



AUSTRALIAN FRESHWATER SCIENCES SOCIETY

Formerly Australian Society for Limnology, Est 1961

AFSS member update from Queensland August 2023

Compiled by Queensland Rep, Jonathan Marshall

Freshwater Downunder! – Alisha Steward

We can't talk about Queensland and AFSS without mentioning the success of the Freshwater Sciences conference at the Brisbane Convention and Exhibition Centre, 3rd – 7th June. Queenslanders on the Local Arrangements Committee included **Stuart Bunn**, **Fran Sheldon**, **Alisha Steward**, **Paul Bertsch**, **Luke Carpenter-Bundhoo**, **Natalie Jones**, and **Michelle Hobbs**. **Stuart** and **Alisha** were also on the Conference Organising Committee, and **Catherine Leigh** was a member of the Program Committee.

The conference was a joint event with the Australian Freshwater Sciences Society, the New Zealand Freshwater Sciences Society, and the Society for Freshwater Science. Local, interstate, and international delegates got mingling and dancing during the conference dinner at the Felons Barrel Hall, Howard Smith Wharves, and hung out at the Plough Inn at Southbank – the official conference watering hole. Pre-conference activities also included a tour of local craft breweries. Field trips included a Brisbane City Botanical Gardens walk, a Mount Coot-tha Botanical Gardens Walk, and a birdwatching walk at Oxley Common. A Fun Run also took place through West End and South Brisbane. The conference's major sponsors were Tourism Australia, Tourism & Events Queensland, and Brisbane Economic Development Agency, Brisbane City Council, showcasing Brisbane and Queensland to over 800 delegates from over 30 nations.



Freshwater Sciences delegates enjoying the conference dinner and live band at the Felons Barrel Hall, Brisbane.

Ecosystem Functioning of the Subtropical Peat Swamps of SE Queensland

Prof **Cathy Yule**, (cyule@usc.edu.au) and team of academics, undergraduates, PhD students and post-docs together with staff from the Queensland Department of Environment and Science started research on the peat swamps of K'gari in Jan 2023. We are investigating the aquatic fauna (invertebrates, frogs and fish using traditional methods and eDNA), flora, peat substrate/carbon sequestration (coring up to 3 m down into the peat), microbes, litter decomposition, and water quality of 8 peat swamps and comparing them with a nearby freshwater swamp and a developing peatland. We are investigating the impact of fire on the flora, fauna and carbon sequestration and we will be investigating nutrient cycling and food webs.

The acidic (pH 2.89 – 4.75), anaerobic, blackwater pools of the peat swamps support diverse aquatic invertebrates (> 40 taxa recorded so far) including a novel isopod, shrimps, yabbies, Cladocera, Odonata, bugs, beetles, caddisflies and chironomids, as well as threatened fish and frogs. Not surprisingly our leaf litter decomposition studies revealed extremely low rates of litter decomposition.

Whereas tropical and boreal peat fires are typically catastrophic, sometimes lasting years, destroying flora, fauna and peat layers, this did not occur in the intense 2020 fires on K'gari which burnt over 70,000 hectares. Recovery was well established within months after the fires. Peat cores exhibit charcoal layers sandwiched between the peat showing regular occurrence of fires and subsequent recovery. We welcome anyone interested in collaboration



Sampling Bogimbah Creek peat swamp
Showing strong recovery 2.5 years after severe fires of 2020



Dr **Darshanaa Chellaiah** (APEC fellow) Deploying litter
bags in Red Lagoon

Queensland Department of Environment and Science (DES)

Water Planning Ecology (WPE) Team – Jonathan Marshall

Environmental Assessments are under way for multiple Queensland Water Plans, putting considerable pressure on the assessment team including AFSS members **Laurisse Luke, Bill Senior, Norbert Menke** and **Niclas Lundsgaard**. The team are being greatly assisted in this by the new bespoke ecological modelling platform EcoRisk Projector, developed by the team with Queensland Government funding in close association with **Truui** (<https://truui.com>). This platform converts daily flow and other input time series into ecological time series using various means and then applied Threshold of Concern type logic to assess ecological risks under different hydrology scenarios. The new software streamlines and adds layers of quality control to the risk-based assessment process that has been used for informing Queensland water planning for nearly 20 years.

Other WPE staff, including AFSS members **Jonathan Marshall, Peter Negus, Kate Hodges, Alisha Steward, Jessica McCabe and Giselle Pickering**, have been busy on research projects to inform environmental assessments. **Pete** is just finalising threat and conditions assessments for rivers in the Gulf of Carpentaria using the Q-Catchments cause-effect risk framework used throughout the state. This places risks from flow alteration into context of the spectrum of anthropogenic risks to riverine ecosystems. He is also finalising a large literature review of climate change impacts to freshwater ecosystems. This has informed a project **Jon** and **Kate** are undertaking with others to model climate change effects on the function of waterholes as drought refuges in dryland rivers. The team have also been working on the next phase of our research project, funded by the Commonwealth Environmental Water Office, looking at resilience of fish populations in the Queensland Murray-Darling Basin to the regionally severe 2018-2020 drought. We have added an element of metapopulation genetics assessments to the suite of assemblage and otolith microchemistry-based analyses already undertaken and are excited to see how peak drought habitat availability interacts with movement to influence post drought population genetics of fishes. **Giselle** and **Jess** have also systematically collected mussel shells to act as spatial integrators of temporal strontium isotope variability. Data from the shells will be used to improve the regional isoscape and better spatially interpret fish movement patterns. In another climate change project, **Jon** and **Giselle** and others have been using eDNA to map the post-drought distribution of cold-stenotherm fish species in southern Queensland. The team, especially **Kate, Alisha** and **Jon**, are also developing and managing a fairly large number of new projects to support Basin Plan science in the Queensland Basin. One of these, continuation of the Hot Place Hypoxia project looking at oxygen and thermal regimes in refuge waterholes and fish ecophysiology in response to these, has recently been successfully funded as an ARC Linkage project. We are very pleased about that! This work will continue as a partnership between Queensland Government, Uni WA, Uni Qld, Griffith Uni and Murdoch Uni.

Aside from this day-to-day work, a number of WPE staff presented at the recent Freshwater Downunder mega-conference and it was greatly enjoyed by all.

Here are some recent publications we have contributed to:

O'Mara, K., Venarsky, M., **Marshall, J.** and Stewart-Koster, B., 2023. Diet-habitat ecology of invasive tilapia and native fish in a tropical river catchment following a tilapia invasion. *Biological Invasions*. <https://doi.org/10.21203/rs.3.rs-2290238/v1>

Tibby, J., **Marshall, J.C., Lobegeiger, J.S.**, Amos, K.J., **Pickering, G.** and Myburgh, T., 2023. Sedimentation from landscape clearance-induced soil erosion threatens waterhole persistence in a semi-arid river system, southern Queensland, Australia. *Marine and Freshwater Research*. <https://doi.org/10.1071/MF23016>

Zhai, S.Y., Huang, P., **Marshall, J.C., Lobegeiger, J.**, Cramp, R.L., Parisi, M.A., Franklin, C.E., Prior, A., Kurucz, K. and Hipsey, M.R., 2023. Modelling prolonged stratification and hypoxia in dryland river waterholes during drought conditions. *Inland Waters*, pp.1-61. <https://doi.org/10.1080/20442041.2023.2213629>

Mayne, B., Espinoza, T., Crook, D.A., Anderson, C., Korbie, D., **Marshall, J.C.**, Kennard, M.J., Harding, D.J., Butler, G.L., Roberts, B. and Whiley, J., 2023. Accurate, non-destructive, and high-throughput age estimation for golden perch (*Macquaria ambigua* spp.) using DNA methylation. *Scientific Reports*, 13(1), p.9547. <https://doi.org/10.1038/s41598-023-36773-2>



The DES WPE team are working with others to study fish population recovery from drought in the Qld Murray-Darling Basin. Some native species such as these golden perch are recovering, but alien carp (and goldfish) are also showing strong drought resilience.



WPE Scientist Giselle Pickering collecting an eDNA sample in the headwaters of the Condamine River to assay for the post-drought distributions of mountain galaxias and river blackfish in Queensland.

Wetland Condition Science Team – Cath Leigh

Catherine Leigh has migrated back home to Queensland and joined **Maria Vandergragt's** DES Wetland Condition Science Team in November last year. The team conduct annual assessments of and report on the condition of freshwater floodplain wetlands in the Great Barrier Reef catchments, from the Burnett Mary region up to Cape York in the far north.



Cath and the team are just back from a week's field trip up in Cape York, assessing 16 wetlands in and around Rinyirru and Muundhi National Parks, choppering in and out of the remote wetland sites. **Cath** and **Maria** also presented at the joint AFSS-NZFSS-SFS Freshwater Sciences conference held in Brisbane in June, on the wetland monitoring program analysis methods. The 2022 Report Card, which includes results of the wetland condition assessments, will be available later this year.



Photos of Cath sampling wetlands on Cape York and one of the residents

Australian Rivers Institute, Griffith University – David Hamilton and Mariah Millington

- 1. Research updates. Descriptions of progress or exciting developments in people's various research programs.**
 - We have recently developed a tool to aid in 'building catchment resilience'. The tool is for data driven investment decision making to help in catchment planning. See <https://www.catchmentresilience.org/>
 - **Stuart Bunn** and adjunct **Tim Jardine** recently contributed to a study published in Biology Letters which compared the diet of present-day crocodile populations in Kakadu and around Darwin with that of museum specimens collected in the same area ~50 years ago. The recovery of crocodile populations appears to be supported by terrestrial sources including feral pigs.
 - **Mohammadhassan Ranjbar** and **David Hamilton** recently showed how a decrease in wind and the higher temperatures accompanying climate change may cause larger algal blooms in the future. Published in Water Research, the study found that a 20% decrease in wind speed will increase blooms of the freshwater cyanobacterium *Microcystis*.
- 2. Student activity, progress, and successes. This could be anything from thesis commencement, confirmation, published papers, successful field campaigns, scholarships, awards, and thesis completions.**
 - 2022 Freshwater Sciences Conference Travel Grant, Best Poster Presentation and Runner Up Best Oral Presentation by HDR, **Mariah Millington** (see attached poster).
- 3. PhD completions**
 - **Peta Zivec**, *Natural regeneration of floodplain vegetation in semi-arid agricultural landscapes*. Supervisors: **Fran Sheldon** and **Sam Capon**

- **Naima Iram**, *Greenhouse gas emissions from wetlands versus other land use*. Supervisors: **Fernanda Adame Vivanco & Stuart Bunn**
- **Benny Rousso**, *Optimization of cyanobacteria bloom management through improved forecasting models and optical sensors*. Supervisors: **Edoardo Bertone & David Hamilton**
- **Mohammad Hassan Ranjbar**, *Individual-based modelling of cyanobacteria blooms*. Supervisors: Professor **David Hamilton**, Dr **Amir Etemad-Shahidi** & Dr **Fernanda Helfer**

AFSS member **Mariah Millington** has submitted her PhD thesis for examination at Griffith University, under Prof. **Fran Sheldon**, Prof. **Mark Kennard**, Dr. **Stephen Balcombe**, and Dr. **Bonnie Holmes**.

Thesis title: The Underbelly of the Ornamental Industry – Unregulated trade and invasive species raise concern for unique native freshwater ichthyofauna.

Several chapters are under review with various Journals looking at aspects of unregulated trade, management, and exploitation of ornamental fish, so keep an eye out for those!

Next career stage isn't official yet, but **Mariah** will remain in the ornamental fish biosecurity/policy area.

Mariah was the deserving recipient of the following awards at the recent Freshwater Sciences conference.

Presentation title: Disconnecting Supply– effectiveness of the Facebook wildlife trade bans

Winner of the Best Poster Presentation

Runner up for the Best Oral Presentation

4. International visits.

We are currently hosting:

Professor Mark Gessner. Department Head, Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), Stechlin, Germany

- **Professor José Francisco Gonçalves Júnior**. Universidade de Brasília, Brazil
- **Professor Dale Robertson**. U.S. Geological Survey, Upper Midwest Water Science Center, Wisconsin, USA
- **Professor Gretchen Rollwagen-Bollens**. Washington State University, Vancouver, Canada
- **Professor Stephen Bollens**. Washington State University, Vancouver, Canada
- **Dr Ana Matei**. Tropical Water Research Alliance (TWRA), Brazil

5. Career milestones and awards.

- HDR candidate, **Michelle Hobbs**: recognised by Cosmos Magazine during NAIDOC week (2-9 July) as one of 52 Aboriginal and Torres Strait Islander people who are “changing the world”.
<https://cosmosmagazine.com/people/culture/52-aboriginal-and-torres-strait-islander-people-changing-the-world/>
- Michelle Hobbs**: recipient of the 2023 Australian Academy of Science Aboriginal and Torres Strait Islander Scientist Award <https://news.griffith.edu.au/2023/02/09/emerging-indigenous-women-scientists-recognised-with-academy-award/>

6. Conference and workshop attendance Local to international.

- Freshwater Sciences Downunder**. Brisbane, Australia, 3-7 June 2023 – chair of the organizing committee: **Stuart Bunn**
- SEFS**. Newcastle, United Kingdom, 18-23 June 2023 – attendees from the Australian Rivers Institute included **David Hamilton** (plenary speaker), **Fran Sheldon**, **Rebekah Grieger** and **Luke Carpenter-Bundhoo**
- ARI Authors** (see below bold) have been involved in recent high-profile papers,
 - **D Hamilton (ARI co-author)**: Nava et al., [Plastic debris in lakes and reservoirs](#). Nature 619 (7969), 317-322
 - **S Bunn, S Hasan, B Stewart-Koster, C Ndehedehe (ARI co-authors)**: Rockstrom et al., [Safe and just Earth system boundaries](#), Nature 619: 102–111

University of Queensland Franklin Eco lab - Rebecca Cramp

Rebecca Cramp and colleagues are currently exploring the effects of aquatic hypoxia on the thermal and oxygen tolerances of juvenile silver perch as part of our collaborative Hot Place Hypoxia project with QLD government, Uni of WA, Griffith University and Murdoch University. We are examining the capacity for juvenile fish to adjust physiology, morphology and behaviour to offset some of the depressive effects of chronic low aquatic oxygen levels. These data will be used to develop a physiologically-informed habitat quality assessment tool that will aid waterhole management and water flow decisions in the Northern Murray Darling Basin.





Lab testing silver perch for the effect of hypoxia on metabolic rate and testing oxygen tolerance thresholds

A refugee from NSW - Lindsey Frost

After 6+ years of drought, fire, pestilence and flood **Lindsey Frost** is finally Dr Frost! **Lindsey** lives in Qld so is a Qld AFSS member, but all her study and work is out of UNE in NSW. She has completed a study on the influence of long and short term hydrology on trophic dynamics and energetics in the Gwydir wetlands where she found some interesting links between long-term hydrological regime and basal resource quality as well as between inundation length and the spatio-temporal distribution of energy in the aquatic invertebrate food web throughout an inundation cycle. Lindsey's research has opened the door for many future research questions and will keep her busy for some time yet.



Dr Frost in action during and after her PhD