# Phytoplankton and zooplankton distribution along the Western Antarctic Peninsula: Implications for food web dynamics

# BACKGROUND

- Montes-Hugo et al. (2009) and Mendes et al. (2013) found recent shifts in phytoplankton distribution associated with climatic variables: the former mapped abundance via satellitederived chlorophyll concentrations
- Atkinson et al. (2004) noted increasing salp and decreasing krill stocks on a decadal scale



Figure: (A) Inset map depicting the Western Antarctic Peninsula study area in pink. (B) Representative Antarctic food web highlighting the lower trophic levels. The foundation are phytoplankton; large diatoms are consumed by krill, and smaller cryptophytes are consumed by salps. Salps are a dead end in the web while krill offer nutrition for higher trophic levels. Shifting abundances and distributions at the lower levels have consequences for the entire food web.

## QUESTIONS

### Horizontal comparisons: populations at the same level

<u>Phytoplankton</u>: Do cryptophytes and diatoms co-exclude each other? Zooplankton: Do salps and krill co-exclude each other?

### Vertical comparisons: populations through the food web

Do diatoms and krill co-occur? Do cryptophytes and salps co-occur?

### Hypothesis

Horizontal comparisons will show segregation into areas of higher abundance and vertical comparisons will show areas with correlation between predator and prey

# METHODS











Inverse distance weighted interpolation (raster) and reclassification for each population to determine distribution patterns



Sample calculation of additive (phytoplankton co-exclusion) and multiplicative (krill and diatom co-occurrence) **map algebra** for raster grids

## CONCLUSIONS

- This project established distribution patterns and correlations for populations whose abundance is important to higher levels in the Antarctic food web
- Future work can investigate temporal changes, correlations with seabirds and mammals, and potential driving of distribution by sea ice, temperature, salinity, or depth

### REFERENCES

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- Montes-Hugo, M., Doney, S. C., Ducklow, H. W., Fraser, W., Martinson, D., Stammerjohn, S. E., & Schofield, O. (2009). Recent changes in phytoplankton communities associated with rapid regional climate change along the Western Antarctic Peninsula. Science, 323(5920), 1470-1473.

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