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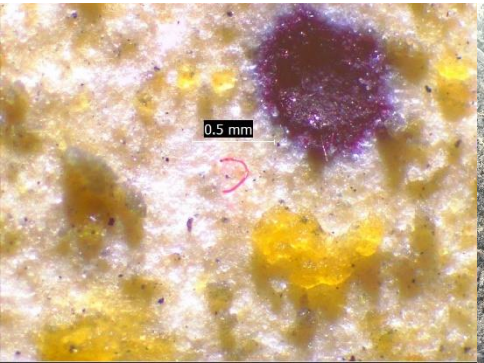
Microplastics in the environment: implications for the microbial world

Dr Olga Pantos





Plastics in our environment

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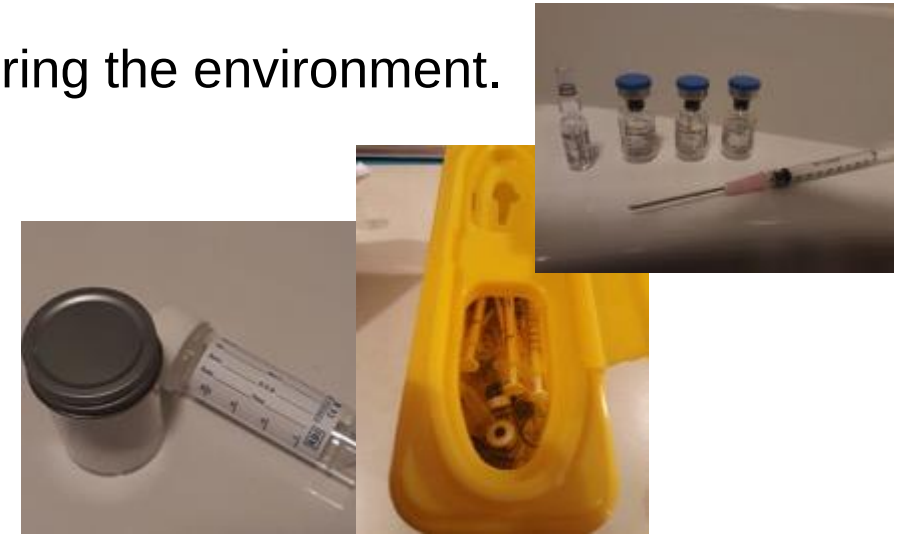
- Estimated ***311 million tonnes*** of plastic items were produced in 2014.
- Expected to total ***33 billion tonnes*** **by 2050**.
- Majority is single-use plastics. E.g. bottles, bags.

- Only 9% globally is recycled – value depends on crude oil value.
- Majority ends up in landfill, or entering the environment.
- Pervasive.
- Earth, water and air all affected.

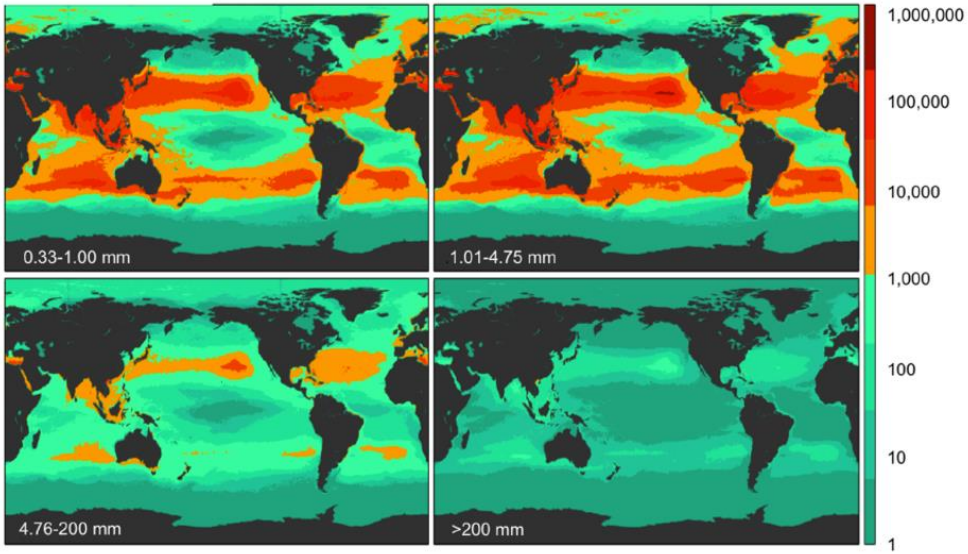


Types of Microplastic

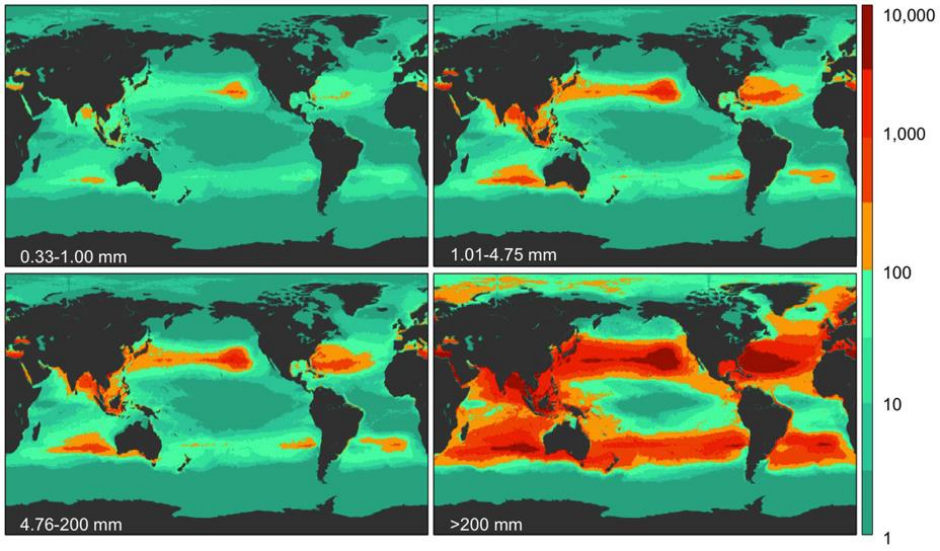
- 100 µm – 5 mm
- 1º microplastics
  - Made for purpose:

    e.g. microbeads
- 2º microplastics
  - Breakdown products of larger plastic items
    - fibres – nets/clothes
    - fragments of larger items
- Continued breakdown into nanoplastics

Prediction of ***count densities*** (pieces km^{-2})



Prediction of ***weight densities*** (g km^{-2})



Current estimates:

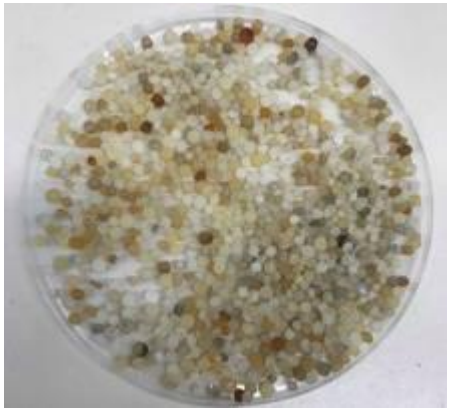
>5 trillion pieces

>250,000 tonnes

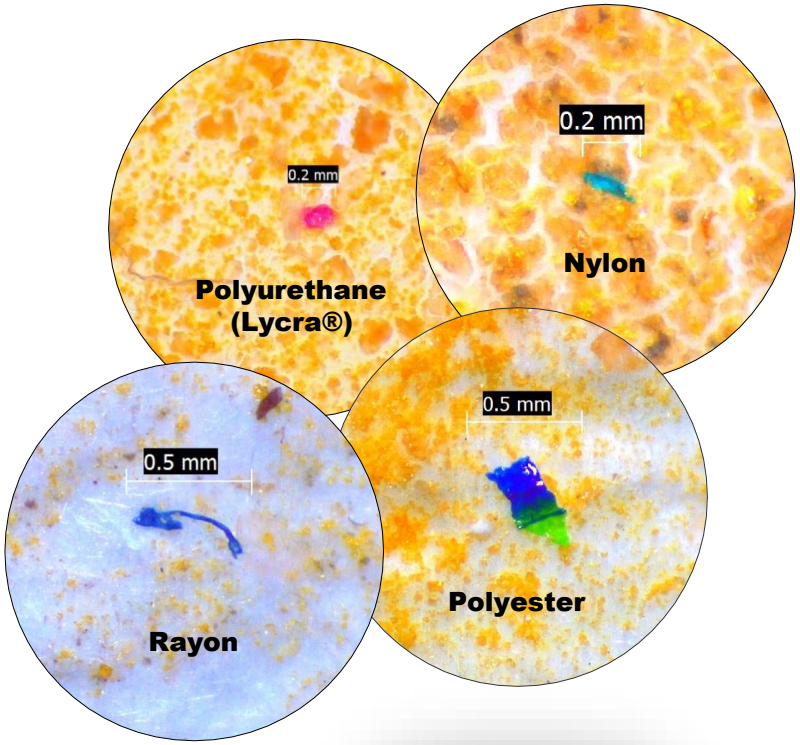
Plastic smog

Water column

Beach debris



Sources of Freshwater and Marine Microplastic



- Wastewater effluent:
  - Domestic/industrial and personal cleaning products
  - Clothing
  - Industrial processes
  - Synthetic carpet cleaning
- Fragmentation of larger items

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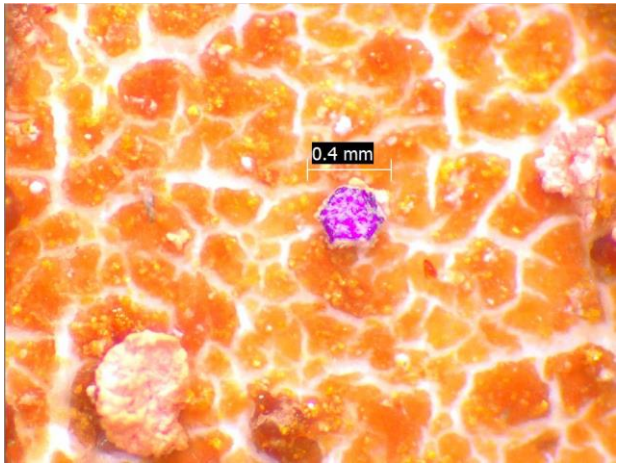

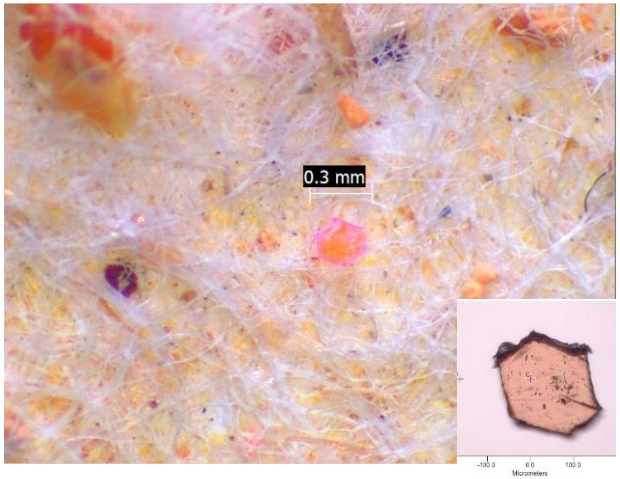

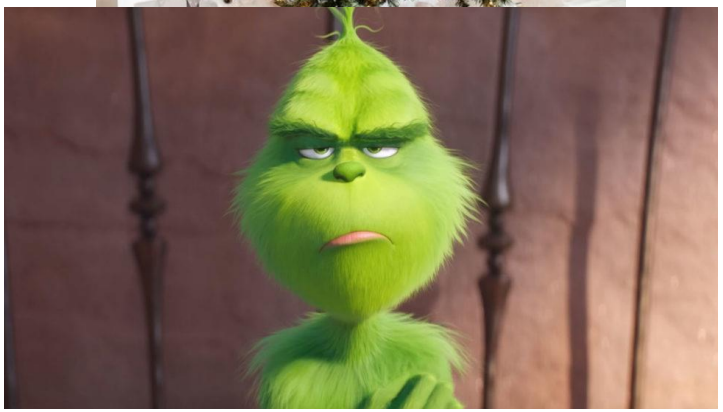

Terrestrial Microplastic Sources: *Food production and waste*

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Potential Impacts

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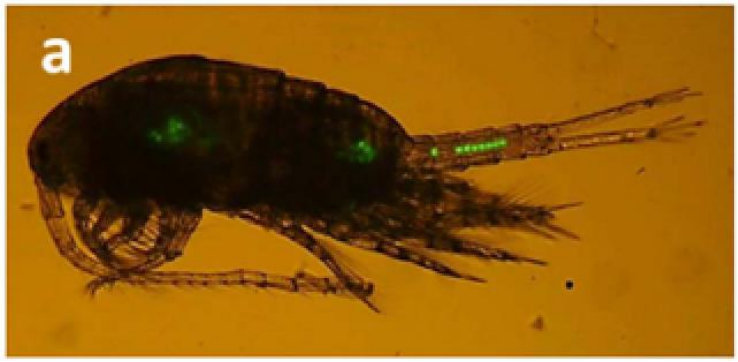
- Reduced biomass
- Endocrine disruption
- Physical damage



- Accumulation and concentration of other chemicals
- Facilitate uptake of chemical contaminants
- Bioaccumulation of chemicals and trophic transfer – food safety
- Ecosystem disruption through loss of key species

Microbial World

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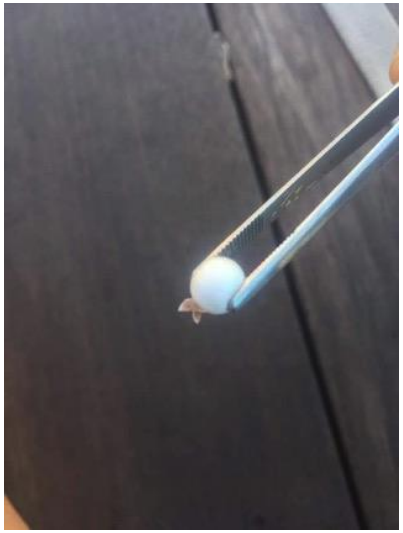
- Ecosystem function – nutrient cycling
- Microbiome composition – organism health
- Biosecurity risks – marine microrafting
- Wastewater treatment efficiency
- Horizontal Gene Transfer – Virulence and AMR



MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

2018-2023

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Microplastics in New Zealand's Ecosystems: the levels, the impacts and the potential solutions

- Microbiologists
- Molecular biologists
- Environmental chemists
- Microbiologists
- Marine biologists
- Polymer chemists
- Freshwater ecologists
- Ecotoxicologists
- Marine modellers
- Social scientists

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CAWTHRON INSTITUTE

Northcott Research Consulting Ltd.

Working together with a large number of stakeholders including: industry, iwi, communities, regional and national government, NGOs.

Impacts of plastics on New Zealand's plastispheres…and hopefully some solutions!

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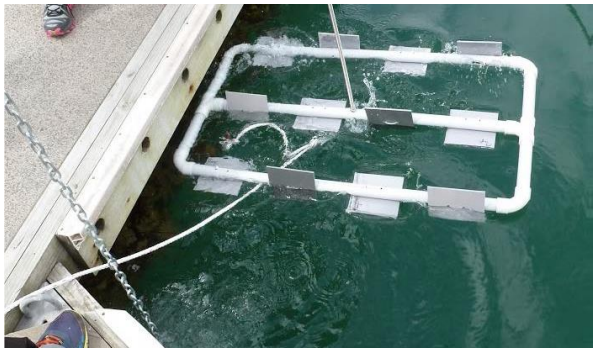
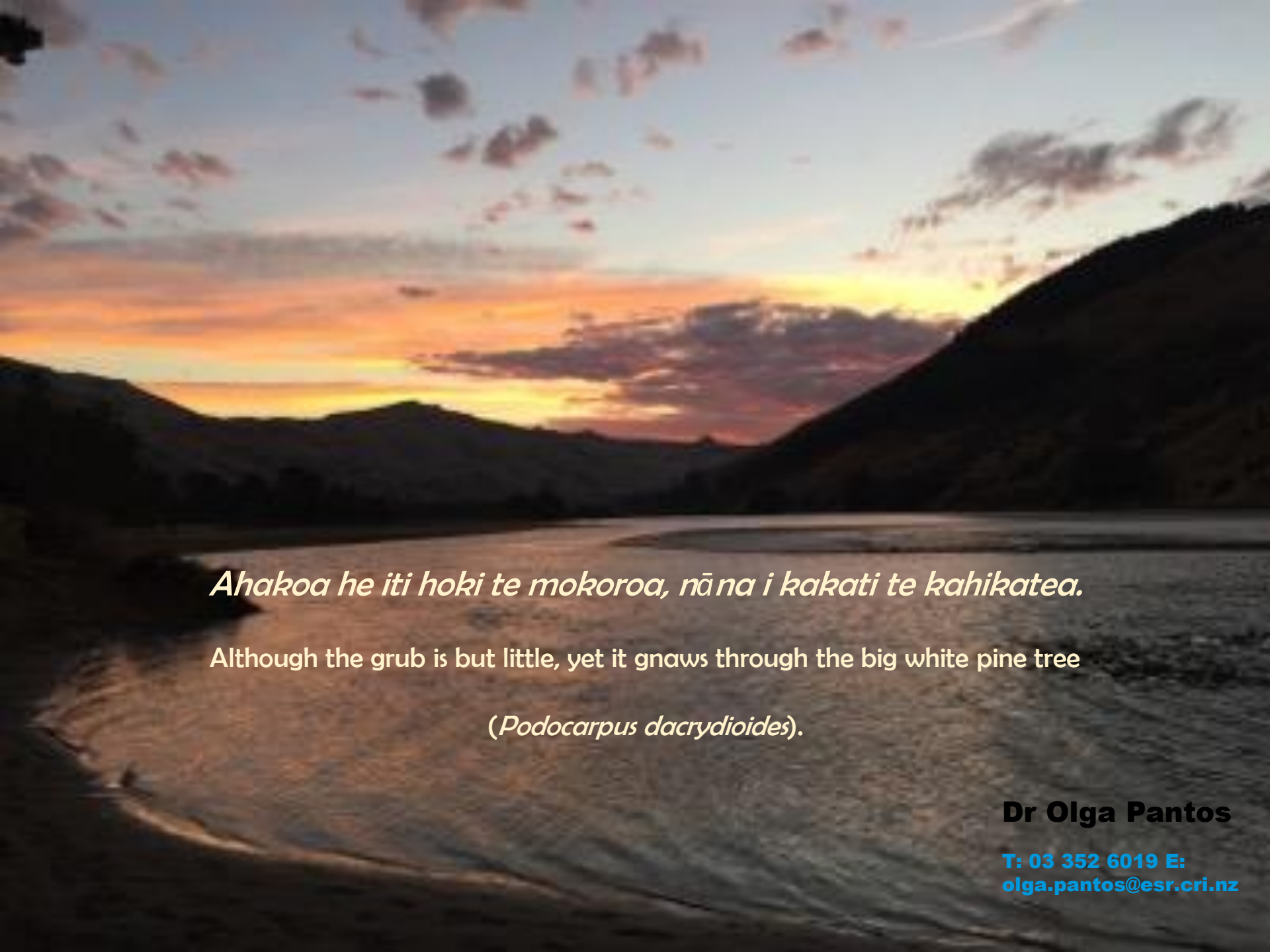
- Ecosystem function – community development
- Microbiome composition – organism health
- Marine microrafting – biosecurity & WWTP
- Differences between plastic type and age
- Microbial degradation of plastic



www.marinebiosecurity.org.nz

- Marine system and Wastewater Treatment Plants
- Marinas: Nelson, Christchurch, Auckland
- WWTP: Christchurch
- Plastics: 5
- Virgin and aged plastics
- Sampling over time

OHA 2019



Ahakoa he iti hoki te mokoroa, nāna i kakati te kahikatea.

Although the grub is but little, yet it gnaws through the big white pine tree

(*Podocarpus dacrydioides*).

Dr Olga Pantos

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