

# How threatened planarians can be when ingesting contaminated prey with microplastics?

Sara Silva<sup>1</sup>, Andreia C. Rodrigues<sup>1</sup>, Amadeu M. V. M. Soares<sup>1</sup>, Carlos Gravato<sup>2</sup>, Teresa Rocha-Santos<sup>3</sup>, Ana Patrício Silva<sup>1</sup>

<sup>1</sup>CESAM (Centre for Environmental and Marine Studies) and Department of Biology, University of Aveiro, 3810-193 Aveiro, Portugal

<sup>2</sup>Faculty of Sciences, University of Lisbon, Campo Grande, 1749-016 Lisbon, Portugal.

<sup>3</sup>CESAM (Centre for Environmental and Marine Studies) and Department of Chemistry, University of Aveiro, 3810-193 Aveiro, Portugal

\*mail to: saramonteiro99@ua.pt

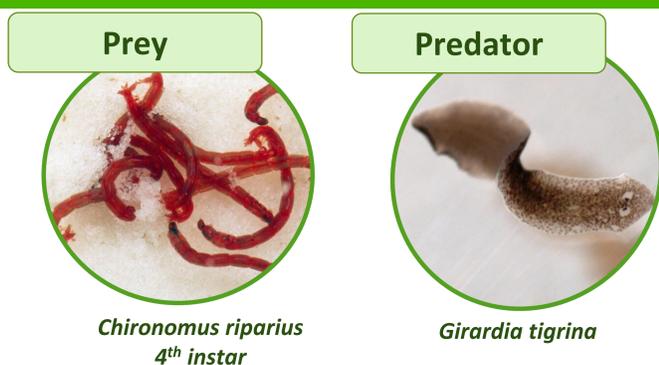


## Introduction

- Freshwater environments are major sinks of microplastics from in land anthropogenic activities → threatening their biota that underpin several ecosystem services.
- Polyurethane is a polymer widely applied on building and foams insulation and in several types of coatings and paints.
- There is no substantial information on predatory organisms, particularly the ones that present extracorporeal and intracellular digestion such as planarians.
- Trophic transference of these particles along the food chains, although to be expected, also remains little explored.

**Aim:** Evaluate behavioral and physiological responses of the planarian *Girardia tigrina* after consuming contaminated prey - *Chironomus riparius* 4th instar larvae previously exposed to microplastics of Polyurethane.

## Material and Methods



1. Exposure of *Chironomus riparius* larvae to PU-MPs (375 mg/kg, 7-9 μm, 10 days, 20°C, 16h light: 8h dark)

2. Confirm larval length and behaviour (locomotion) [1]

3. Feeding assay with alive (un)contaminated prey for 3h, and address

3.1. Number of ingested prey

3.2. Locomotion

3.3. Regeneration

3.4. PU-MP uptake (histology)

## Conclusions

Planarians ingested more contaminated chironomid larvae, probably related to a higher activity revealed by such larvae as planarians display a preference for live prey that produce greater disturbance in the water [2]. Nonetheless, such ingestion might also be a result of a potential lower nutritional value of the contaminated larvae, which could be inferred when evaluating the energy reserves (proteins, lipids, carbohydrates) of larvae as previously performed [3].

Consumption of contaminated prey did not change planarians locomotion, but significantly affected auricles regeneration. Planarians fed on contaminated processed liver also revealed slow processed of regeneration [4,5]

[1] Paper submitted to IJERPH, Manuscript ID: ijerph-2044753; [2] 10.1007/s40614-018-00176-w; [3] 10.1016/j.jhazmat.2020.123775; [4] https://doi.org/10.1016/j.aquatox.2019.105354; [5] https://doi.org/10.1016/J.JHAZMAT.2022.128673

## Acknowledgments

This study was supported and CESAM (UIDP/50017/2020 + UIDB/ 50017/2020 + LA/P/0094/2020) and CompPET research project (POCI-01-0145-FEDER-030361). ALPS was funded by FCT (CEECIND/01366/2018)



FCT Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR Portugal



## Results

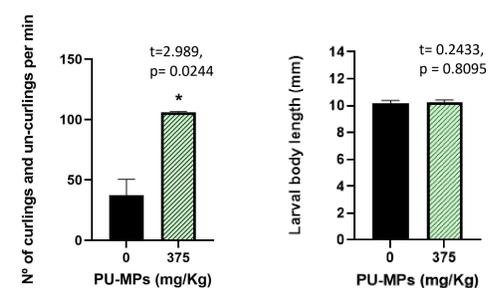


Figure 1: Effects of polyurethane microplastics (PU-MPs) on *Chironomus riparius* larval behaviour (left side) and length (right side) after 10 days of exposure.

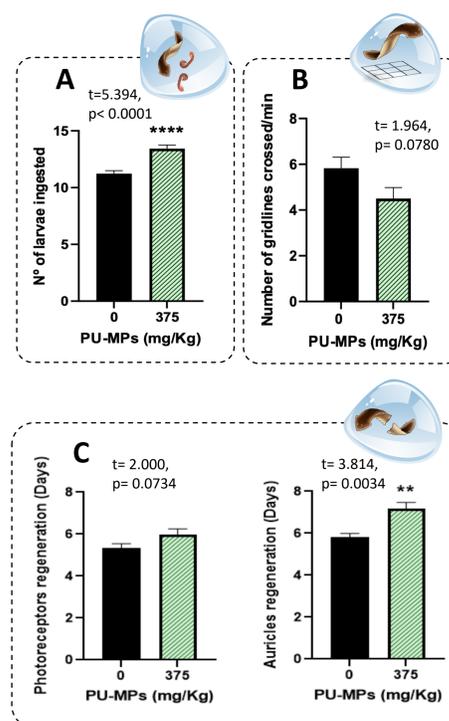


Figure 2: Number of consumed (un)contaminated alive prey by *Girardia tigrina* (A), and consequent effect on locomotion (B) and regeneration (C).

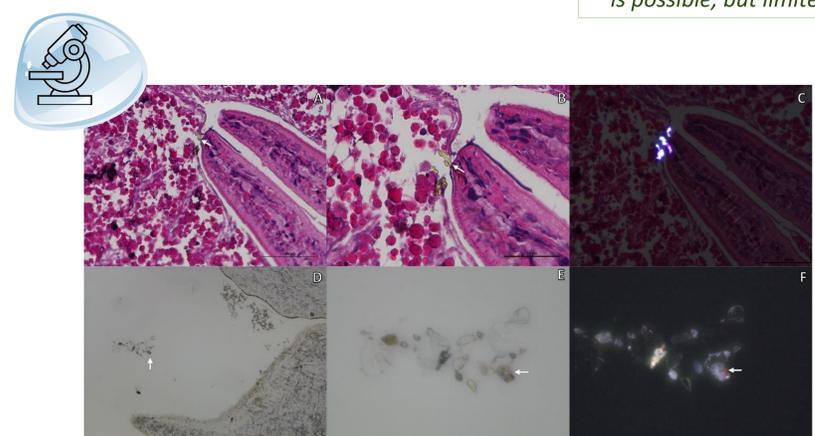


Figure 3: *Girardia tigrina* experimentally exposed to polyurethane (PU-MPs). Planaria stained with haematoxylin & eosin showing an agglomerate of particles (suspected microplastics) near the tip of the pharynx (20x, A; 40x, B; 20x under polarized light, C). Planaria stained with Nile Red showing an agglomerate of organic matter, including a Nile Red stained sphere, in the pharyngeal pouch (20x, D; 40x, E; 40x under polarized light, F).