AUSTRALIAN FRESHWATER SCIENCES SOCIETY

Formerly Australian Society for Limnology, Est 1961

AFSS member update from the Northern Territory October 2023

Compiled by NT Rep, Erica Garcia

Charles Darwin University and University and CSIRO – Kaline De Mello (Research fellow)

Wetland mapping and classification, and wetland condition assessment in the Adelaide River Catchment

Considering the future projects of water extraction in river systems in the Northern Territory, there is a need to better understand the riverine systems and how future development can affect wetlands associated with these systems. Dr. Kaline de Mello (kaline.demello@cdu.edu.au) came from Brazil to work on this project with Dr Erica Garcia, Dr Anna Richards, Dr Keller Kopf and Prof. Jenny Davis. The main aim of this project which includes CDU and CSIRO to develop an automated method for wetlands mapping considering seasonal spatial variations, wetland classification, and wetland condition assessment in the Australian tropical savanna. Because of the natural variation of wetlands in the wet-dry tropics, we aim to investigate the persistence and longitudinal connectivity of pools within wetlands to identify crucial refugia during the dry season. For that, we are using remote sensing information, existing maps, expert consultation, and information collected in the field to build a framework for wetlands and classification using Google Earth Engine. As part of the Adelaide River Catchment Ecological Assessment, a project with the Department of Environmental, Parks and Water Security in the NT government, we started the project with this catchment as a study case.

Ground truth for wetland mapping and classification – visiting coastal wetlands in the Adelaide River Catchment.

Ground truth for wetland mapping and classification – visiting the Adelaide River.

Pugging of soil by cattle or feral animals in a Billabong in the Adelaide River floodplain.

Charles Darwin University and University and CSIRO – Colton Perna (PhD student)

Colton Perna has been working on his PhD on food webs in the Roper River. He completed field work in June 2023 and has now collected two samples following a below average wet season flood and two samples following an above average wet season flood. He has collected over 1500 samples for stable isotope and fatty acid analysis as well as over 3000 measurements for condition assessment. The next step is to extract the fatty acids in collaboration with

the Southern Shark Ecology lab at Flinders University. All the stable isotope samples will be getting freeze dried at CDU and then sent to Flinders for analysis with the fatty acid samples. This will be done early 2024.

These samples will be used to describe the trophic ecology of river and wetland sites within the Roper River and the impact of flood variability on food webs. The fatty acids will be used to examine differences in food web quality between seasons and wetland and river habitats.

Colton hopes to submit three manuscripts as part of his overall thesis by Dec. 2024.

Charles Darwin University – Tegan Dedman (PhD Candidate)

Experimental studies on the impacts of saltwater intrusion in the freshwater coastal wetlands of the Top End's floodplains

As part of Tegan's PhD, she has completed both a microcosm and mesocosm experiment simulating the impacts of increased salinity on freshwater coastal wetlands. Freshwater habitat is at particular risk of being impacted by salt water in this region due to the flat topography of the coastal zone, the higher rate of sea level rise and high tidal ranges. The microcosm experiments looked at changes to the density and diversity of different biota including phytoplankton, benthic algae, and macrophytes, using sediment cores inundated with one of four treatments ranging from freshwater to sea water. The mesocosm experiments were a larger scale experiment which looked at phytoplankton, benthic algae, macrophytes, zooplankton, macroinvertebrates, and small fish. The mesocosms

examined changes to food web structure and the quality of food (using fatty acid analysis) under freshwater and a low and high salinity treatment.

Tegan has been working with Dr Keller Kopf (CDU), Dr Erica Garcia (CDU), Prof. Jenny Davis (CDU), Dr Lauren Meyer (Flinders University), Dave Wilson (Local aquatic expert), and Morris Pizzutto (Aquaculture lecturer) to develop and run the experiments which are now complete. She has also finished the fatty acid analysis after travelling to Adelaide to collaborate with the Southern Shark Ecology lab at Flinders University.

Tegan has almost finished drafting her first paper and hopes to submit it this month followed by two more papers early next year.

Developing a Riverine Carbon Flux Budget for Australia

Charles Darwin University – Francesco Ulloa-Cedamanos (Research Fellow) and Adam Rexroade (PhD Student)

Terrestrial landscapes are generally thought of as carbon sinks, yet the amount of carbon they sequester may be overestimated due to unaccounted losses through streams and rivers. Water draining the landscape carries with it different forms of carbon that can end up in the atmosphere as greenhouse gases or downstream in oceans as dissolved or particulate forms of carbon. A team of researchers at Charles Darwin University is attempting to quantify how much carbon, what forms of carbon, as well of the origins of carbon that are leaching from the land. So far, the team has sampled almost 100 rivers across the Northern Territory and northern Queensland in both the wet and dry season. Later this year they will travel to New South Wales and Tasmania to sample more streams. Using these data, observations from the Terrestrial Ecosystem Research Network (TERN), remote sensing, and machine learning, they will develop a continental-scale carbon budget for streams and rivers to rectify the current Australian carbon budget. Their work aims to fill data gaps in tropical carbon cycling as well as further our understanding of continental and global scale carbon cycling and its role in climate change.

Francesco Ulloa-Cedamanos preserving carbon samples at a stream in eastern Queensland (left) and Adam Rexroade measuring CO_2 /CH_4 gas evasion from a stream in Litchfield National Park in the NT (right).

Charles Darwin University, Research Institute for Environment & Livelihoods - Jenny Davis, Erica Garcia, Dylan Irvine & Roanne Ramsey

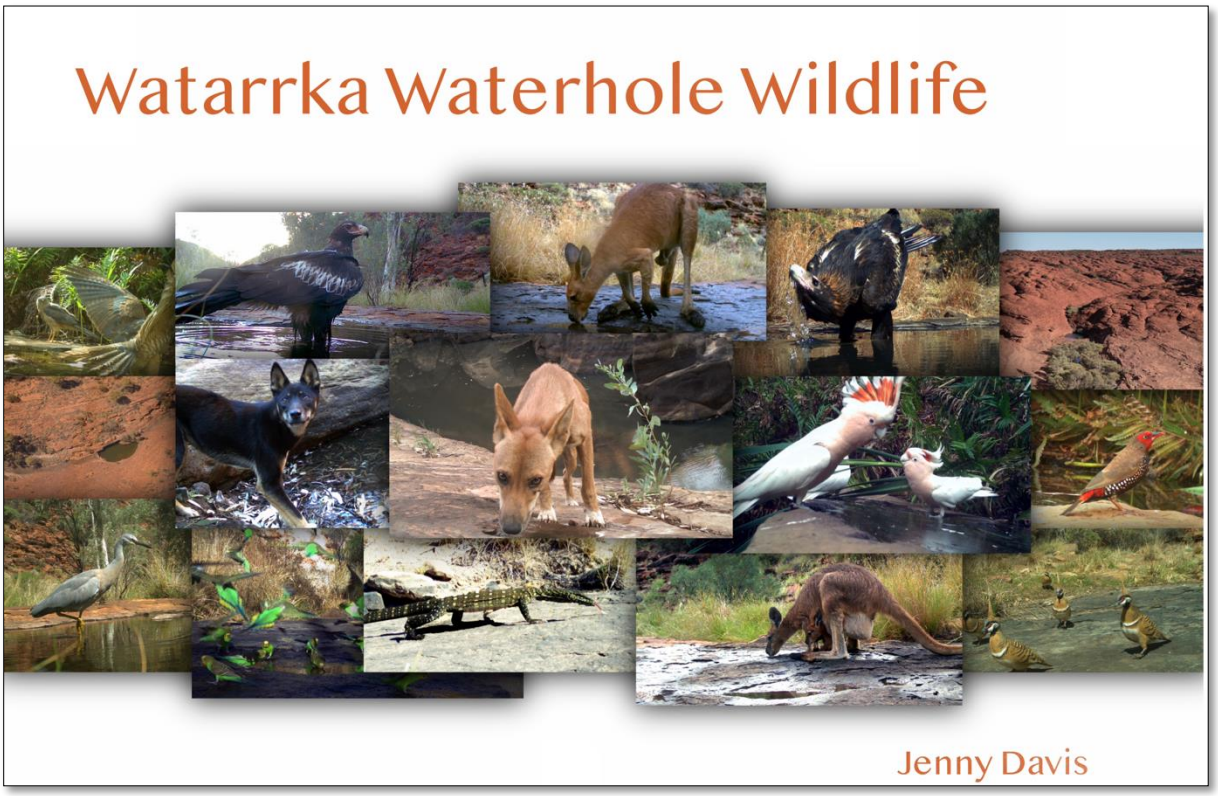
Citizen Science: Northern Australian Groundwater Security Project

Groundwater is an important resource across northern Australia and, with vast distances to contend with, not a lot is known about water quality within many local aquifers. This new research project, funded by The Ian Potter Foundation, The Northern Hub and Inspired NT, seeks to increase the understanding of the quality of groundwater resources available to local communities, and the environment, across northern Australia through community-based data collection. People power far exceeds the ability to install infrastructure to collect this much-needed water quality data. The first task of this project is to build a project app and website to enable community members to record groundwater data at their bores, and to follow the project results. These digital tools are being built in collaboration with members of CDU's Energy & Resources Institute. As soon as the app is ready, water sampling kits will be distributed for the collection of groundwater samples. These will be analysed at CDU for multiple variables, including isotopes for determining water sources (recent rain or ancient aquifers) and eDNA to detect groundwater biota. Understanding more about groundwater resources will both inform the sustainable development of northern Australia and help local communities keep an eye on their groundwater into the future.

The Citizen Science: Northern Australian Groundwater Security project team- from L to R.

Dr Dylan Irvine (hydrogeologist), Prof. Jenny Davis (freshwater ecologist), Dr Erica Garcia (freshwater ecologist) & Roanne Ramsey (research manager)

For anyone who has been following Jenny Davis's waterhole cameras tweets (@waterpenny 10) from Watarrka National Park, in central Australia, a summary of the project to date (nearing a decade of data collection) and a compilation of the best images is now available in paperback & kindle versions from Amazon.com.au.



Charles Darwin University – Julia Constance (PhD student)

Movement ecology and natural mortality of threatened river sharks.

The Speartooth Shark (*Glyphis glyphis*) and Northern River Shark (*Glyphis garricki*) are threatened species listed under the EPBC Act which occur patchily in some rivers, estuaries, and marine waters of northern Australia and Papua New Guinea. To understand how each of these species utilise their environments throughout their life cycles and how anthropogenic changes to habitat may affect each species, an extensive acoustic receiver array has been maintained in the Adelaide, South Alligator, West Alligator, and Wildman Rivers since 2013. Two-hundred sharks were tagged, with data for individual sharks spanning up to 10 years. Julia continues to maintain this receiver array, with new data downloaded in April and June this year, and range testing occurring in October. Data from the receiver array is being used to calculate natural mortality for each species and each life stage, as well as analysing seasonal movement ecology for each species in each river.

Julia Constance manoeuvres research vessel into position to retrieve acoustic receiver using grapple hook (due to the presence of Saltwater Crocodiles) (top), and (bottom) an acoustic receiver is retrieved before being cleaned, serviced, data downloaded, and redeployed.