NATURAL VARIABILITY OF MACRO-ZOOPLANKTON AND LARVAL FISHES OFF THE KIMBERLEY, NW AUSTRALIA: PRELIMINARY FINDINGS

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Anthropogenic effects to the Kimberley pelagic ecosystem

- Many expanding pressures in Kimberley (e.g. oil and gas, fishing, aquaculture)
- Pelagic ecosystem of the Kimberley is becoming increasingly exposed to disturbance
- Marine populations rely upon the pelagic ecosystem for reproductive success (e.g. corals and fishes) and for food (e.g. krill for whales)
- Need to have good baseline data to ascertain any effects
• Very large tides (>10m)
• Circulation is a complex interaction between tides, wind and regional ocean currents (Condie & Andrewartha 2008)
• Seasonal reversal of currents largely in response to wind field
Highly seasonal rainfall and fluvial discharge (turbidity)

Source: CSIRO

Rainfall Data

AIMS

Beckley
Physical oceanography
• tides, currents, water masses

Biological oceanography
• light climate, phytoplankton, zooplankton and larval fishes
• The voyage encompassed a spring-neap cycle
• Transect A (spring tide) repeated as C (neap tide)
Regional temperature and salinity properties

- Very warm surface water (>30°C)
- Cooler, lower salinity deeper water
- Little variability across region and between spring (A) and neap (C)
• Strong temperature stratification
• Warm high-salinity water over shelf
• Some lower salinity coastal water
• No strong frontal structures
• A decreasing trend in bio-volume of macro-zooplankton and concentration of larval fishes from coastal to oceanic waters
• Significant (p< 0.001) cross-shelf structuring driven by the factor Isobath
Highest concentrations in coastal waters - mostly larvae
*Pseudeuphausia latifrons* dominated shelf assemblage
Higher diversity in oceanic waters and characterised by species of *Stylocheiron* and *Euphausia*
Larval fish assemblages - concentrations

- Significant (p< 0.001) cross-shelf structuring
- Highest concentrations in coastal waters
- Influence of subsequent tides confounded by diel variation (not significant)
- Larvae of neritic taxa dominated assemblages but declined offshore
• 6,513 larvae from 110 teleost families
• Assemblages at Lacepede Islands and in King Sound different from shelf stations
• Neritic taxa occurring offshore possibly dispersed from Scott Reef
• Different environment or limited exchange?
Larval Fish Assemblages

- Overall significant cross-shelf structuring ($p<0.001$)
- Clear spatial separation between coastal, shelf and oceanic assemblages as well as the Lacepede Islands and King Sound
Natural Variability of Larval Fish Assemblages

**Isobath**

- 2000
- 1000
- 500
- 200
- 100
- 50
- + KS
- + Lac

**2D Stress: 0.14**

- Lanternfish
- Dragonfish
- Wrasse
- Unicornfish
- Mackerel
- Snakemackerel
- Wrasse
- Anchovy
- Grouper / Cod
- Goby
- Snapper
- Pelagic codlet

**Lanternfish**

**Wrasse**

**Anchovy**

**Grouper / Cod**

**Goby**

**Snapper**

**Pelagic codlet**
Future Work and Significance

• Larval fish are being identified to genus/species level - data will be examined further to elucidate trends which may be masked by analysis at the broad family level.

• To resolve the influence of tide, a 24 hr station, sampled during voyage is currently being analysed.

• These preliminary results have provided first insight into natural variability of macro-zooplankton and larval fish assemblages in the Kimberley pelagic ecosystem.

• This information will be useful for industry, management and planning, particularly for the evaluation of any anthropogenic impacts to the Kimberley pelagic ecosystem.
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Temperature and salinity properties over a tidal cycle

- TS profiles over 12 hr period (between subsequent tides)
- Shift from more stratified conditions at low tide to more well mixed at high tide
• Alongshore velocity greater (0.1 – 0.2 m s\(^{-1}\)) compared to cross-shelf