

Characterisation of the stygofauna assemblages of the Beetaloo Sub-basin, Northern Territory

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Livelihoods



Background

- Definition:

- Ground water fauna, or stygofauna, are animals that live permanently underground in water.
- Stygofauna live in a range of groundwater habitats—from tiny spaces between sand grains to pools and streams in caves.



Amphipod
(image courtesy Bennelongia)

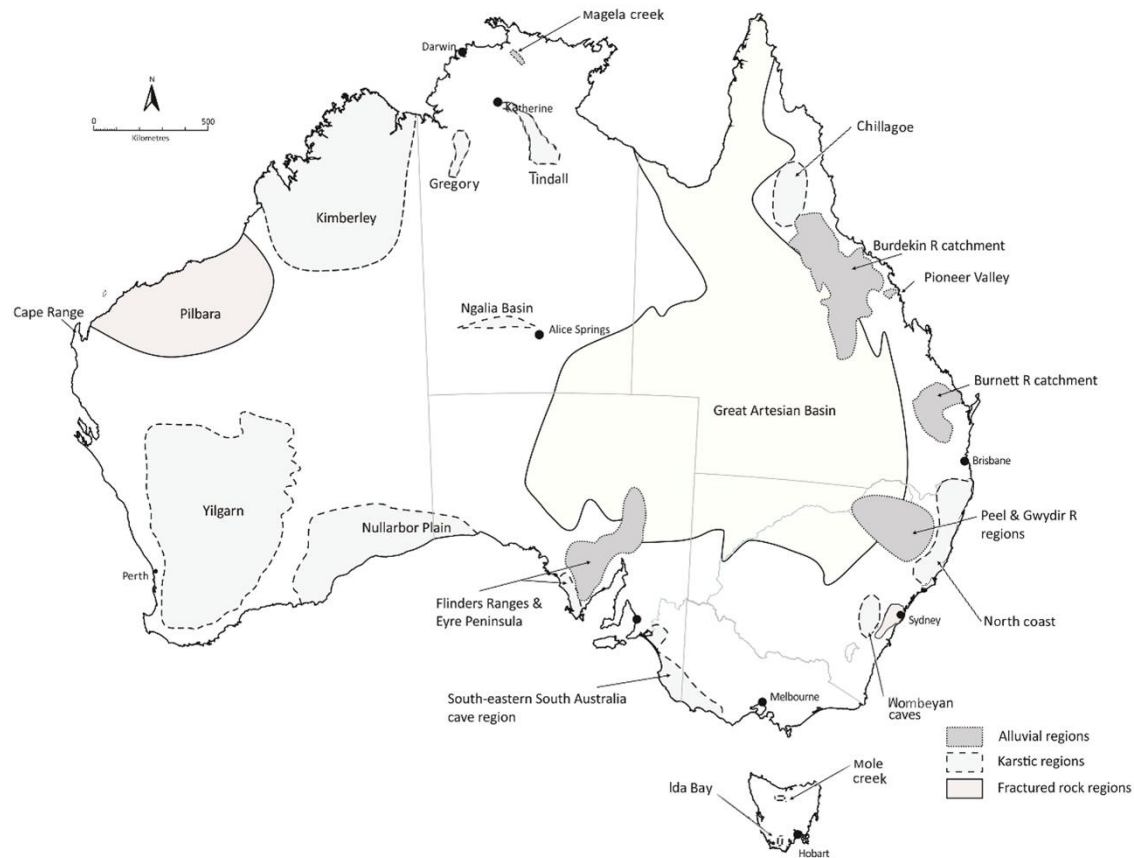


Beetle
(image courtesy Bennelongia)



Blind cave fish

Background - General aquifer types and regions where stygofauna have been found



Modified from Tomlinson and Boulton (2008) with additional information from Guzik *et al.* (2008), Hose *et al.* (2015a) and Chandler *et al.* (2017) and this study (the Tindall aquifer)

Pilot project

Overall project objective.

- To provide new knowledge concerning stygofauna and subterranean groundwater dependent ecosystems in the Beetaloo Sub-basin and Roper River system

Approach.

- Carry out a pilot scale sampling program to examine a limited series of bores/bore water for the presence of stygofauna

Project Team

Gavin Rees (CSIRO)

Daryl Nielsen (CSIRO)

Jenny Davis (CDU)

Stefanie Oberprieler (CDU)

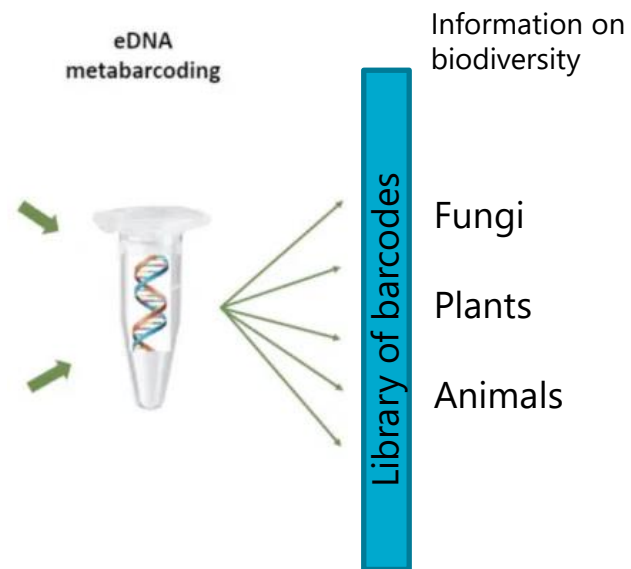
Garth Watson (CSIRO)

Michael Shackleton (LaTrobe Uni)

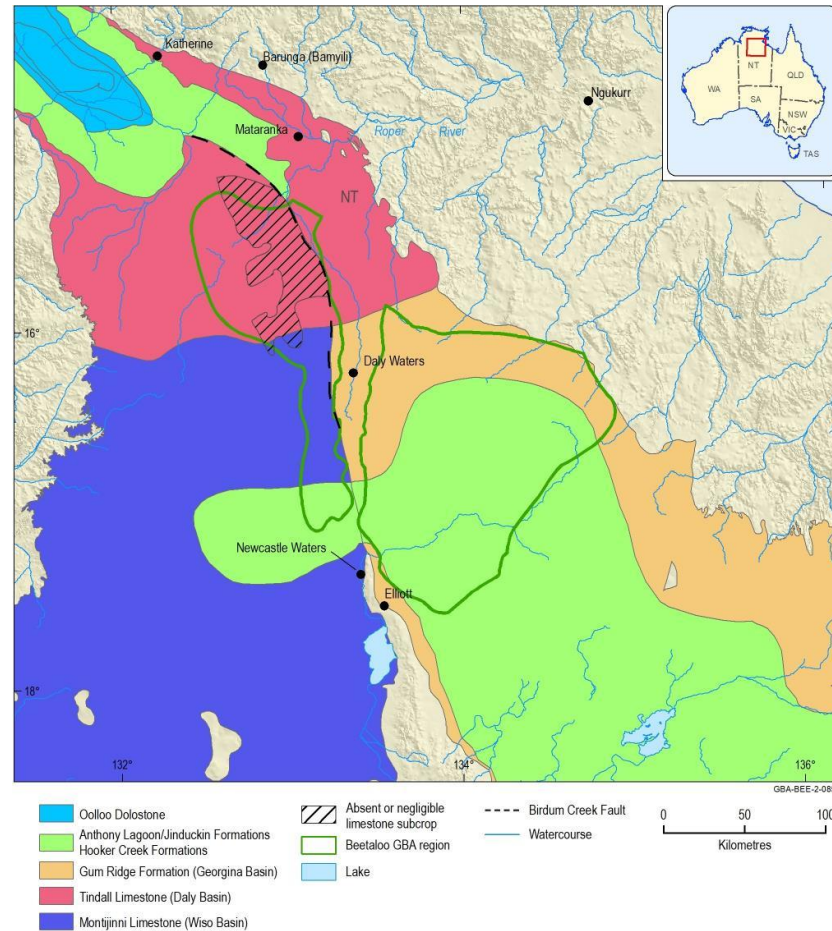


Project – brief approach

- Sample bore water from:
 - 28 sites, including 2 springs,
 - From Mataranka to semi-arid Barkly Tablelands
 - Combination of sites within and outside leases, to sample different types bores
 - Carried out a second sampling trip. Further bores and revisited some earlier bores
- Use a range of bore sampling methods, depending on type of bore
- Preserve and identify any organisms
 - Where relevant, use DNA barcoding to identify organisms
- Use an environmental DNA approach to examine bore water
 - Detecting the DNA from organisms in bore water rather than entire organism



Location



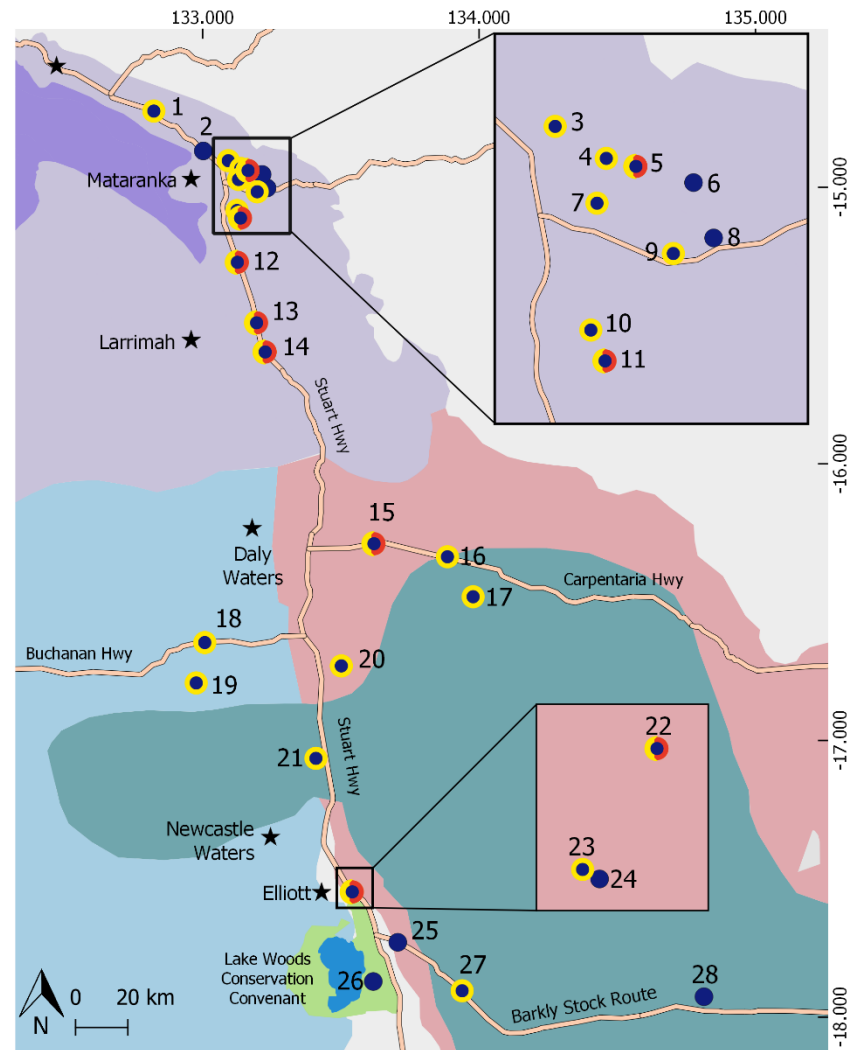
Legend

- Bores sampled in 2019
- Presence of stygofauna indicated by eDNA only
- Presence of stygofauna indicated by both collection of specimens and eDNA

Major hydrostratigraphic units

- Ooloo Dolostone
- Tindall Limestone (Daly Basin)
- Gum Ridge Formation (Georgina Basin)
- Montijinni Limestone (Wiso Basin)
- Anthony Lagoon/ Jinduckin Formations

- ★ Main Towns
- Main Roads



Bores – some examples



Buchanan Downs



Shenandoah homestead

Bores – some examples



Elliot 8 (RN036781)



Mataranka Homestead
(RN35796)



Bores – some examples



Bores – sampling using pumps



Pumped water is passed through an ultra-fine net to collect animals



Bores – hand held nets



Results

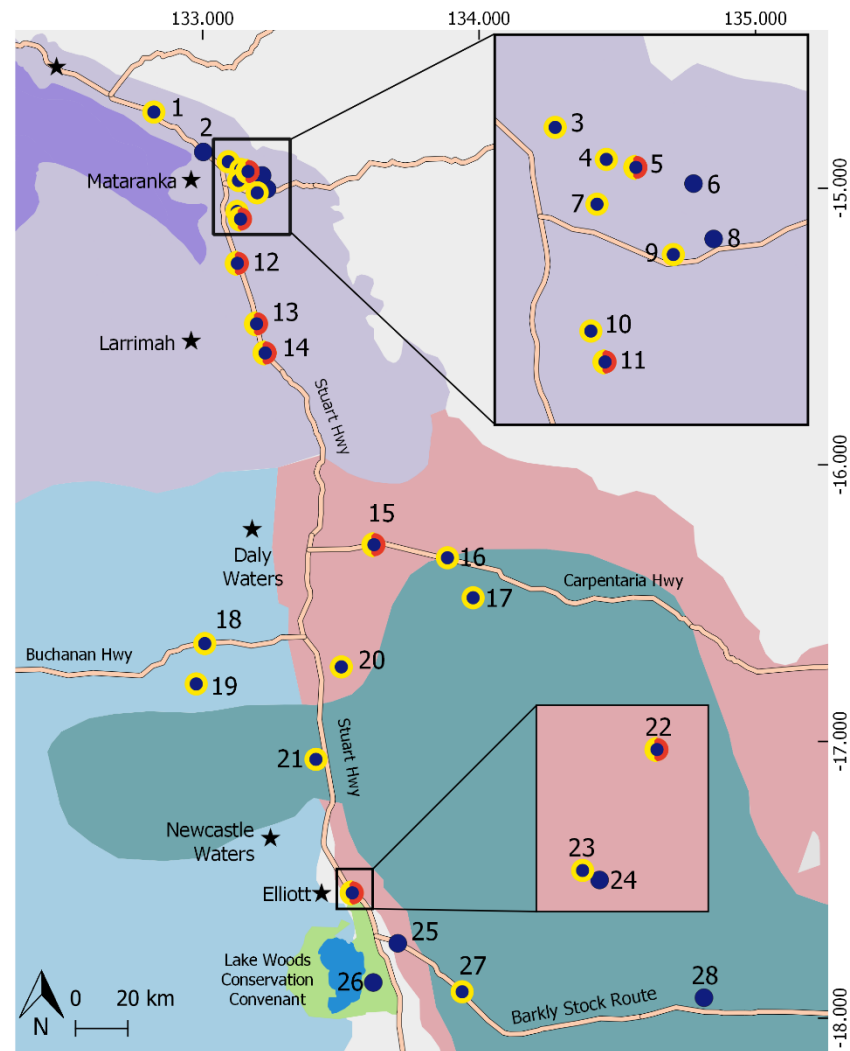
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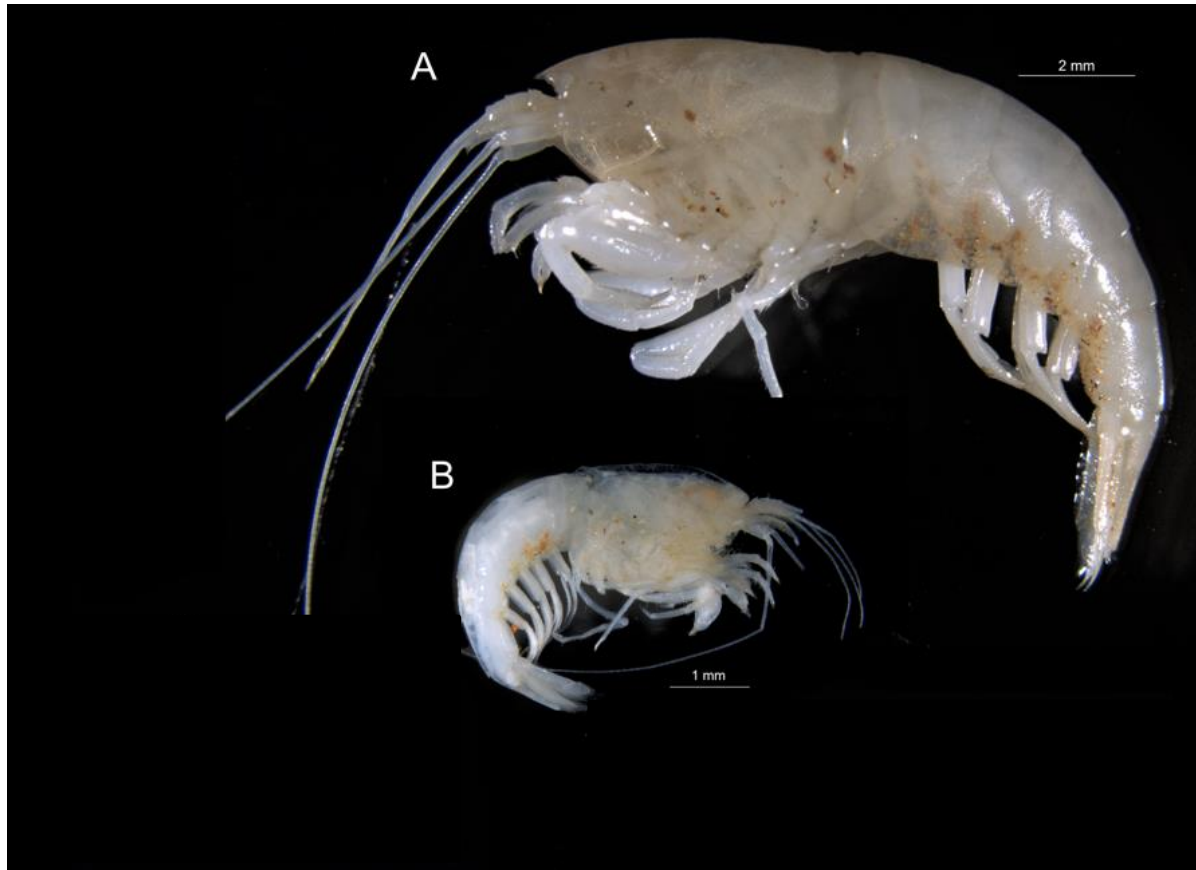
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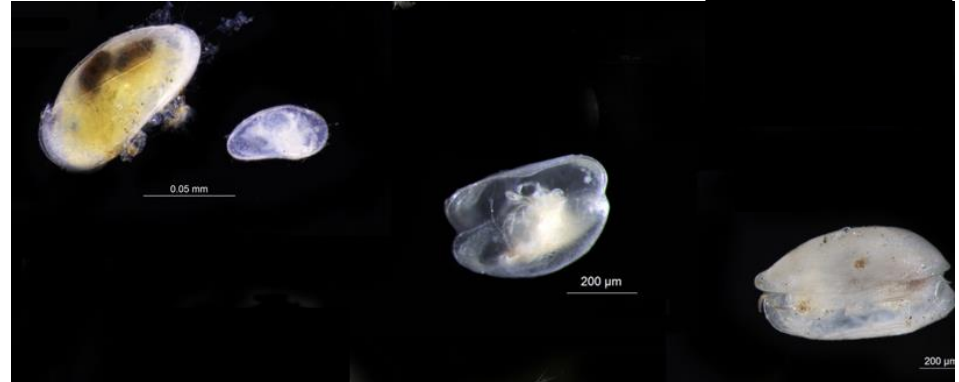
Blind shrimp



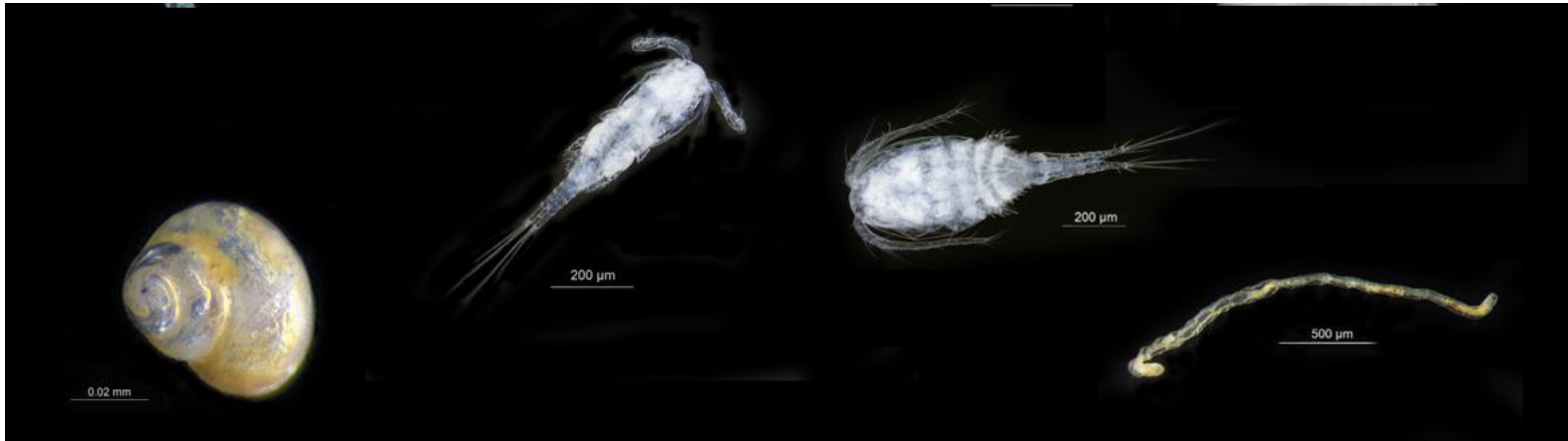
Small crustaceans



Amphipods-
A very small crustacean



Ostracods –
Another class of small crustaceans



Snail

Cyclopoids-
Tiny crustaceans
(‘zooplankton’)

Worms

eDNA as a detection tool

- Our eDNA recognized three categories of organisms
 - Contaminant terrestrial DNA. Eg, ants
 - Probable soil organisms. Eg, soil fungi,
 - Organisms dwelling in bore waters. Eg, crustaceans detected by netting
- Stygofauna DNA detected across many bores
- Accurate identification of eDNA results requires
 - Animals accurately identified
 - DNA barcodes obtained and have been put into the DNA libraries

Results

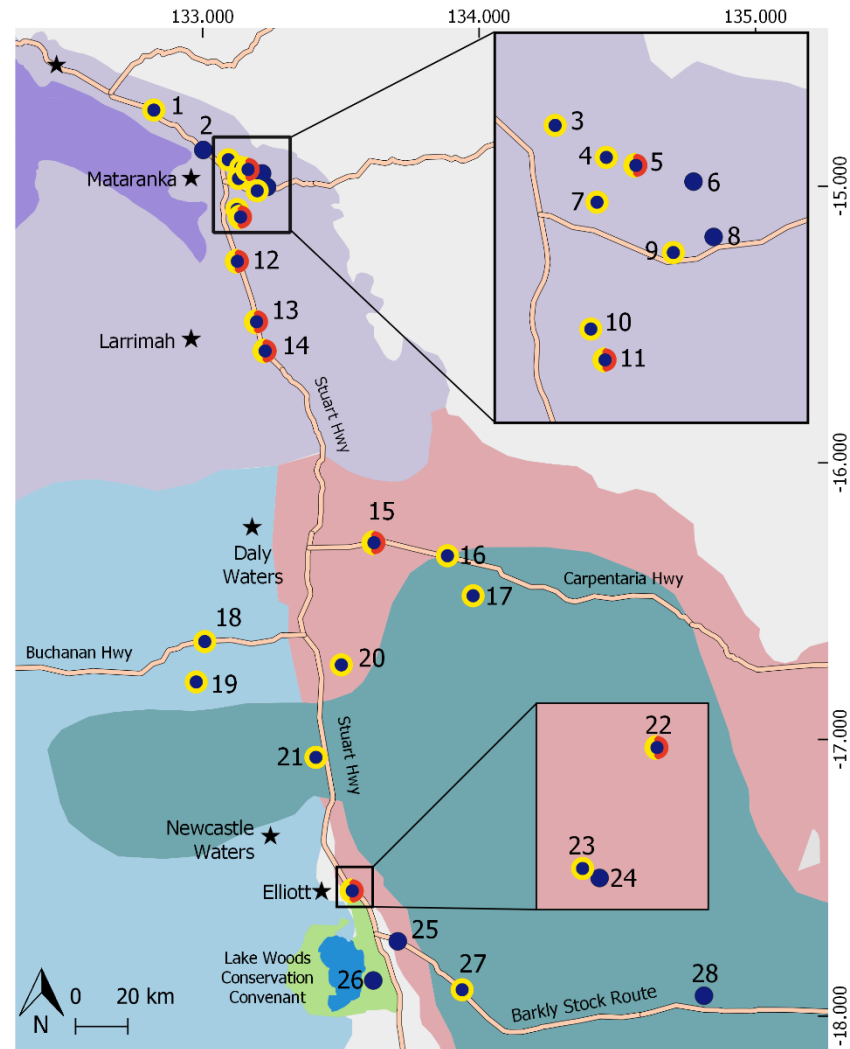
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Stygofauna dominated by crustaceans

Organised food web

- shrimp top predator?



Returning to the shrimp

- Three species been described from Cutta Cutta caves near Katherine
 - *Parisia unguis*, *Parisia gracilis*, *Pycnisia raptor*
 - Extremely limited taxonomy (single specimens, pieces of animal), so very low certainty about their true identity
- Our specimens most closely related to *Parisia unguis*
 - Given low genetic diversity of our specimens, this species spread over some 500km

Summary points

- First studies of the aquifers showed stygofaunal communities were dominated by crustaceans
- Showed little affinity with the stygofauna recorded from more extensively sampled Western Australian aquifers
- Highly likely new genera and species present in the Beetaloo Sub-basin
- Evidence of connectivity within the aquifer across our sample sites

Acknowledgements

- Stuart Halse (Bennelongia Environmental Consultants)
- John Short (BioAccess Australia)
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Thank you

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