Zooplankton Observations and Modelling (ZOOM): A case study mapping zooplankton

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The Observation-Modelling Gap

• Different languages and communities
• Little Z data used in model assessment (Arhonditsis & Brett 2004)
  • 95 % for P
  • 20 % for Z
• Z observations sparse in time and space
• Work in different units (wet weight vs N)
• Modellers aim for simplification; observationalists highlight diversity
• Z observations “not standardised”
Comparing observed and modelled temperature is relatively easy?!@#$%%^
Why is it not as straightforward with zooplankton?

>140 sampling devices (for Z), all with different shapes/sizes

Mesh sizes

Tow directions

Depths

Remember, very few Z data collected for model assessment
Why the lack of “standardization”?  

• Target organisms: e.g., krill vs copepods vs larvaceans vs microZ  
• Research question: e.g., fisheries vs vertical migration vs productivity vs food for megafauna  
• Scale: e.g., local vs regional vs basin (cost)  
• Area of the ocean: e.g., tropics vs temperate vs poles
1. Improve collaboration between observationalists and modellers
2. Develop Z products for modellers
3. Bring observations and models closer together
Progress

ZOOM Workshop 2016

Modelling what we sample and sampling what we model: challenges for zooplankton model assessment

1. Modelling the plankton – enhancing the integration of biological knowledge and mechanistic understanding

• Facilitating zooplankton data uptake into models
• Collaborating on model assessment case studies

ZOOM Workshop 2017
How can we use “non-standardized” plankton data in model assessment?

1. Data Wrangling: Transforming observed data to be more like model (i.e., use conversions)
2. An observation model: Making process model more like observations, BUT not easy when many samplers (and behaviours)
3. “Advanced data wrangling”: Model the data statistically and compare with model output. Are the patterns the same?
Modelling zooplankton biomass
Zooplankton biomass model (net, CPR, LOPC)

(n = 11,480, r² = 38%)
Zooplankton biomass – Seasonal

Summer

Dry weight (mg/m³)

Winter
Assessment of eReefs model

Summer

eReefs: Large Z biomass

Z biomass from statistical model

Skerratt et al. (submitted)
Assessing emergent patterns

**Z from statistical model**

- Log10(Biomass) vs. Chl-a
- Depth vs. Chl-a

**Z from eReefs model**

- Chl-a vs. Depth
- Depth vs. Chl-a

Skerratt et al. (in press); Robson
Estimated global Z biomass (LOPC data)

$r^2=23\%, n = 72,554$
Estimated Z functional groups (nets)

Krill \( r^2 = 50\% \) (n=16,956)

Larvaceans \( r^2 = 39\% \), n=2,735)
Conclusions

• Little assessment of Z in models
• “Non-standardization” of Z sampling, statistical models needed
• Combining IMOS net and CPR data with historical data using statistical models fills gaps in time and space
• Produced first data-driven national & global gridded Z biomass product
• More to be done assessing whether functional relationships discerned in observed data are emergent from models... (see talk on *Trichodesmium* tomorrow)...