

# PML

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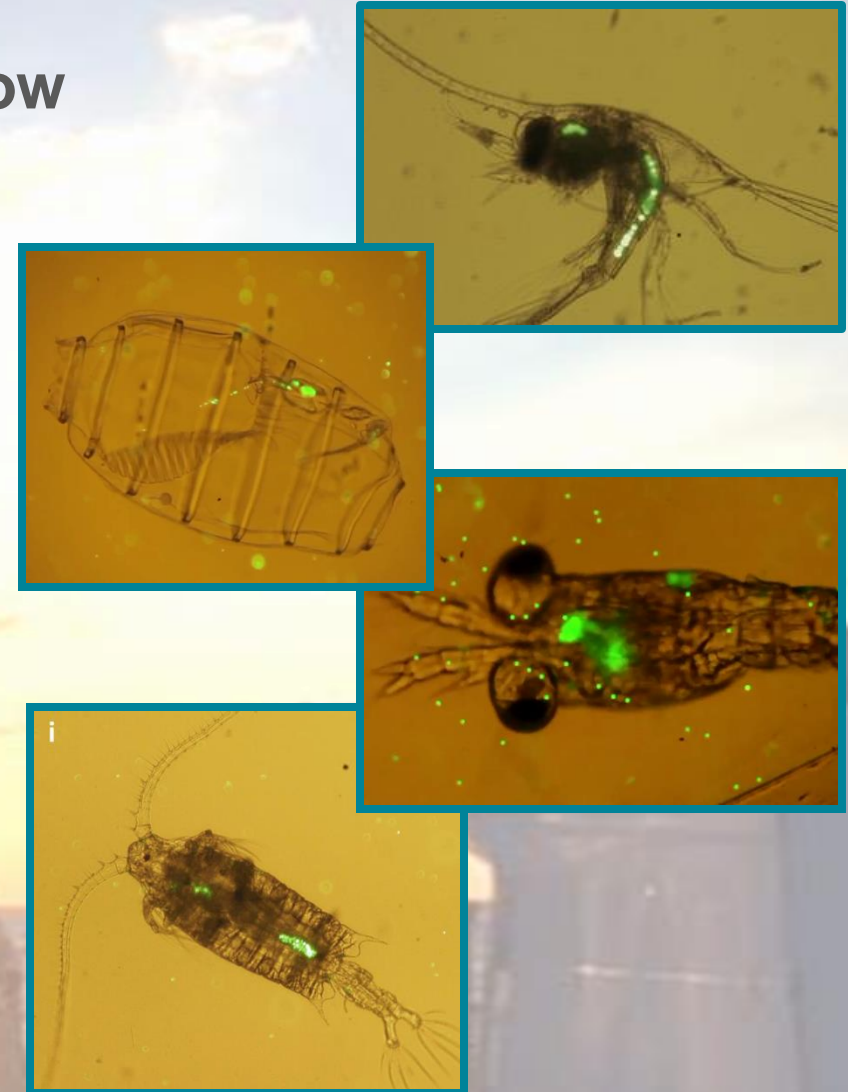
## Bioavailability and ingestion of microplastic by zooplankton in the natural environment

Pennie Lindeque, Rachel Coppock, Elaine Fileman,  
Amanda Beesley and Matthew Cole

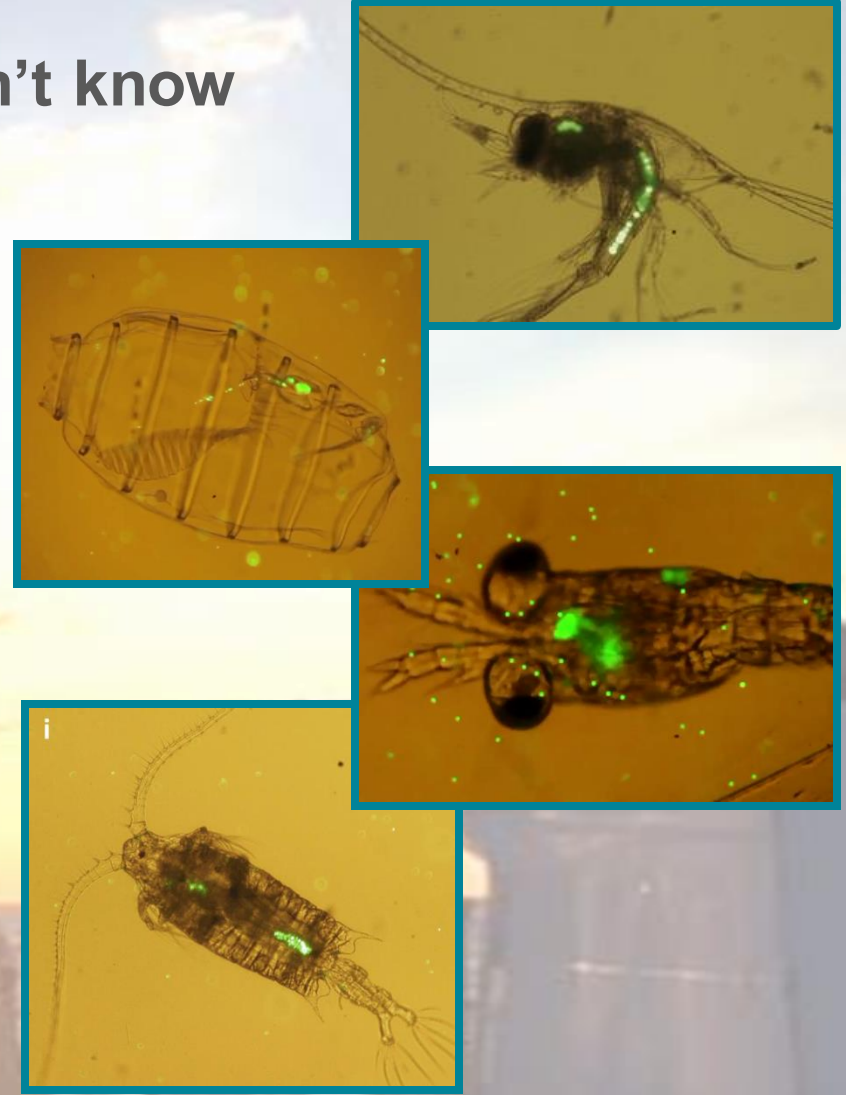
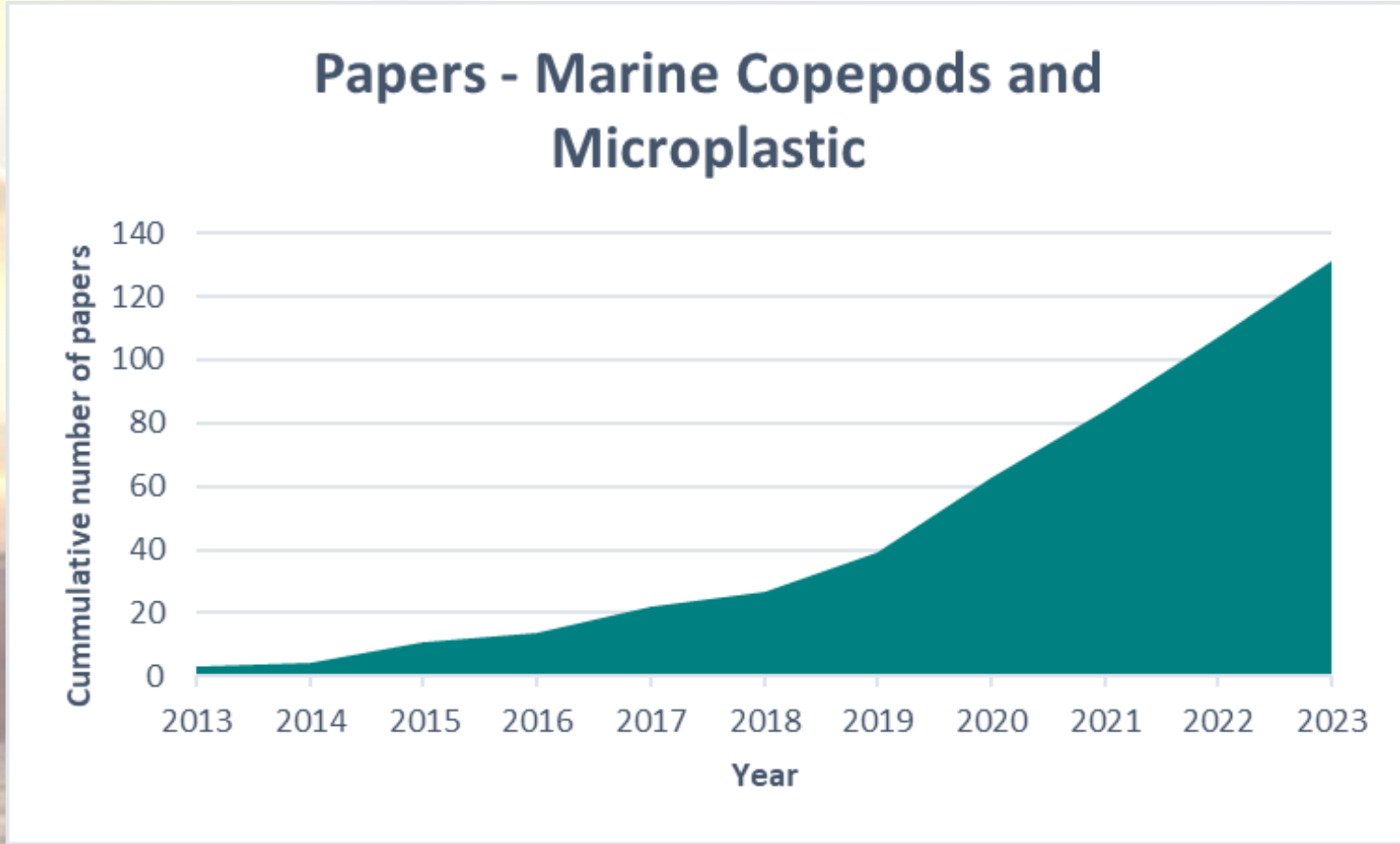


## Microplastic ingestion by zooplankton: what we know

- † Occurs in a range of taxa under laboratory conditions
- † Significantly reduces algal feeding in many groups
- † Negatively affects health: Egg hatching, egg viability, lipid accumulation, moulting, etc
- † Influenced by MP ageing, shape and infochemicals
- † Not all lab studies have shown negative effects
  - † Copepod behaviour reduces the risk of MP ingestion

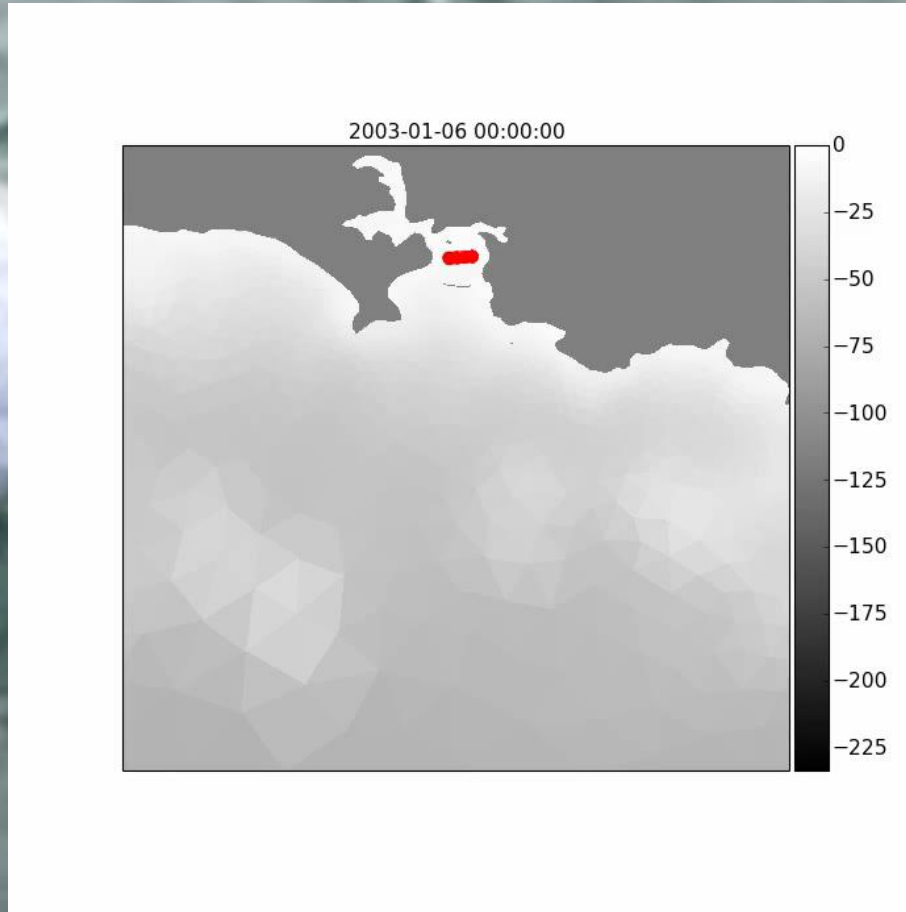


# Microplastic ingestion by zooplankton: what we don't know



### Aims of Study:

- ⌘ Are MP ingested by ZP in their natural environment?
- ⌘ How does this vary over space and time?
- ⌘ What are the drivers of ingestion?
- ⌘ Is there evidence of selectivity?





- ~ 12,000 zooplankton picked out and processed
- Enzymatically digested
- Ingested plastics characterised and counted
- Associated waterborne microplastic
- Zooplankton abundance counts



	Average	Range
# Microplastics (MP) m <sup>-3</sup>	16	1-110

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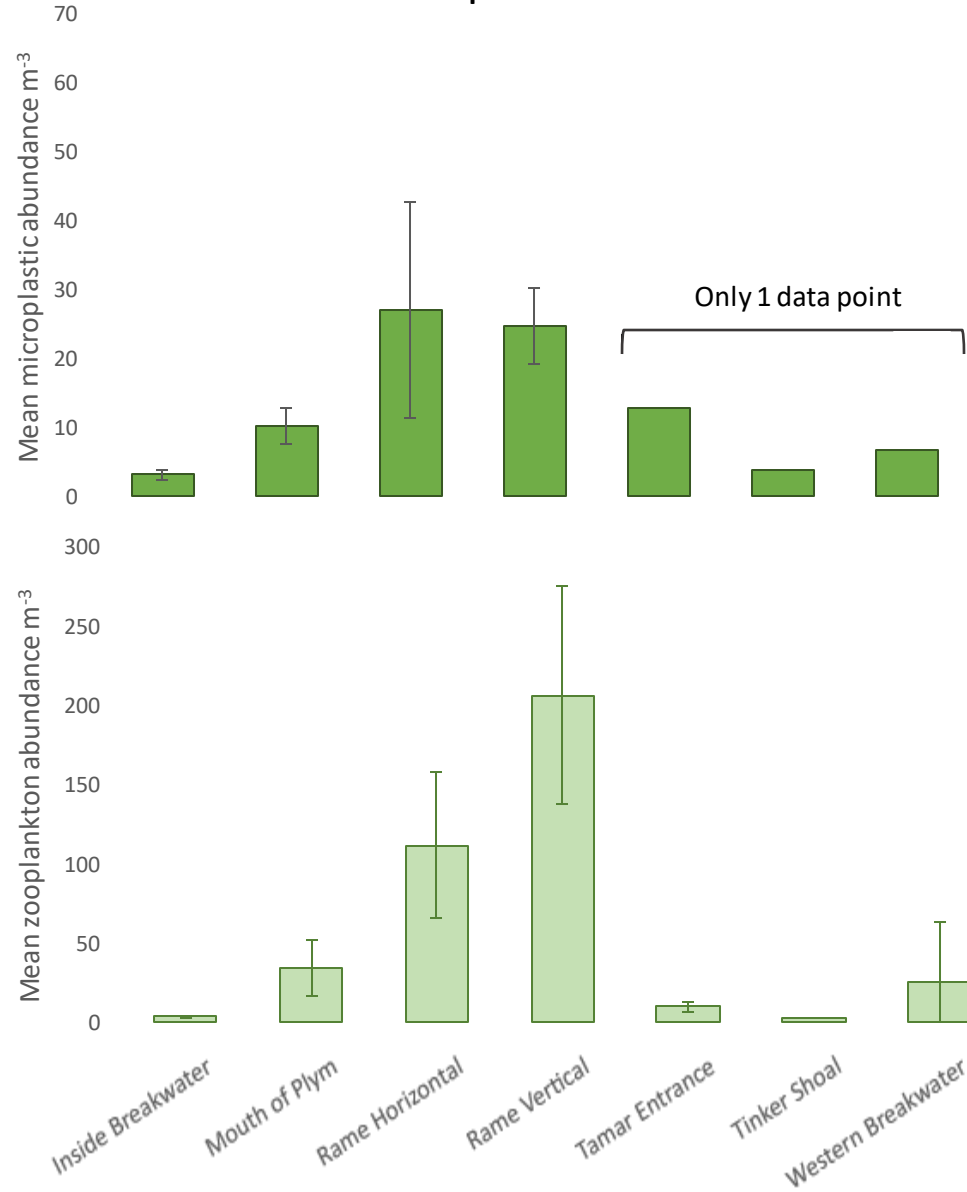


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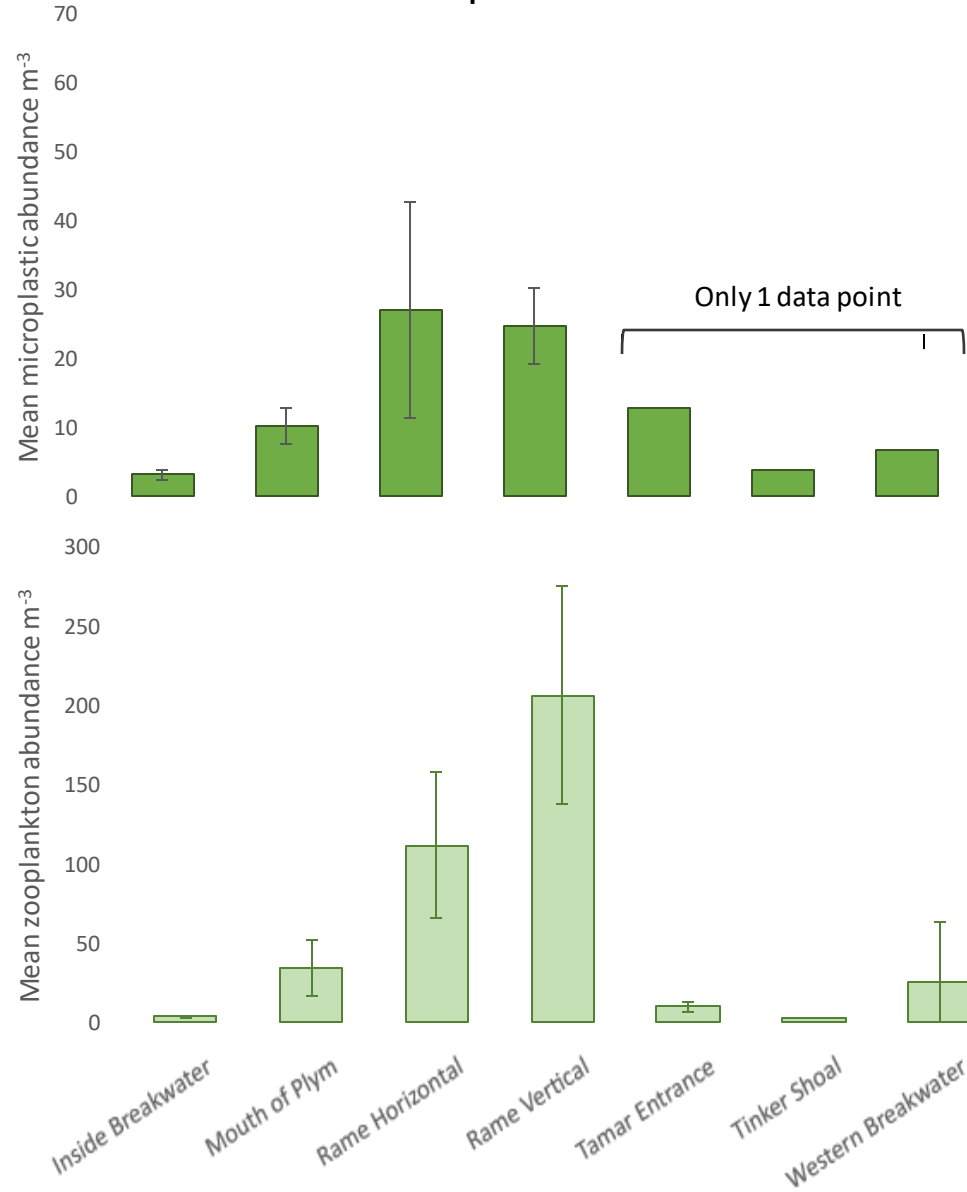
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Encounter Rate (ER) MPm <sup>-3</sup> / ZPm <sup>-3</sup>	2.00	0.002-20 (1 MP to every 500 ZP, to 20 MP per 1 ZP)
Ingestion (I) Total number of MP ingested/# ZP processed	0.038 (1 MP / 25 ZP)	0.003-0.227 (1MP / 300-4.5 ZP)

## Spatial

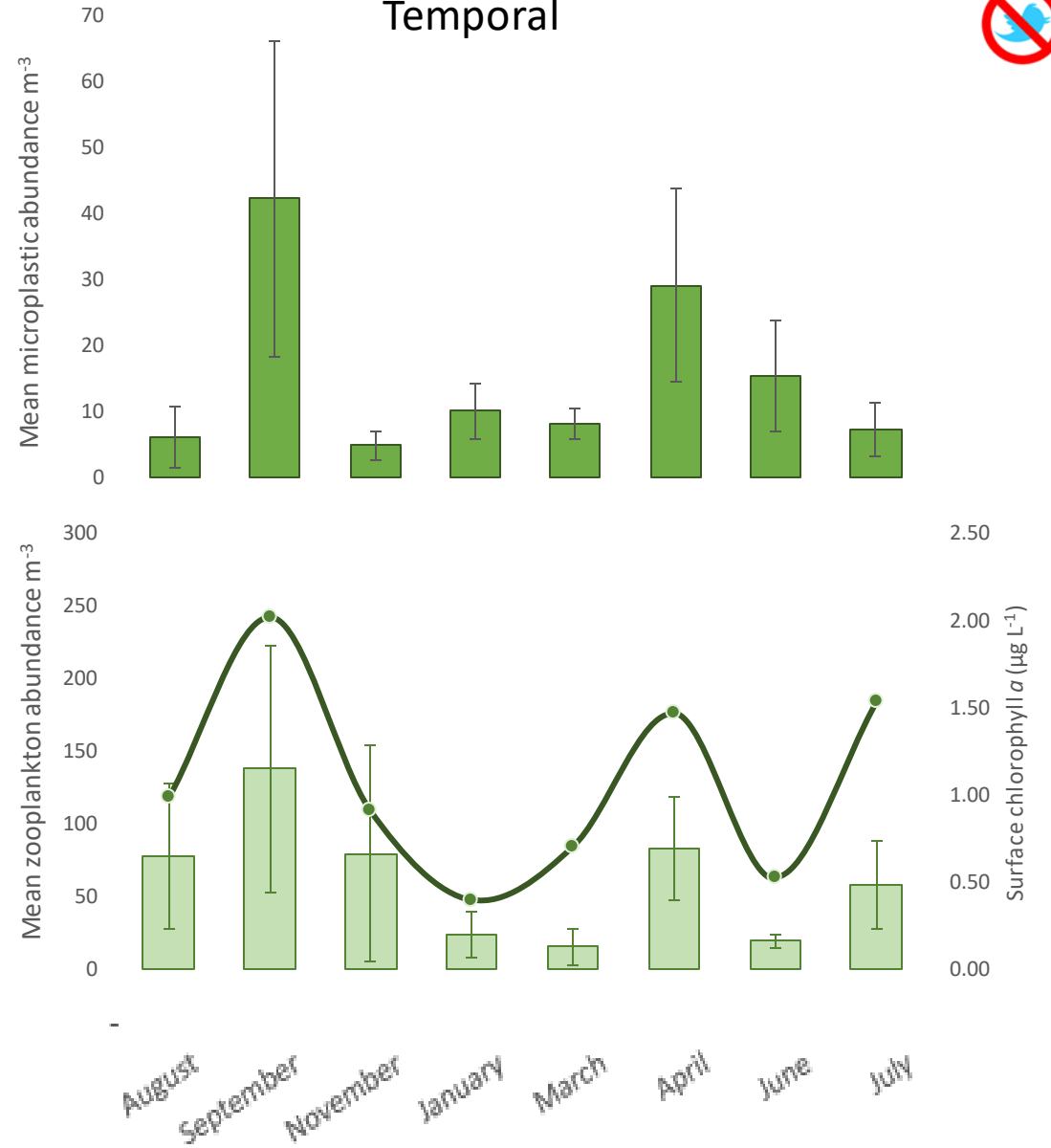




### Spatial

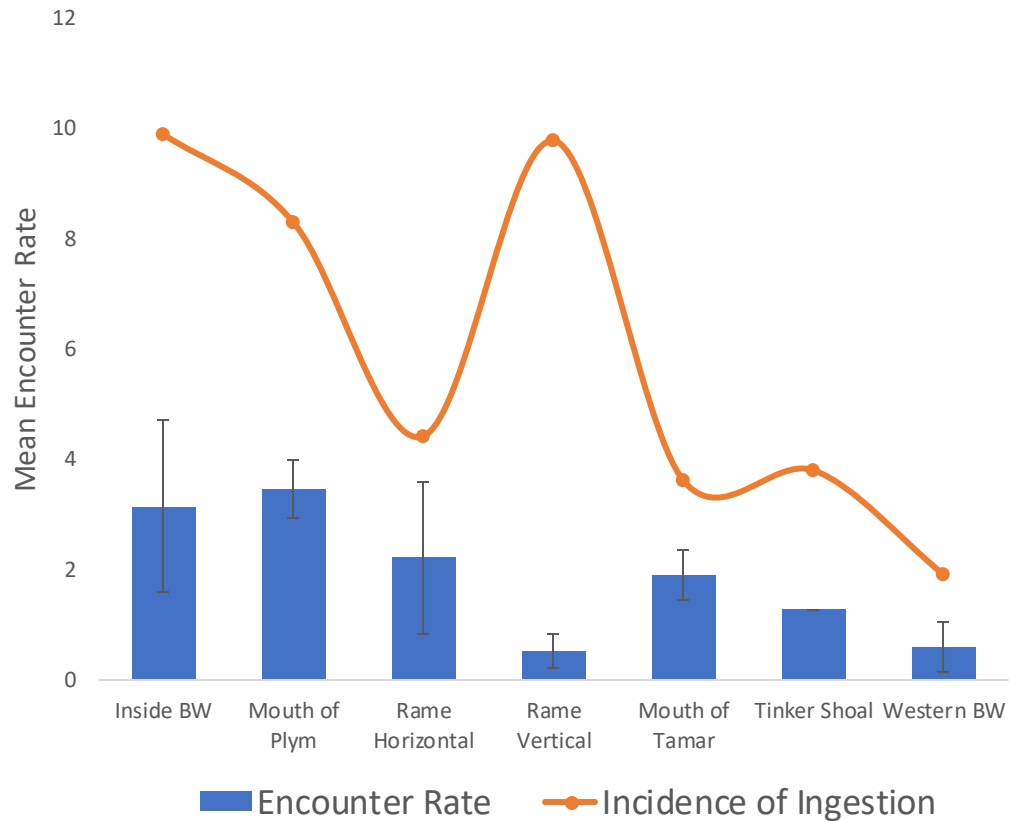


### Temporal

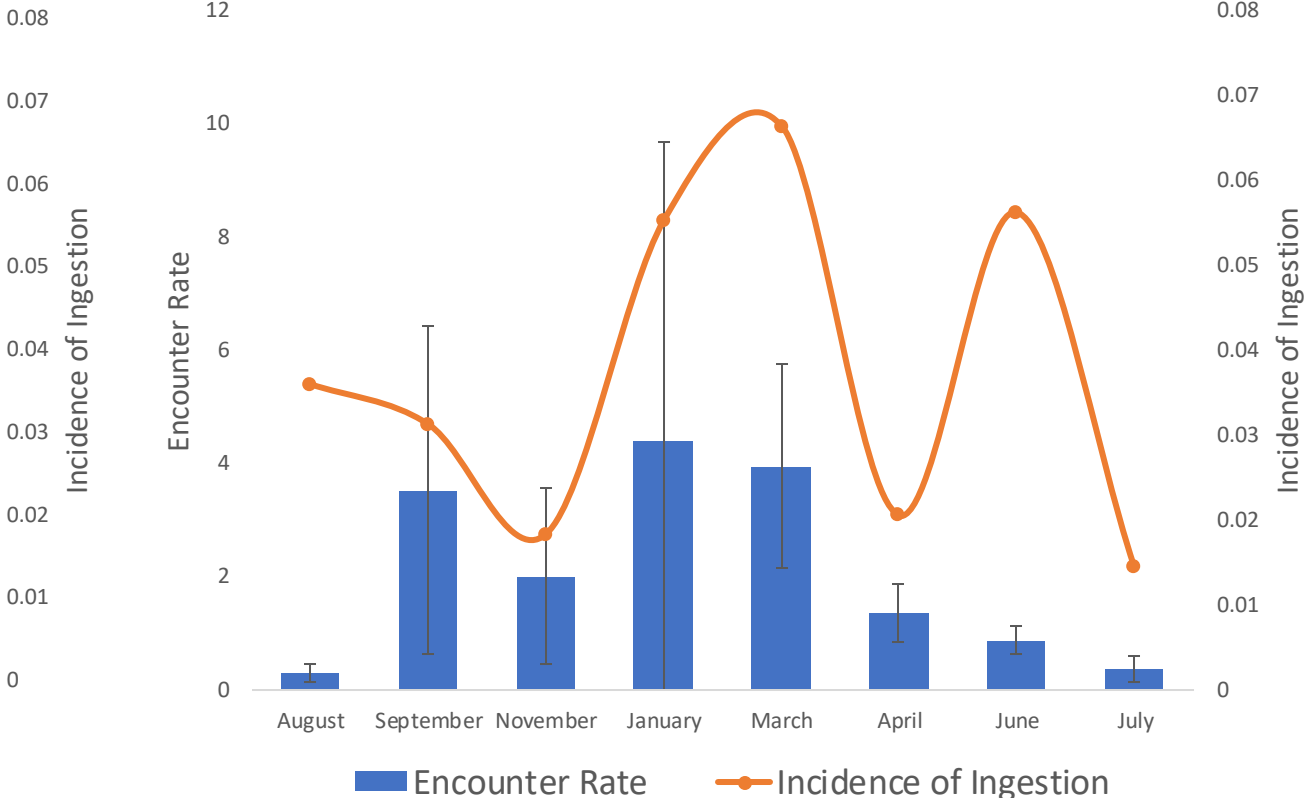




Spatial



Temporal



Incidence of Ingestion and Encounter Rate

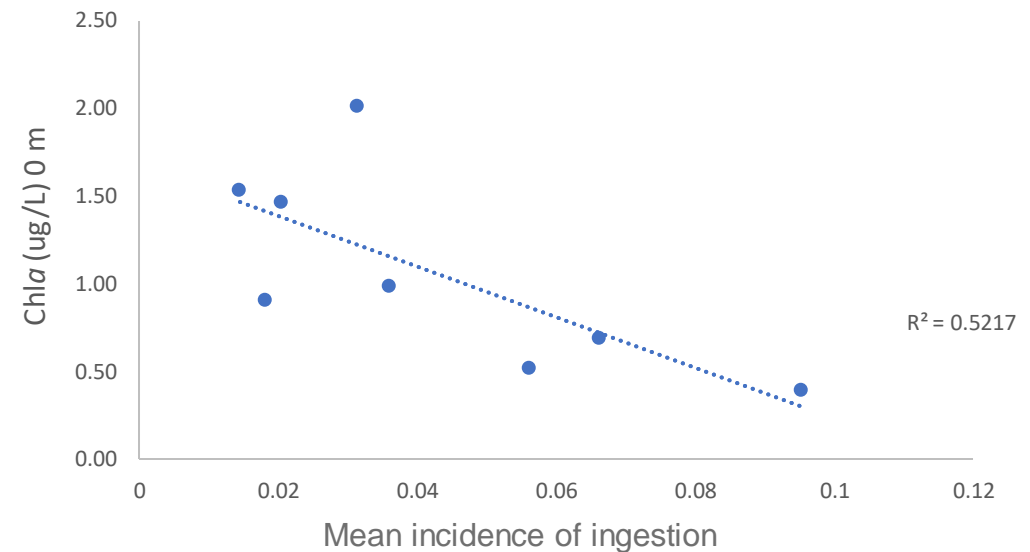
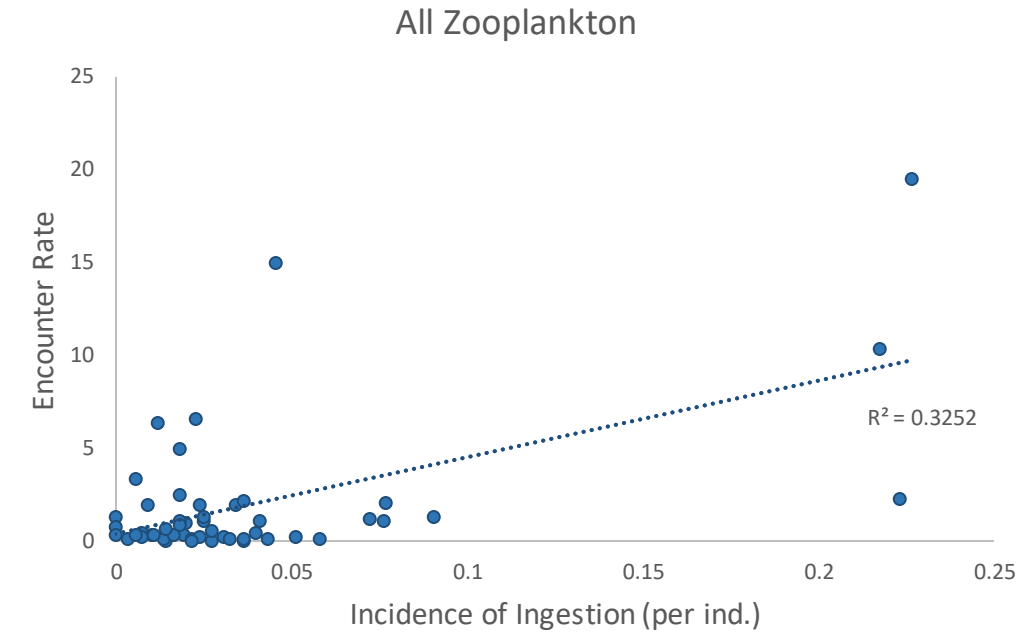
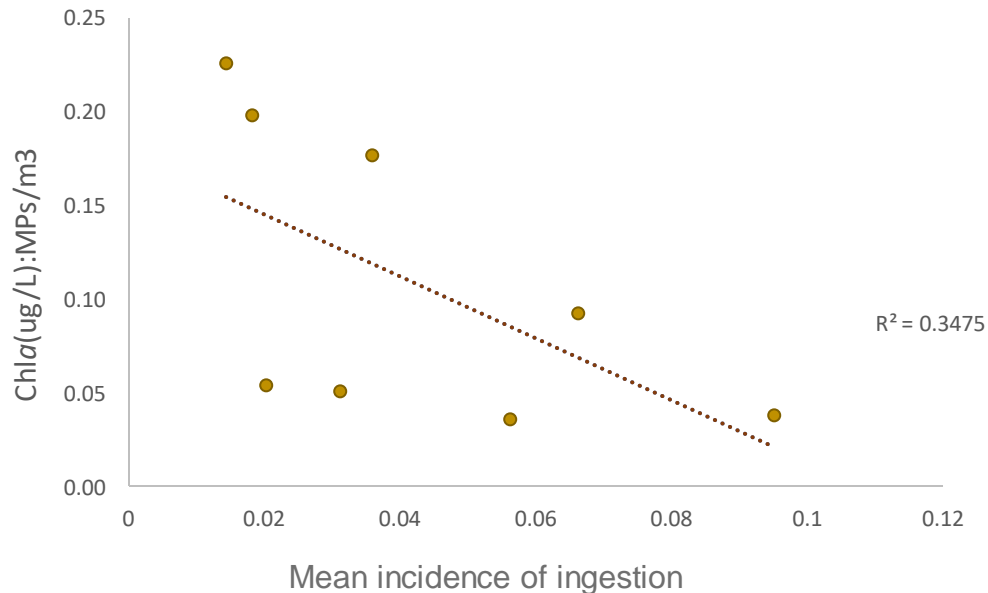
## What drives ingestion?



Correlation between Encounter Rate and Ingestion = 0.3252

Correlation between Chla:MPs and Ingestion = 0.3475

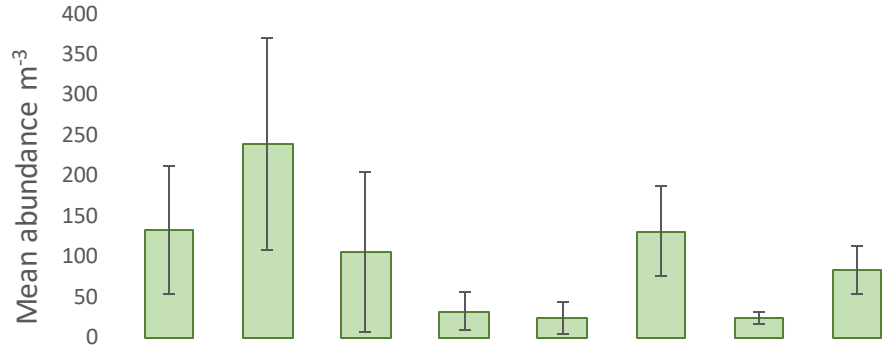
Correlation between Chla and Ingestion = 0.5217



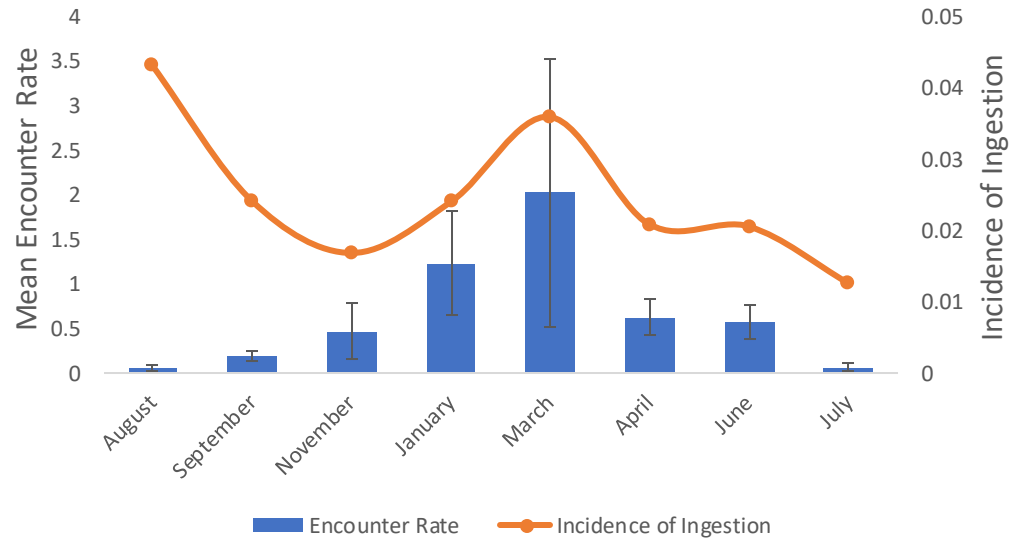


## Copepods

**a**

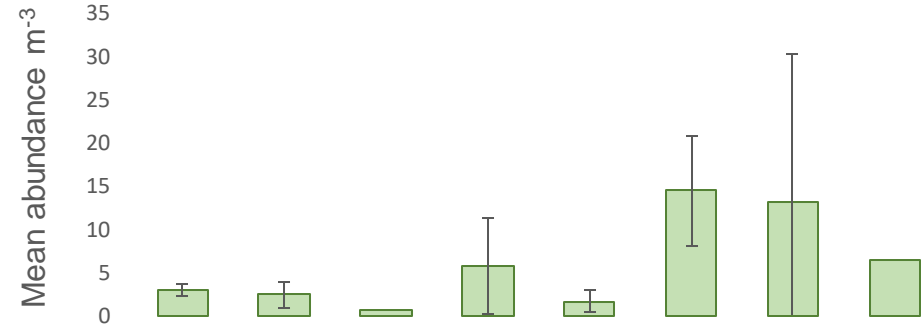


**c**

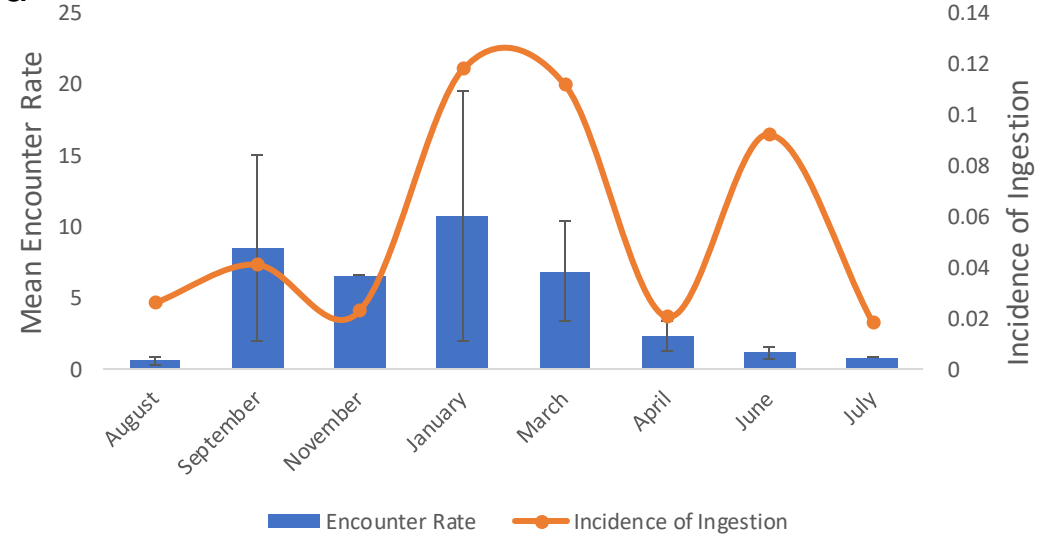


## Decapods

**b**

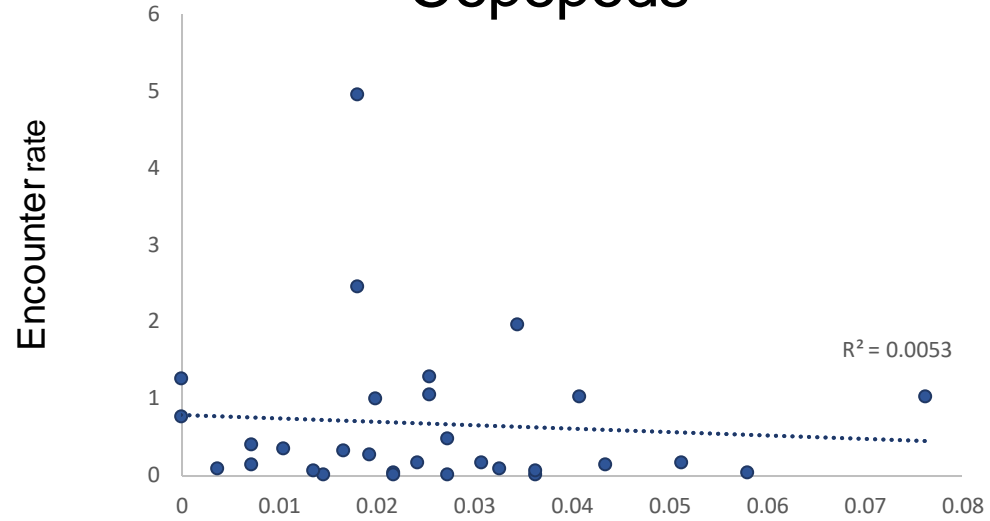


**d**

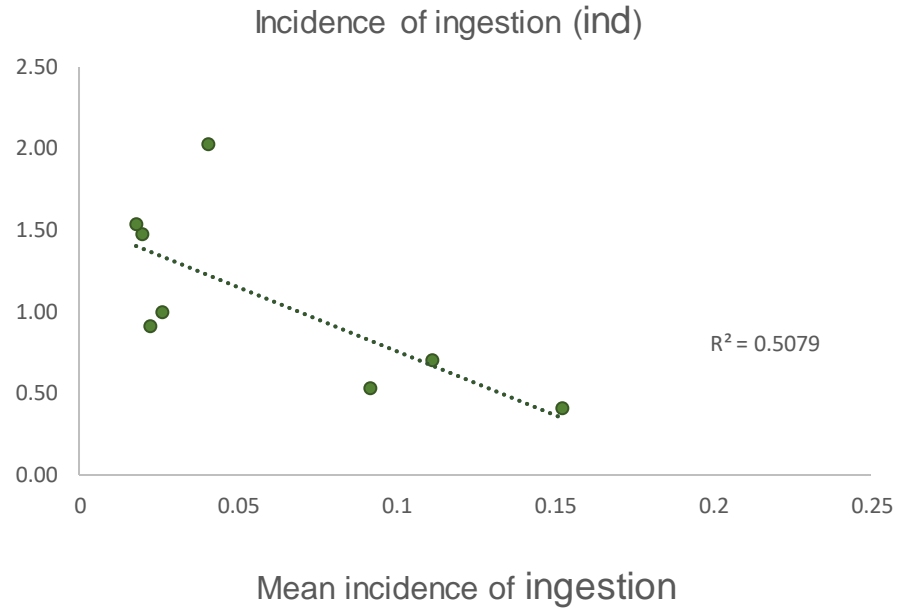
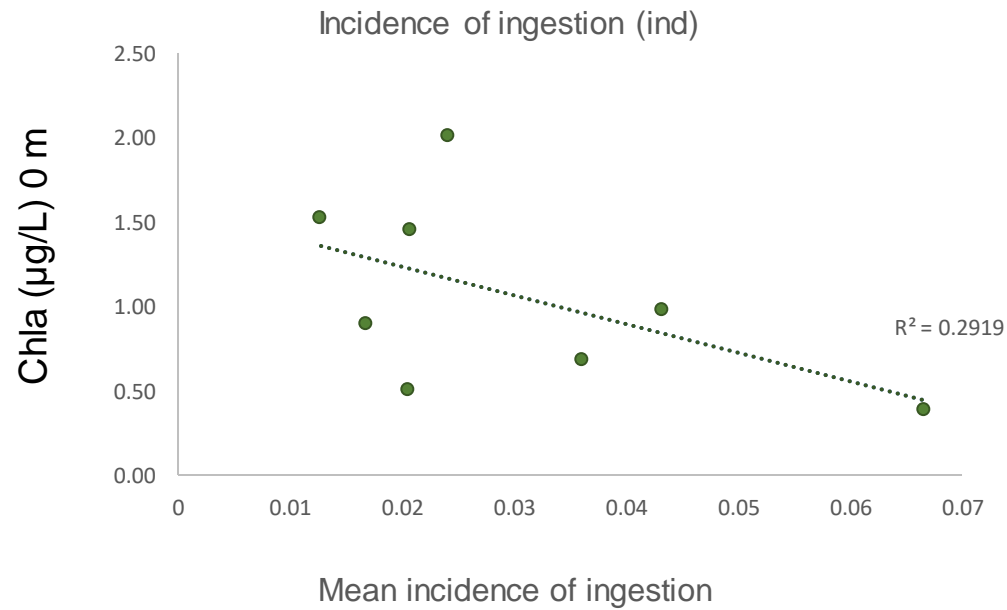
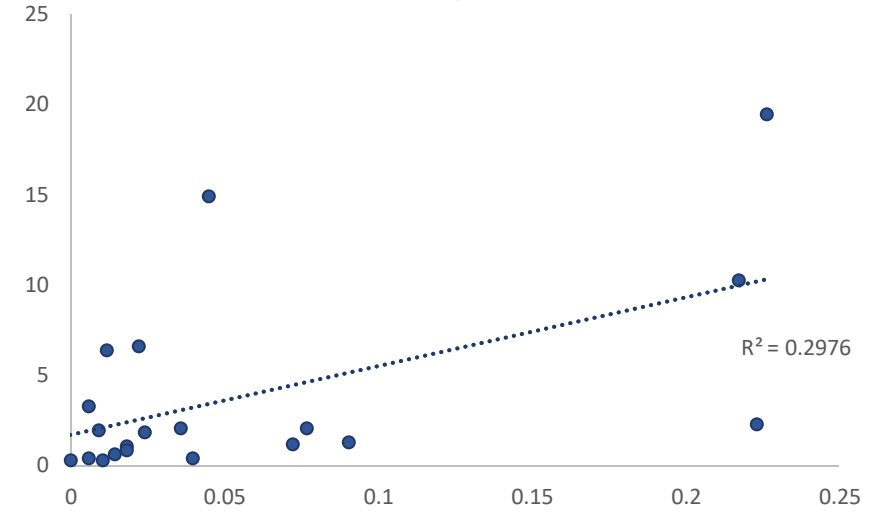




## Copepods



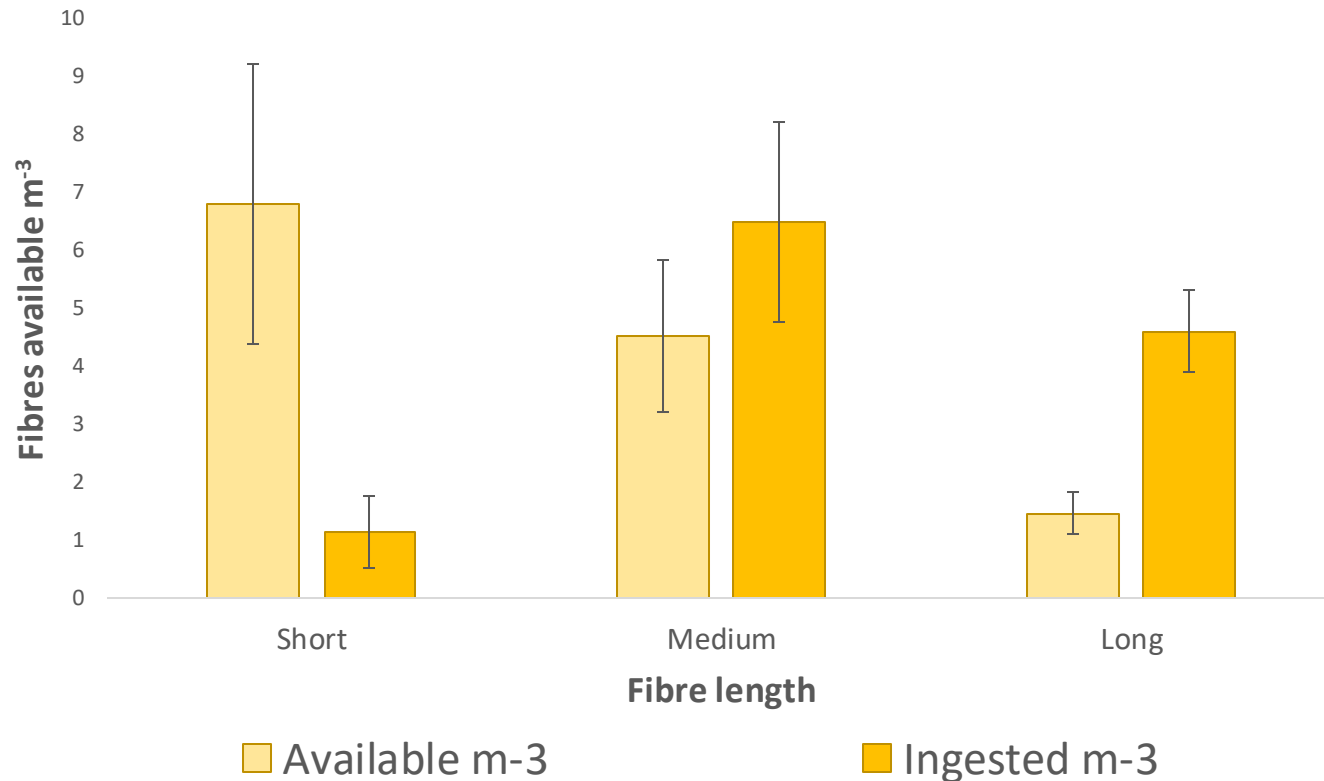
## Decapods



# Evidence of selection?



## Length of fibres



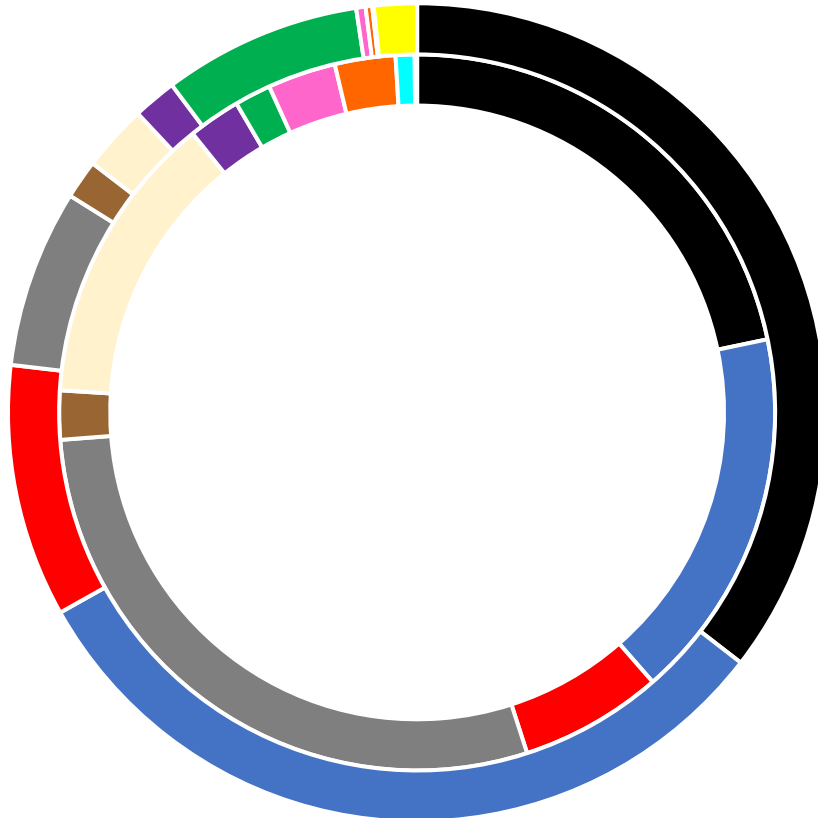
- Fibres characterized into 3 length classes
  - short: 0-200  $\mu\text{m}$
  - Medium: 201-1000  $\mu\text{m}$
  - Long: >1000  $\mu\text{m}$
- ZP favour medium and long fibers over short



# Evidence of selection?

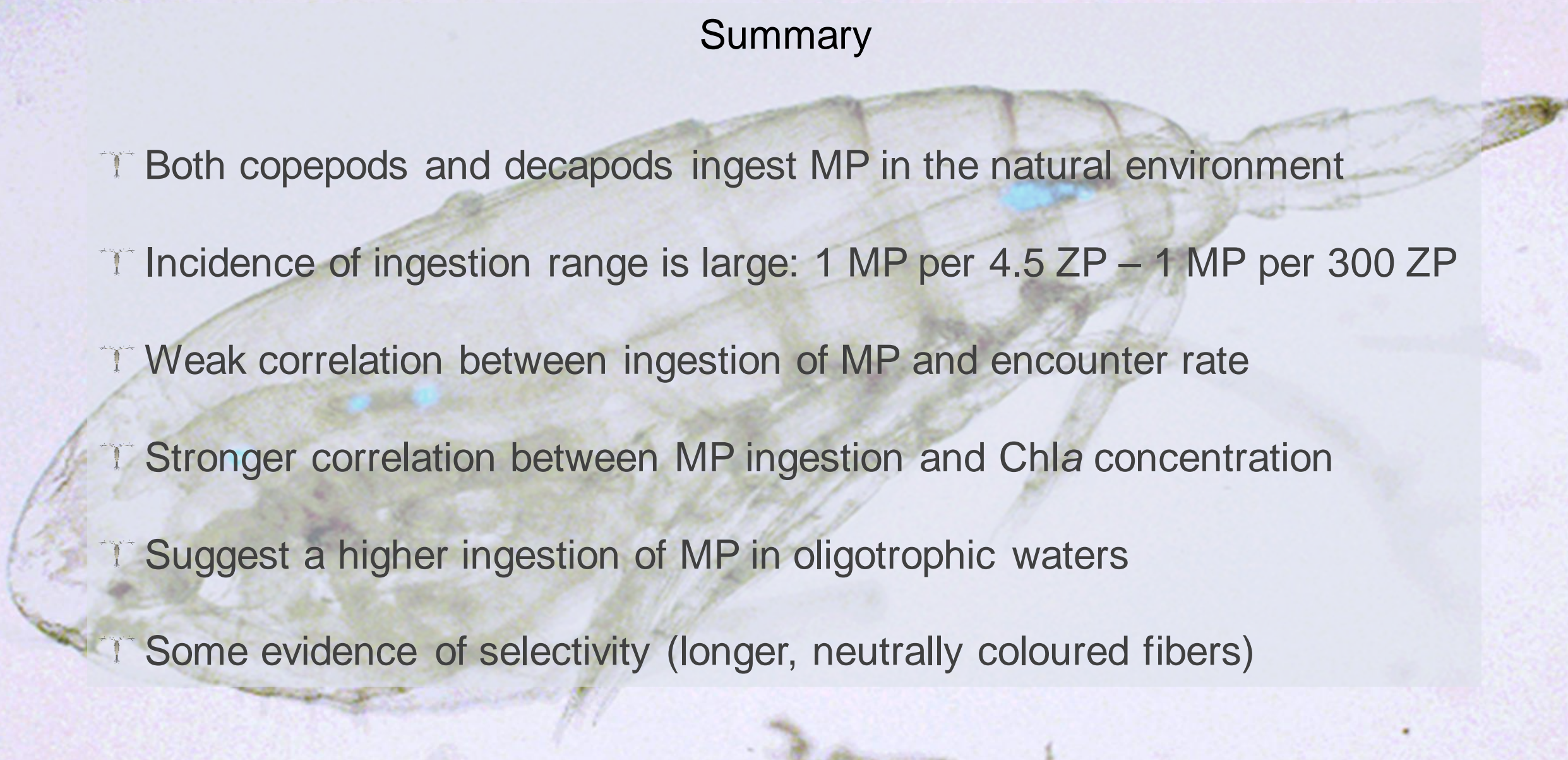


## Colour of fibers



- Colours of microplastics found in water  $m^{-3}$  (outer ring) compared to those ingested by zooplankton (inner ring)
- ZP may favour more neutrally coloured fibres

## Summary

- 
- A large, semi-transparent copepod is shown in a light blue background. The copepod's body is segmented, and its appendages are visible. Several bright blue fluorescent spots are visible within its body, likely representing ingested microplastics. The copepod is oriented horizontally, with its head to the right and tail to the left.
- † Both copepods and decapods ingest MP in the natural environment
  - † Incidence of ingestion range is large: 1 MP per 4.5 ZP – 1 MP per 300 ZP
  - † Weak correlation between ingestion of MP and encounter rate
  - † Stronger correlation between MP ingestion and Chla concentration
  - † Suggest a higher ingestion of MP in oligotrophic waters
  - † Some evidence of selectivity (longer, neutrally coloured fibers)



Thank You