INGESTION OF MICROPLASTICS BY FISHES OF AN ESTUARINE TROPHIC CHAIN IN THE WESTERN ATLANTIC

Anne K. S. Justino [1], Véronique Lenoble [2], Latifa Pelage [1], Guilherme V. B Ferreira [1], Rafaela Passarone [1], Thierry Frédou [1], Flávia L. Frédou [1]

[1] Departamento de Pesca e Aquicultura da Universidade Federal Rural de Pernambuco – DEPAQ/UFRPE, Rua Dom Manuel de Medeiros, s/n, 52171-900, Recife, Brazil.

[2] Université de Toulon, Aix Marseille Univ., CNRS/INSU, IRD, MIO UM 110, Mediterranean Institute of Oceanography, CS 60584, 83041 – TOULON, France

Corresponding author: anne.karen@hotmail.com

BACKGROUND

The whole marine ecosystems are reported to be contaminated by microplastics (MPs), whereas the ecological mechanisms involved in the ingestion of debris by marine organisms are relatively unknown. However, recent researches point out the trophic transfer (Fig.1) as a possible pathway to contaminate species at a high trophic level (Nelms et al., 2018; Ferreira et al., 2019).

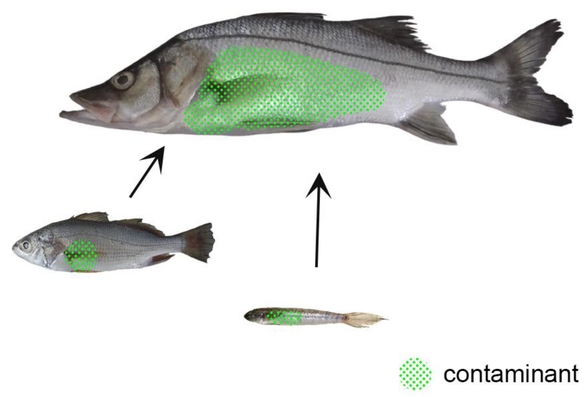

Fig. 1. Trophic transfer scheme - Ingestion of contaminated prey by a high trophic level predator

This study explores an estuarine trophic chain, in a tropical ecosystem, aiming at understanding the patterns responsible for the different ingestion rates of plastic debris observed in three fish species (a predator and two of its main prey).

METHODOLOGY

Situated in a Marine Protected Area (MPA Santa Cruz), the Estuarine Complex of Santa Cruz Channel (Fig.2) is a typical model of an urban tropical estuary, which provide several ecosystems services, but is susceptible to anthropogenic impacts. A total of 82 fishes were collected through the local fishery, 30 individuals of *Centropomus undecimalis* (Piscivore), 21 of *Bairdiella ronchus* (Zoobenthivore) and 31 of *Gobionellus stomatus* (Detritivore). For a reliable assessment of microplastic contamination in the digestive tracts of fishes, a digestion protocol using NaOH (1M) was applied with the implementation of procedural blanks. We also followed the recent recommendations by Markic et al. (2019) and Hermsen et al. (2018) to avoid cross-contamination and minimize over/underestimation of microplastics samples.

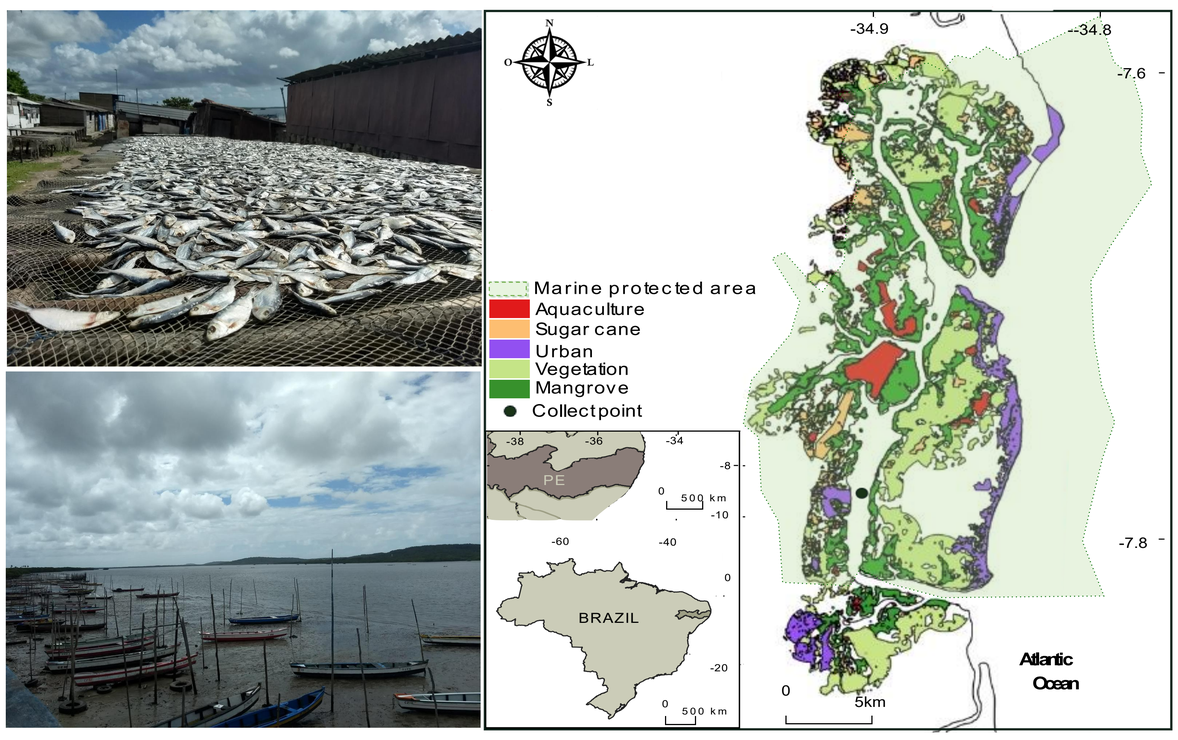

Fig. 2. Map of the Estuarine Complex of the Santa Cruz Channel - Brazil

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CAPES

BOLSAS FUNBIO CONSERVANDO O FUTURO

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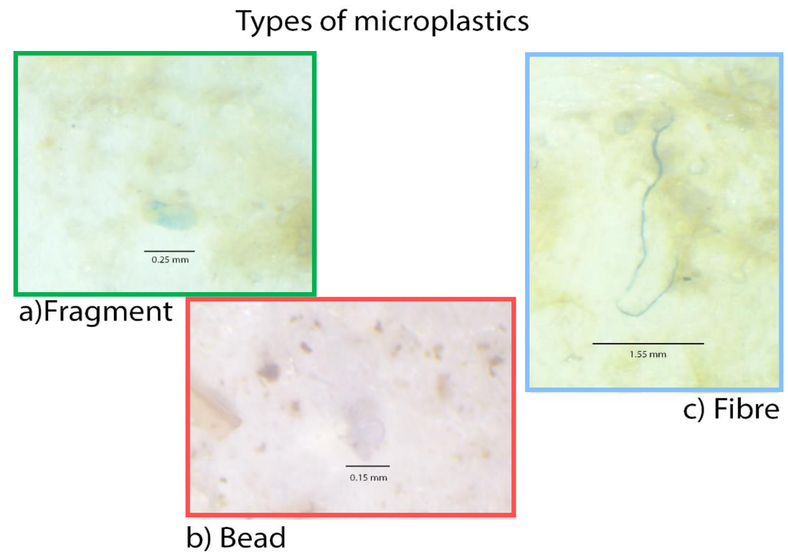
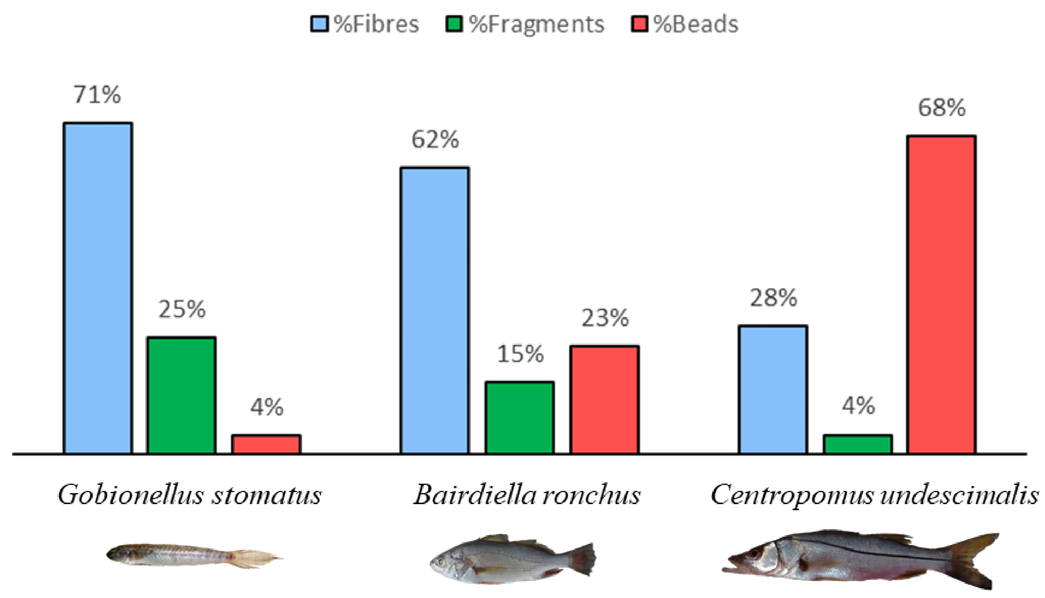
RESULTS

- Ingestion of microplastic differed significantly depending on the trophic level. The predator, *C. undecimalis* was the most contaminated species (3.3 ± 2.9 MPs fish^{-1}), followed by their two prey *G. stomatus* (1.7 ± 1.5 MPs fish^{-1}) and *B. ronchus* (1.2 ± 1.3 MPs fish^{-1}).



- Regarding the types of MPs ingested by fishes, most were fibres (47%), beads (40%) and fragments (13%), and varied between the species, *C. undecimalis* (68% beads, 28% fibres and 4% fragments), *B. ronchus* (23% beads, 62% fibres and 15% fragments), and *G. stomatus* (4% of beads, 71% of fibres and 25% of fragments).



- The length of MPs ingested also varied according to the species. *G. stomatus* (1.7 ± 2.3 mm fish^{-1}) ingested the longest MPs, followed by *B. ronchus* (0.8 ± 0.7 mm fish^{-1}) and *C. undecimalis* (0.5 ± 0.6 mm fish^{-1})

CONCLUSION

Our findings suggest that piscivores fish are more susceptible to be contaminated by microplastics since the ingestion rates increased with the trophic level. Our study also highlights a useful protocol of gut digestion applied for estuarine organisms, which can be replicated to other similar species and ecosystems.

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