

GREAT AUSTRALIAN BIGHT RESEARCH PROGRAM

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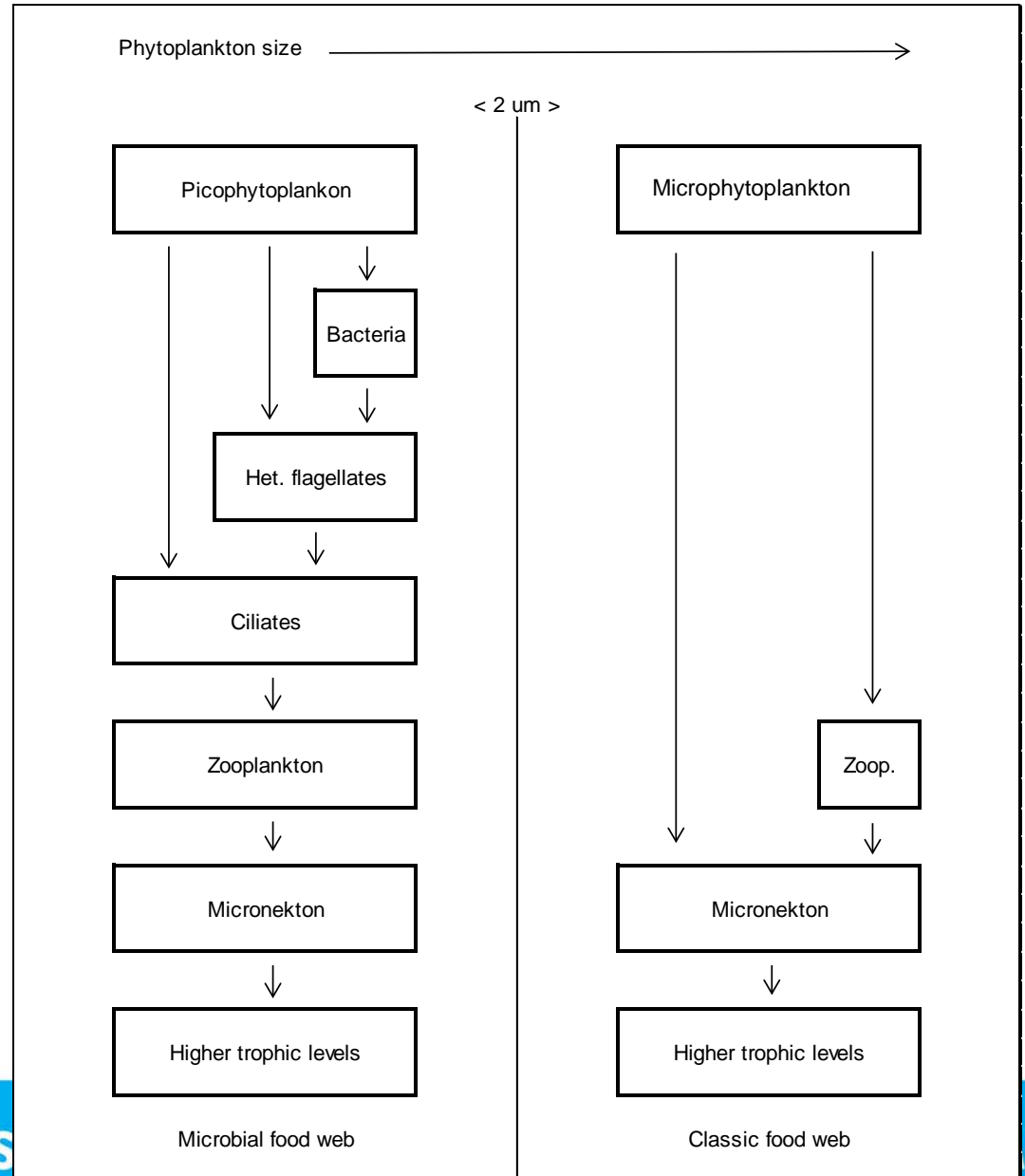
Lower trophic ecosystem dynamics in the Great
Australian Bight



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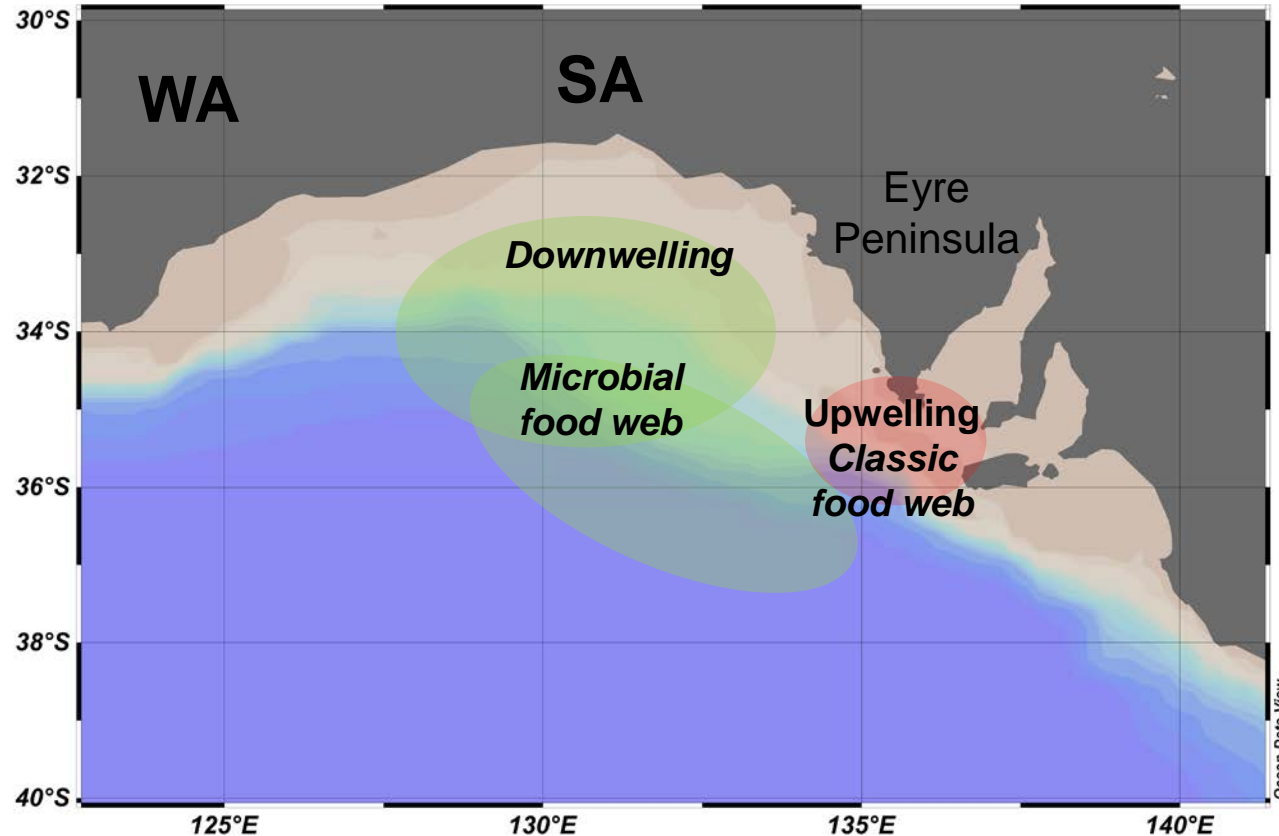
The lower trophic ecosystem

- More steps = less efficient energy transfer
 - Each organism needs to use some of that energy to survive
- Food web type will be influenced by the nitrogen source
 - $\text{NH}_4 \rightarrow$ picophytoplankton
 - $\text{NO}_3 \rightarrow$ microphytoplankton
- Is there enrichment?

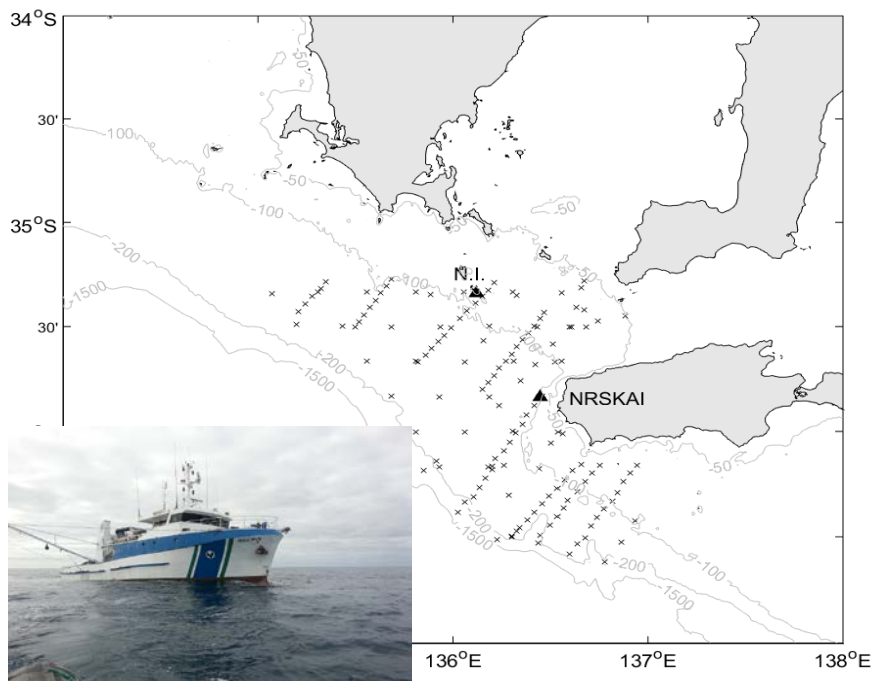


Key hypotheses

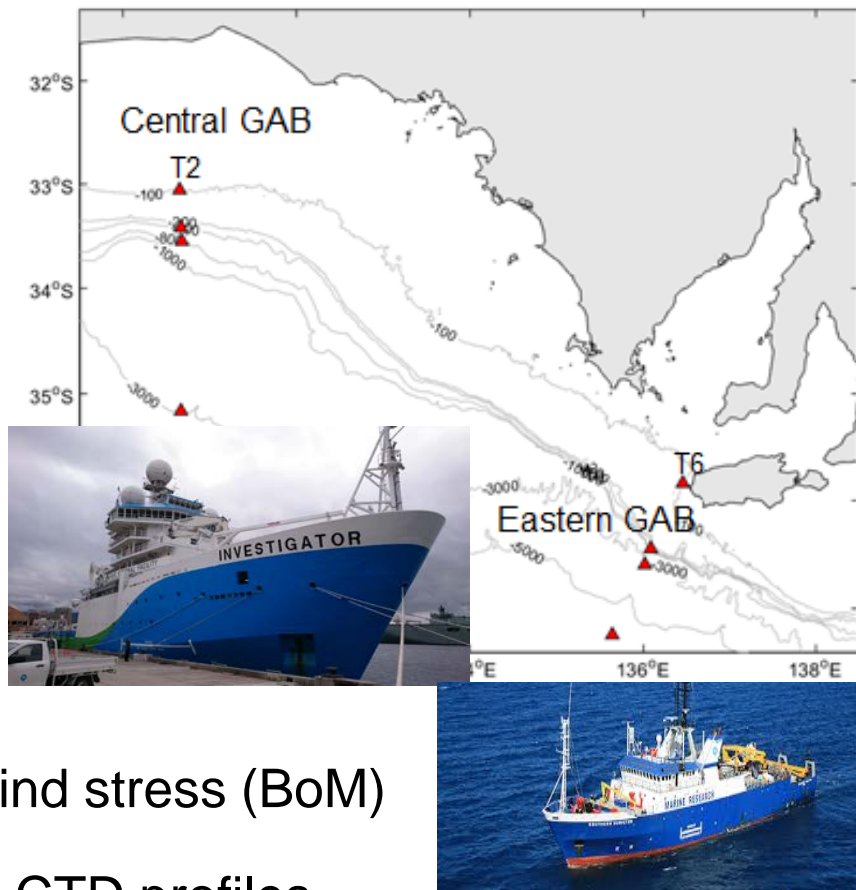
- That the microbial food web dominates across the GAB
 - The classic food web only occurs on the shelf in the eastern GAB during upwelling
- Shifts in the influence of upwelling and downwelling will trigger shifts in food web dynamics which will have implications for ecosystem productivity



Temporal variation

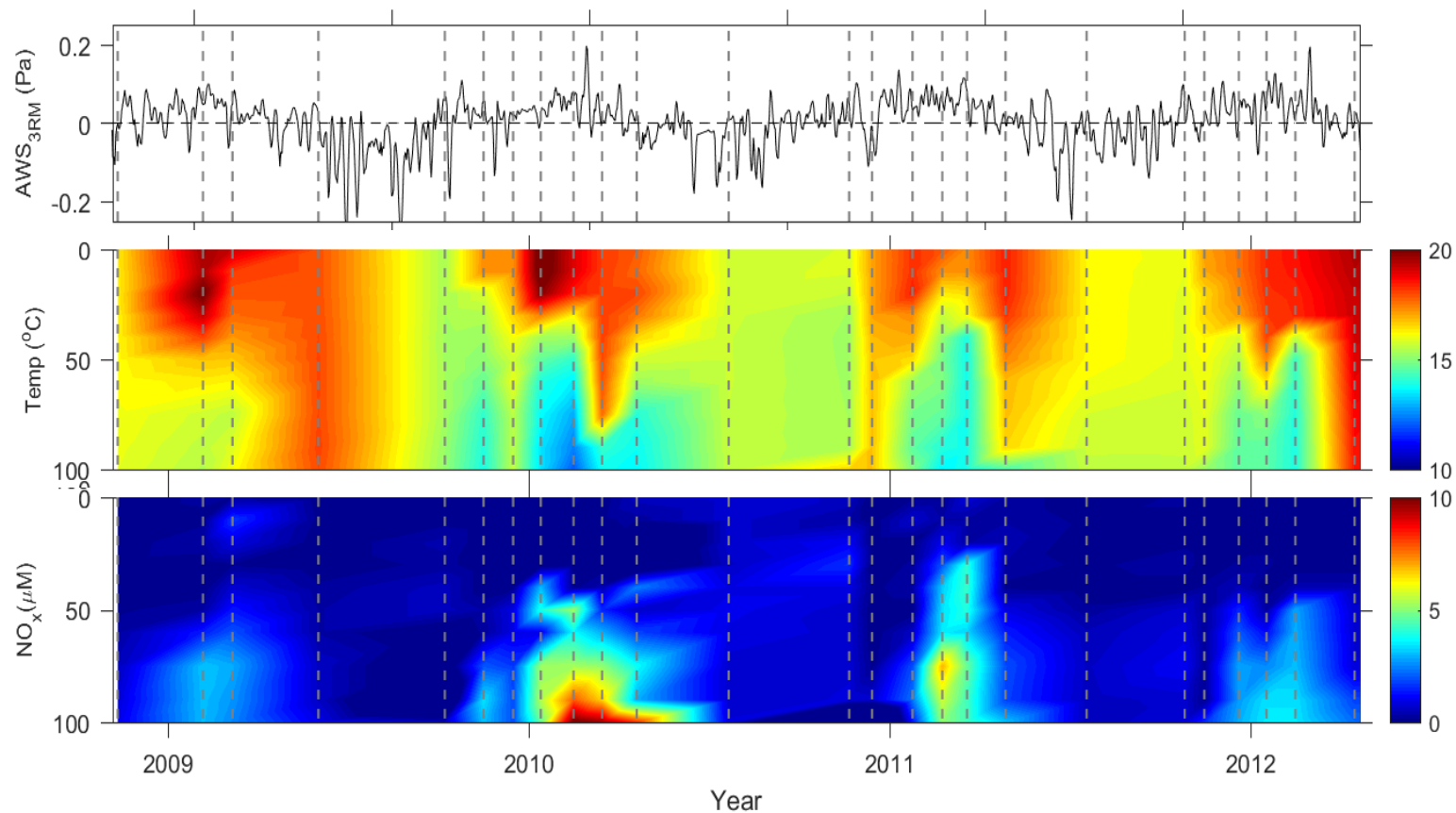


Spatial variation

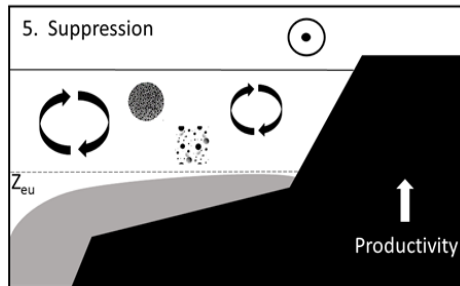
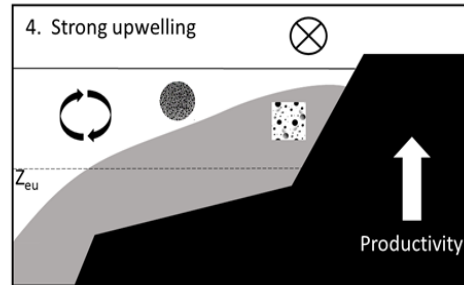
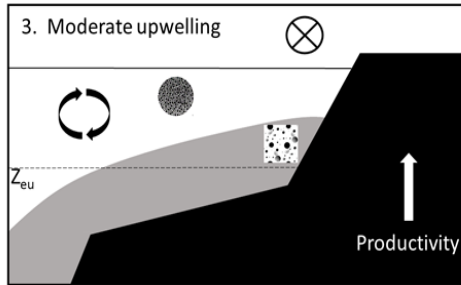
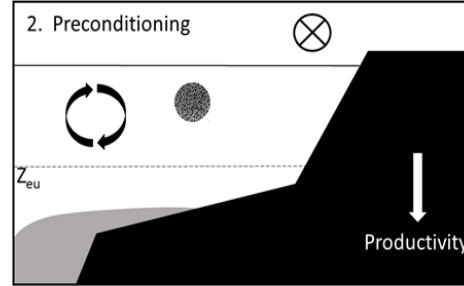
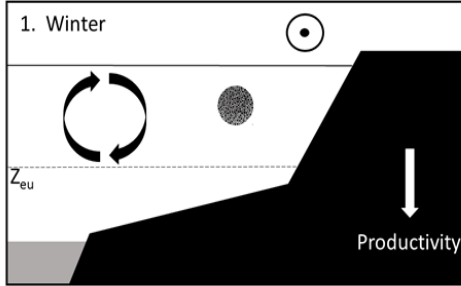


Integrated **Marine**
Observing System

- Alongshore wind stress (BoM)
- Mooring data, CTD profiles
- Water samples @ 10 m/SCM/depth (100/120 m)
 - Dissolved nutrients, Pigments, Microbes, Plankton



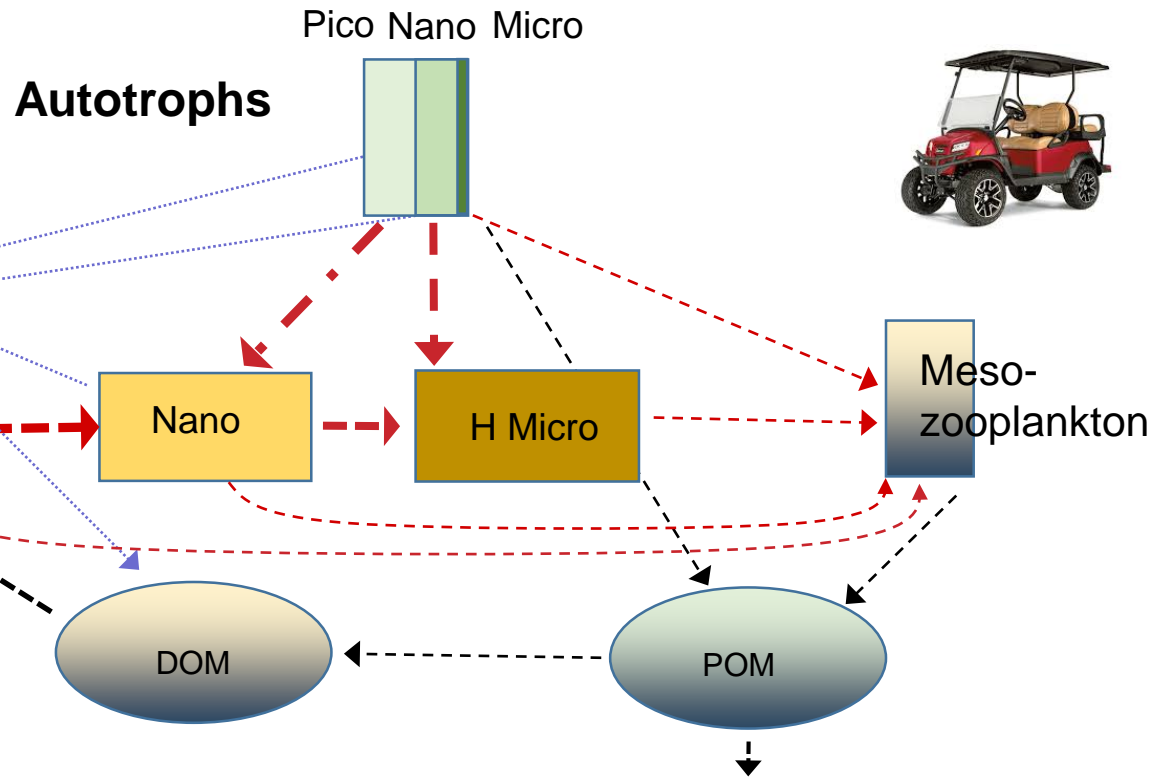
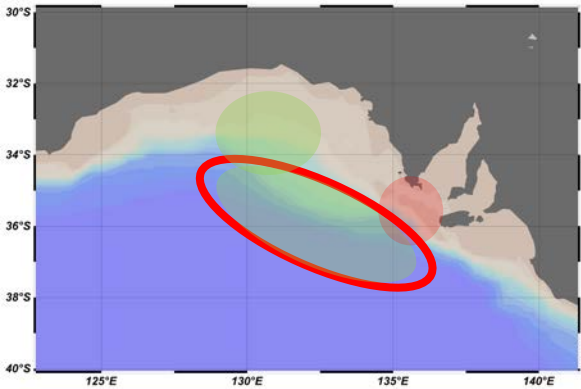
- Enrichment not seen until late in the upwelling season



- Changes in upwelling/downwelling scenarios drive changes in biomass and size structure of phytoplankton that underpin the food web
- Productivity in the eastern GAB will depend on the combination of scenarios that occurs in the region in a given season

Mid-slope and offshore (year round)

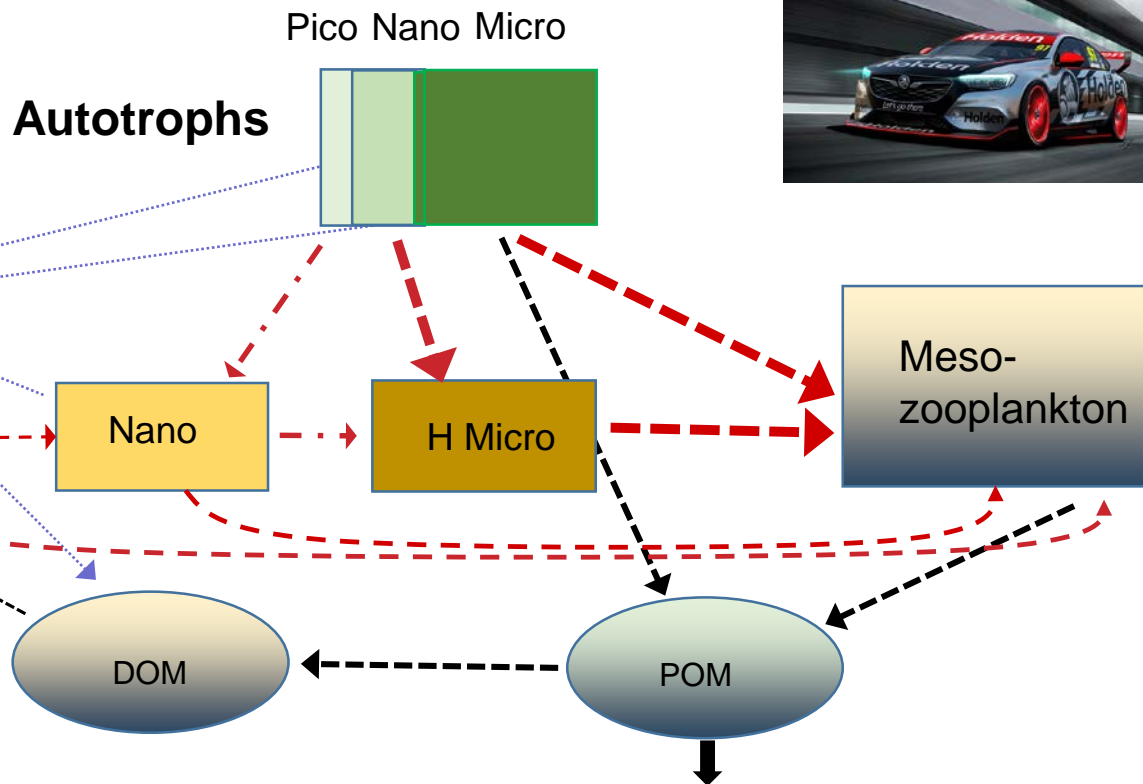
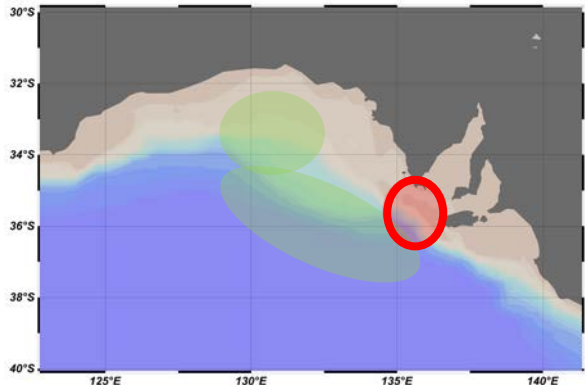
'Recycled' nutrients (NH_4)



Microbial food web

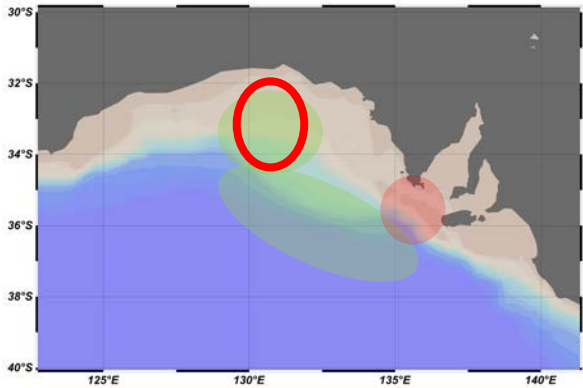
Eastern GAB shelf and upper slope (upwelling)

'New' nutrients (NO_3)



Classic food web

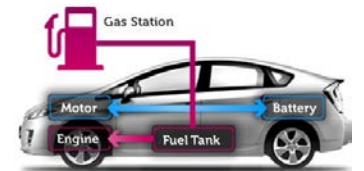
Central GAB shelf (year round)



'Recycled' nutrients (NH_4)

Nitrification →

'Recycled' nutrients (NO_3)



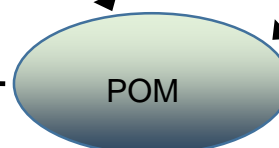
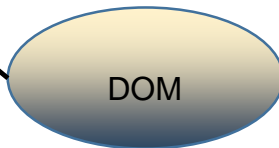
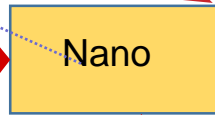
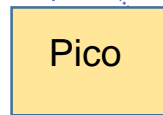
Pico Nano Micro

Autotrophs



virus

Heterotrophs



"Hybrid" food web

Key findings – lower trophic ecosystem dynamics

- Significant enrichment in the eastern GAB occurs late in the upwelling season after a period of preconditioning
- Remote sensed measurements underestimate primary productivity in the eastern GAB
- Overall ecosystem productivity depends on the combination, duration, and intensity of upwelling/downwelling events which drive variations in enrichment and phytoplankton size structure that govern the efficiency of energy transfer up the food web
- A newly documented “hybrid” food web underpinned by biologically mediated enrichment processes is operating in shelf and slope waters of the central GAB
 - **The central GAB has a greater contribution to overall GAB ecosystem productivity than previously thought**

Implications

- Our improved understanding of lower trophic ecosystem dynamics will assist in the calibration of trophodynamic models which will provide new tools for the management of marine resources in the region
- Our more detailed characterisation of natural variation in lower trophic ecosystem dynamics provides the knowledge required to monitor and manage potential future anthropogenic impacts
- The central GAB plays a more important role in overall GAB ecosystem productivity than previously thought
 - Should be reflected in plans to manage marine resources in the region

The team

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