

## **Environmental controls on pteropod ecology and physiology along the Western Antarctic Peninsula**

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### **Abstract:**

Pteropods (pelagic snails) are an abundant zooplankton taxon in the Western Antarctic Peninsula (WAP), a region affected by rapid climate warming. Pteropods are important grazers of phytoplankton and prey for higher trophic levels in the WAP, but less is known about their physiology, population dynamics, and biogeography in the region. This information is key to understanding the fate of pteropods in a more acidified, warming ocean. To determine the effects of shifting environmental conditions on pteropod physiology and biogeography along the WAP, I analyzed long-term datasets (1993-2017) collected as part of the Palmer Antarctica Long-Term Ecological Research (PAL LTER) study. Shipboard collections and multi-factorial experiments were also conducted to determine the effects of rapidly changing environmental conditions on pteropod metabolism and feeding ecology, and to identify their contribution to biogeochemical cycling. Results indicate that pteropod populations have remained stable over the past 25 years, with some pteropod species even increasing during this period. Environmental factors including warming and associated sea ice retreat best explained long-term trends in pteropod abundance as well as their stable population dynamics and growth rates. Results from physiology experiments reveal a small increase in metabolism under elevated temperature and lower food conditions, suggesting pteropod physiology will be affected under future warming. Finally, analysis of pteropod gut contents revealed overall low diversity in their prey with high spatial variability indicating that prey composition is mostly tied to latitudinal and cross-shelf environmental gradients along the WAP. These results show pteropod abundance and physiology reflect a range of environmental conditions present in the WAP, which have important implications for food web interactions and biogeochemical cycling.