Preliminary study on microplastic assessment in the digestive system of marine mammals and turtles found stranded on Samos Island, Eastern Aegean Sea

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INTRODUCTION
The North-Eastern Aegean sea is characterized by the presence of a unique marine biodiversity, including cetaceans, turtles and monk seals, which occupy the top of the trophic chain and play an important role as bioindicators. To date, very few studies have been carried out for microplastic analyses in marine megafauna. However, previous research on the digestive tract of different marine species confirms the bioavailability of marine plastic debris.

RESULTS
For all analyses, the environmental contamination blank controls did not indicate significant contamination levels in comparison to the levels found in the samples.

**Dolphins**
A total of 1306 microplastics was found. Fibres were more abundant than fragments (χ² = 224.93, df = 1, p-value < 2.2e-16).
Blue was the predominant colour (χ² = 2322.4, df = 9, p-value < 2.2e-16).
The majority of the items found belonged to the size class B (0.2 - 0.5 mm) (χ² = 324.64, df = 5, p-value < 2.2e-16).
The main amount of plastic items found in the third stomach was higher than in the other compartments, although not significantly (Kruskal-Wallis χ² = 4.2041, df = 5, p-value = 0.53264) (Fig. 2).

**Turtles**
A total of 3554 microplastics was found. Fibres were more abundant than fragments (χ² = 857.77, df = 1, p-value = 2.2e-16).
Blue was the predominant colour (χ² = 4172.2, df = 8, p-value < 2.2e-16).
The majority of the items found belonged to the size class B (0.2 - 0.5 mm) (χ² = 1108.7, df = 5, p-value < 2.2e-16).
The main amount of plastic items found in the oesophagus was higher than in the other compartments, although not significantly (Kruskal-Wallis Test: χ² = 1108.7, df = 3, p-value = 0.04587) (Fig. 3).

**Monk seals**
A total of 297 microplastics was found. Fibres were more abundant than fragments (χ² = 128.03, df = 3, p-value < 2.2e-16).
Transparent was the predominant colour (χ² = 320.48, df = 8, p-value < 2.2e-16).
The majority of the items found belonged to the size class B (0.2 - 0.5 mm) (χ² = 152.96, df = 8, p-value < 2.2e-16).
The main amount of plastic items found in the stomach was higher than in the other compartments, although not significantly (χ² = 225.86, df = 1, p-value < 2.2e-16) (Fig. 4).

DISCUSSION
A high concentration and variety of microplastics were found throughout each tract of the digestive systems, confirming the wide pollution of plastic affecting the top predators of the trophic chain. The discovered trend showed that a greater amount of microplastics was found in the oesophagus of the turtle dataset, which can be explained by certain anatomical characteristics of the species. This finding highlights the importance of considering all compartments of the digestive tracts when conducting microplastic assessments.

The prevalence of specific colours and sizes needs further studies to identify the source.

CONCLUSION
Considering the number of samples and the species of turtles this study underlines for the first time the relevance of the oesophagus in microplastic analysis. First data on microplastic contamination in Mediterranean Monk seal are reported in this research. Analyses need to be conducted to understand whether there is a link between size and sex of the animals and the abundance of microplastics. Toxicological analyses are necessary to determine the potential impact on the health of these species in the Aegean Sea.

This study proposes an innovative, cost-efficient and targeted method, which maximises the results of a complete assessment of micro and macroplastic content in the digestive tracts of marine megafauna.

References:

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