Rivers of Plastic: Plastic Pollution and Aquatic Health

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Biotechnology and Biological Sciences Research Council

A BLAST FROM THE PAST: MEMORIES OF MY HOME

Plastic pollution in Pakistan

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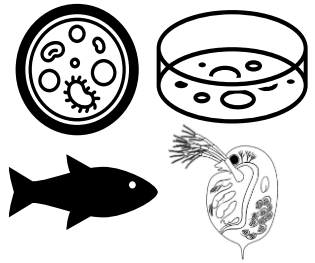
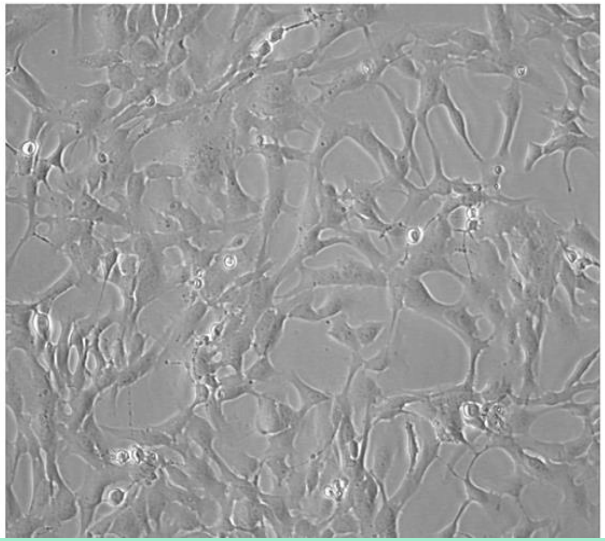
MODEL BIOLOGICAL SYSTEMS TO TEST MICROPLASTICS & ADDITIVES



Cellular system

RT-Gill cell line

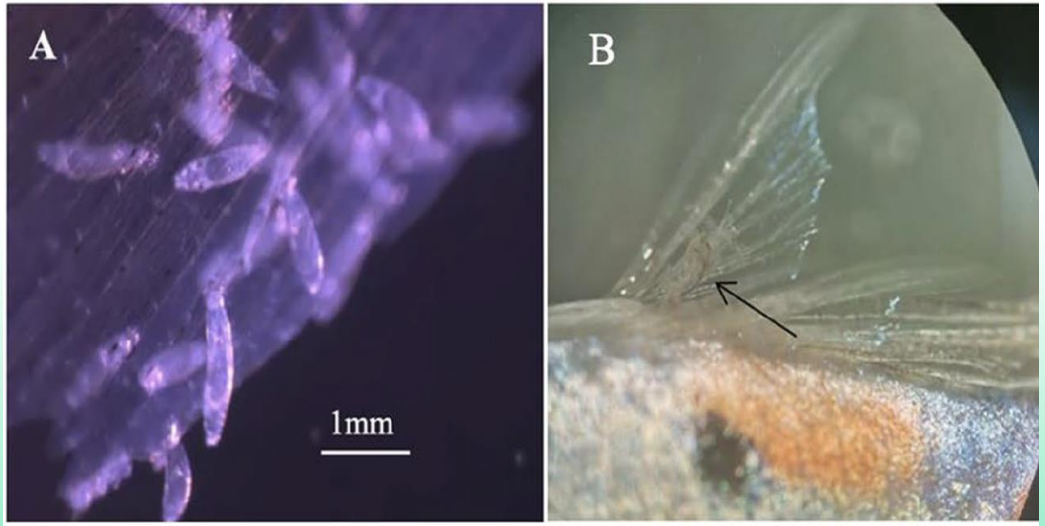


Invertebrate system

Daphnia magna

Vertebrate system

Guppy- *Gyrodactylus turnbulli*

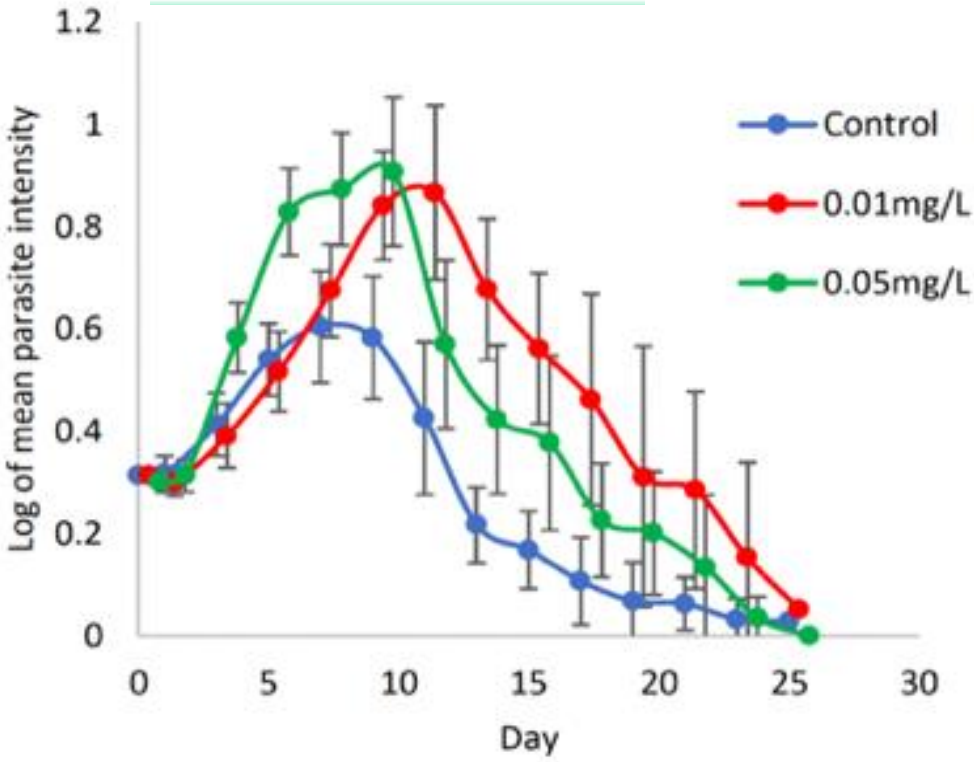


Multiple & flexible systems to test functional effects of plastics and additives

Plastic Fish: the story so far

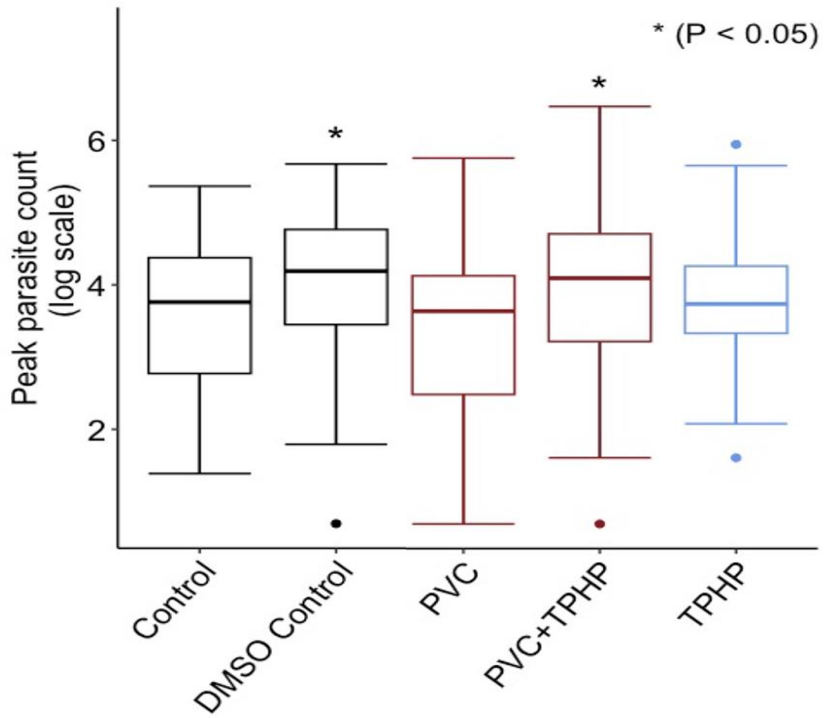
Business as usual: petrochemical plastics and their additives

Petrochemical plastics



Masud & Cable 2023

Petrochemical plastics + additives



Cheung et al. 2025

Petrochemical plastics bad BUT interactions with additives makes them more harmful

THE MYTH OF GREEN PLASTICS: GREENWASHING OR PROMISING ALTERNATIVE ?

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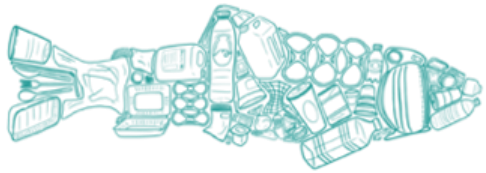
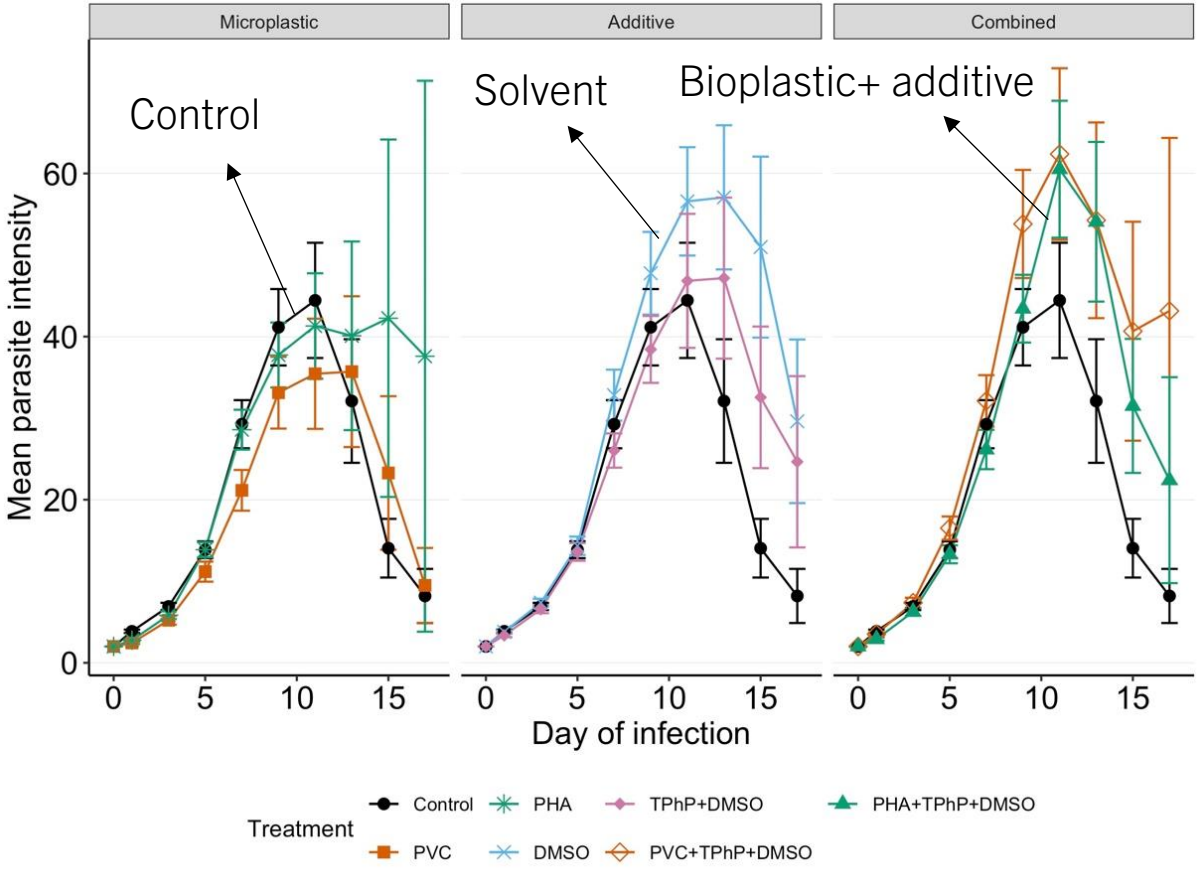
Plastic Fish: the story so far

A better future? The promises of bioplastics

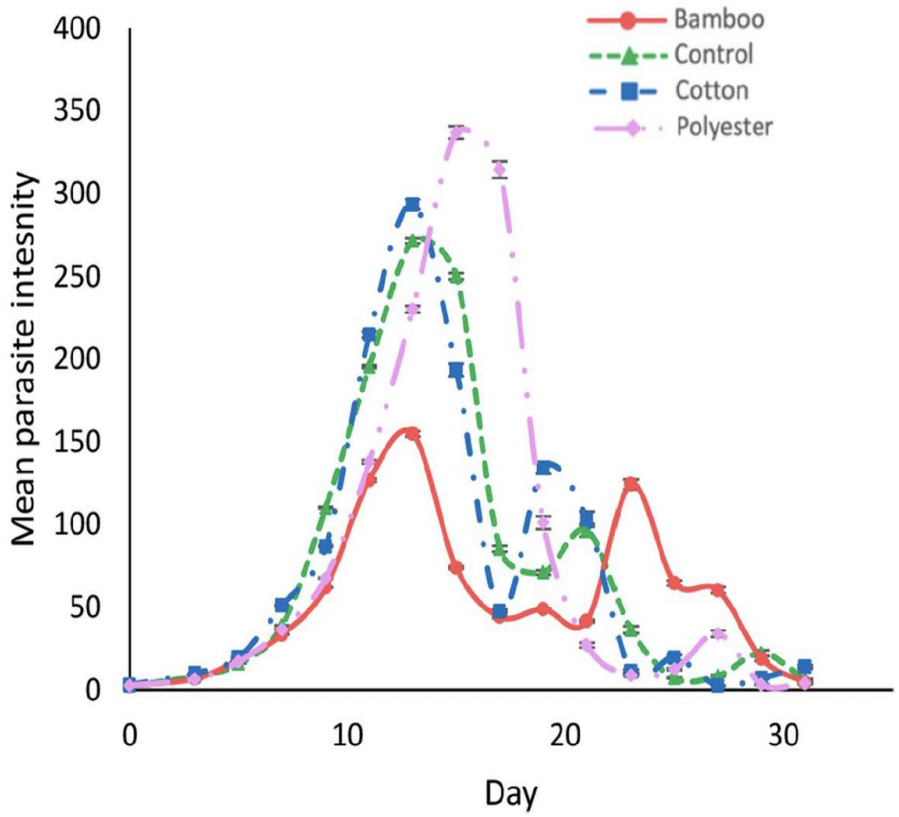


Petrochemical + bioplastics + additives



Cheung et al. 2025

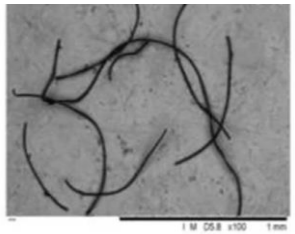
Synthetic vs. natural fibres



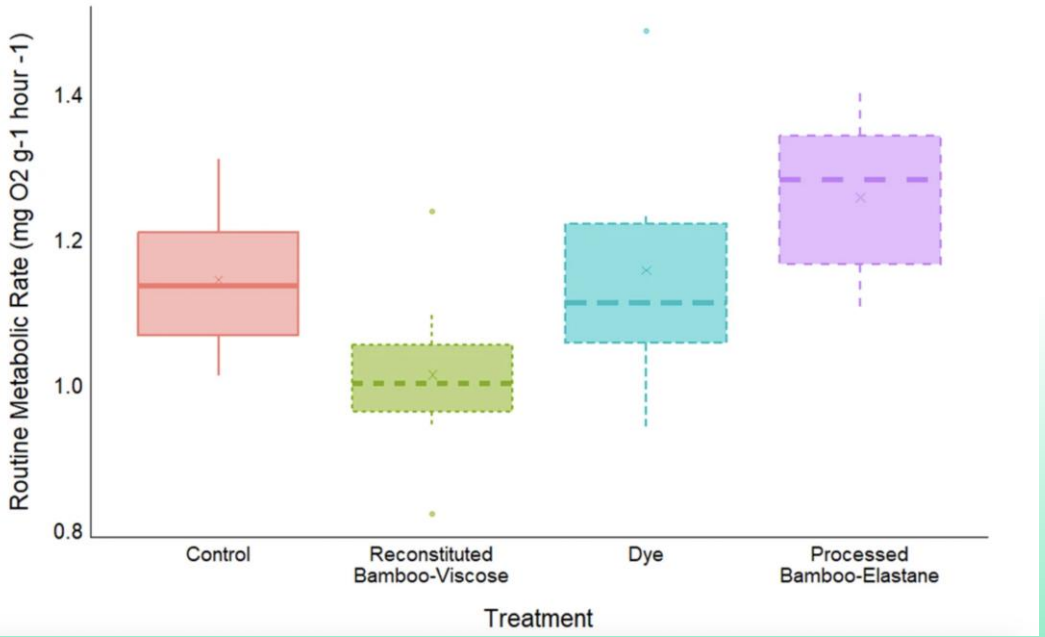
MacAulay et al. 2023

Plastic Fish: the story so far

Digging deeper: the polymer or the additives?



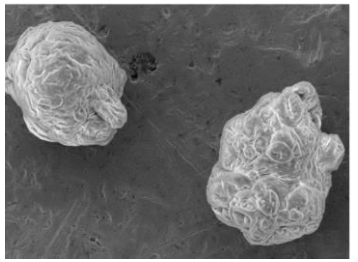
Natural fibres & dyes



MacAulay et al. 2024

Novel plastics & old additives

Petrochemical -PVC



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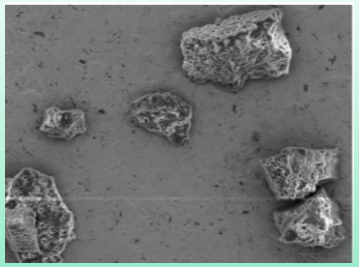
Bioplastic -PHA



No difference in desorption

Cheung et al. 2025

Using the same additive on bio-polymers is NOT a solution to the plastic problem

PLASTIC ASSOCIATED CHEMICALS: THE RED FLAG?

>6000 chemicals linked to plastic production

BASEL / ROTTERDAM / STOCKHOLM CONVENTIONS

Basel - hazardous waste movement and disposal

Rotterdam - Import of hazardous chemicals and pesticides

Stockholm - eliminate/restrict persistent organic pollutants

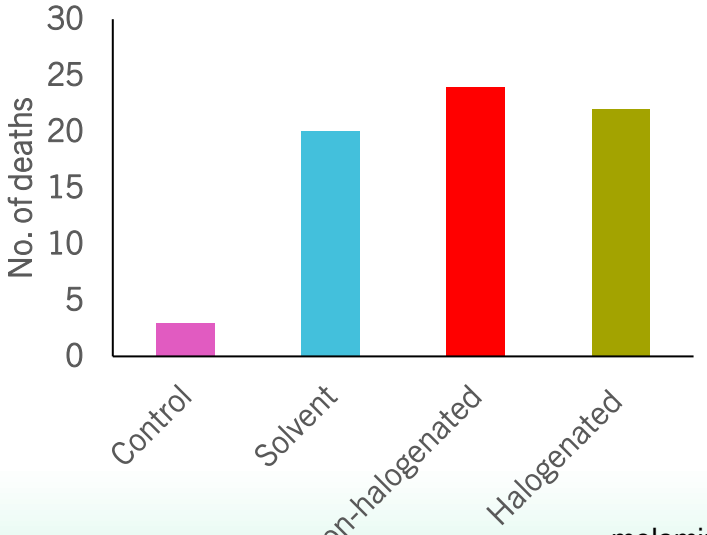
Plastic associated chemicals fall into all 3 categories

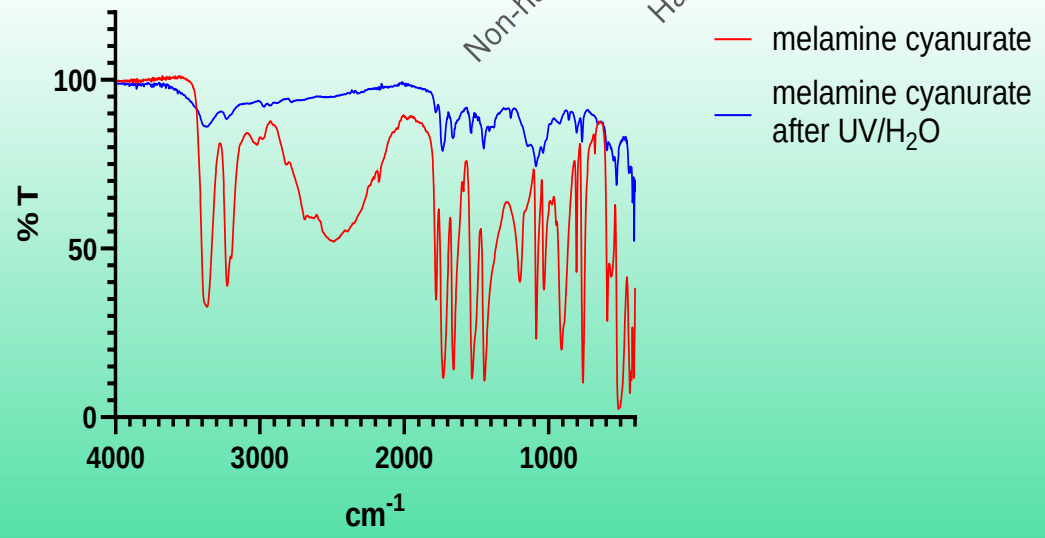
SAFER ALTERNATIVES: THE CASE FOR NON-HALOGENATED FLAME RETARDANTS

Halogenated flame retardants= toxicity and cancer concerns

Halogenated

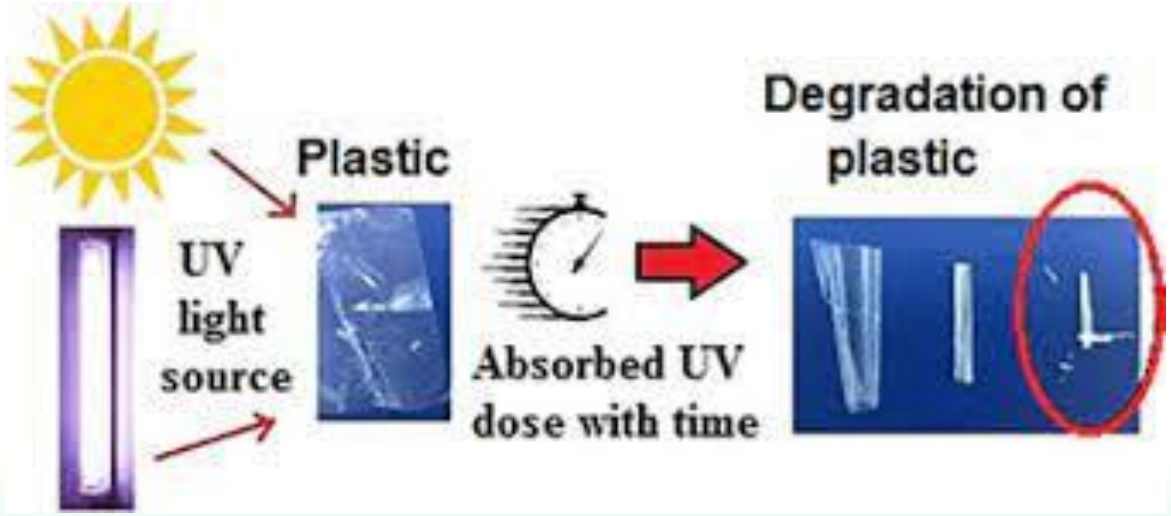
Non-halogenated



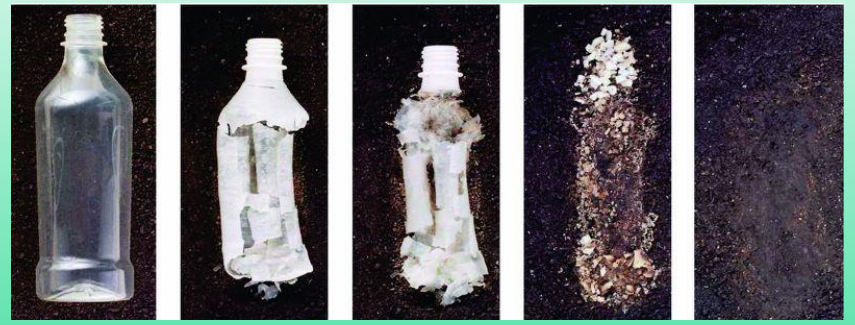


ASSESSING CLAIMS OF DEGRADATION

Environmental chambers



Mesocosm studies

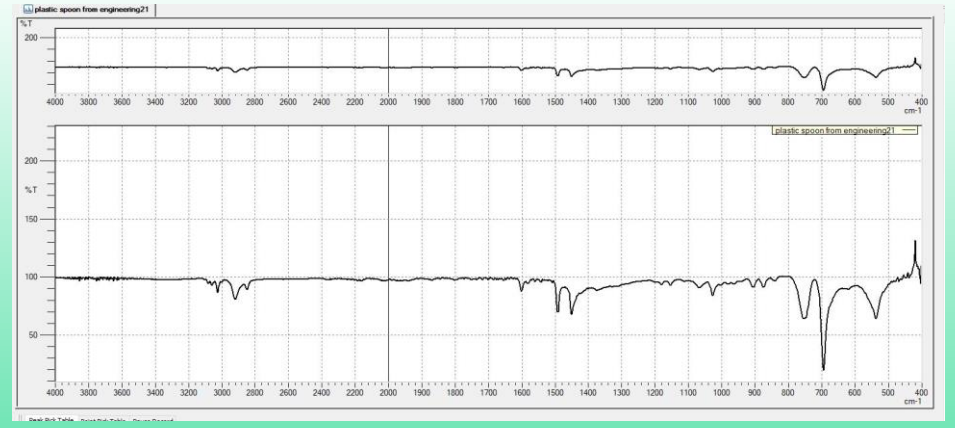


'Accelerated'
VS
'Natural'
conditions

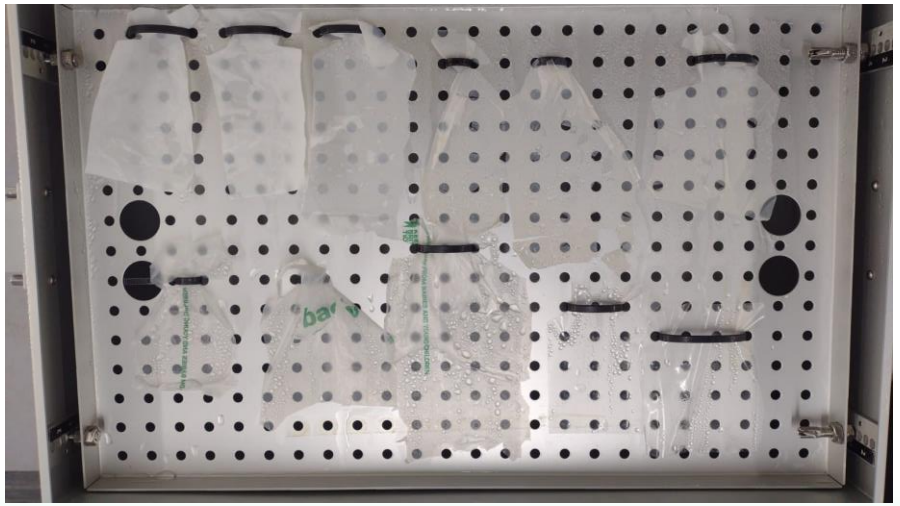
BEFORE AND AFTER-THE FACE OF CHANGE

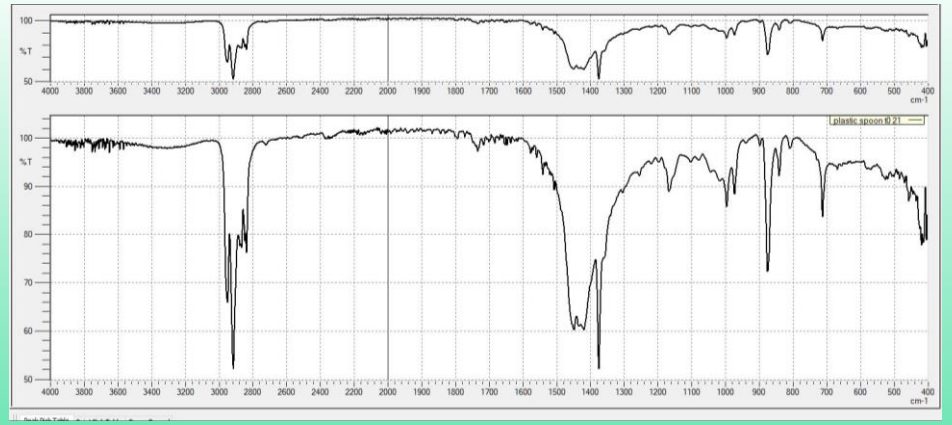
Environmental chambers

Before



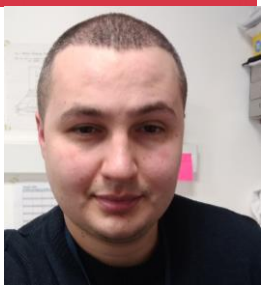
After



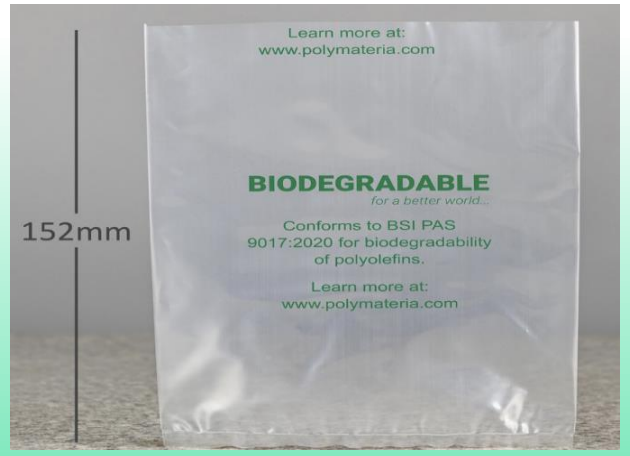


BEFORE AND AFTER-THE FACE OF CHANGE

Mesocosm degradation



Before



After

Some industries are clearly more honest than others!

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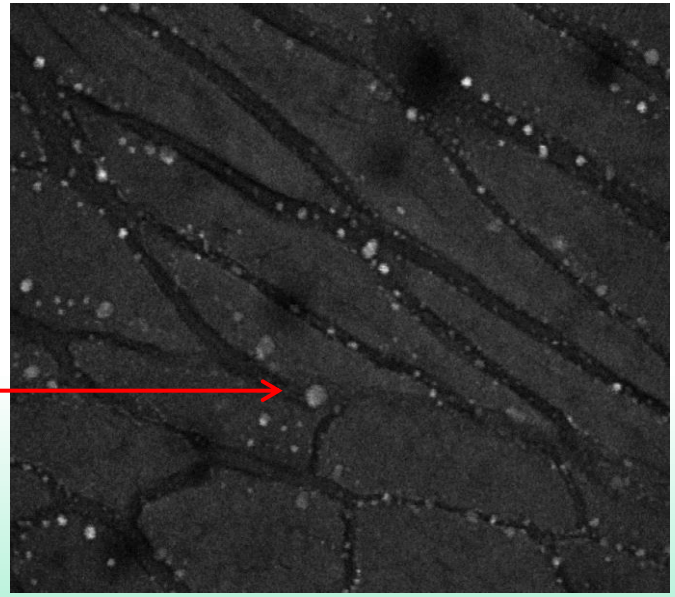
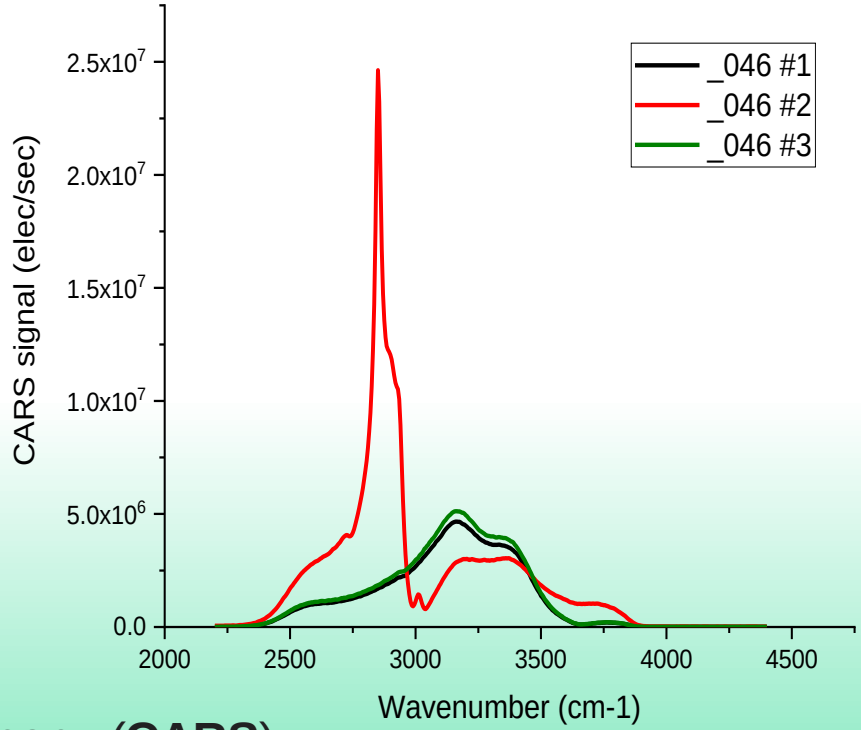
DEVELOPING NOVEL TOOLS: WHAT ARE WE EATING?

Collaborating with fish farms across the UK





Coherent anti-Stokes Raman scattering spectroscopy (**CARS**)

Novel analytical tools for assessing food security

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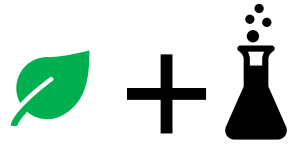
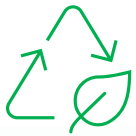
SUMMARY

- Petrochemical microplastics and their additives are toxic

- Bioplastics are not bad on their own, but the additives make them toxic



- Industries must be honest about the compost capacity of their products



- Single additive substitutions will not work

- Future work must focus on food security threat posed by nanoplastics + additives

TAFF TIDY: A COMMUNITY ACTION PROJECT

Creating a world record for river health

GUINNESS WORLD RECORDS

OFFICIAL ATTEMPT

FRIDAY 21 MARCH 2025

11AM-2PM

WITH OUR DELIVERY PARTNER, KEEP WALES TIDY, WE HAVE ALREADY REACHED THE MINIMUM REQUIREMENTS SET BY GUINNESS FOR A NEW WORLD RECORD FOR THE MOST PARTICIPANTS IN A RIVER CLEAN-UP (MULTIPLE LOCATIONS)

PER LOCATION:

- MINIMUM 50 PEOPLE
- 60 MINUTES CLEANUP
- WITNESSES & VOLUNTEERS REQUIRED

ANTICIPATED TO ENGAGE THOUSANDS OF PARTICIPANTS

cadwch keep gymru'n wales daclus tidy

3 CONFIRMED LOCATIONS, WITH MORE COMING SOON