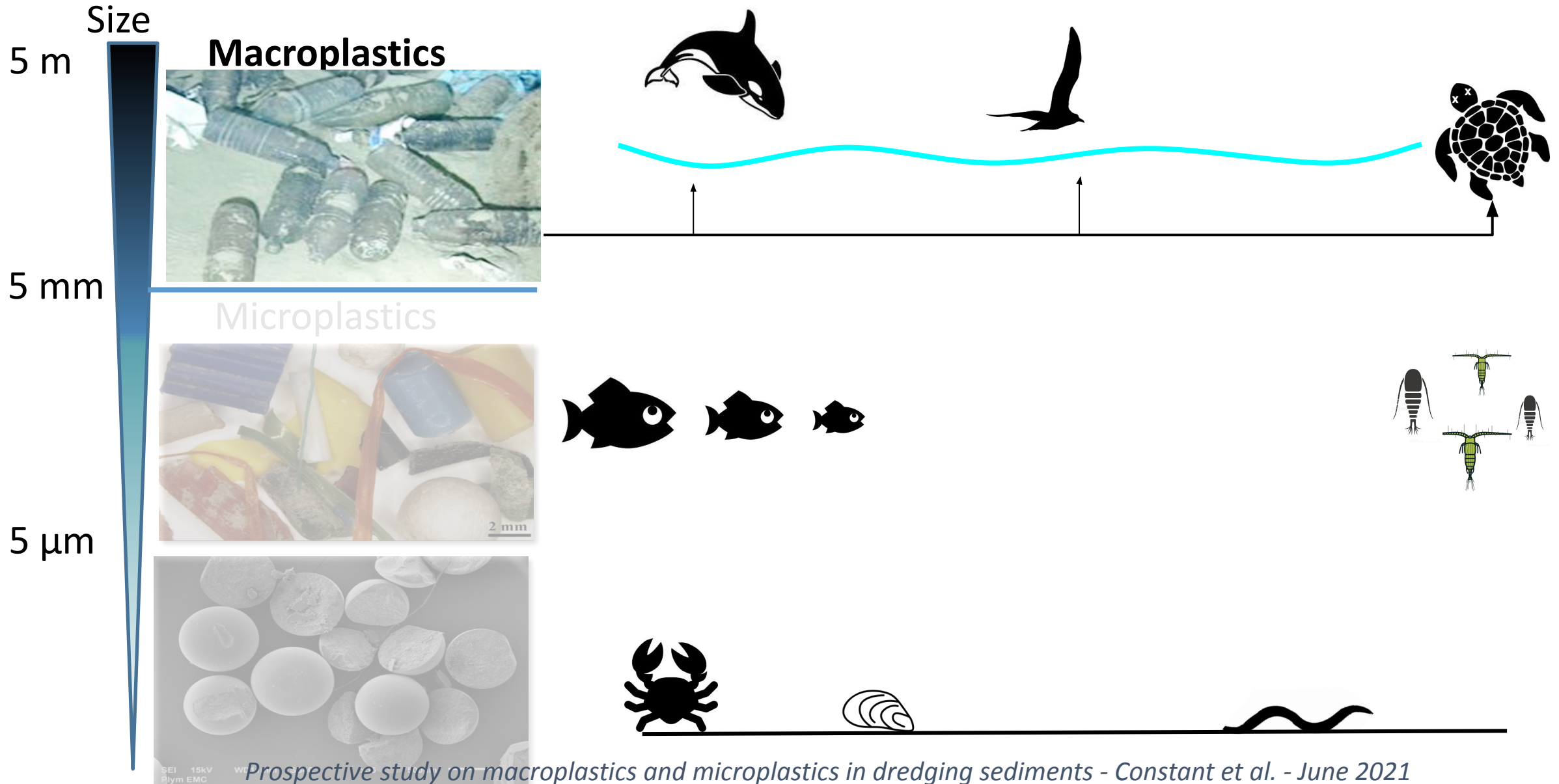
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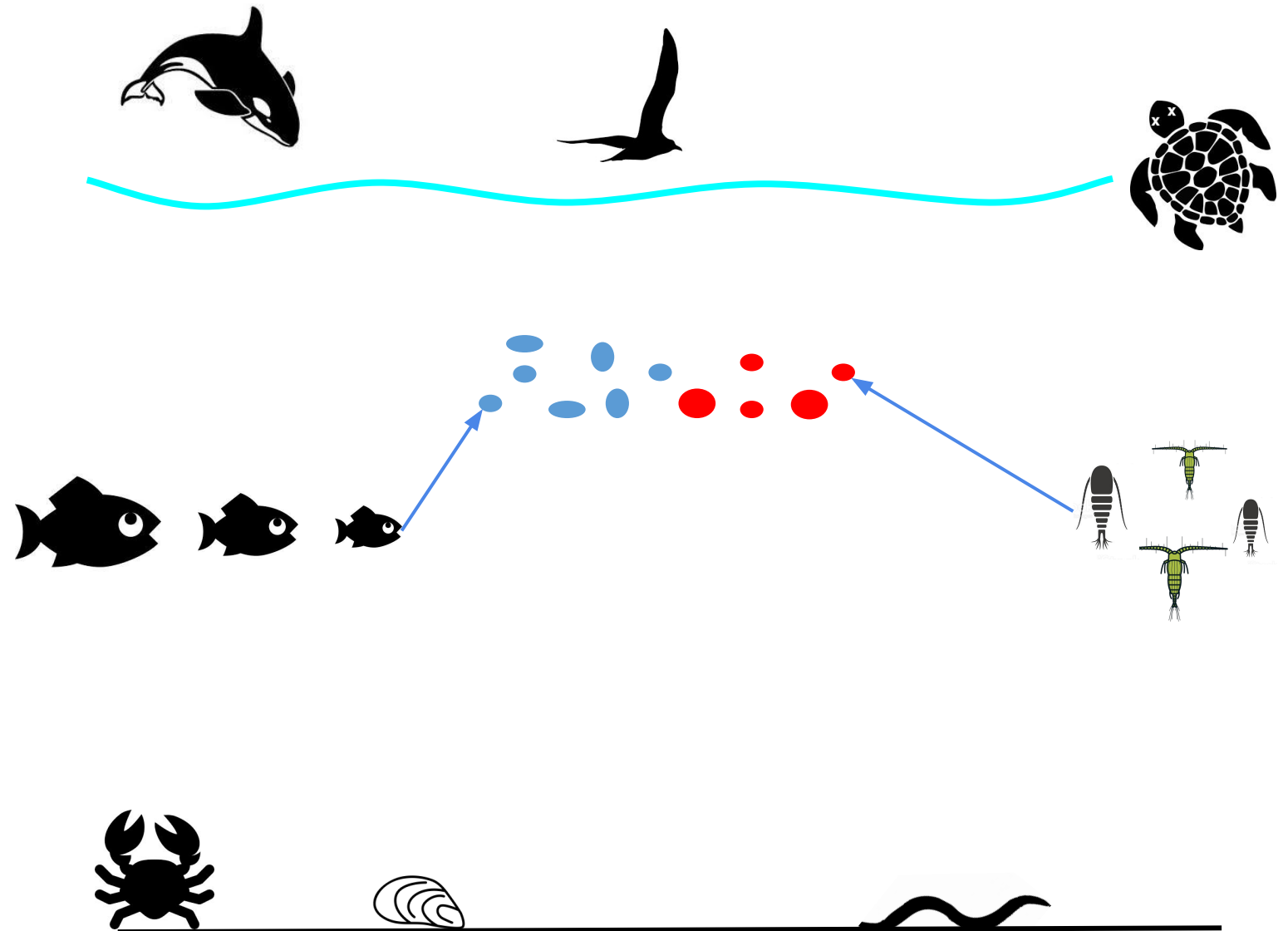
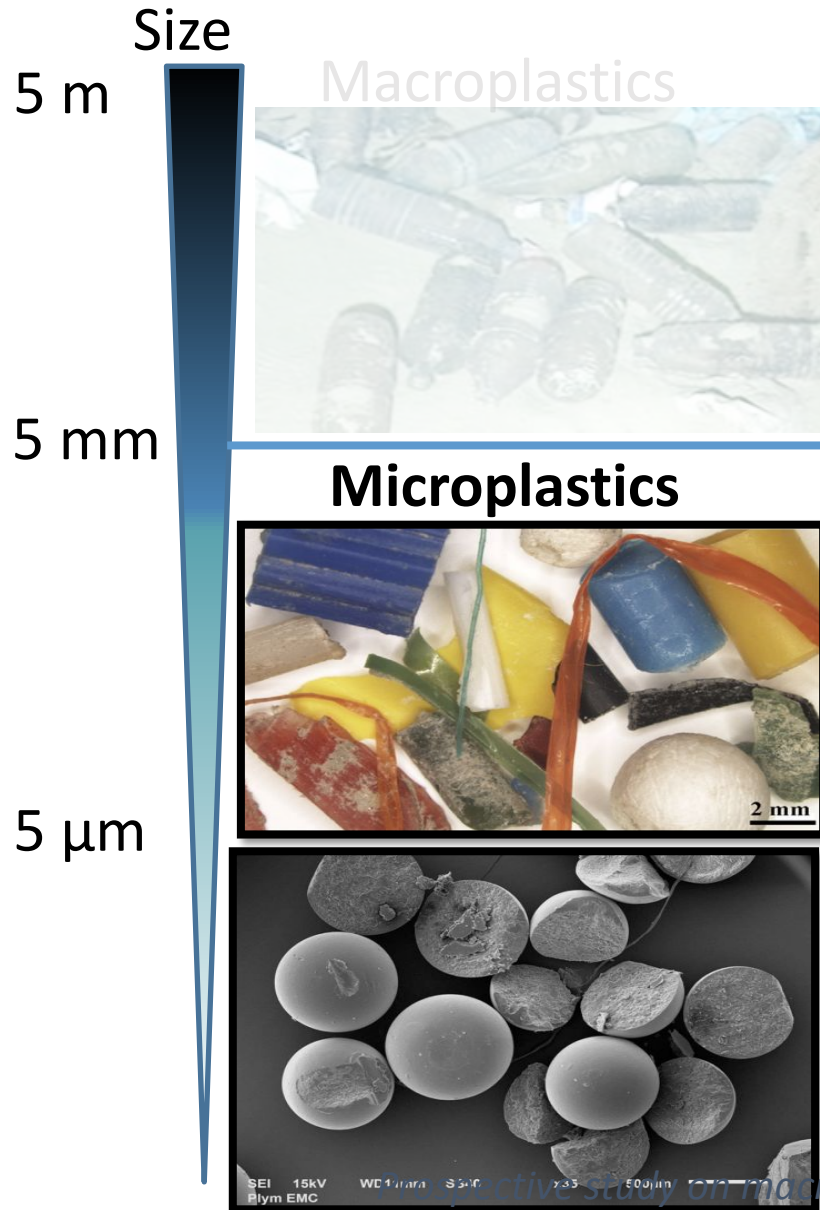


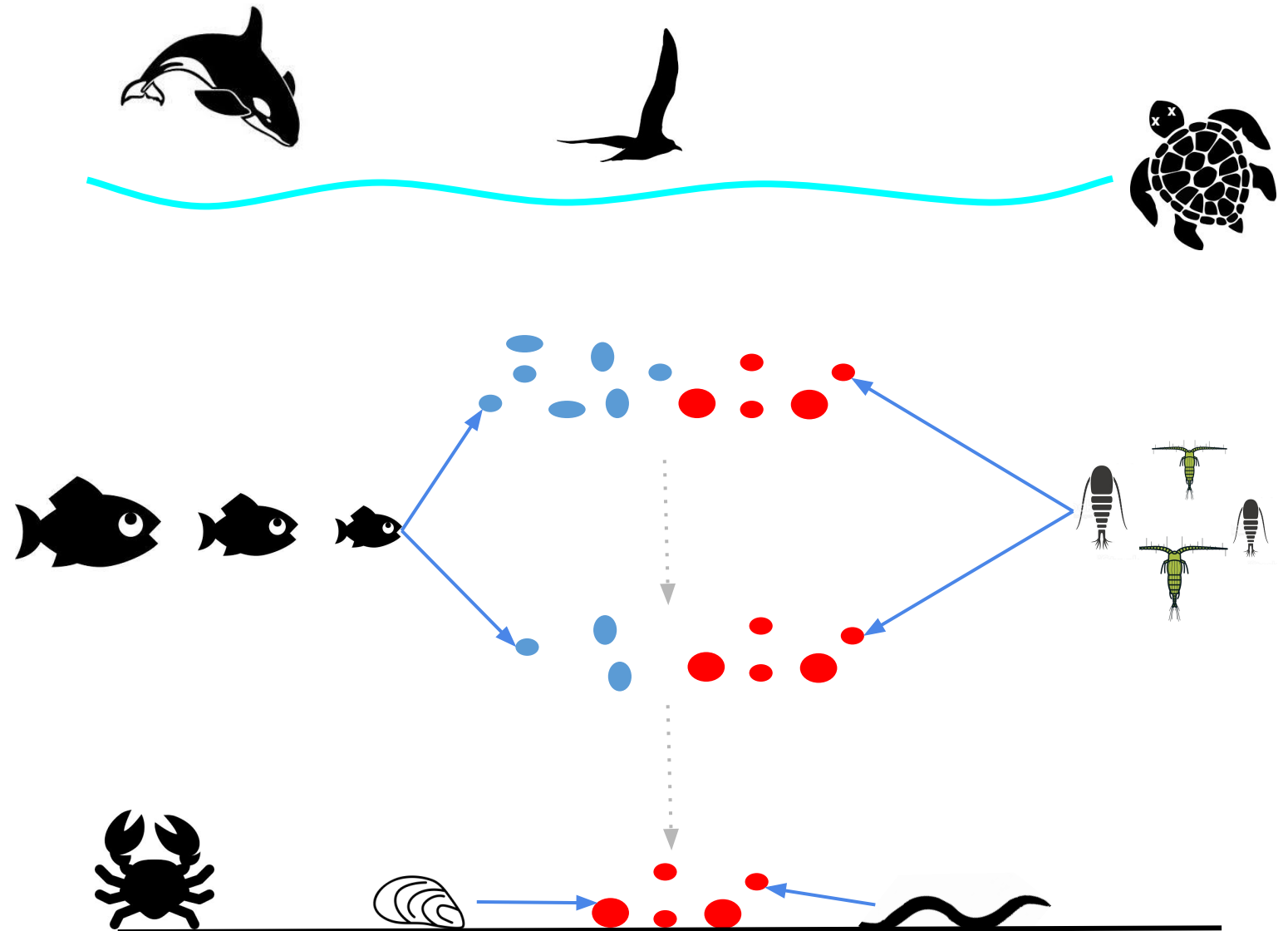
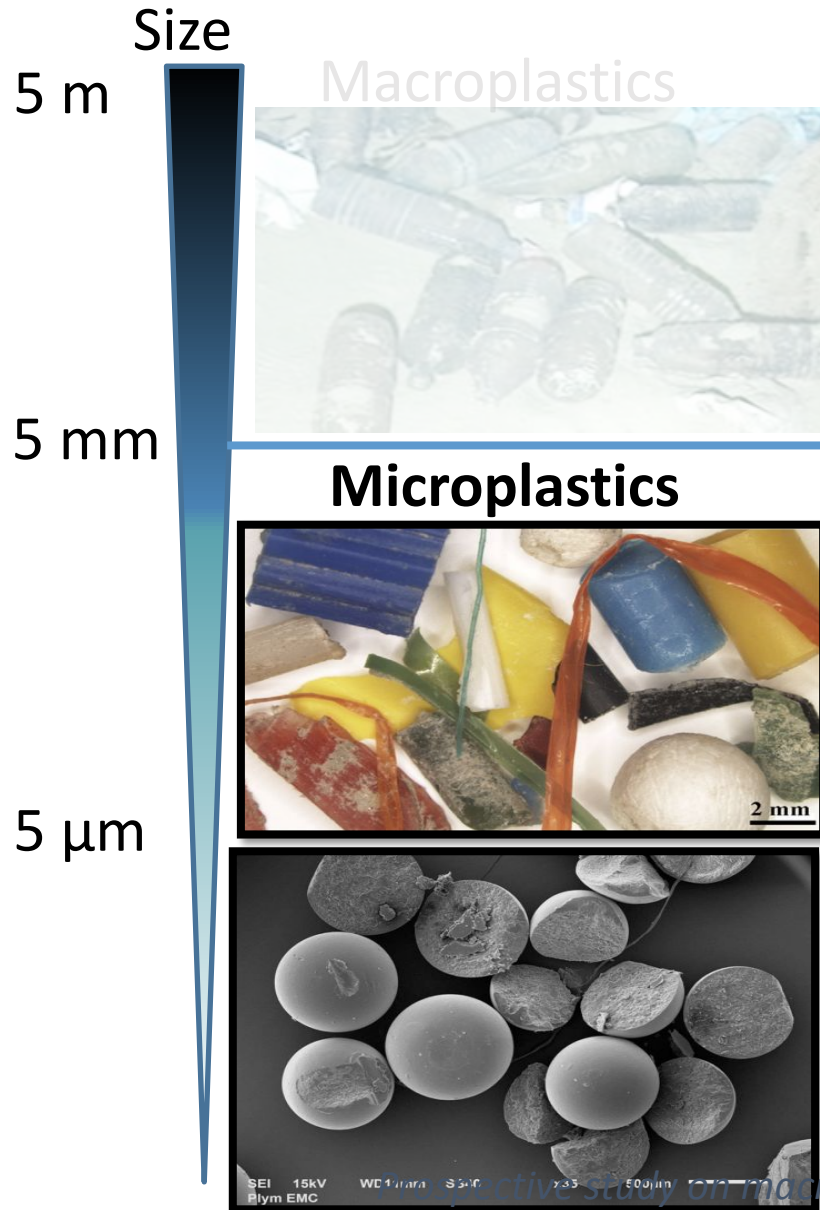
Plastic pollution: A persistent and global issue

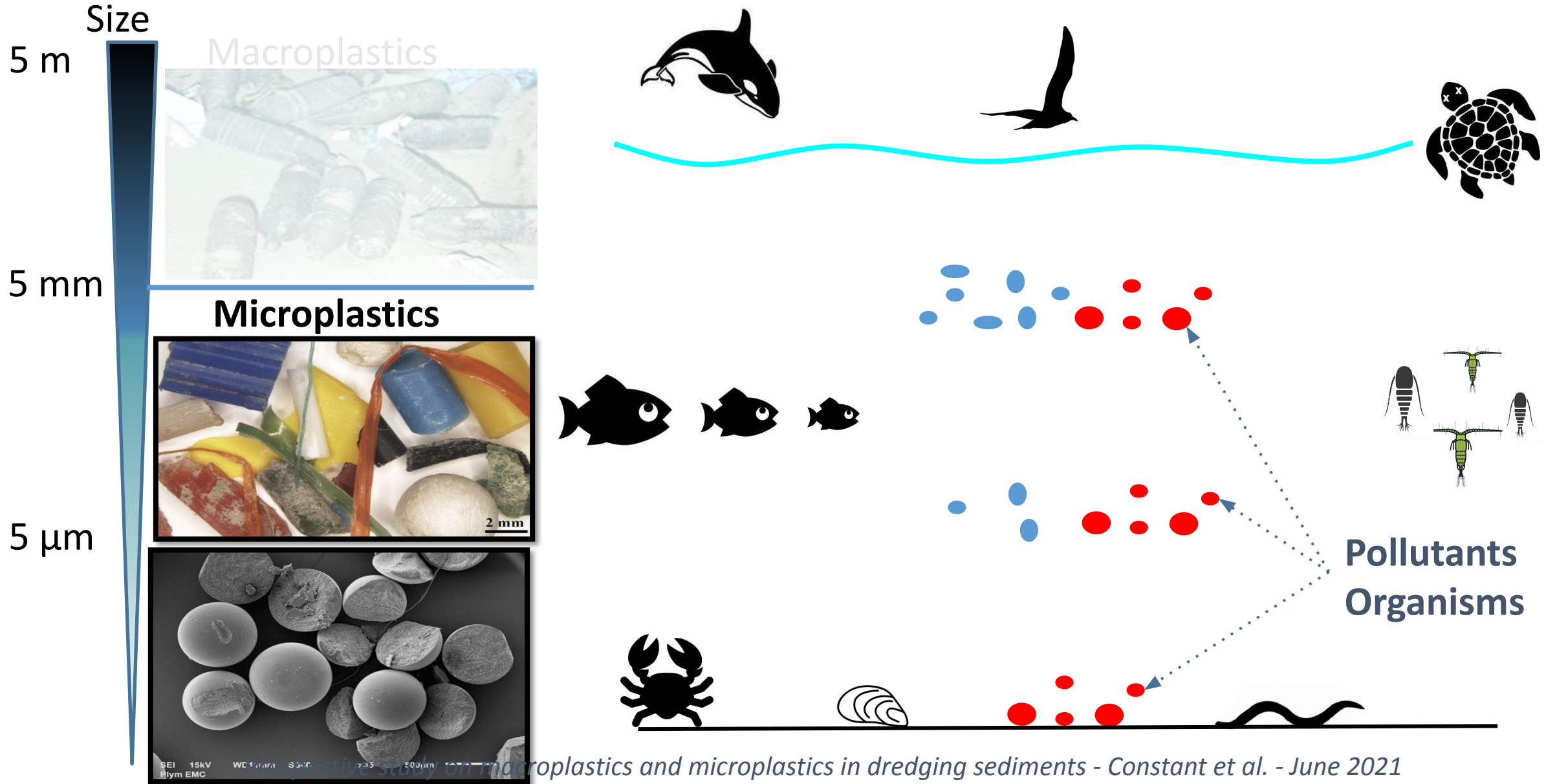
- Production:
> 3.7×10^8 tons (2019);
- To oceans: 2-5%
 - At the surface:
 1.0×10^4 - 2.5×10^5 tons;
- Lifetime:
 10^2 - 10^4 years.







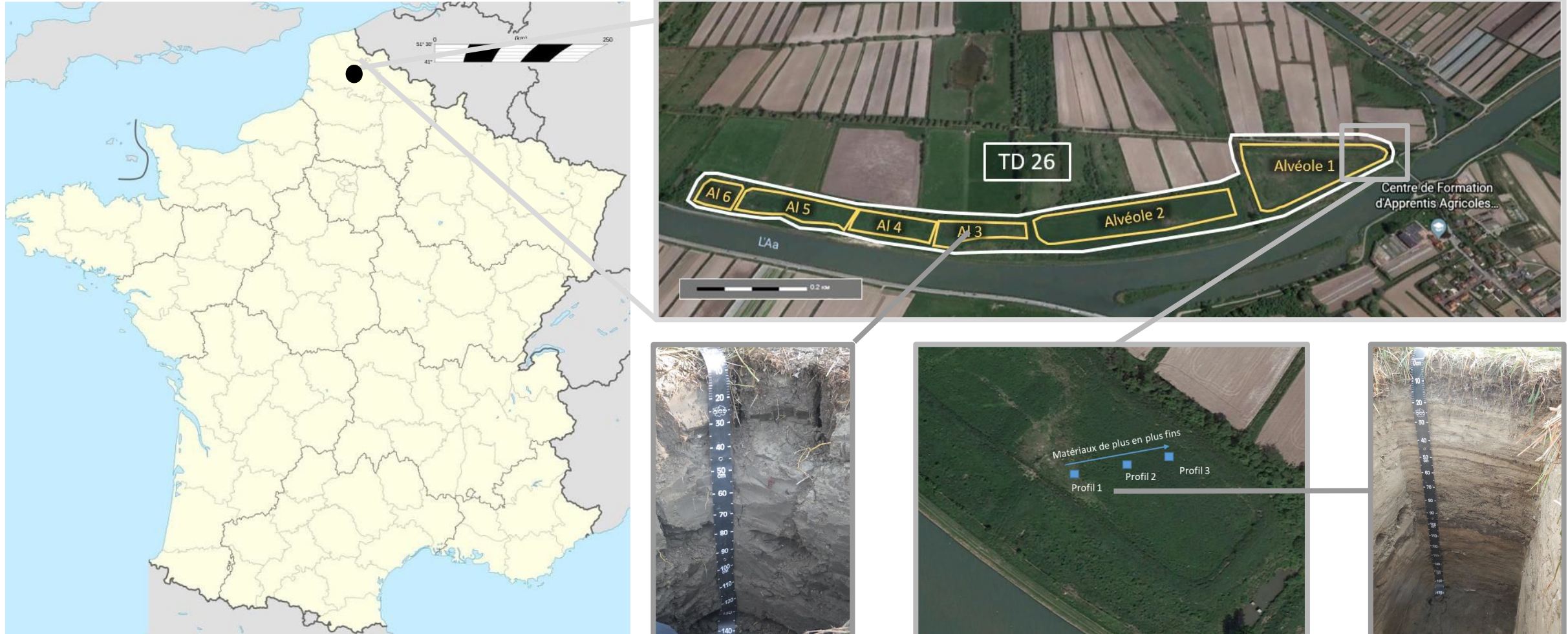




Dredging sediments: Interests

- River beds accumulate high quantities of plastics;
- Hydrodynamic processes are stopped after dredging;
- Long term **stock**: out of the plastic cycle ?
- No observation available.

Study case: Sampling sites



Prospective study on macroplastics and microplastics in dredging sediments - Constant et al. - June 2021

Plastics extraction from sediment: Macroplastics & microplastics

Sampling



Trowel

Plastics extraction from sediment: Macroplastics

Sampling ⇒ Treatment



Sieve 5 mm

Plastics extraction from sediment: Microplastics

Sampling ⇒ Treatment



Density separation (NaI; 1.6 kg/l)
Oxidation of organic matter (H₂O₂ 30%)

Plastics extraction from sediment: Macroplastics & microplastics

Sampling ⇒ Treatment ⇒ Observation



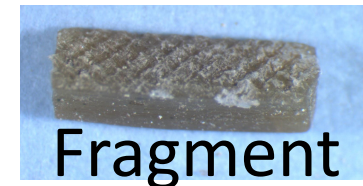
Stereo
microscope

Plastics extraction from sediment: Macroplastics & microplastics

Sampling ⇒ Treatment ⇒ Observation



Fiber



Fragment



Film



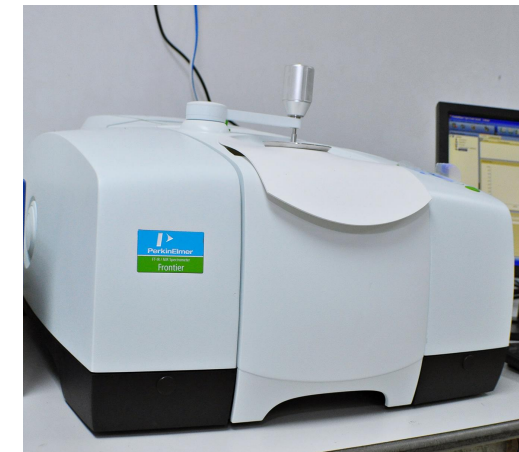
Foam



Bead

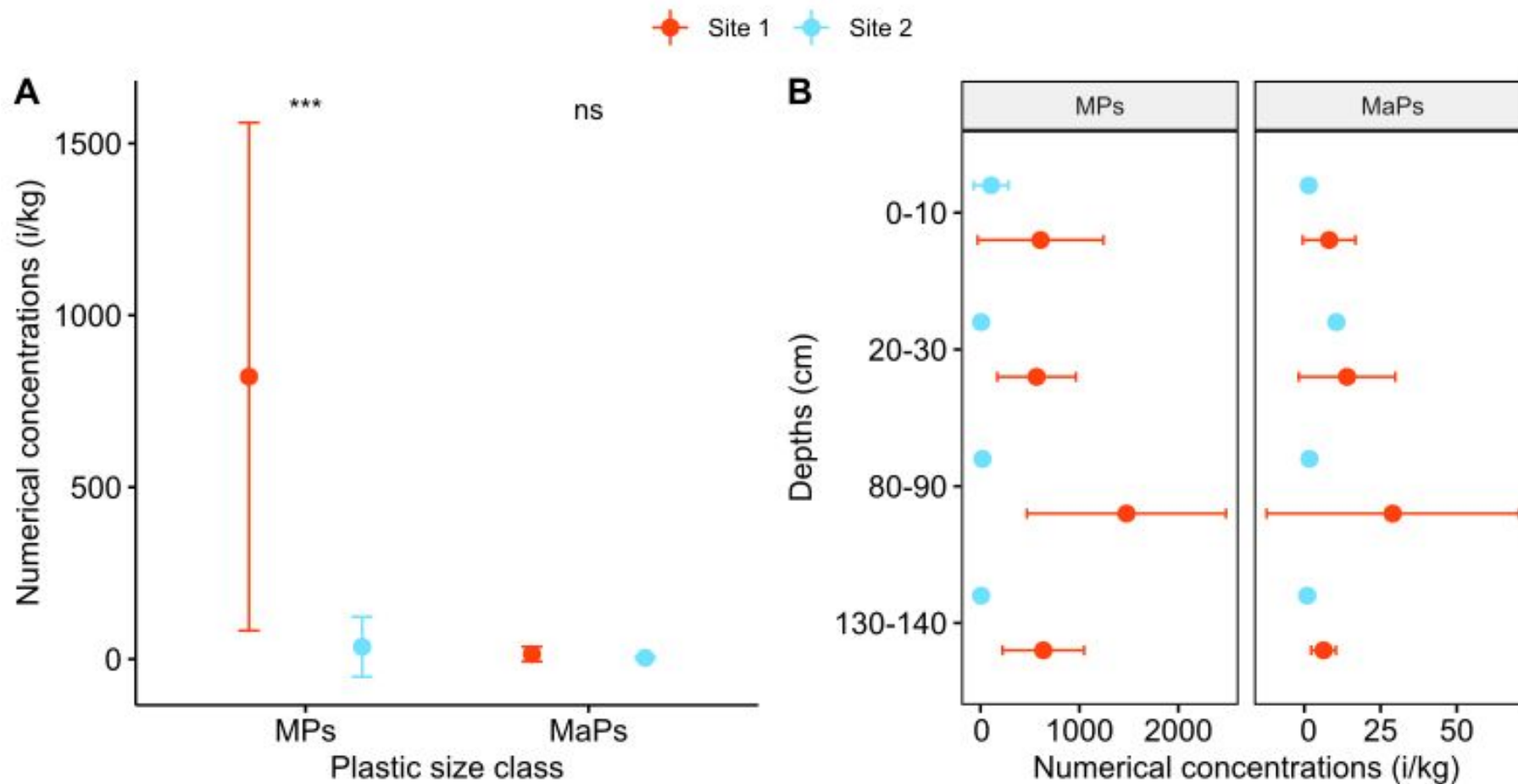
Plastics extraction from sediment: Macroplastics & microplastics

Sampling ⇒ Treatment ⇒ Observation ⇒ Identification



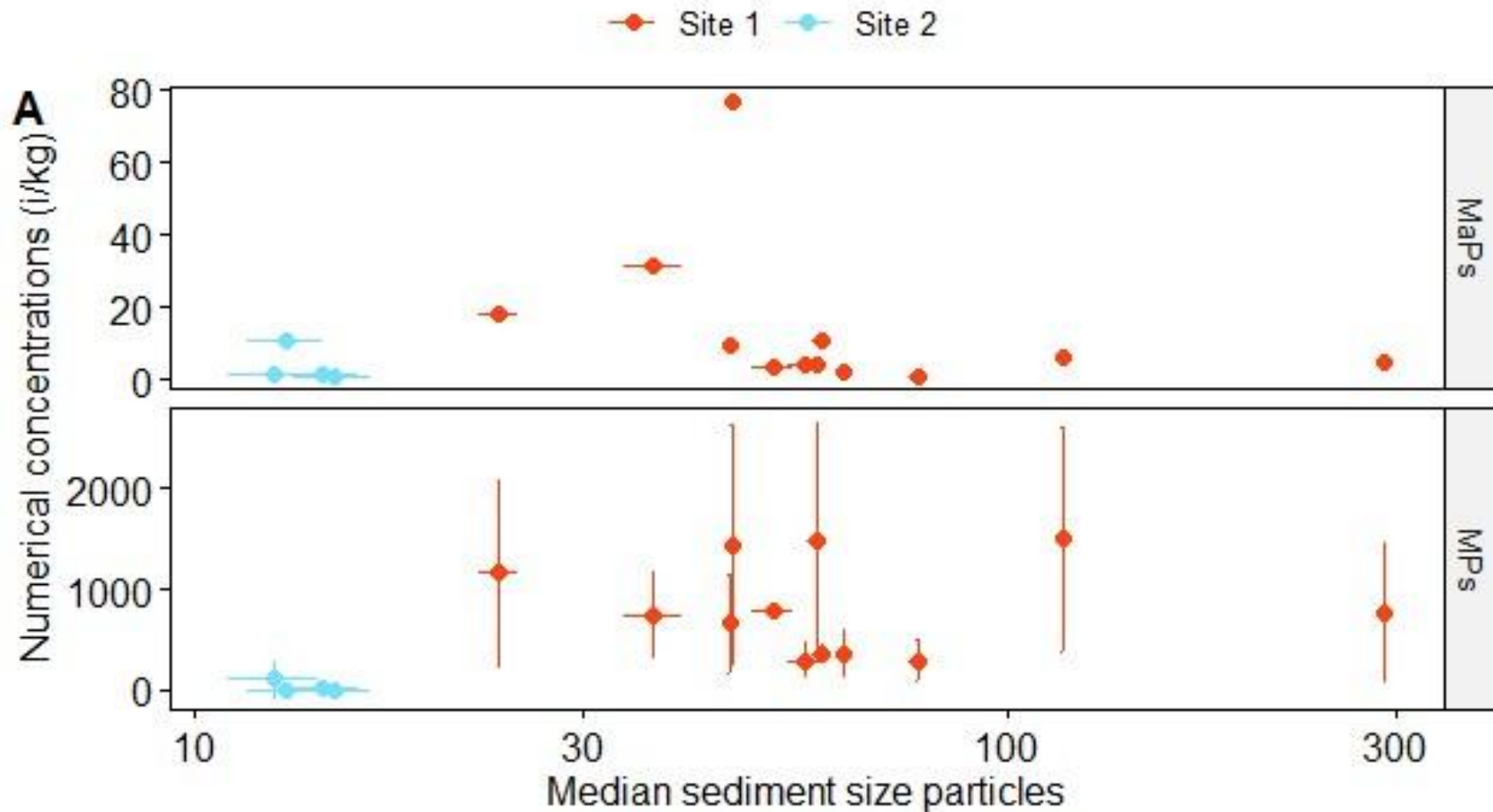
Spectrometer
FTIR

Quantity of plastics: Concentrations by sites and depths



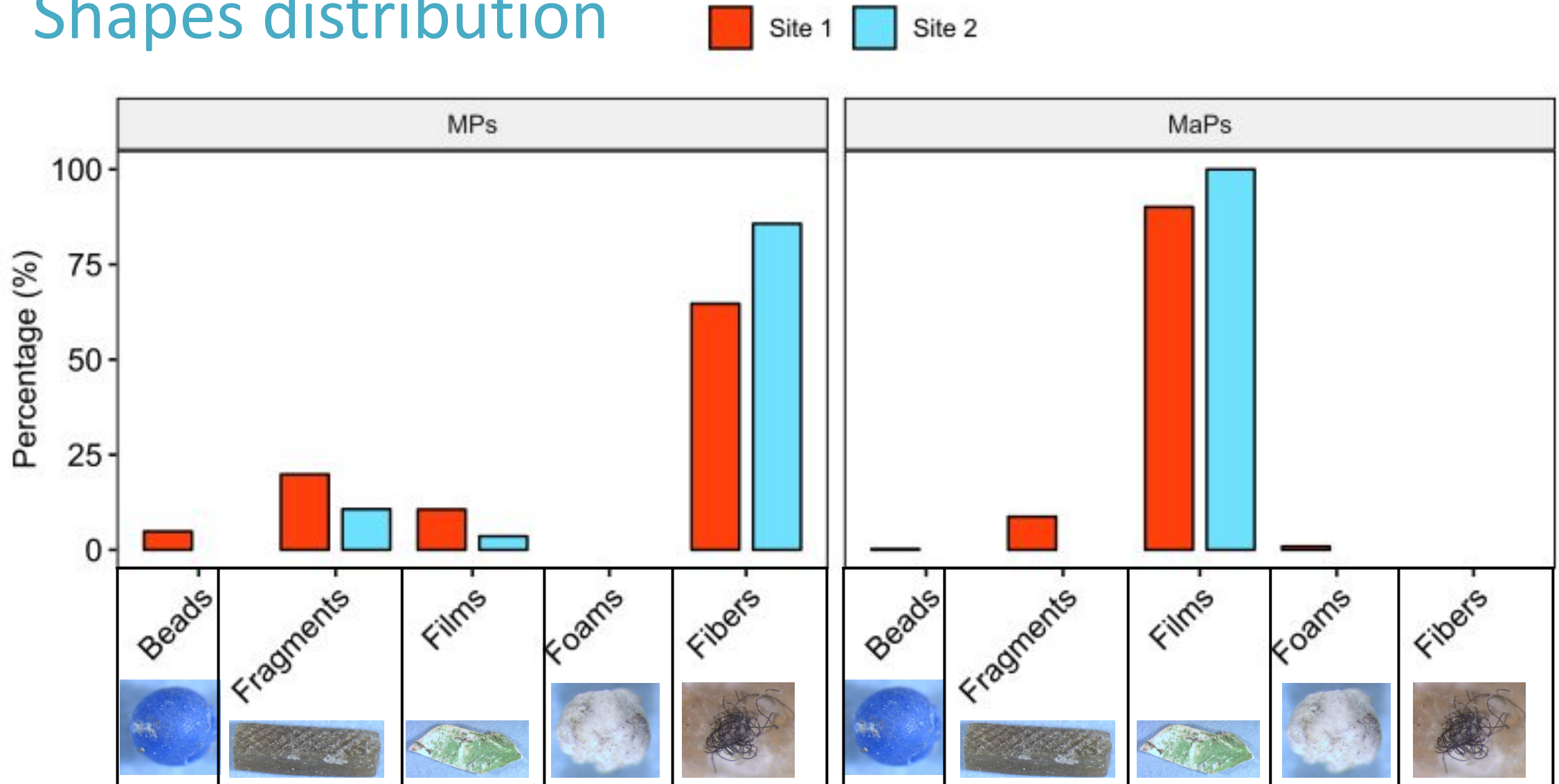
Constant *et al.* (2021)
ES&T

Quantity of plastics: Co-variation with median sediment size

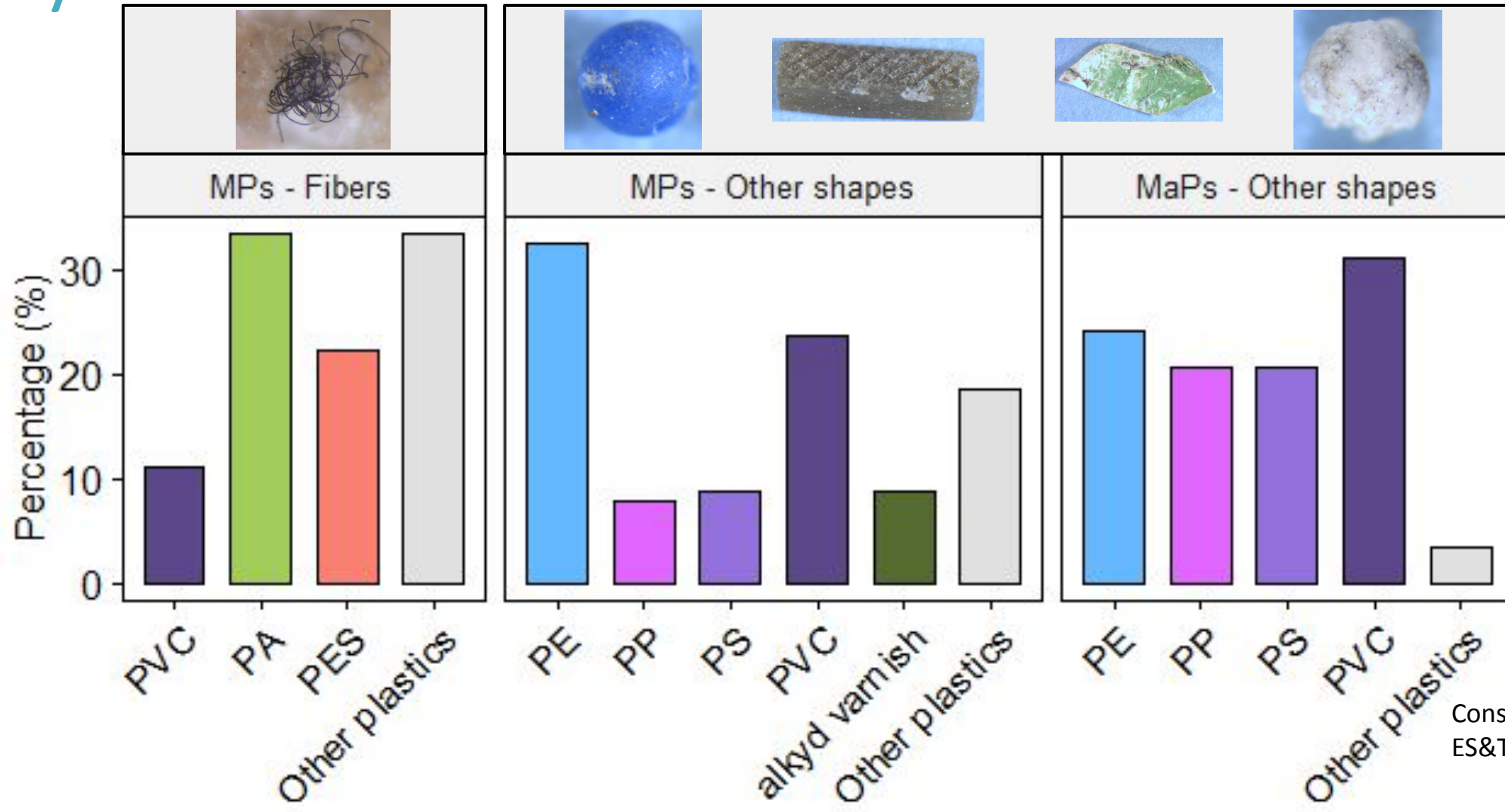


Constant *et al.* (2021)
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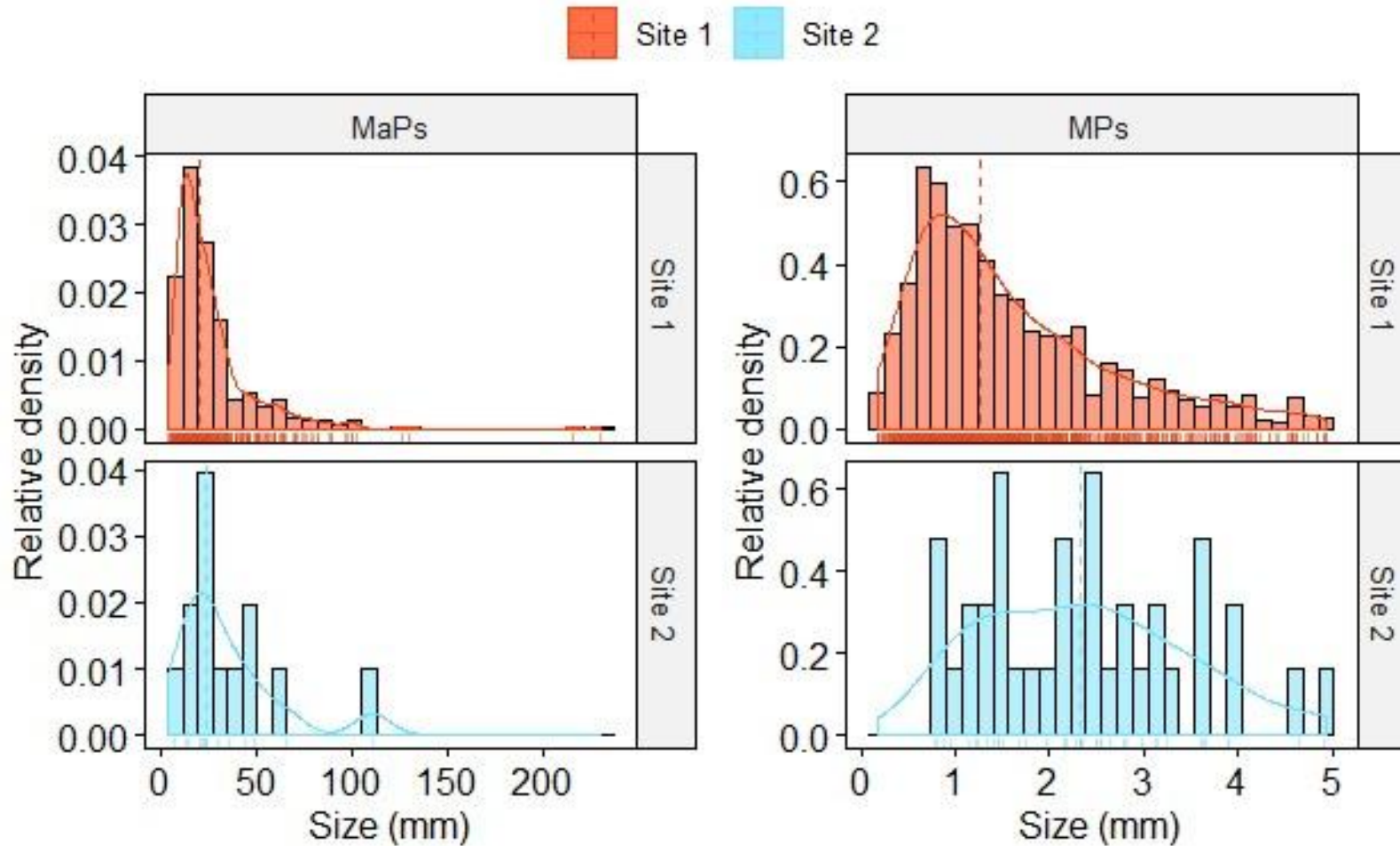
Quality of plastics: Shapes distribution



Quality of plastics: Polymer distribution



Quality of plastics: Size distribution



Plastics trapped in dredging sediments:

Conclusions

- One of the highest concentrations of MaPs observed;
- High heterogeneity at **small scales**:
 - ➔ No linear trends with **sediment** features;
- Prevalence of MaPs **films** and MPs **fibers**;
- Massive quantities at the site scale (>1 t)
 - ➔ Dredging sediment: a forgotten important stock?

An aerial photograph of a river construction site. In the foreground, an orange excavator is mounted on a large metal barge. The river flows through the center, with another barge and excavator further upstream. The left bank is a construction area with a truck, a green dumpster, and a red car. The right bank is lined with dense green trees. The sky is clear and blue.

Thank you!

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