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Microplastics in Freshwater Environments

An Emerging (Health) Issue

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Emerging Issue

- 1997: Captain Moore discovers floating plastic in the middle of the Pacific (Plastic Soup)
- 2004: Term “microplastics” is coined
- 2011: UNEP “emerging environmental issue”
- 2016: First conference ever on “Plastics in Freshwater Environments” in Berlin

General Picture 2016

- “Plastic Soup” is recognized as environmental issue for marine ecosystems
- But hardly considered as such for freshwater systems
- Microplastics in freshwater are sporadically studied
- Most countries lack policy/legislation

Causes & Effects

- Production & consumption of plastic increases
- Plastic is very persistent, does not degrade
- It does fragmentize
- Micro- and nanosized plastics accumulate in aquatic environments
- Plastics enter the Food Chain
- Plastics potentially threaten Human Health

Few freshwater studies

Main findings of 31 studies

- South America & Mexico: 2
- USA & Canada: 7
- Europe: 16
- China: 3, Mongolia 1
- Africa (Tanzania): 1
- Russia: 1

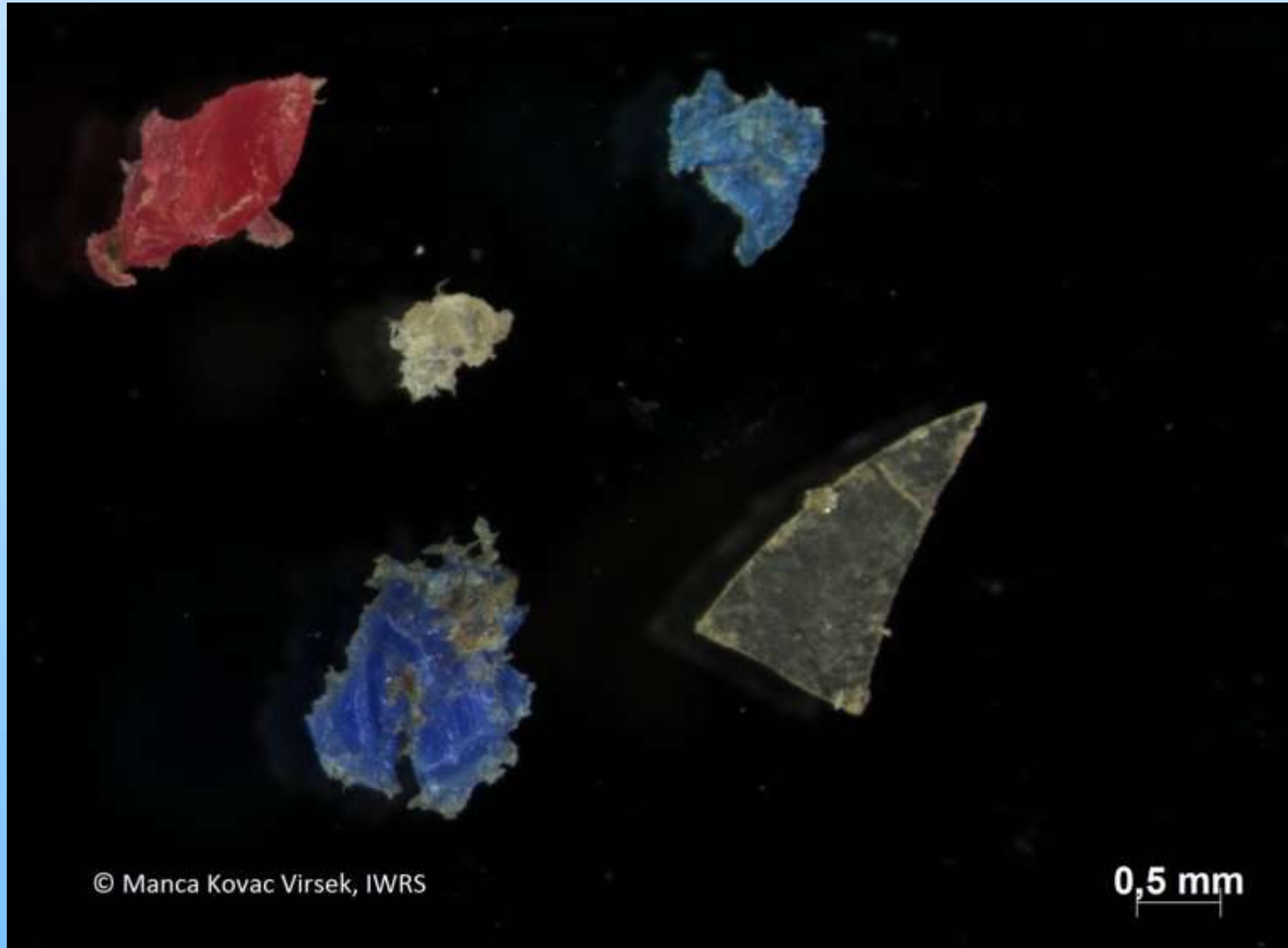
Focus

- Occurrences of microplastics
- In water, sediments
- In organisms like fish, and filter feeders
- Differences in concentrations (e.g. close to cities or industries)
- Different types, pathways and sources

Different Types

- Fragments
- Fibres
- Flakes
- Filaments
- Spherules
- Pellets
- Films
- Granules

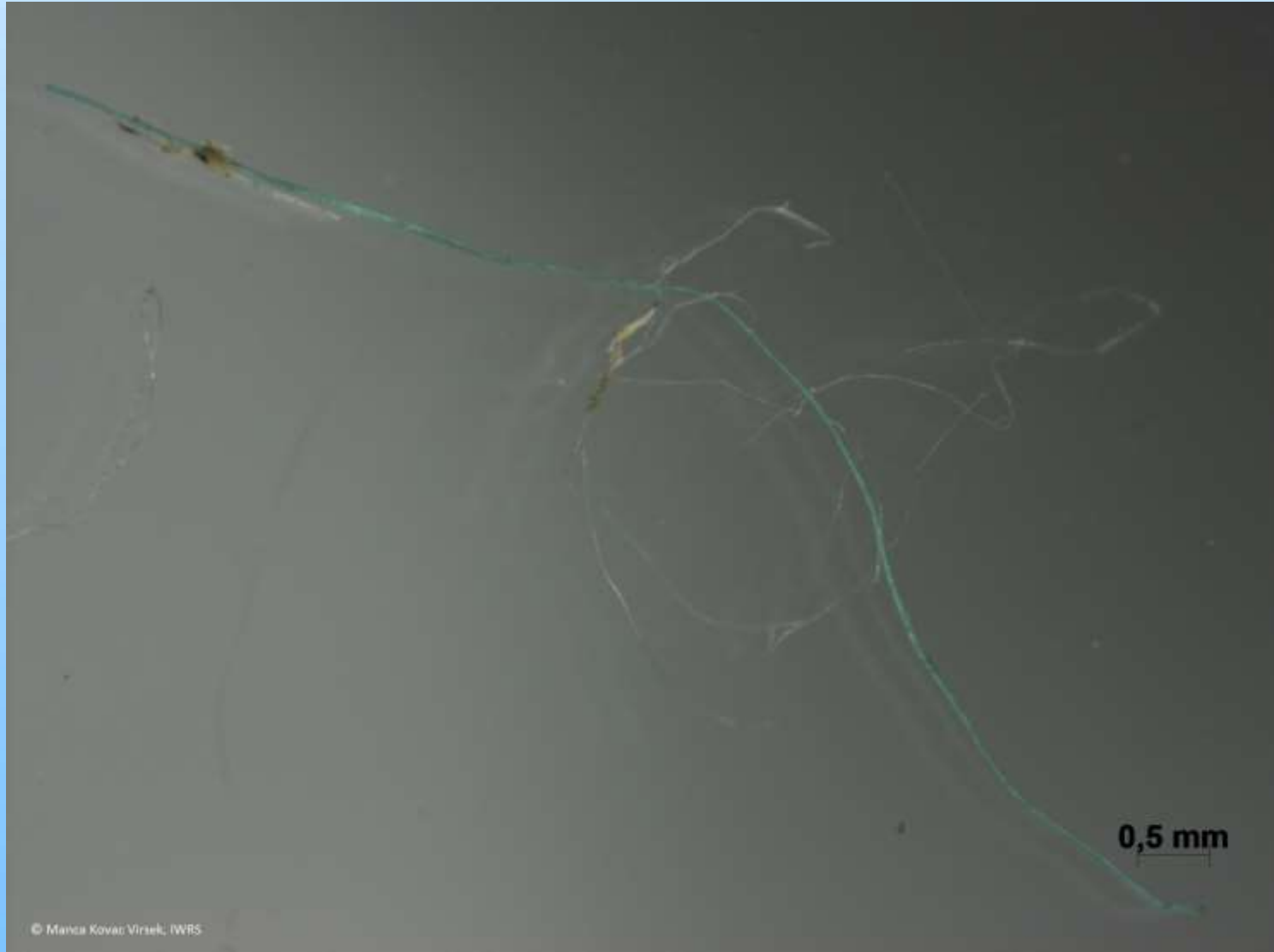
Fragments from River Rhine



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0,5 mm

Fibres from River Danube



Different Sources

- Fragmentation of debris
- Tires
- Synthetic garments
- Cosmetics
- Detergents
- Paint
- Spills from industry (pellets)

Microplastics in cosmetics



Other Pathways (hardly studied)

- Atmospheric fallout
- Mowing litter on roadsides
- Usage of artificial turf
- Plastic mulching in agriculture
- Grinder pumps in high pressure sewage
- Leakages from recycling industry

Different places

- Remote lake in Mongolia
- Victoria lake, Africa
- Arctic
- Deep sea, sediments
- Alpine lakes
- Chinese estuary
- Effluent WWTPs

Different Methods used Low Rate of Comparability

- Mesh sizes differ
- Sampling: anecdotal evidence
- Lack of research standards & protocols
- Circumstances differ (weather, discharges)
- Technological limitations

Overall picture

- Microplastics are everywhere
- Many sources and types
- No method to clean waterways in a cost-effective way
- Biota ingest microplastics (with effect on populations?)
- Also countries with modern waste management systems leak plastics
- WWTPs do not capture all microplastics

Rising Human Health Issue

- Plastic in water adsorb toxic chemicals, ingested by species
- Plastic in water leaches added chemicals
- Smallest particles enter tissue, blood, placenta
- Transport of pathogens (microplastics act as a vector)

To Conclude

- There is no easy solution
- Prevention at source
- Measures per source
- Consider plastic in water as hazardous
- Authorities are responsible for water quality and must take the lead
- Act now on the basis of the precautionary principle