

# Investigating the emerging issue of microplastics and their impacts on terrestrial ecosystems

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# PhD Candidate

- 1<sup>st</sup> Class Honours BSc Marine Biology with Professional Studies.
- Work Placement: AZTI Tecnalia, KNIB.
- NI Regional Representative: Surfers Against Sewage.
- Founder and current VP (2020-21): QUB Marine Biology and Zoology Society.
- Plastic Free QUB Member.







# Project Aims

- Investigate emerging issue of MPs and impacts on terrestrial ecosystems.
- Develop methods for extracting MPs from soil.
- Characterise MPs from NI farms using spectroscopic and microscopic methods.
- Quantify the effects of MPs on terrestrial and/or laboratory worms including molecular mechanisms of toxicity response and perform risk assessment.



# Project Approach

- Determine environmentally relevant concentrations of MPs in NI terrestrial systems : FTIR spectrometry equipment, present these data for NI on ArcMap.
- Quantification of potential MP risks on animal health: impacts for Northern Irish terrestrial ecosystems.
- Examine ingestion of MPs: ecosystem functioning and impacts on animal/human health.
- Molecular-genetic response techniques and Big-Data bioinformatics: impact on health and well-being of soil worms.
- Behavioural experiments on soil biota and terrestrial species: Indication of underlying physiological changes.
- Mesocosm experiments: modelling of the impacts of climate change on microplastics degradation.
- Determine potential future tipping points: disruption in ecosystem service within Northern Ireland.





# Hypotheses

1. MPs pollution in soil will increase with proximity to agricultural land.
2. MPs in soil will vary depending on environmental conditions and soil fauna.
3. The fate and biological impacts of MPs exposure in sentinel terrestrial species can provide advanced warnings of environmental risk.



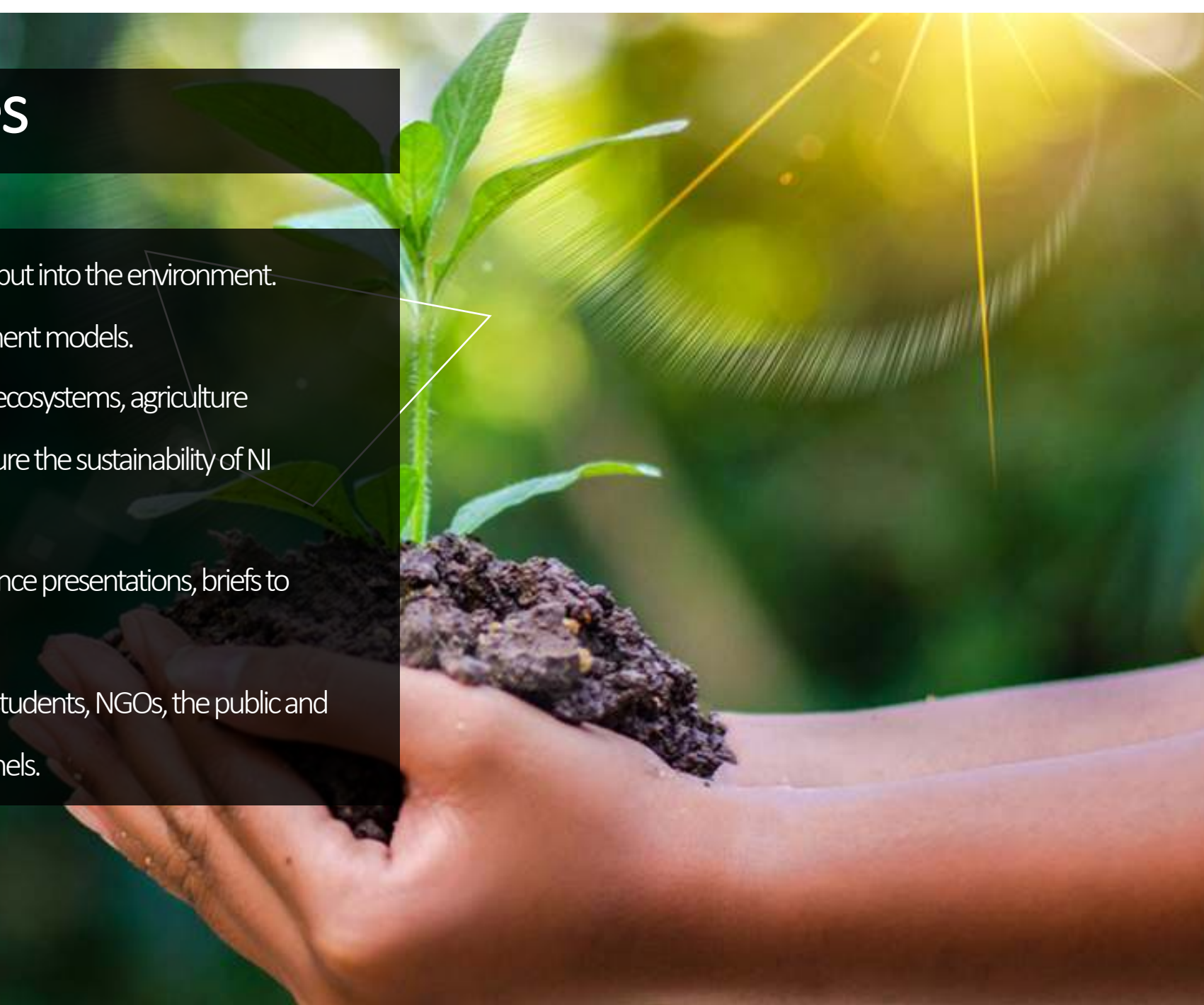


# Data Analysis

- Statistical analysis and graphics performed in R.
- Parametric ANOVA/non-parametric equivalents : differences in MP abundance between/among sites.
- ArcMap.
- Functional response curves and data-analyses (FRAIR R package): quantify feeding and ingestion rates of MPs in worms.
- R package DESeq2: identify differentially expressed genes under MPs toxicity with high degree of significance.
- Sparse principle component analysis: Correlation of gene expression signatures with phenotypic endpoints.

# Expected Outcomes

- Inform strategies to reduce further plastic input into the environment.
- Resulting data analysed to build risk assessment models.
- Inform future policy to protect NI terrestrial ecosystems, agriculture farmland, and the NI agri-food industry. Ensure the sustainability of NI farming in the future.
- Publications in high-quality journals, conference presentations, briefs to policymakers within DAERA.
- Disseminate research findings to university students, NGOs, the public and raise awareness through social media channels.





# Current Work

- BSc Honours project: The influence of anthropogenic changes on shell selection and startle behaviour of the common European hermit crab, *Pagurus bernhardus*.
- Shell acquisition in the common European hermit crab, *Pagurus bernhardus*, when experimentally exposed to MPs.
- Effects on behaviour examined, including motivation through use of a startle probe technique involving exposure to novel visual and aural stimuli.





Thank You



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