Why macroinvertebrate monitoring?

• Assess ecological condition of the ‘estuary’
• Understand patterns & processes of ecosystem changes
• Analyse responses to (natural & man-made) environmental changes
• Explain variations in densities and distribution patterns of migratory shorebirds and fishes
• Evaluate recovery potential

Focus mainly on estuarine benthic macroinvertebrates
7 years of macroinvertebrate condition monitoring (TLM)

Intervention monitoring of macroinvertebrates for water management measures

Projects on *Ficopomatus enigmaticus*

Student projects on -tubeworm reef structures
-tubeworm settlement
-harvestable food & foraging of shorebirds
-fish assemblages and diets

Consequences:
- Artificial opening of the mouth 2009-2010
- Hypersalinity
- Reduction in water level
- Acid sulphate soils
- Aquatic habitat loss
- Declines in bird and fish populations
- ...
What do we know about the condition of the estuary based on macroinvertebrate studies?

How did macroinvertebrates respond to the changes in the estuary?

Do changes in macroinvertebrates matter?

Can our understanding be used to predict responses to future changes?

Have macroinvertebrate studies been useful for management?

Macroinvertebrate condition monitoring
Murray Mouth & Coorong

- Distribution follows salinity gradient
- Decrease in abundances and biomass over time
- Small water release in 2005 had positive effect
- Distinct assemblages in Murray Mouth and South Lagoon
- Benthic assemblages in North Lagoon more variable over time
- Changes in distinction / similarity of assemblages reflect flow situation

- Salinity, sediment grain size and organic matter, as well as O₂ saturation best explain macroinvertebrate changes
• No clear patterns in macroinvertebrates, site specific variations

• Salinity and oxygen saturation contribute to explaining macroinvertebrate community patterns in LL, but further environmental parameter also important.

• Decrease in benthic biomass on both sides of the barrages in recent years
Change in macroinvertebrate communities 2004 – 2010/11

- Murray Mouth was distinct, North Lagoon variable, South Lagoon and Lower Lakes more similar
- 2010 – more similar throughout after flow

Macroinvertebrate response to barrage releases

- Initial flow response increased abundances and presence of juveniles in subtidal sediments
- Previously dried out “mudflats” are getting slowly recolonised
- As freshwater conditions persist in the Murray Mouth, the North Lagoon becomes a refuge for estuarine macroinvertebrates
- Changes are driven mainly by salinity and diss. O₂
Abundances of prominent species in relation to salinity and dissolved oxygen, based on six years of monitoring data.
Disturbance by flow or drought? – both!

Resilience could be impaired after prolonged drought

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**Goolwa Channel Water Level Management Project (GCWLMMP)**

Recolonised by freshwater macroinvertebrates, in particular after the flow.

• Do changes in macroinvertebrates matter?
  ➢ Effects for higher trophic levels

2007/08 drought
experimental exclusion of shorebirds had no effect on benthic assemblages

Opportunistic switch in diet of flounder