Stygofauna in the 21st century Iron-ore mining, coal seam gas and water supply

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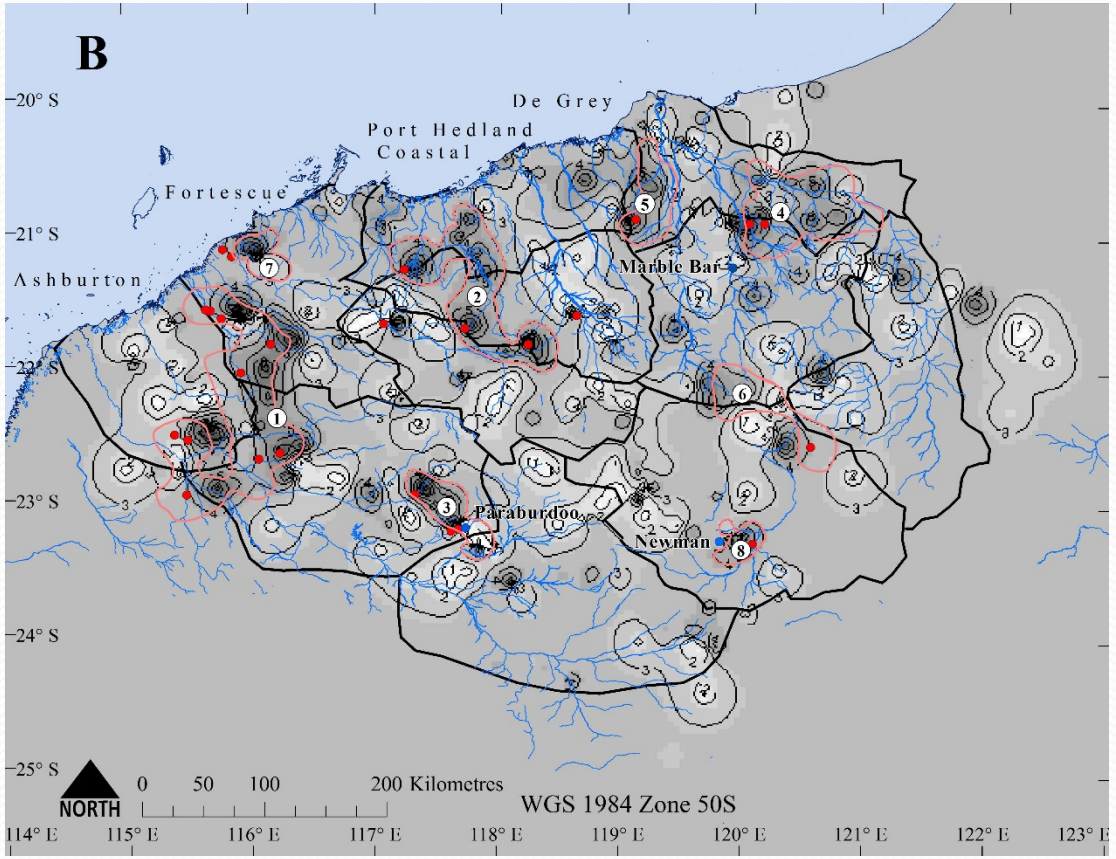
Outline

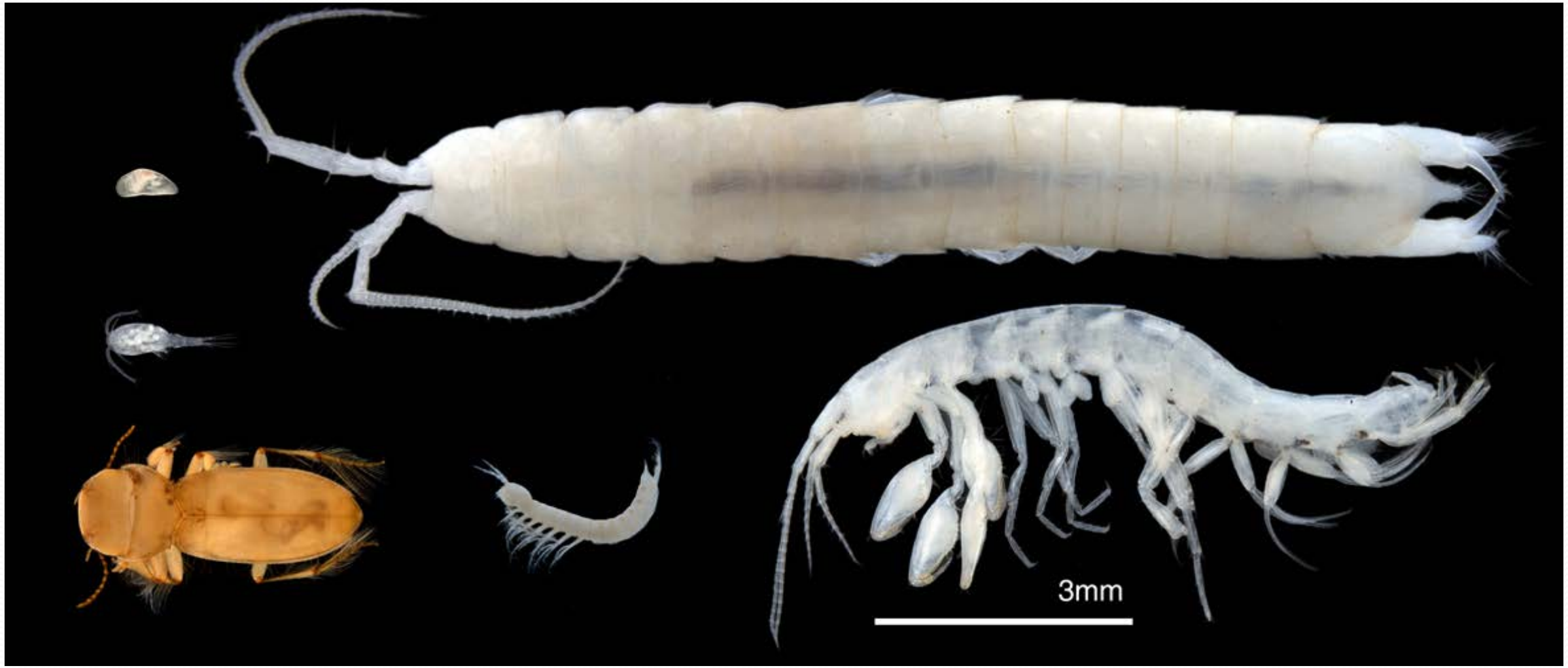
- Coal seam gas has captured public imagination
- Has led to greater awareness of stygofauna
- What are the main stygofauna conservation issues in Australia?
  - Stygofauna are almost everywhere!
  - Important conservation values in arid areas (esp. WA)
  - Obvious threat is habitat loss through de-watering
  - Impact of agriculture is difficult to assess but possibly important
  - Coal seam gas would be expected to be unimportant as threat, though large scale may increase impacts
  - Is assessment process uniform?

Stygofauna

- Mostly crustaceans
- Originally studied in caves and streambeds
- Occur across the landscape
- Low energy, low O_2 environment
- Many species have small ranges
- Occur in unconfined aquifers
- Hydraulic connection to surface

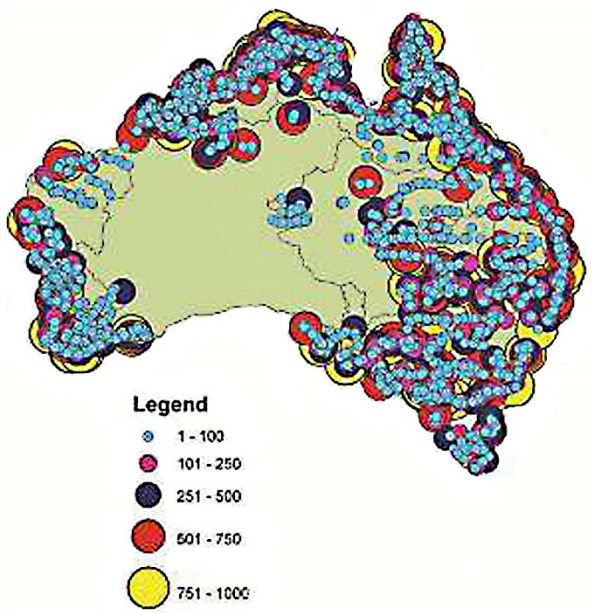


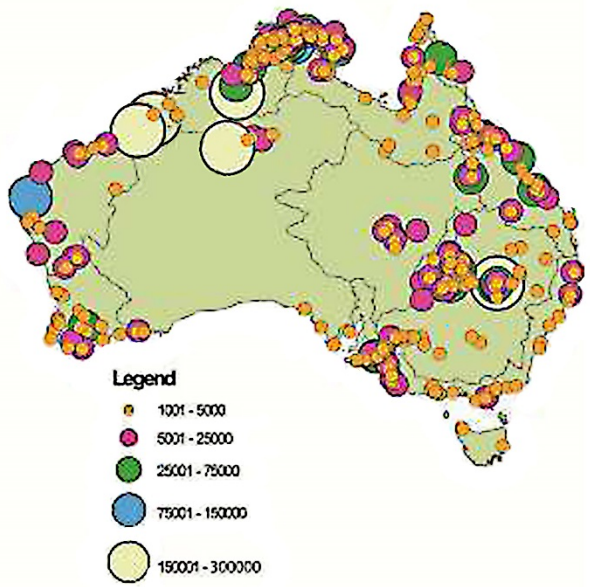
Main groups



National perspective

- National conservation policy is often overly focussed on eastern Australia and the Murray-Darling Basin
- Important waterbird concentrations in north-west WA and the Top End
- High invertebrate endemicity in temporary pools of WA
- Important stygofauna areas in WA



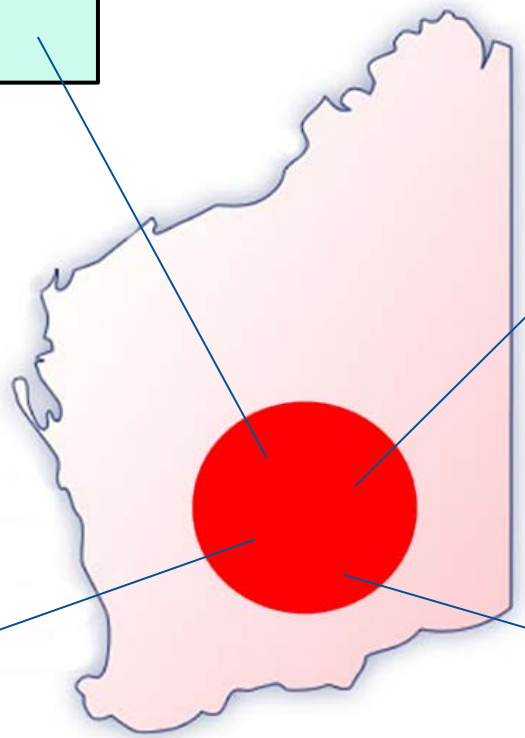


Invertebrates with drought resistance

On the *Bennelongia barangaroo lineage (Crustacea, Ostracoda) in* Western Australia, with the description of seven new species
Koen Martens, Stuart Halse & Isa Schön

Bennelongia timmsi

New genera and species of giant ostracods (Crustacea: Cyprididae) from Australia
S.A. Halse & J.M. McRae

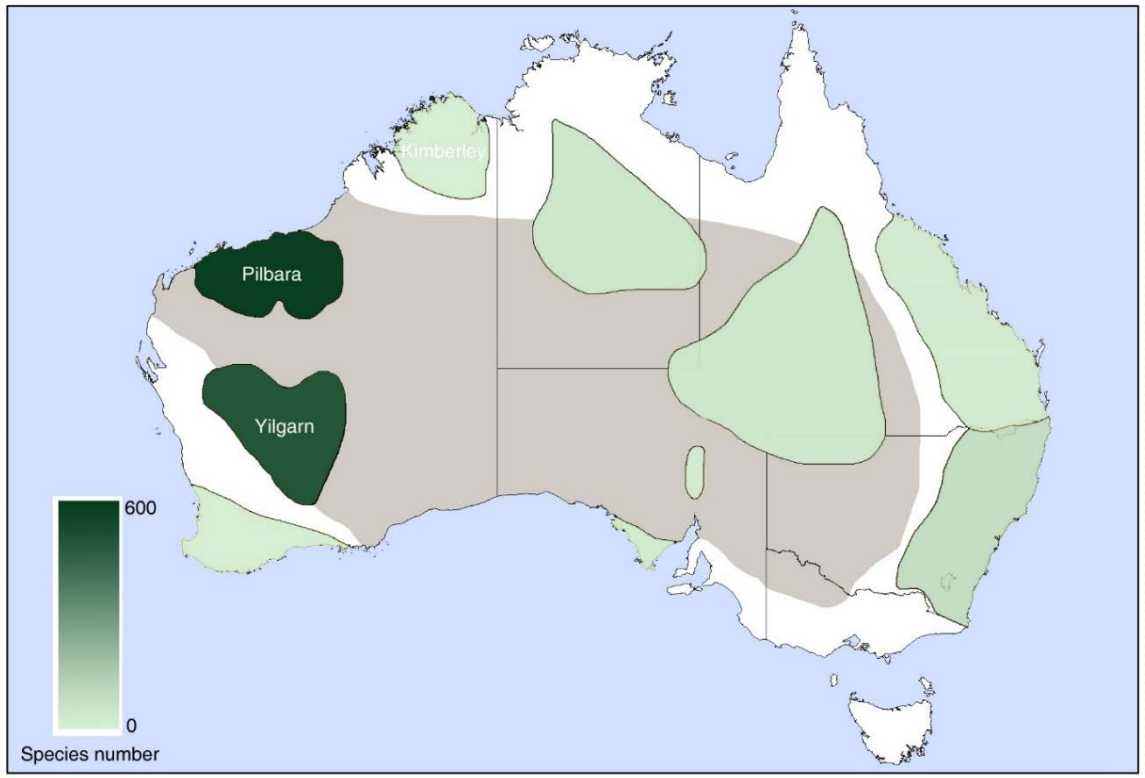


An Identification Guide to the Brine Shrimps (Crustacea: Anostraca: Artemiina) of Australia
Brian V. Timms

***Notothrix halsei* gen. n., sp. n., representative of a new family of freshwater cladocerans (Branchiopoda, Anomopoda) from SW Australia, with a discussion of ancestral traits and a preliminary molecular phylogeny of the order**
Kay Van Damme, Russell J. Shiel & H.J. Dumont

Significance of regions

- Guzik *et al*. 2010 estimated western half of Australia supports 2680 stygofauna species and arid WA is the key area for stygofauna in Aust.
- Halse *et al*. 2013 provide known numbers for different parts of Aust.
  - 350 Pilbara stygofauna
  - Estimated 550 species
  - 650 Pilbara troglofauna



Threats

- Principal threat is usually groundwater drawdown
- Mine de-watering
  - Up to 50 GLpa from individual mines, may have cumulative effects
  - Large drawdowns (to dewater deep pits) over areas up to c. 200 km^2
  - Severity of impact affected by stratification, depth bgl, depth to basement
- Borefield production
  - Drawdown relatively small except immediately around pumps
  - Aim for sustainable yield
  - Up to 45 GLpa from extensive borefields (confined aquifer)
- Agriculture
  - Impacts likely to be greatest in irrigation areas
  - Increased salinity, broadscale application of pesticides, other chemicals, nutrients

Coal seam gas

- Effects on unconfined aquifer are indirect and likely to occur via 'windows'
- Unless spatial extent of windows is large, impacts on stygofauna will be relatively small
- Ranges of 'floodplain' species still being determined
  - syncarids have very poor dispersal
  - possibly affected by agriculture and perhaps coal seam gas
- Field assessment of coal seam gas is a real challenge
  - stygofauna have small ranges, poor dispersal
  - are cryptic, i.e. low sampling success rates and richness predicted only approximately from geology
  - Means stratified sampling programs with large effort

Environmental assessment

- State legislation/regulations
  - Stygofauna treated prominently in WA since 2000 (EPA GS 54, 54A, EAG 12)
  - Qld and NSW include stygofauna in assessments
- EPBC Act
  - Water trigger (coal and coal seam gas only)
  - Listing of TECs
  - Eastern Australia focus