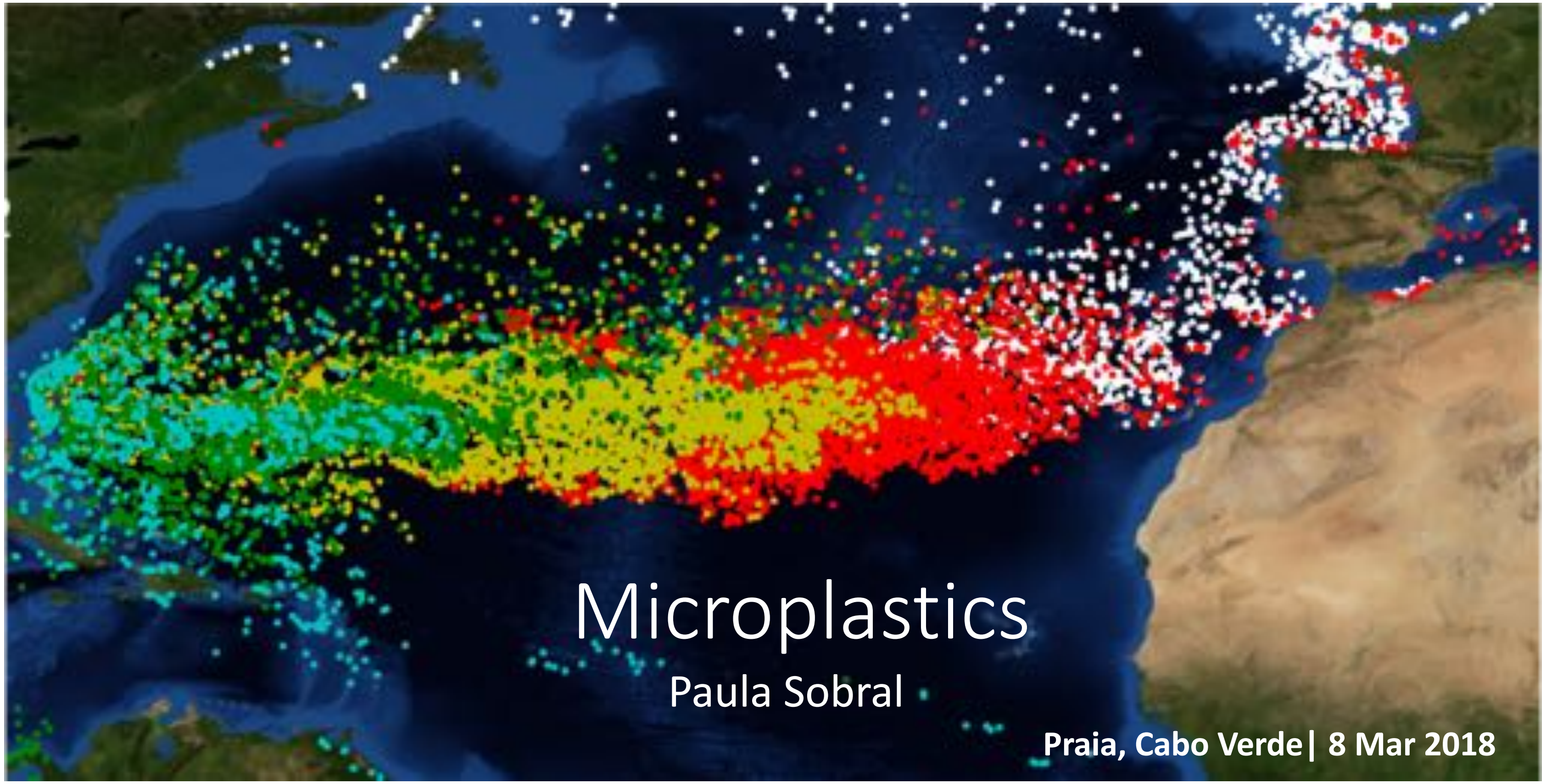
ATLANTIC INTERACTIONS

3rd High-Level Industry-Science-Government Dialogue

Workshop - Clean healthy and sustainable oceans



Microplastics

Paula Sobral

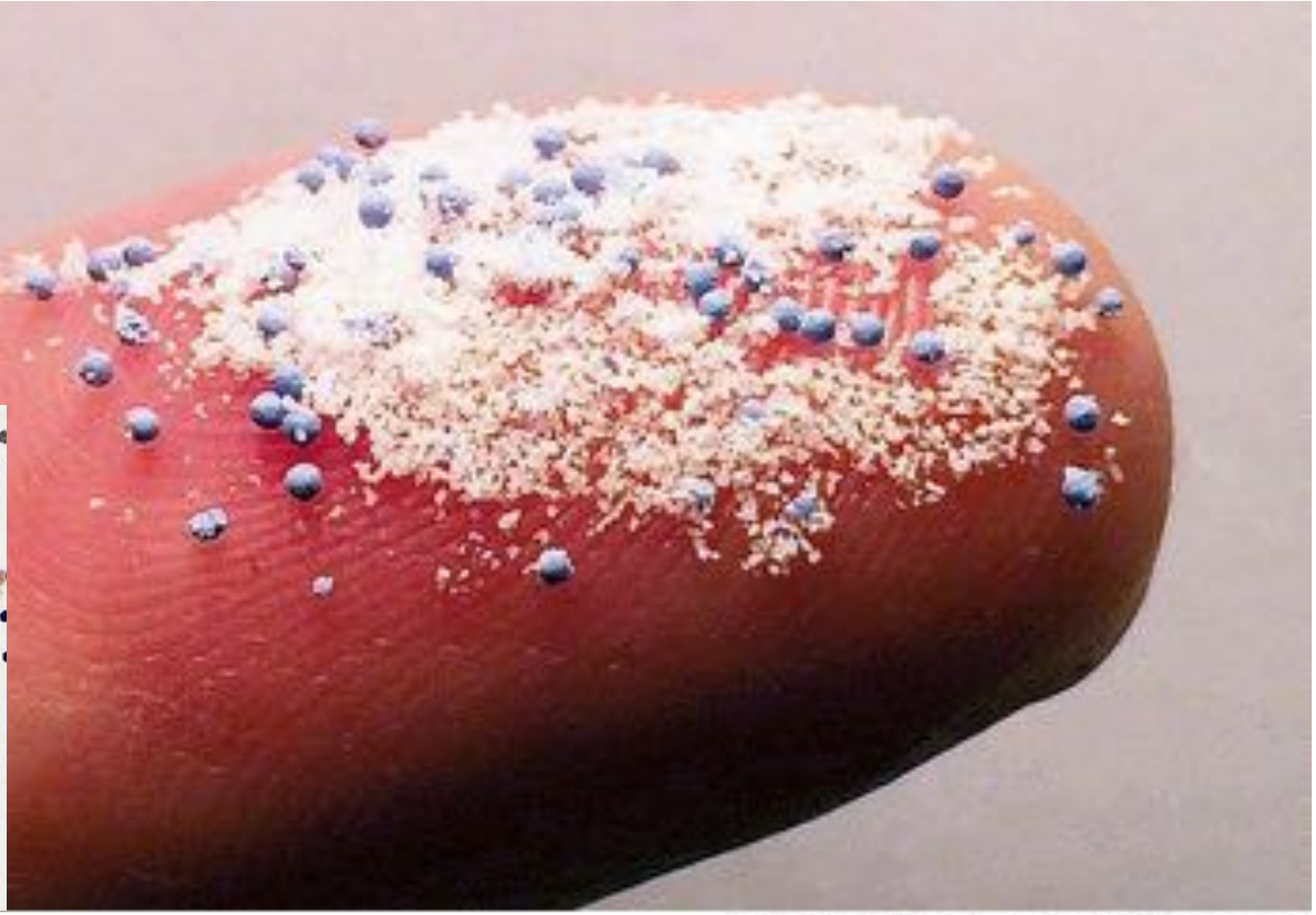
Praia, Cabo Verde| 8 Mar 2018

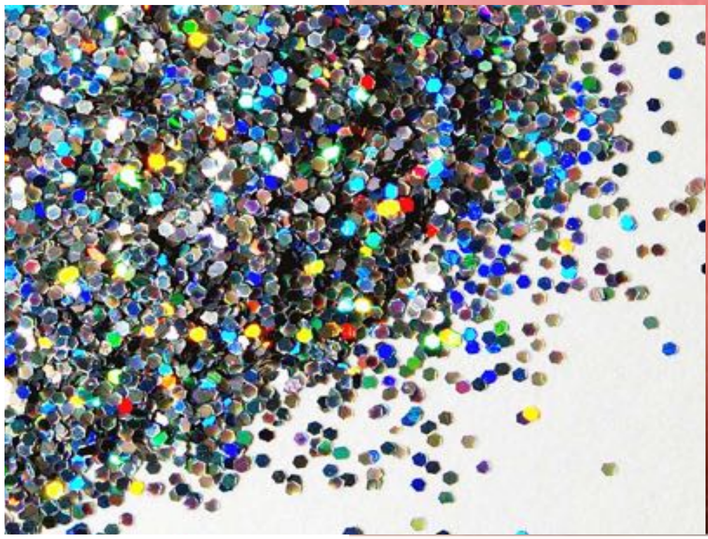
MARE

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Praia do Baleal Norte, April 2018

Antunes et al. 2018 [https://doi.org/10.1016/j.marpolbul.2018.04.025]





Henrik Hamrén/Stockholms universitets Östersjöcentrum

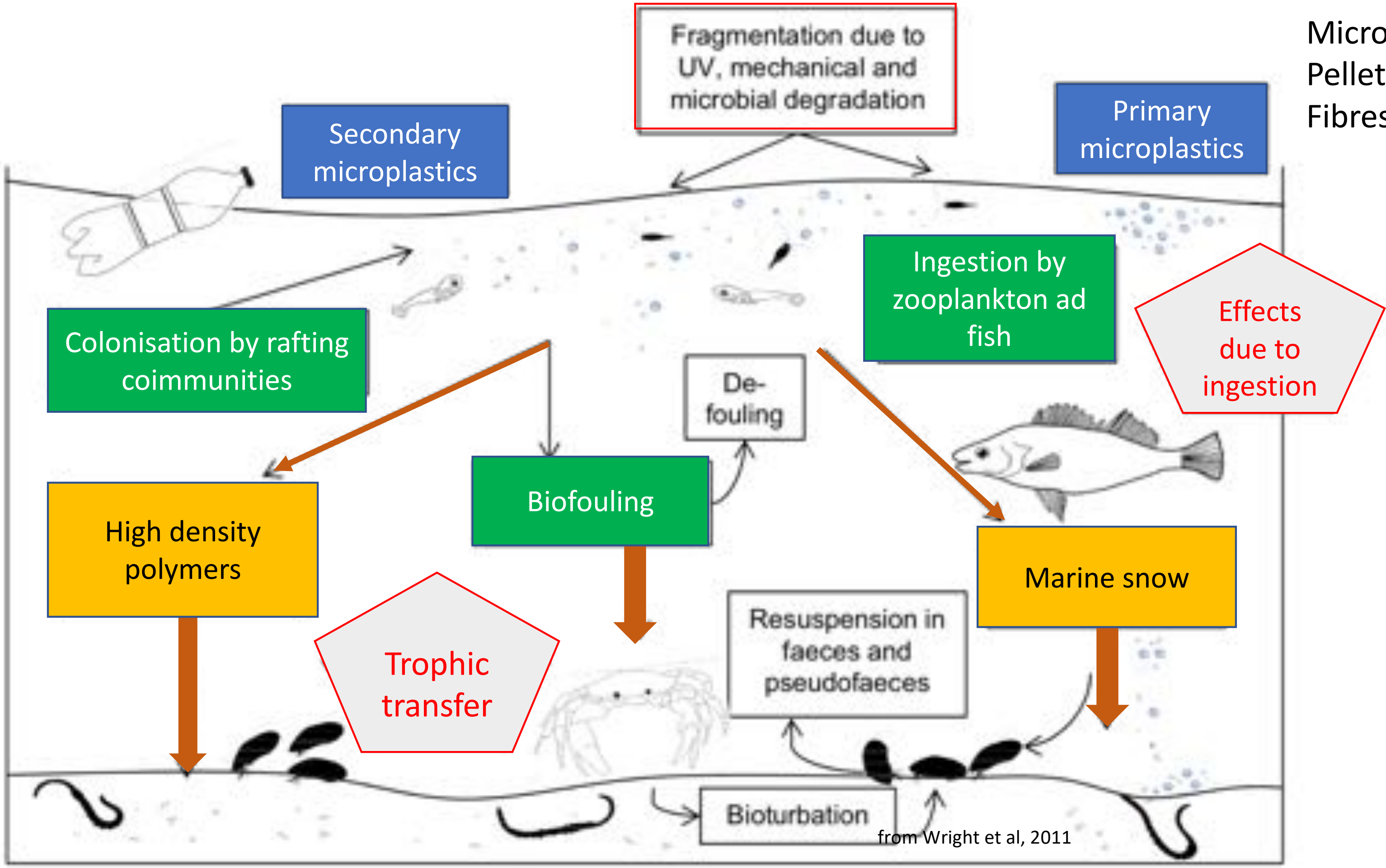
Direct addition to the environment

Fibres

Potential pathways for the transport of microplastics and its biological interactions.

Microbeads
Pellets
Fibres

Size
Density
Abundance
Colour



Ingestion
Active: size selection
Passive: via scavenging or sediment

European emissions of primary microplastics

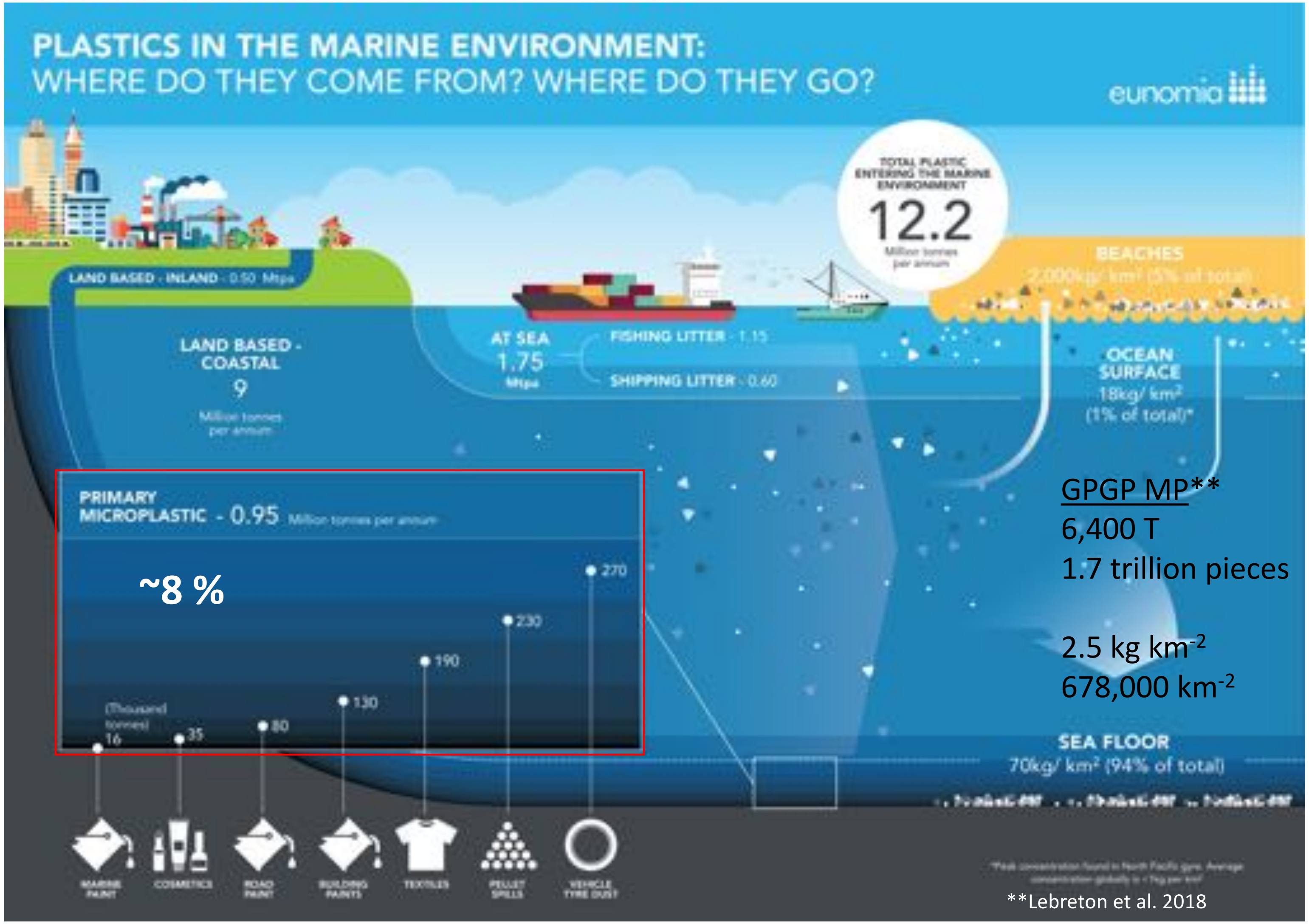
(scaled to a global level using PPP-adjusted GDP)

SOURCE:

Land-based - 78 %
Primary MP - ~8 %
Ocean-based– 14 %

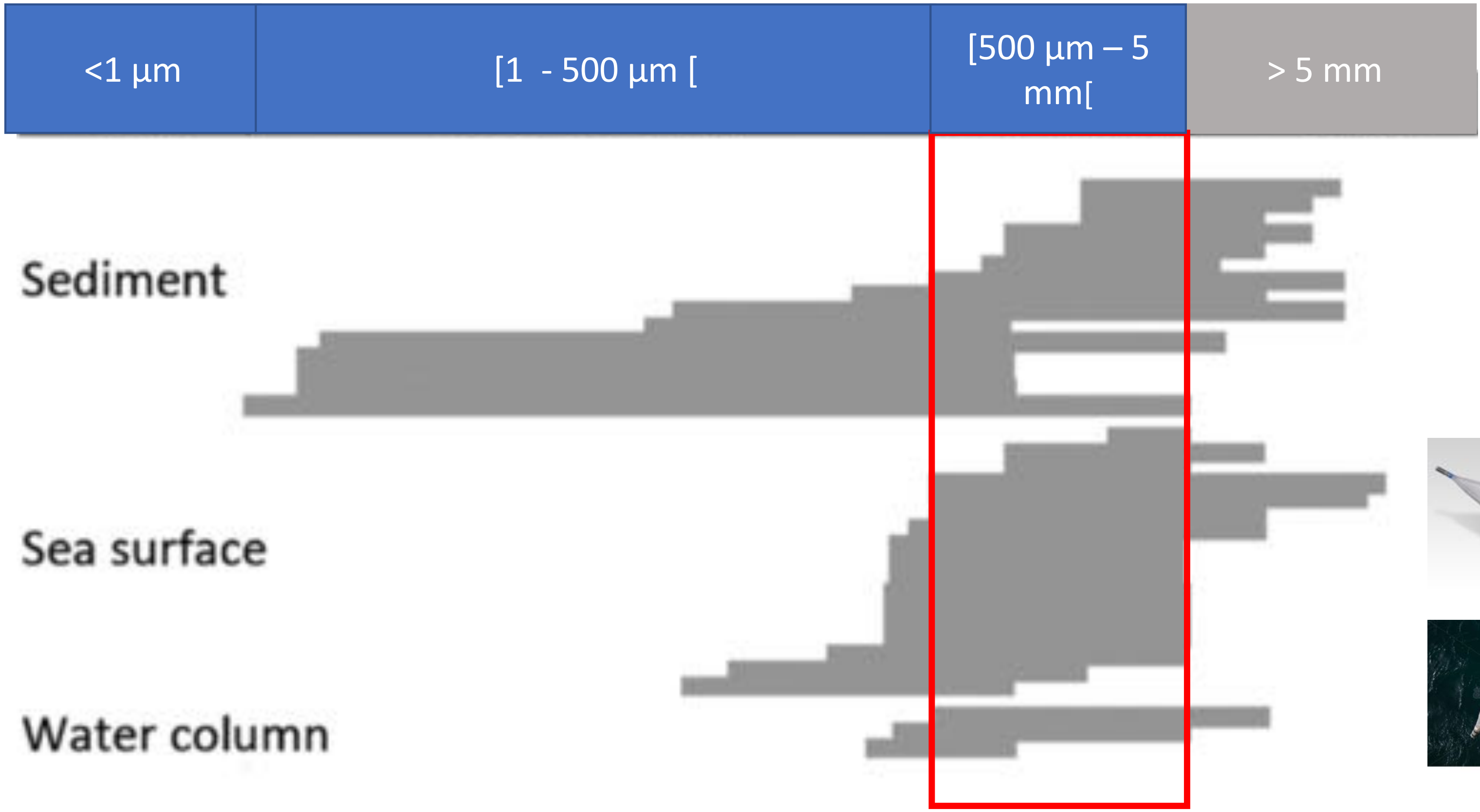
“SINK”:

Beaches – 5 %
Ocean surface – 1 %
Sea floor – 94 %



Eunomia, 2016

Microplastics size is < 5 mm

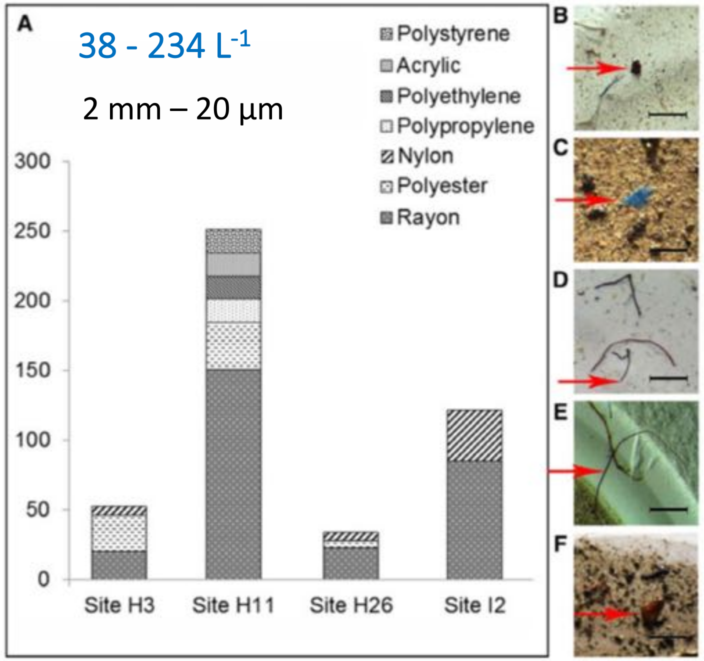


(Adapted from Hidalgo-Ruz et al. 2012)

Realistic concentrations ?

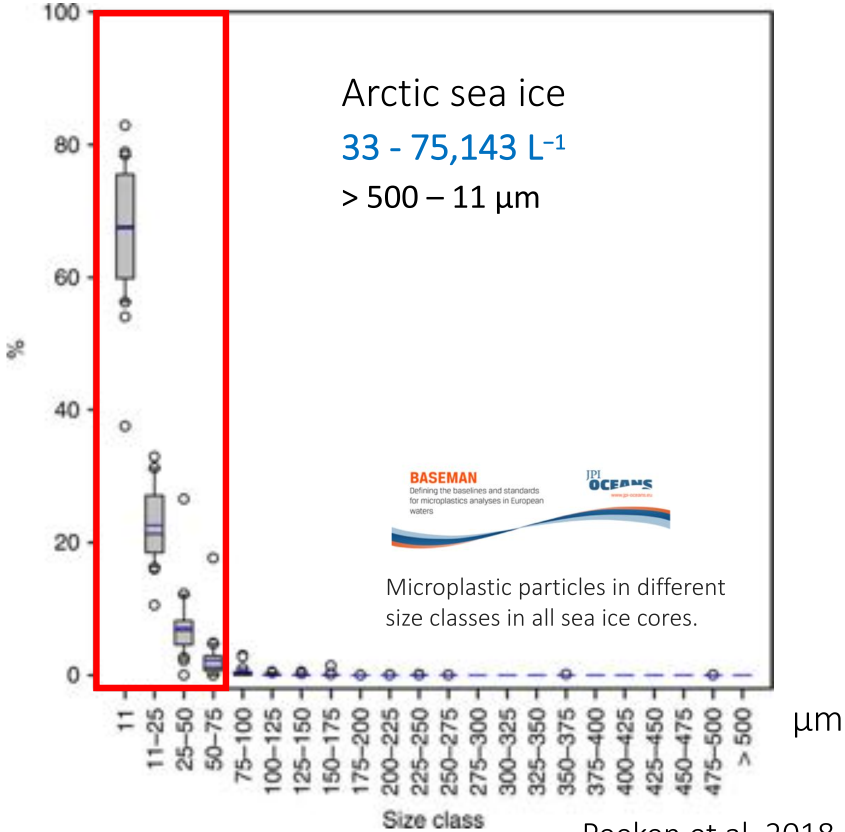
Light microscopy, particles individually analysed µ-FTIR

Arctic sea ice



Total number of microplastic pieces in sea ice cores

Obbard et al. 2014

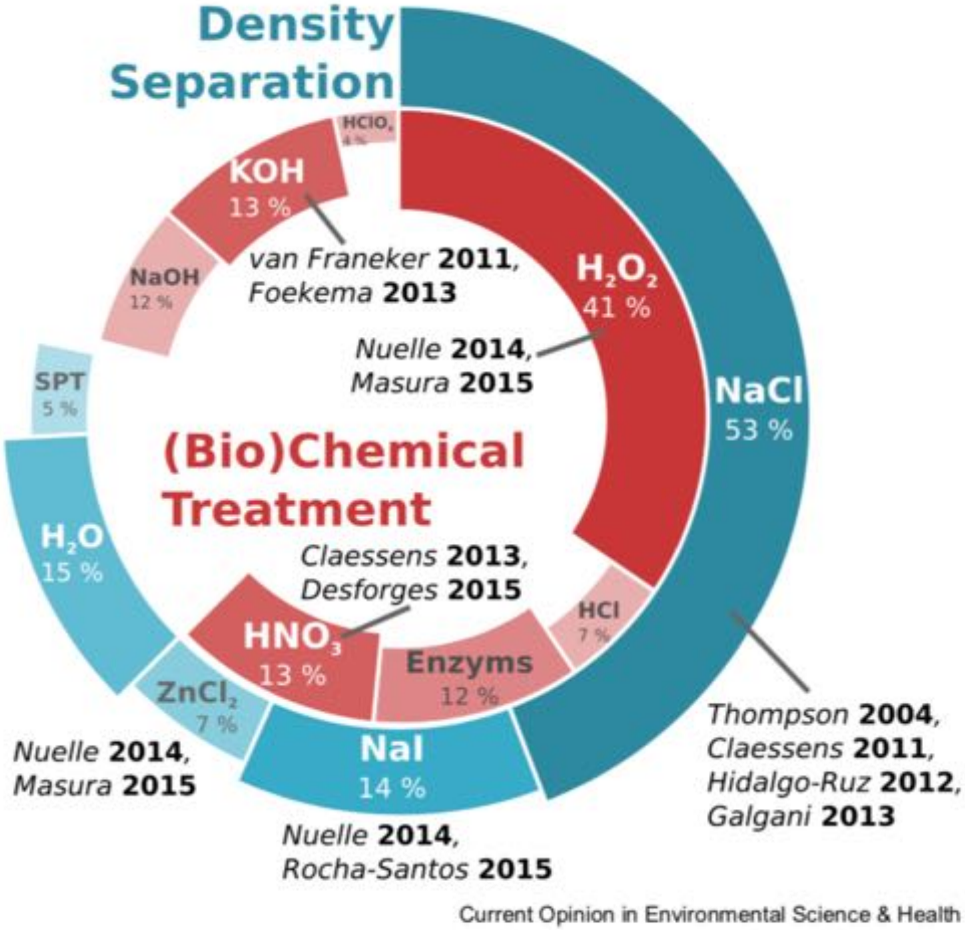


Peeken et al. 2018

Surface imaging FTIR

Detecting microplastics

Analytical methodologies



(Renner et al. 2018)

Overview of the most common density separation (outer ring) and (bio)chemical treatment (inner ring) protocols including their reference authors. The % values are related to 67, or 53 articles, respectively, in which density separation or a (bio)chemical treatment are described.

BASEMAN

Defining the baselines and standards for microplastics analyses in European waters

JPI OCEANS

www.jpi-oceans.eu

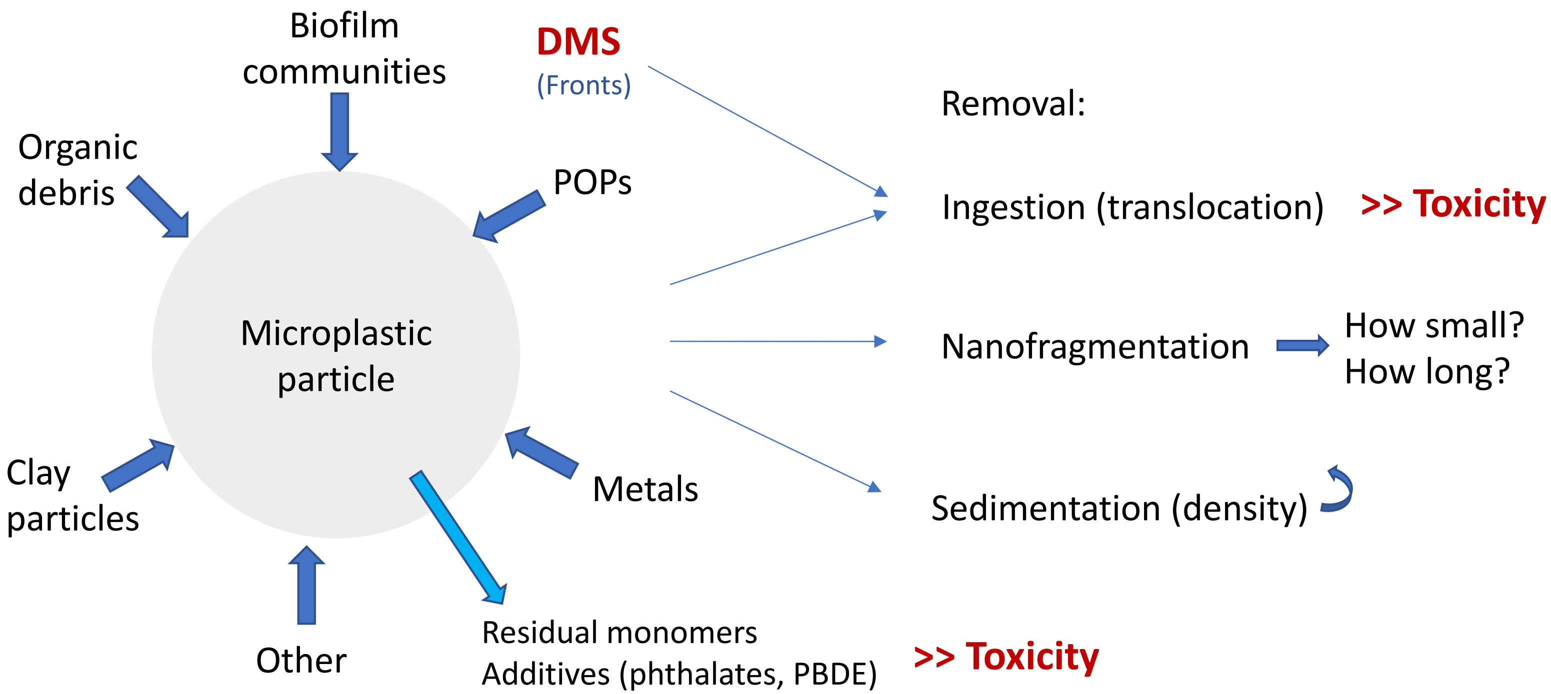
PLASTOX

Direct and indirect ecotoxicological impacts of microplastics on marine organisms

JPI OCEANS

www.jpi-oceans.eu

Microplastics in the oceans – sink is the fate but…



Biofilm and nanofragmentation increases the charge, roughness, porosity and hydrophobicity of the plastic surface and concentrates pollutants . DMS promotes ingestion

Adapted from Wang et al. 2016

Major challenges

Map sources and understand pathways

- Data on size and quantities (number/mass):
  - what is already in the ocean,
  - river inputs to the ocean, including runoff, storm water and effluents from WWTP
  - retention in estuaries

Chemical and physical processes

- Degradation:
  - how long to degrade,
  - how many particles of what sizes?

Major challenges

Biologically-mediated processes

- Changing density - biofilm
- Ingestion -– retention?
- Toxicity - Assess harm to organisms
- Trophic transfer – evaluate disturbance at the ecosystem level
- MP/NP and human health
- Framework for ecological and human health risk assessment

Linking local to global - models

Major challenges

Prevent and reduce impacts

- Waste management improvement (recycle more, improve packaging design)
- Going circular: upcycling and innovation – no litter
- Technology for new materials – Bioplastics…
- Awareness and co-responsibility (and ocean literacy)
- Sustainable consumption options


Thank you!