Microplastic quantification in *Nephrops norvegicus* and relationship with **body condition and biomarker response** in the NW Mediterranean Sea

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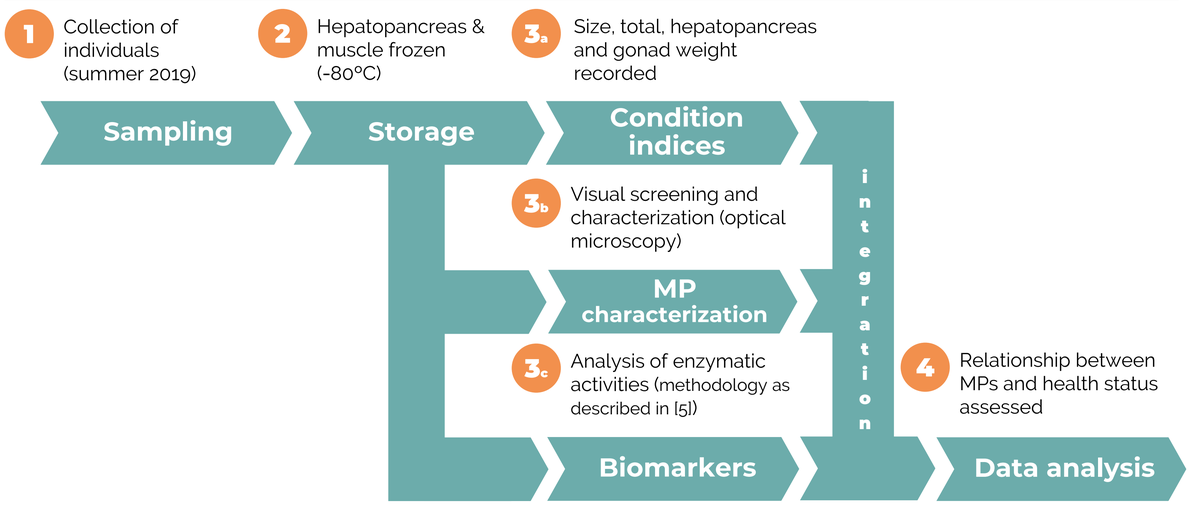
INTRODUCTION

Microplastic (MP) ingestion has been highlighted in several crustacean species. Their close relationship with the sediment is thought to lead to an increased ingestion of MPs which may be retained due to the complexity of their digestive system (gastric mill).

Occurrence of plastics in Nephrops norvegicus has already been reported in the North and Irish Sea as well as in the Mediterranean[1-3] and a negative impact on body condition has been reported after prolonged exposure under controlled conditions. [4] Most recently, it has been pointed out as a valuable bioindicator and flagship species for plastic contamination in the deep-sea[3].

The present study evaluates the occurrence of MPs in wild-caught individuals of *N. norvegicus* from the NW Mediterranean Sea and its potential impact on health assessed through body condition indices and enzymatic biomarkers.

MATERIALS & METHODS



FIBRE OCCURRENCE

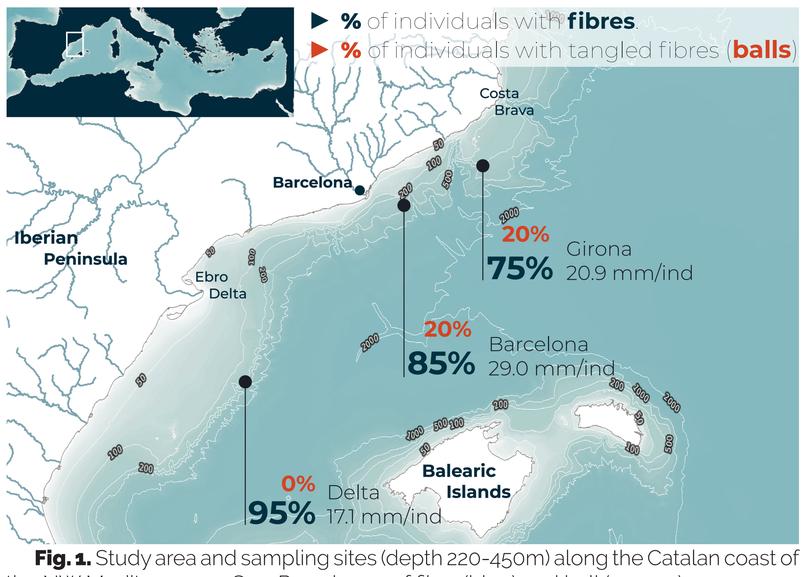


Fig. 1. Study area and sampling sites (depth 220-450m) along the Catalan coast of the NW Mediterranean Sea. Prevalence of fibre (blue) and ball (orange) occurrence and mean fibre load indicated.

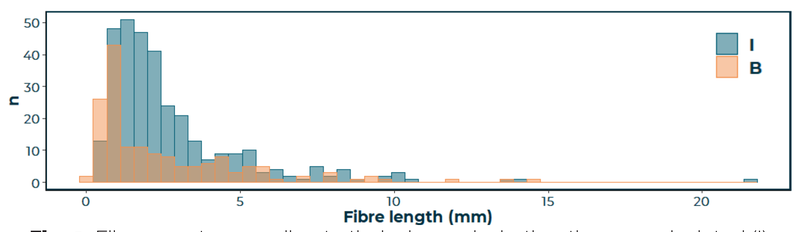


Fig. 2. Fibre counts according to their size and whether they were isolated (I) or as part of a tangled ball of fibres (B).

484 potential MPs were visually sorted in stomach contents. All items found were fibres with varied size (Fig. 2). They were mostly transparent, yellowed or black, and signs of wear were frequent.

Differences in the composition of fibres (see categories in Fig. 3) were found among locations (PERMANOVA, p=0.0117) (Fig. 4).

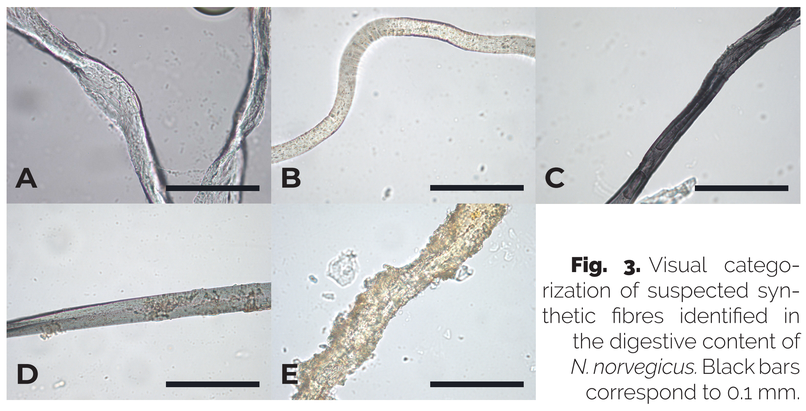


Fig. 3. Visual categorization of suspected synthetic fibres identified in the digestive content of *N. norvegicus*. Black bars correspond to 0.1 mm.

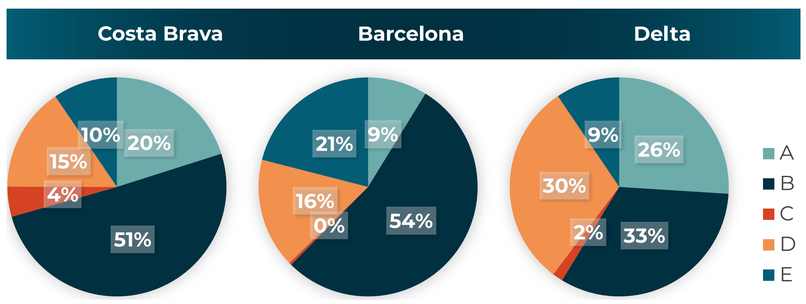
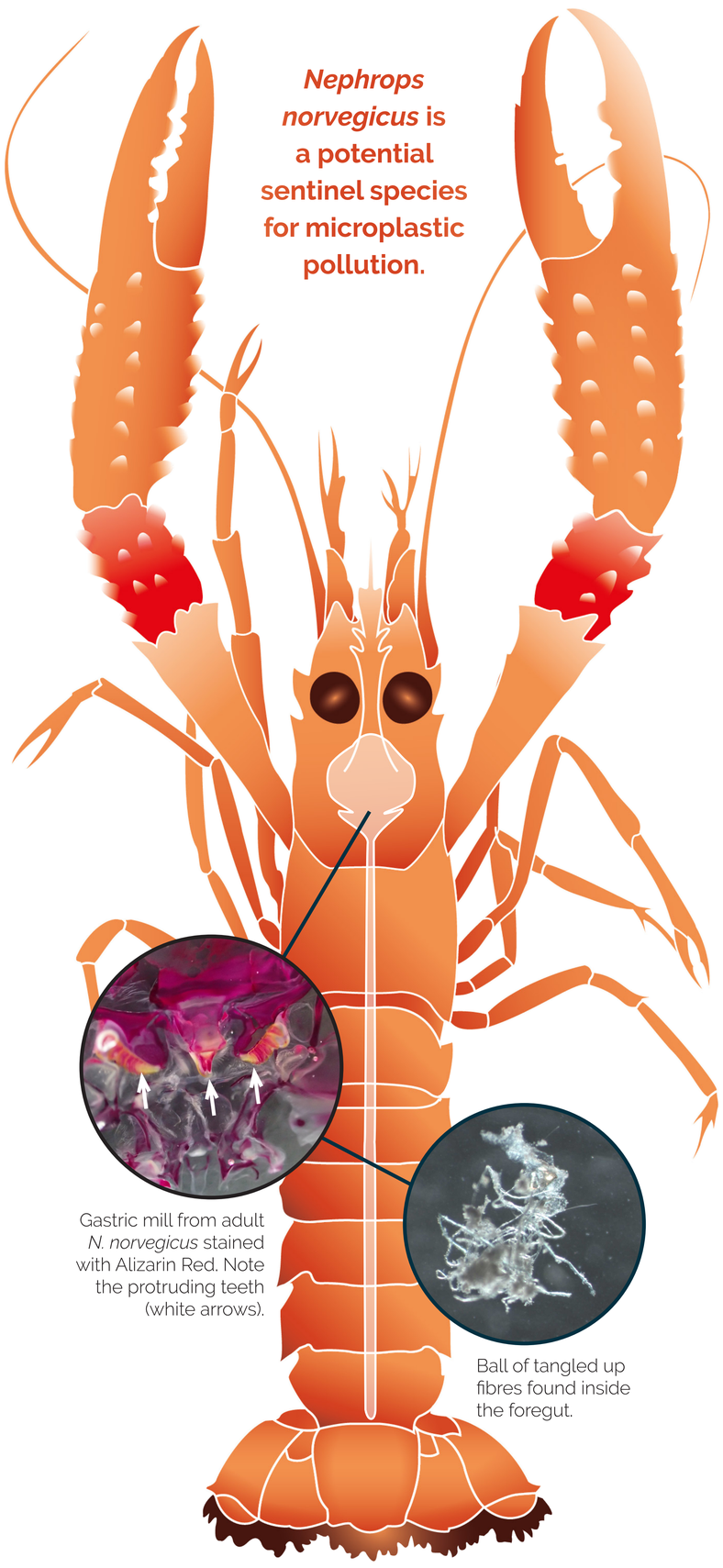


Fig. 4. Fibre composition according to visual categorization for each location.

No significant relationships were observed between condition indices (Kn, HSI and GSI) and fibre load(Fig.5).

No differences in mean fibre load among localities were found, yet occurrence of balls was lower in Delta(Fig.1).



CONDITION INDICES

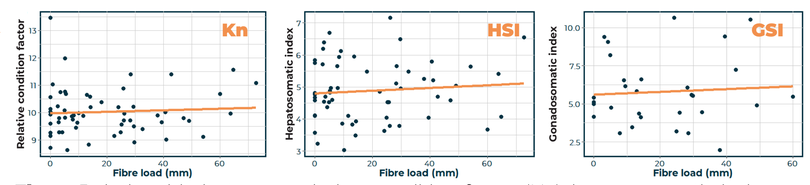


Fig. 5. Relationship between relative condition factor (Kn), hepatosomatic index (HSI) and gonadosomatic index (GSI) with with fibre load.

BIOMARKERS

Lactate dehydrogenase (LDH), citrate synthase (CS), acetylcholinesterase (AChE), catalase (CAT), glutathione-S-transferase (GST), carboxylesterases (CbE) and penthoxyresorufin O-deethylase (PROD) activities were selected (Fig. 6).

Significant correlations between fibre load and enzymatic activities were only found for CAT (p=0.021) and GST (p=0.008).

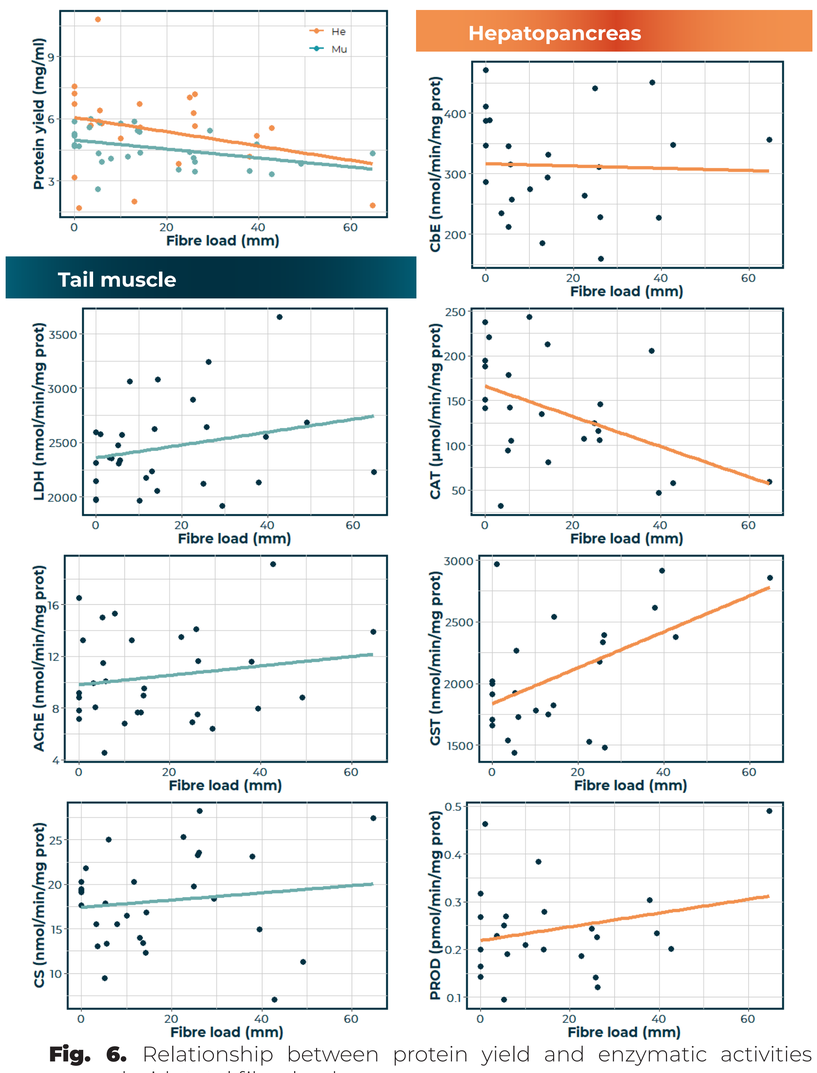


Fig. 6. Relationship between protein yield and enzymatic activities measured with total fibre load.

FINAL REMARKS

▶ Fibre loads seem lower than those reported in other areas for the same species [2] or in this same area for the shrimp *Aristeus antennatus* [6].

▶ A possible inhibition of CAT and enhancement of GST related to fibre load were observed. A similar pattern was reported in another invertebrate exposed to PS microplastics under controlled conditions [7].

▶ **Our results suggest that these individuals might be able to cope with the fibre loads observed as no decrease on condition indices was identified, although further studies will be needed to better understand the biomarker response reported.**

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