# WP1, M4

# The grazers: implications for ecosystem modelling

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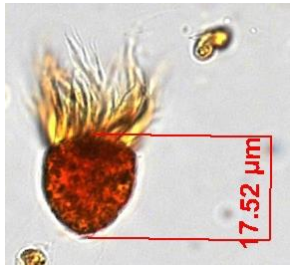
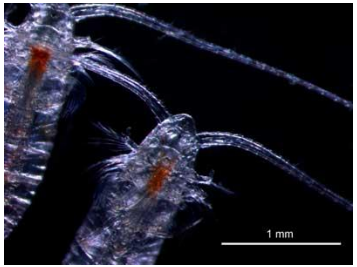
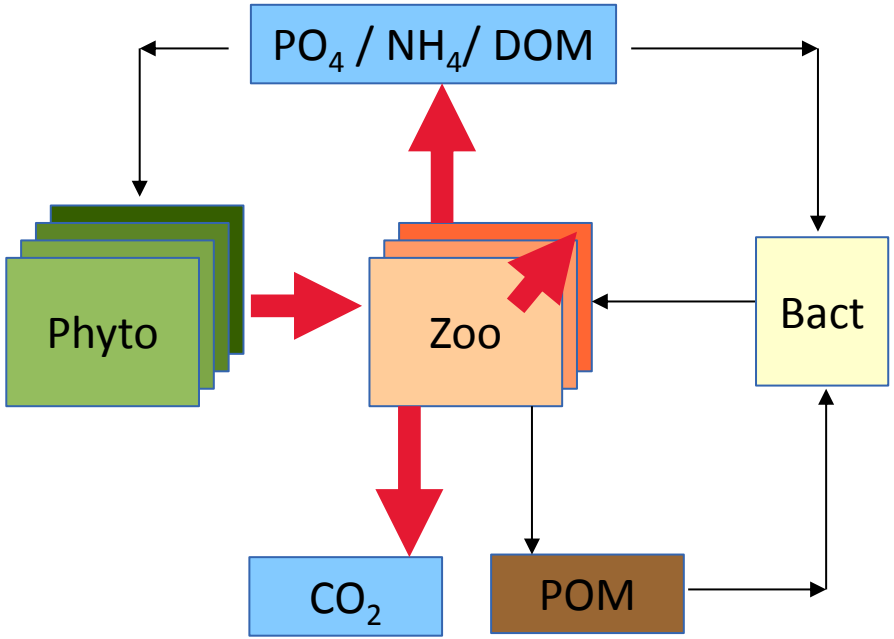


# M4 aims and objectives

**Aim:** to better understand zooplankton-mediated biogeochemistry of shelf-sea ecosystems through improved modelling capability

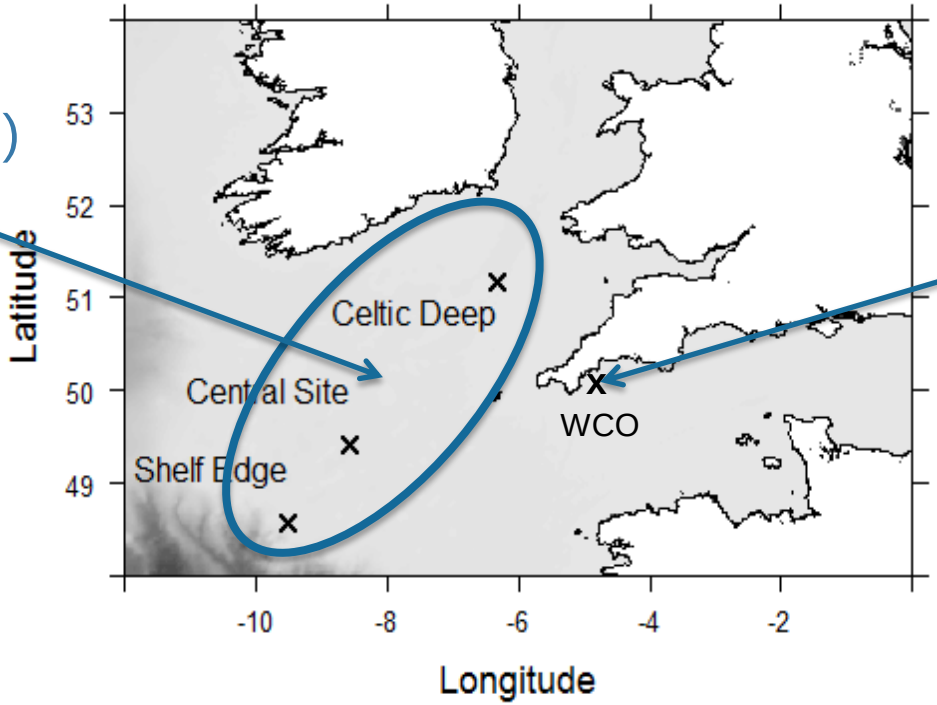
**Objective 1:**
Provide information on model states and rate variables for model validation




**Objective 2:**
Provide new insight to drive model development

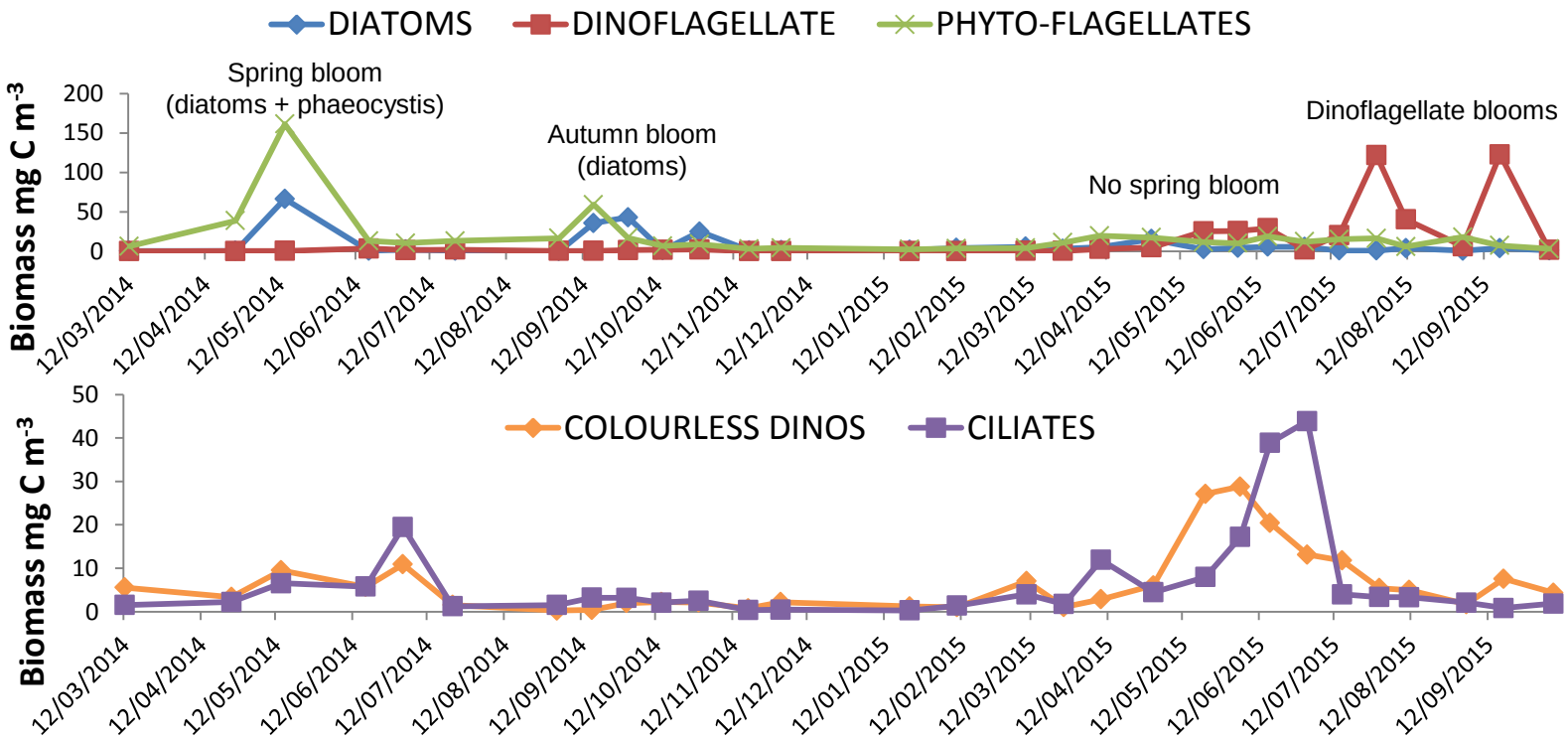
# Study locations

Celtic Sea (CS)



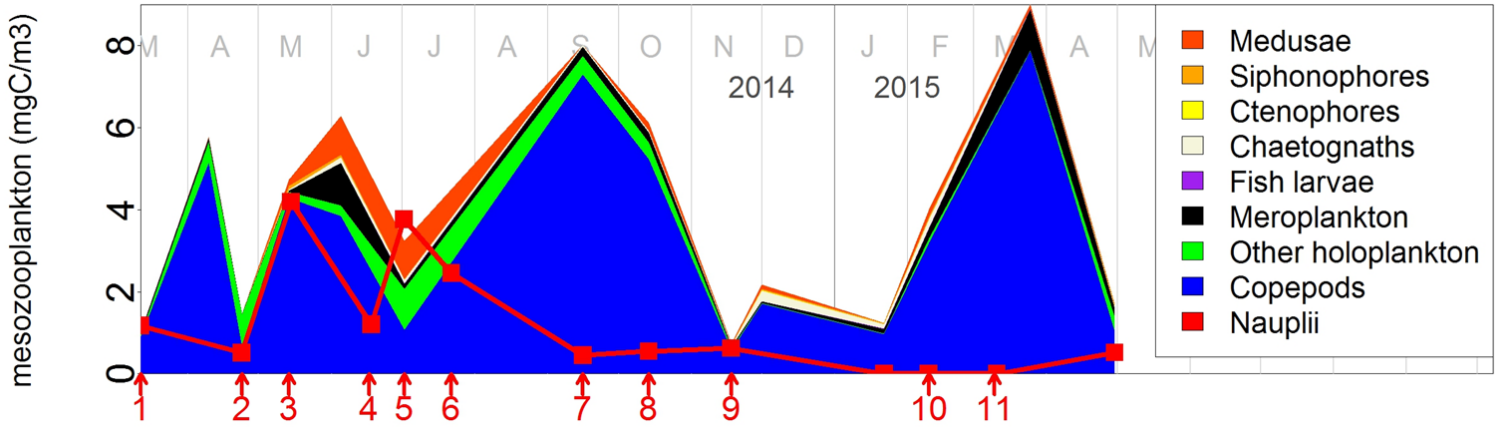

Western Channel Observatory

# O1: States: microzooplankton community (WCO)



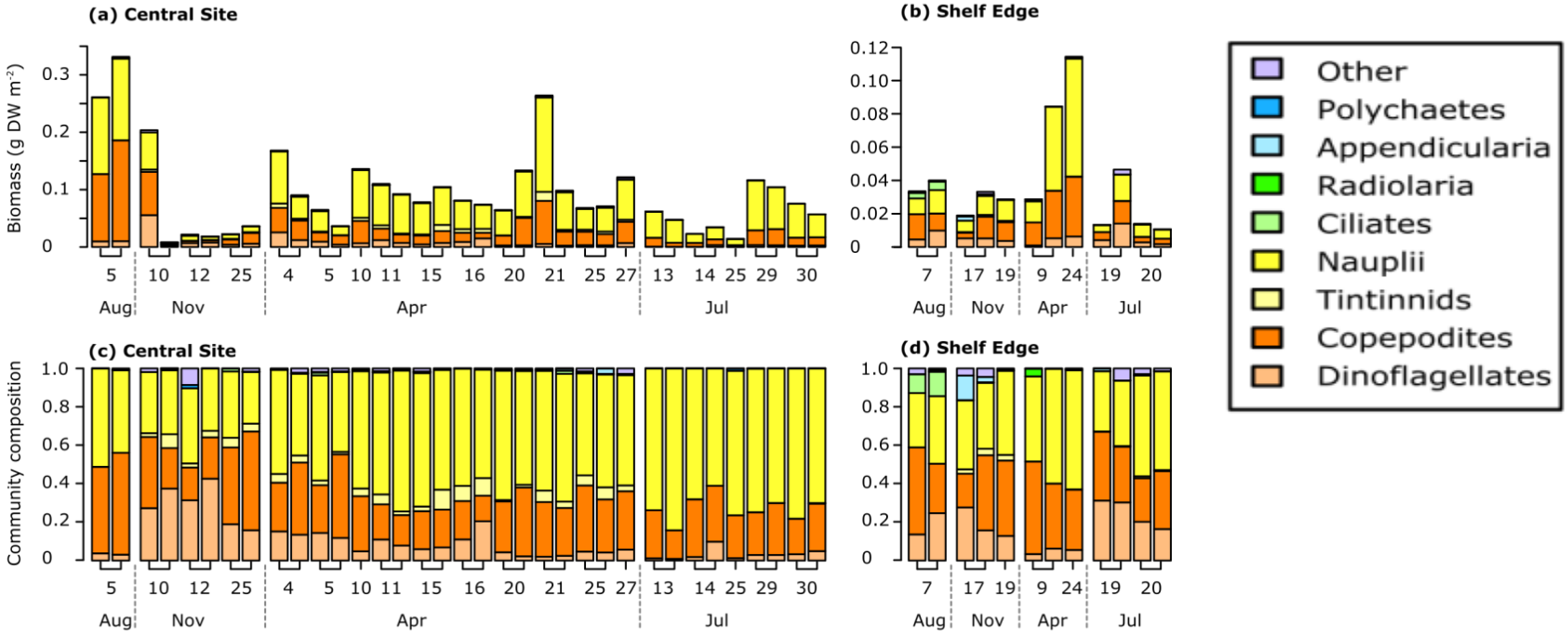

No two years are the same…

# O1: States: mesozooplankton community (WCO)

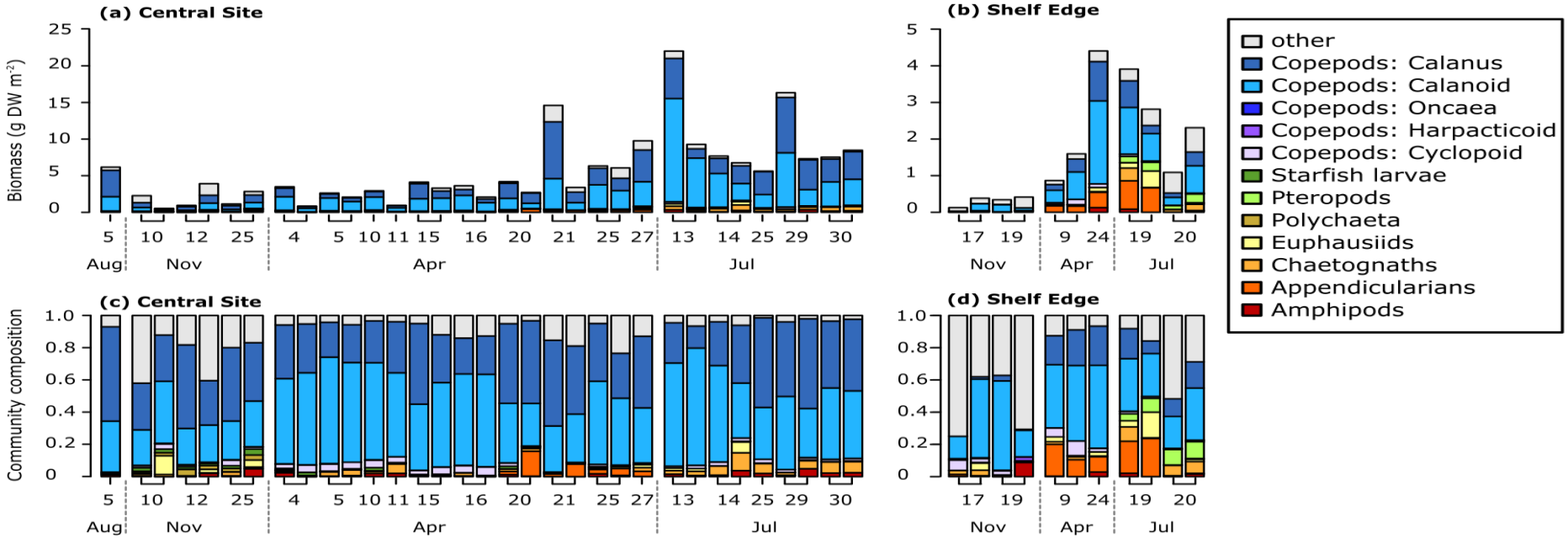



Zooplankton dominated by copepods at WCO

# O1: States: microzooplankton (63-200µm) community (CS)

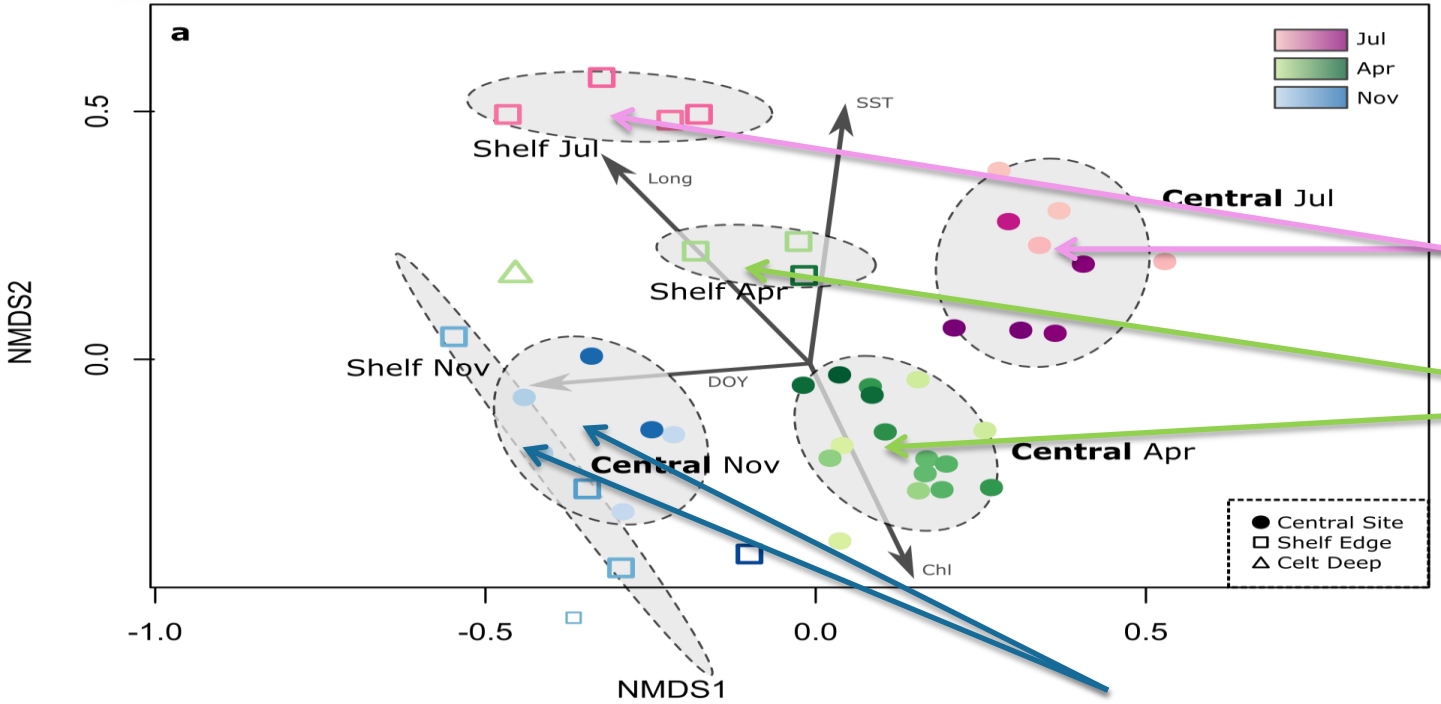


# O1: States: mesozooplankton (>200µm) community (CS)




Zooplankton dominated by copepods across CS

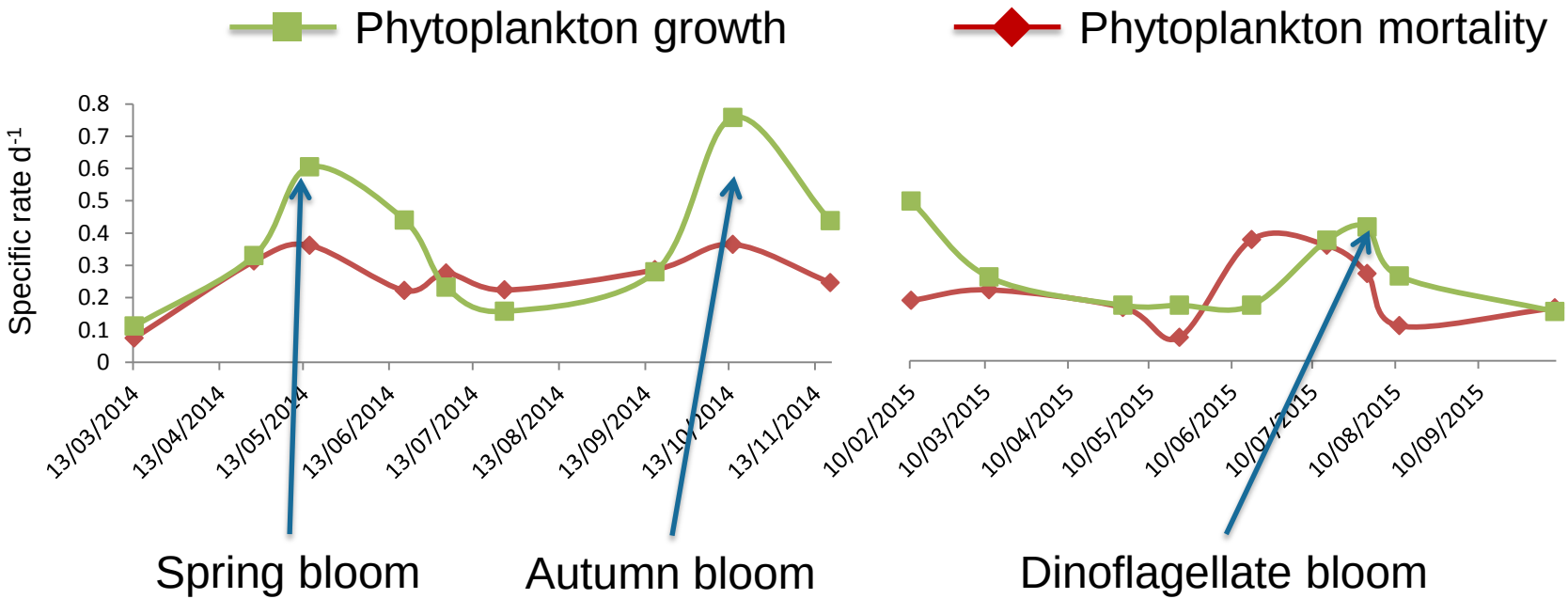
# O1: States: mesozooplankton (>200µm) community (CS)



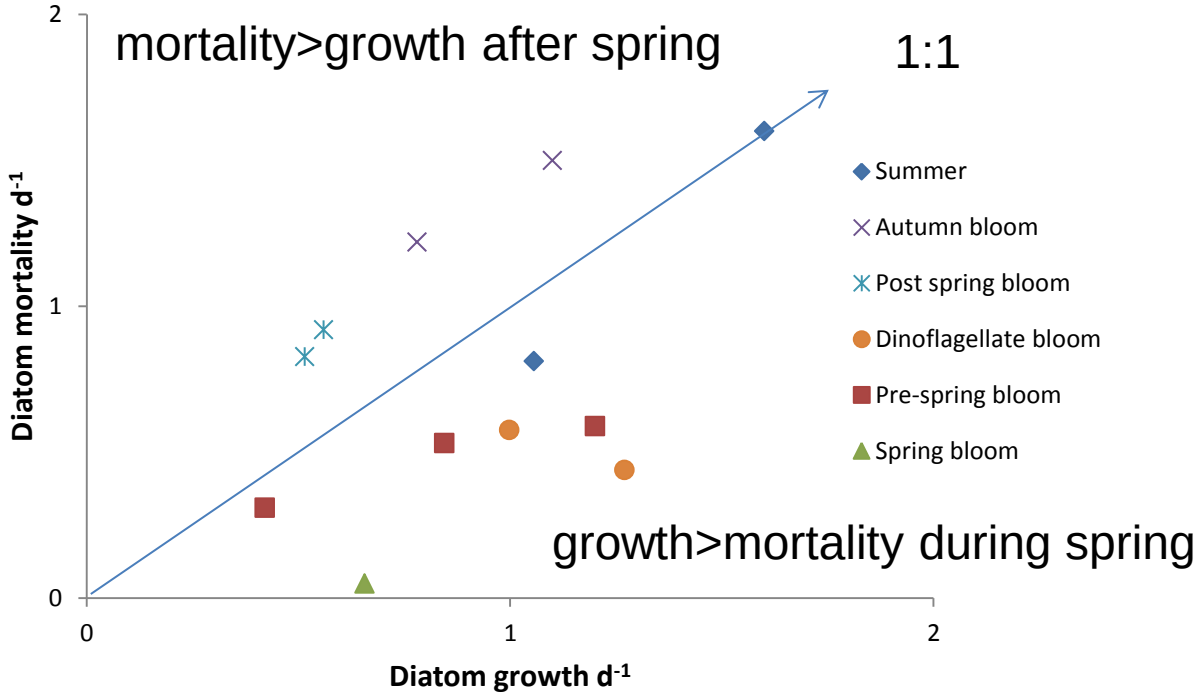

Increasing difference between CCS and shelf edge in April and July

Similar population in November

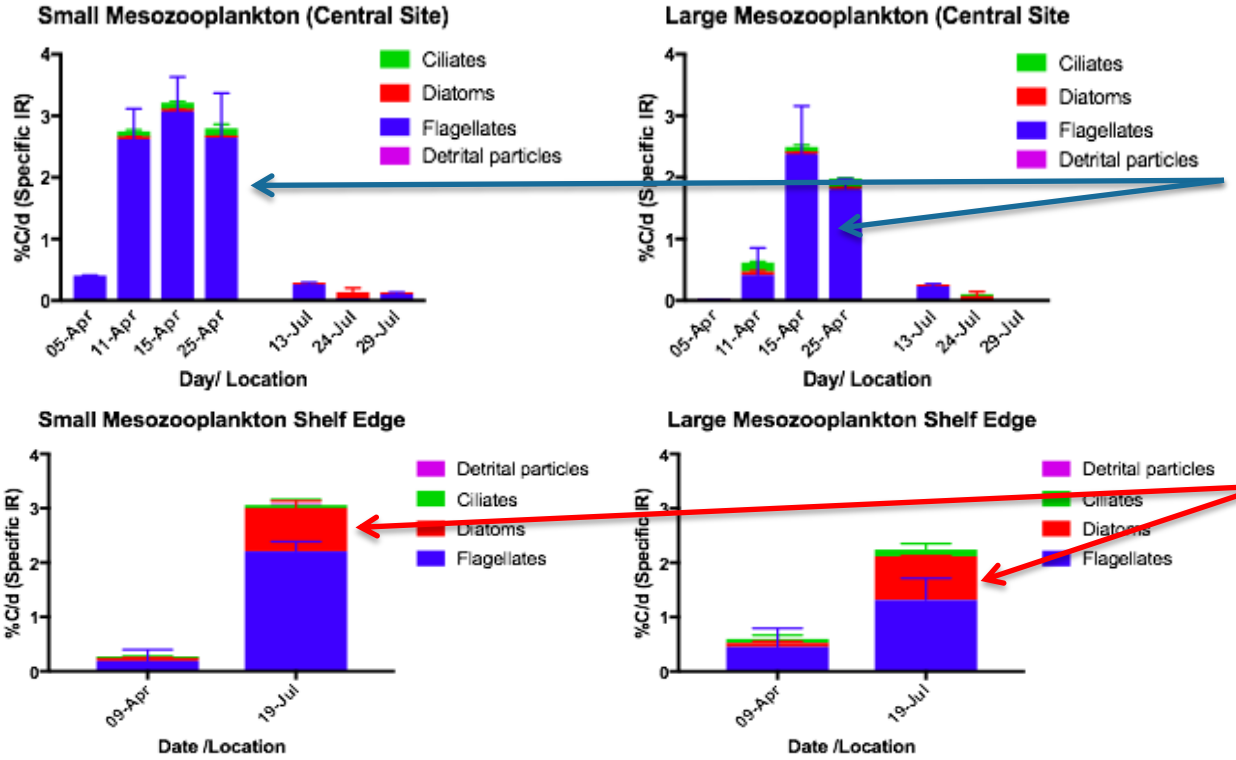
# O1: Rates: microzooplankton community grazing (WCO)



# O1: Rates: microzooplankton community grazing on diatoms (WCO)



# O1: Rates: mesozooplankton community grazing (CS)




Diet dominated by flagellates at CCS

Low ingestion rates in July

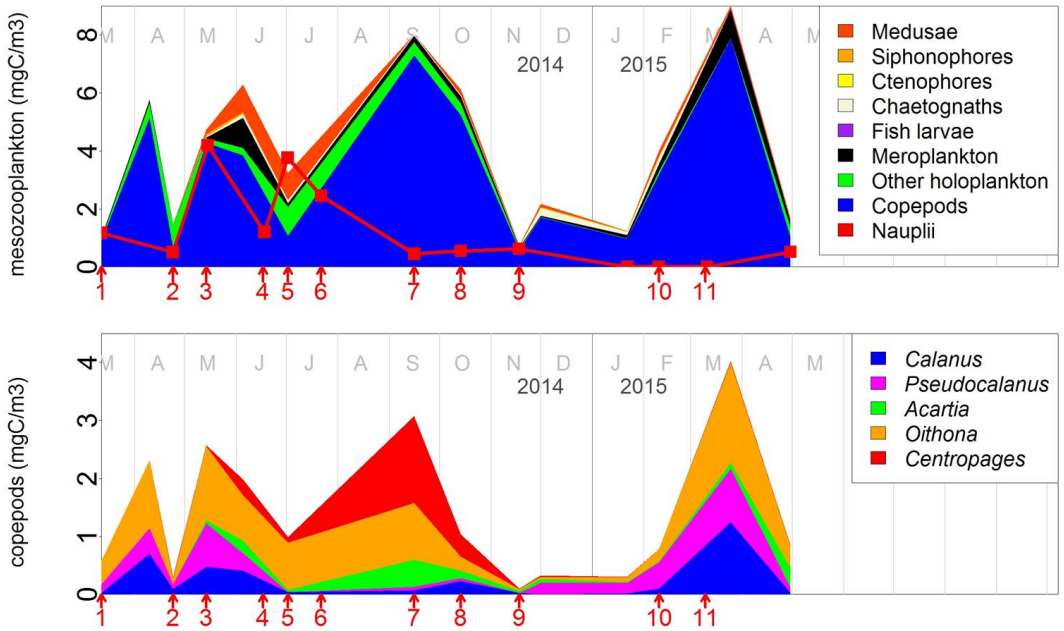
Diatoms increasingly important at shelf edge

# O1. Summary: states and rates

- Celtic Sea and Western Channel Observatory:
- Micro + mesozooplankton dry weight, elemental composition & community composition;
- Micro + mesozooplankton grazing rates;
- Mesozooplankton respiration (CS) & excretion (CS) rates

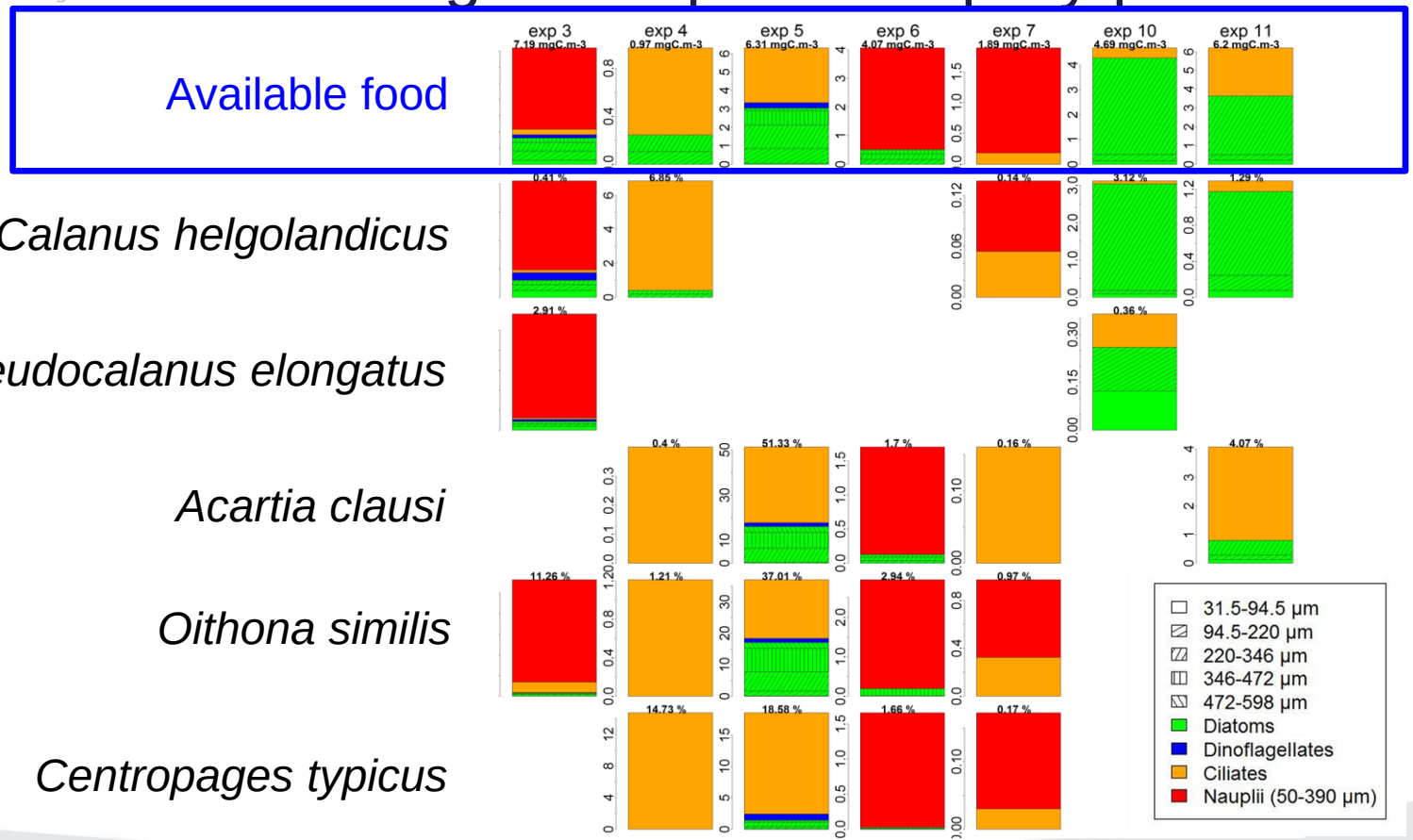
- High variability in space and time
- Copepods dominate throughout the study area
- Grazing rates relatively low (few sizeable prey?)

# O2. New insight: zooplankton prey preferences




Monthly grazing experiments with biomass-dominant copepods

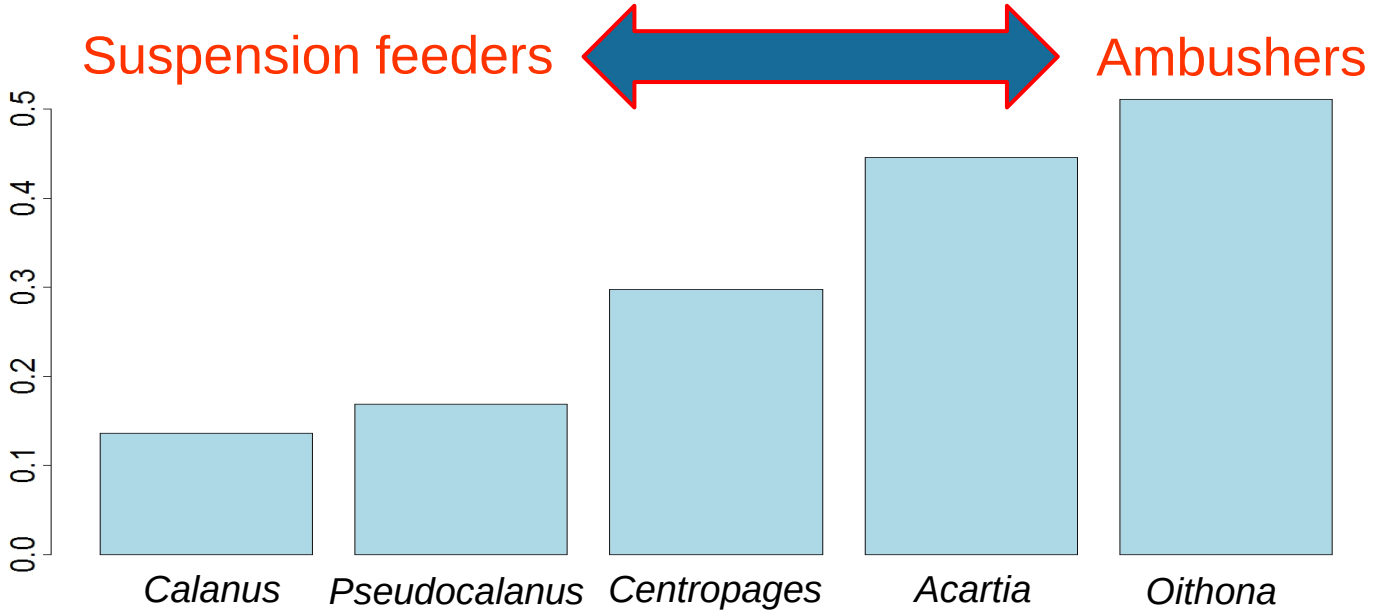
# O2. New insight: zooplankton prey preferences




Diet typically represents what is available

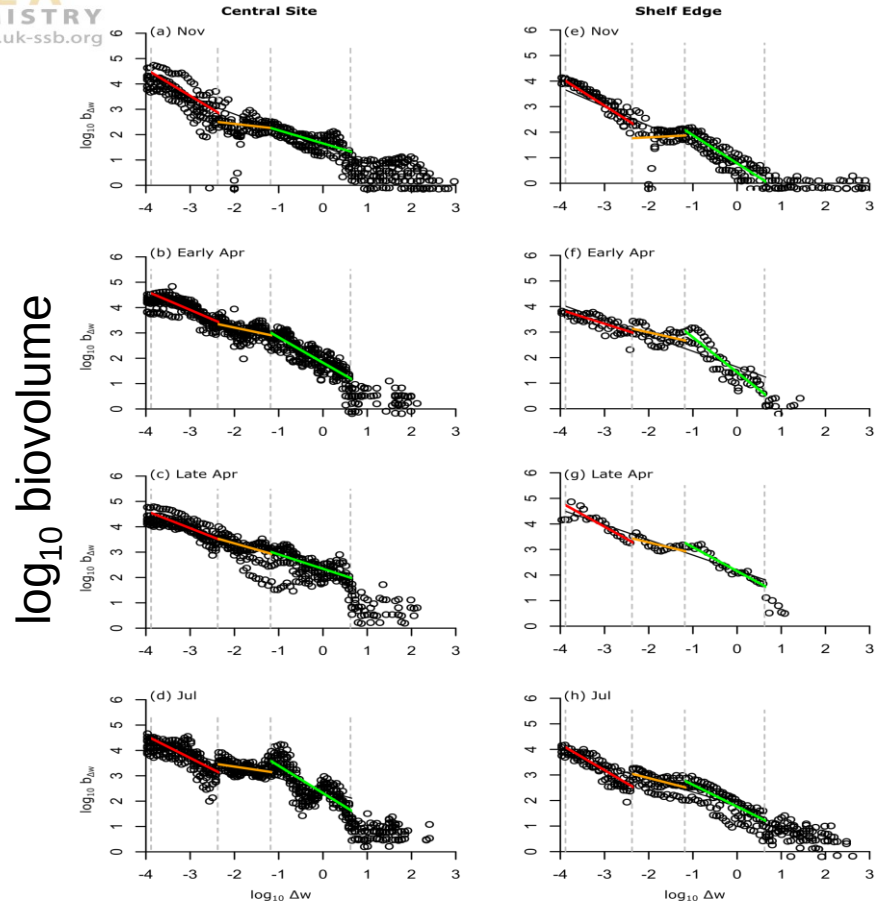
# O2. New insight: zooplankton prey preferences

Max. prey length as a fraction of copepod length




Representing zooplankton feeding by size seems to be a realistic (& simple) option

# O2. New insight: trophic transfer



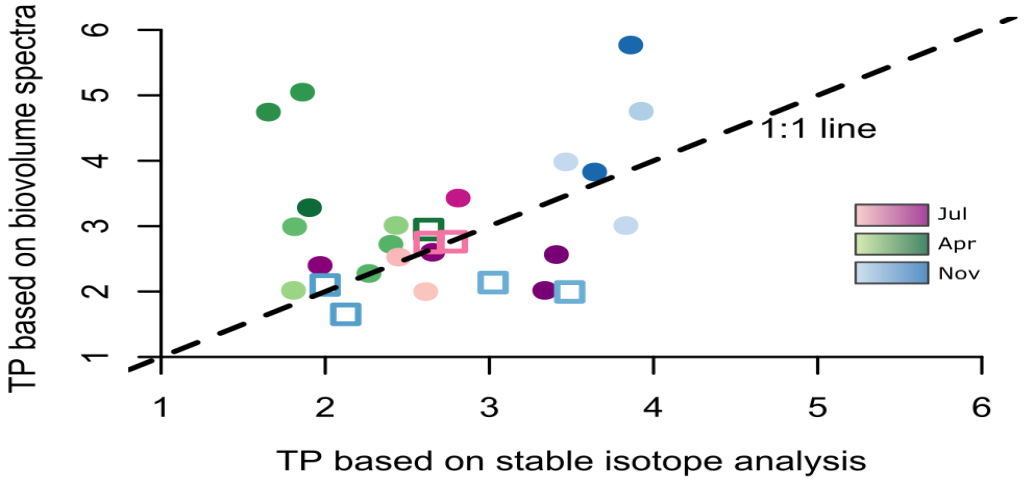

Microzooplankton
Small zooplankton
Large zooplankton

‘Biovolume spectra’ show:

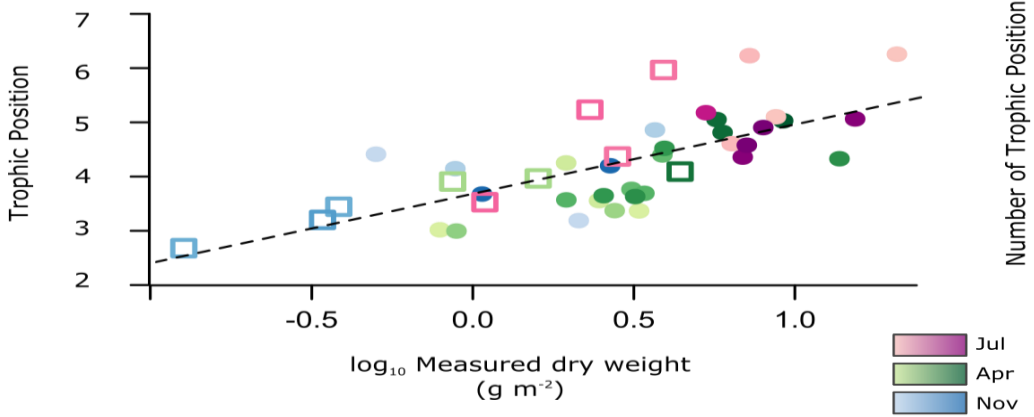
- Biomass
- Trophic position and recycling
- Energy flow

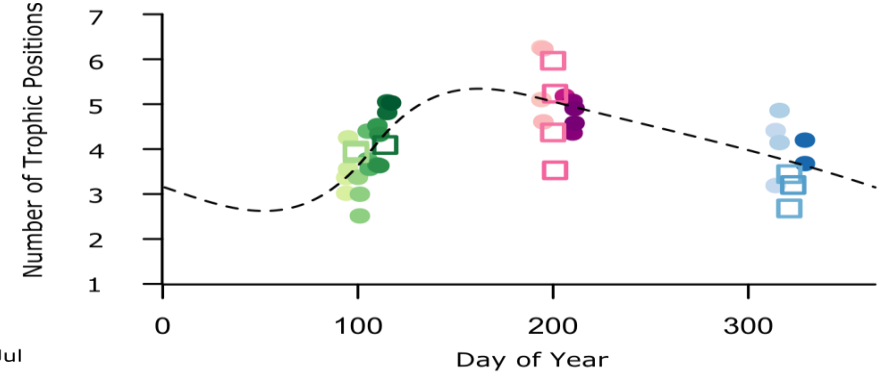
# O2. New insight: trophic transfer

Zooplankton trophic level determined from biovolume spectrum agree reasonably well with stable isotope analysis



# O2. New insight: trophic transfer




**Strong relationship between biomass and trophic position (TP)**

1 additional TP per 10-fold increase in biomass (10% transfer efficiency)

Number of trophic positions, and hence transfer efficiency, varies in space and time

# O2. Summary: model developments

- No need for complex prey selection models – size is sufficient
- Size is also useful for examining trophic position & ecosystem status
- Allowing zooplankton TP in models to vary through space and time will permit more meaningful insight into how they influence the ecology and biogeochemistry of the ecosystems within which they reside.
- Lots of state and rate data available!

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# Thanks for your attention (and funding!)

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