

Consequences of the new rulers of the fjord

The trophic role of the jellyfish, *Periphylla periphylla*, in the western Norwegian fjord food web

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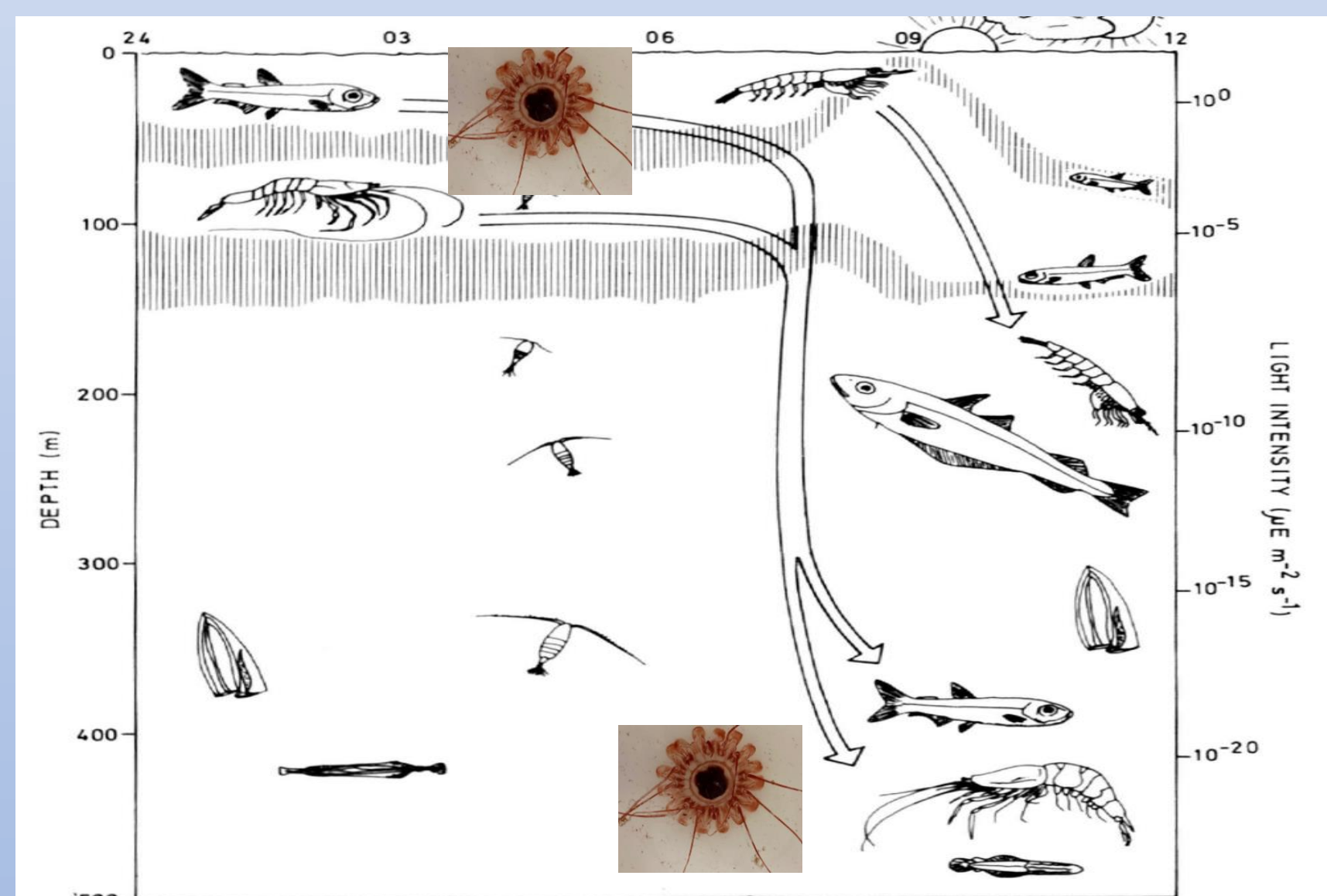
A: Close-up of an individual helmet jellyfish. B: View of one deep pelagic haul pulled up on deck. C: Content of one deep pelagic haul; 9 buckets of *Periphylla* and one 1 bucket of other organisms.

1. Changing environment

The helmet jellyfish, *Periphylla periphylla*, in Norwegian called Kronemaneten, is a deep-sea jellyfish found in small concentration, about $<0,02$ individuals per m^3 , around the world.

In the last 50 years, the population has exploded within the western fjordic environment, >2 individuals per m^3 by 2010, and *Periphylla* is now highly abundant in some area.

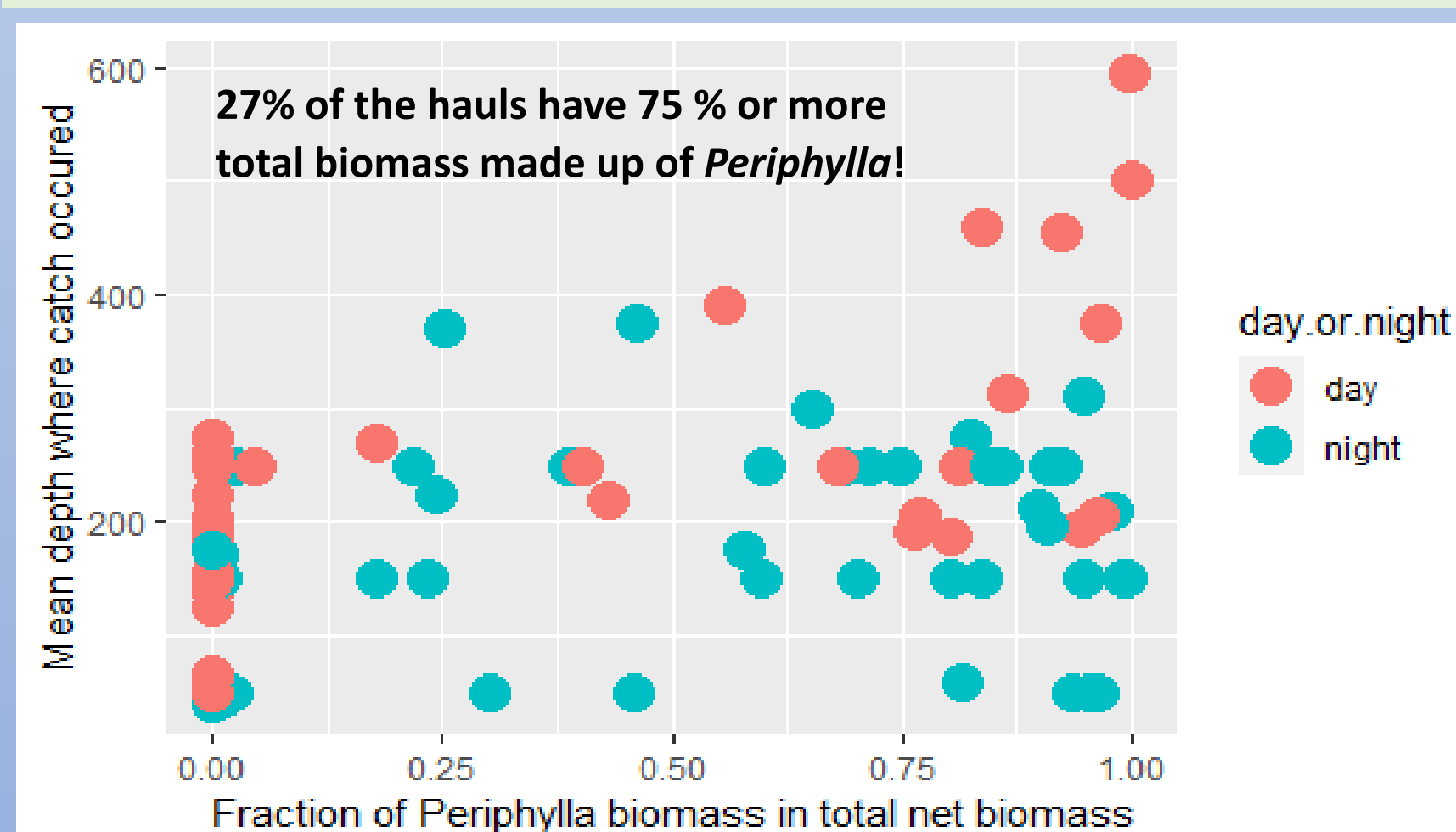
We want to know: **How will this impact the food web?**



P. periphylla added to the schematic of Masfjord food web (from Giske, 1990). *Periphylla* were previously not included as were not common enough at the time.

2. Food web interactions

Periphylla periphylla is a holopelagic predator. They are photophobic and typically below 2000 meters. They perform diel migration, coming up shallower at night, to hunt zooplankton, specifically in the western Norwegian Fjords, like Masfjord and Østerfjord. Previous papers found that the main source of food for *P. periphylla* is larvae of fish and copepods. No natural predators are known.



Data from 110 hauls taken during BIO325 cruises between 2021 and 2022 in Masfjord and Fensfjord. The figure shows the depth of each haul and how much of the haul biomass was made up of *Periphylla*



4. Studying trophic value

Jellyfish have historically been thought of as trophic dead ends, as jellyfish tissues have low nutritional value.

If so, to what extent can *Periphylla* impact the food web?

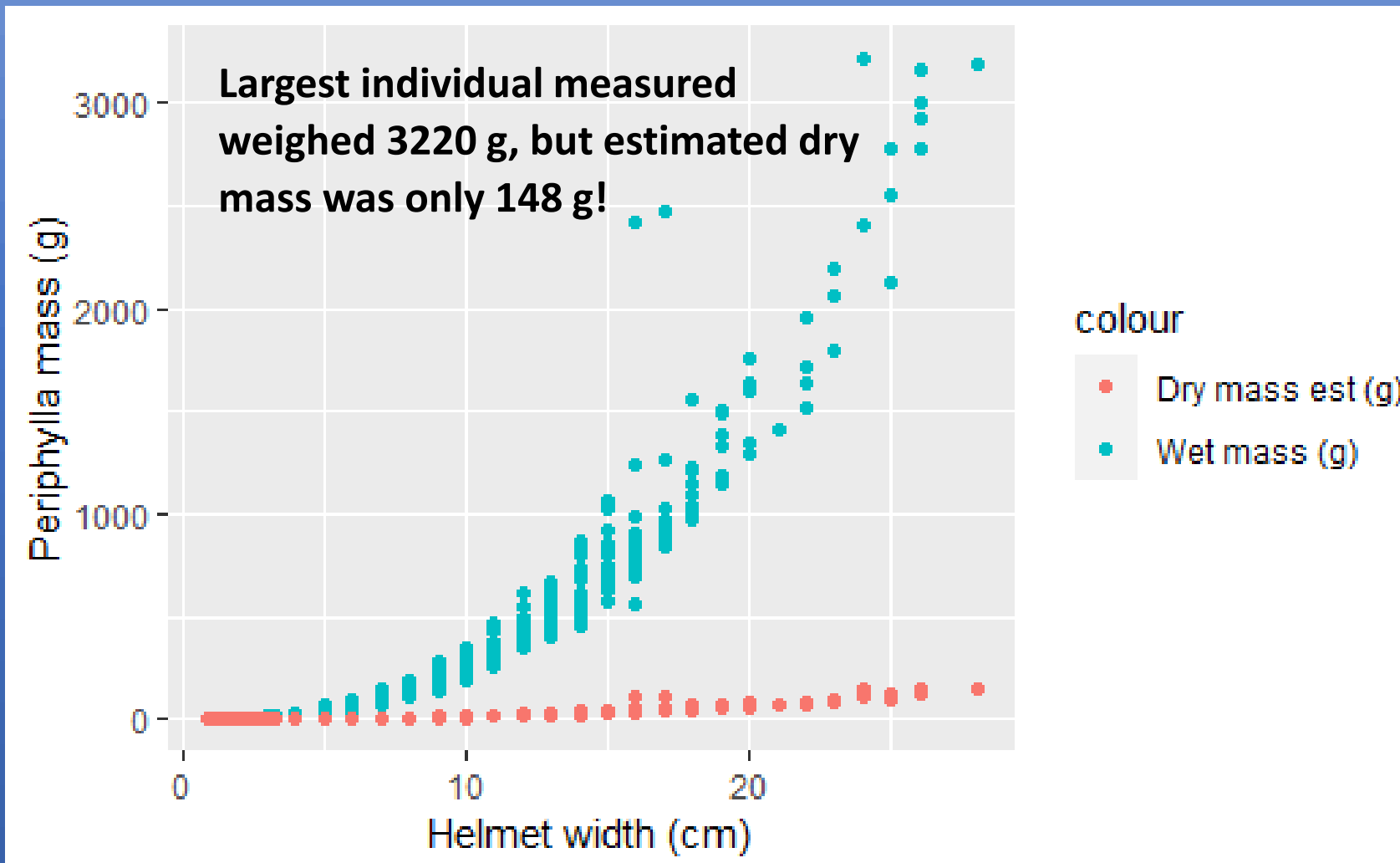
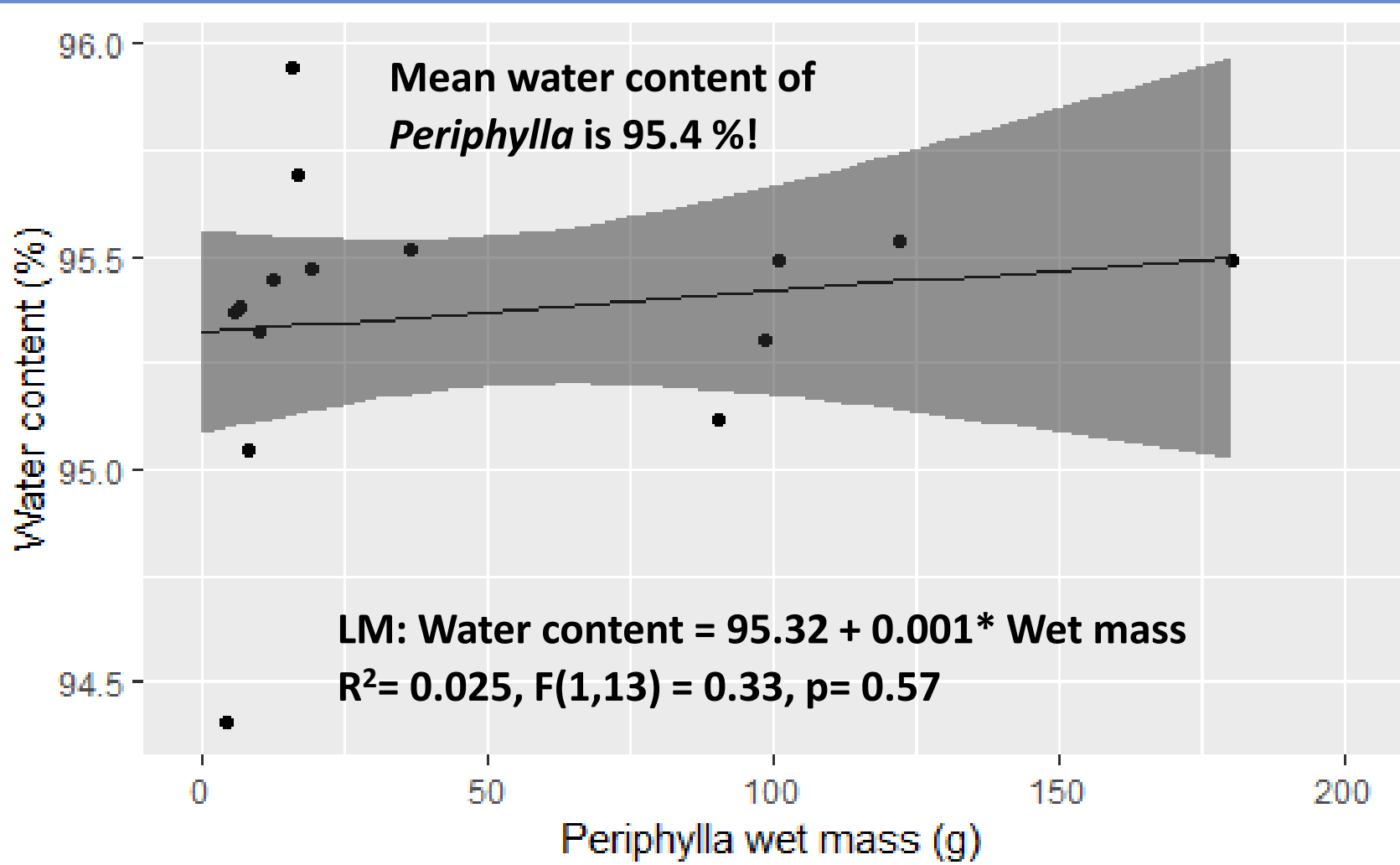
Examining the water content and dry mass ratio of *Periphylla* can provide insight into their trophic value.

Future work will compare water content across tissue types and will include stable isotopes of *Periphylla* tissue to examine their trophic position in the fjord food web.

3. Fjordic takeover

Data taken on BIO325 cruises show the extent of the takeover by *P. periphylla*.

Note how most data where the amount of *Periphylla* was at 0% occurred at shallower depths during daytime. This aids in confirming the diel migration *Periphylla* performs to avoid sunlight.

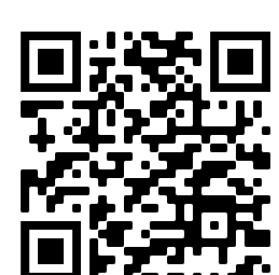


Data from the BIO325 2022 cruise shows the large size range of *Periphylla* from 0.5 – 3220 grams wet mass. We examined the mass to length relationship for wet and estimated dry mass. *Periphylla* sizes are frequently recorded using helmet width.

We tested if there was an effect of *Periphylla* size on water content, using a linear model. No statistically significant effect was found.

5. Conclusion

Periphylla periphylla is highly abundant, if counted by their growing numbers in the fjords. At the same time, most of that abundance, even for individuals weighing over 3 kg, is water. Therefore, the energetic biomass of *Periphylla* is likely much lower the high abundance suggests. Large knowledge gaps still exist about their role in and impact on the fjord food web.



References:

Geoffery et al. (2018) Polar Biology
Giske et al. (1990) Sarsia
Jarms et al. (1990) Sarsia

