Fantastic jellies and where to find them

Depth and seasonal variation in gelatinous zooplankton in Masfjorden

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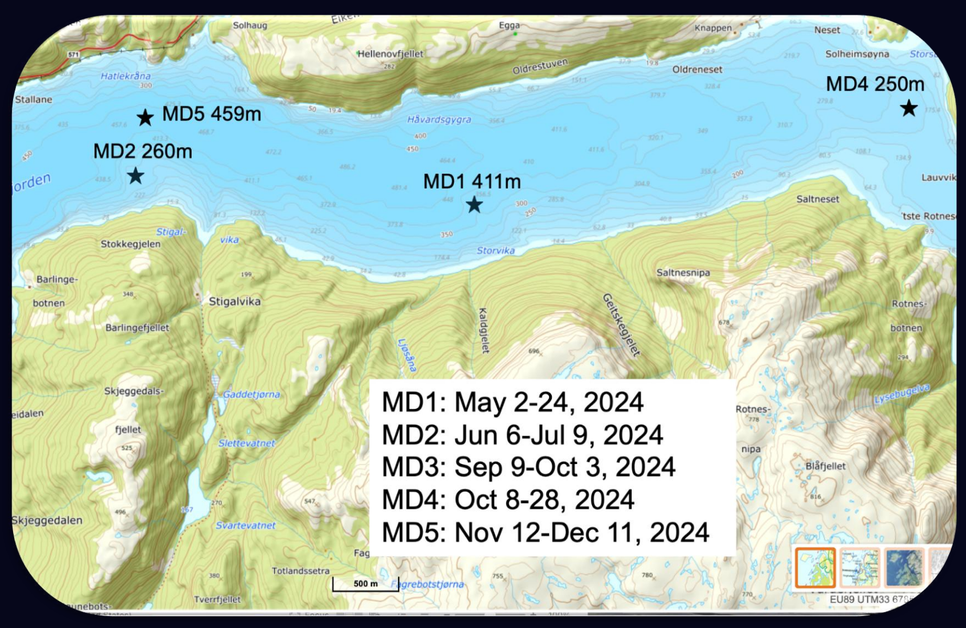
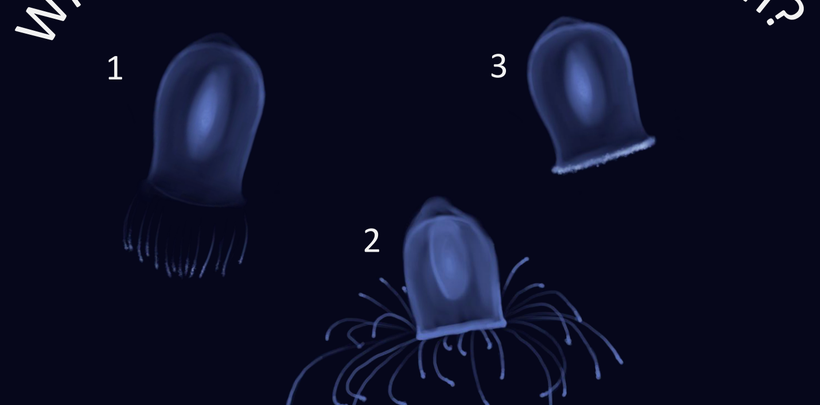
«Working with net-caught specimens is akin to trying to construct a snowball after it has hit a wall.»
Peter Herring, 2002

How to study fragile organisms

Gelatinous organisms and their ecological roles have long been overlooked because traditional net-based sampling often destroys them before they can be studied. Autonomous benthic landers like DOV BEEBE help solve this problem. Built in California (Gallo et al. 2020), BEEBE sits on the deep seafloor and records video and environmental data. This lets us observe these organisms in their natural habitat with minimal disturbance.



What are gelatinous zooplankton?

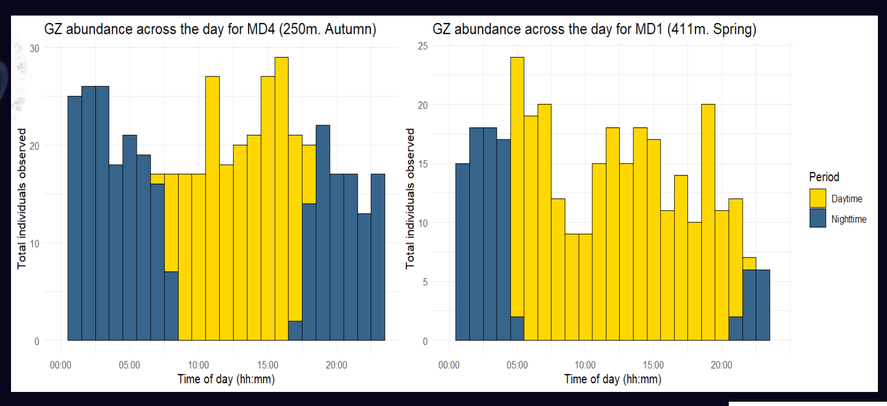


Gelatinous organisms are soft-bodied invertebrates that lack any hard parts. Their jelly-like bodies are mostly water (Lalli & Parsons, 2001), meaning they are usually transparent and very fragile. This makes them hard to catch and to see (Hosia, 2007).

Most gelatinous organisms are planktonic, meaning they drift in the water column and generally cannot swim against the current. In this study, the behaviours of gelatinous zooplankton (GZ) were observed and recorded. Some species, such as Aglantha digitale (pictured above), show several distinct behaviours. With practice, it becomes clear when an individual is swimming (1), feeding (2), or drifting (3).

Method

BEEBE was deployed in different areas in Masfjorden for 3-4 weeks at a time. A 20 second video clip was recorded every 20 minutes for all deployments except MD2, in which there were 30 minutes between clips due to the length of the deployment. I looked through these clips and annotated abundance, richness, and behaviour. Some species, like *Euplokamis cf dunlapae, Aglantha digitale,* and *Bolinopsis infundibulum* could usually be identified with high certainty. Other organisms, which had few or unclear identifiable traits, were identified down to the lowest taxonomic level possible. For example the class *Appendicularia* and the phylum *Chaetognatha.*

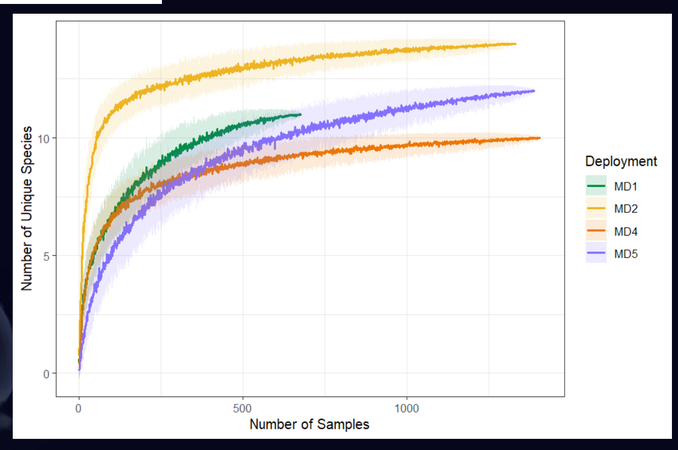


Day/night patterns

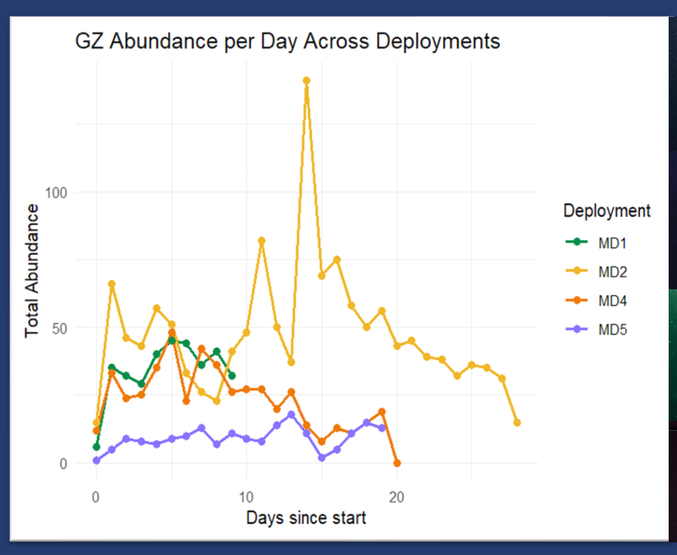
Patterns in abundance seemed to be more linked to season than to depth. MD4 and MD5, which had similar day lengths, also had a similar day/night pattern. The same goes for MD1 and MD2. There is a stronger pattern when there is more light throughout the day.

Species Richness

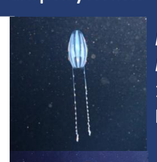
Rarefaction curves show differences in species richness across deployments. MD2 had the highest diversity of all deployments, which could be depth (260 m) and season (summer) related. In contrast, MD4 from a similar depth (250 m), but in autumn had the lowest diversity of all deployments. The two deeper deployments (MD1 and MD5) had similar biodiversity but differed slightly in evenness.



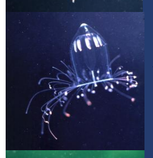
Abundance



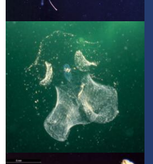
Most abundant species per deployment



MD1
Euplokamis cf dunlapae
150 observations
Photo: Kathleen Reed



MD2
Aglantha digitale
580 observations
Photo: Claudia Mills



MD4
Appendicularian
189 observations
Photo: Andrew J. Martinez

MD5
Chaetognath
70 observations
Photo: Tae Yoon Park

This plot suggests that there might be a seasonal component to differences in GZ abundance. MD2, which was sampled in mid-summer, had by far the highest abundance, in large part due to the 580 observations of *Aglantha digitale.*

Conclusion

DOV BEEBE was found to be an effective platform for studying patterns of gelatinous zooplankton abundance, biodiversity, and behavior. Despite some challenges with visibility and field of view, the video data was sufficient to taxonomically identify gelatinous zooplankton, and revealed possible seasonal and bathymetric differences in abundance and biodiversity of the GZ community, as well as diurnal and behavioral patterns. The video data also revealed differences in environmental conditions such as turbidity and current speed and direction, which provide important context for the organismal observations.

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Acknowledgements

Thank you to the CLIFORD team who assisted with BEEBE deployments and recoveries, including K. Hardy, H. Savolainen, F. Midtøy, I. Sandnes, T. H. Sørlie, J. Skadal. Project funding was provided by the Bjerknes Centre Strategic Grant to project CLIFORD. The code for bootstrapped rarefaction diversity curves was provided by Ashley Nicoll.