ARI Aquatic Quarterly Update

Autumn 2023

Red Gums in a wetland receiving water (Photo: Damien Cook)

Monitoring vegetation in wetlands that are being restored

The Wetland Revival Trust (WRT) has started a new project to restore wetlands on private land along the lower Loddon River floodplain. This project will trial and monitor the impact of ecological restoration practices at a landscape scale, by re-instating more natural hydrology and restoring native vegetation cover and health. In turn this will increase soil carbon and soil moisture holding capacity as well as providing biodiversity refuges.

Inspecting sites to be monitored

A vegetation quadrat

ARI staff have been working with the WRT to develop and implement a vegetation monitoring program to provide robust evidence of the effectiveness of these restoration actions in Red Gum and Black Box vegetation communities.

The monitoring design assesses the abundance and diversity of plants in 'restoration' sites (which are being revegetated and receiving water for the environment) and well matched 'control' sites (where no active management is occurring). This will allow changes due to restoration actions to be distinguished from changes that might occur naturally. Monitoring has been completed before restoration works, and sites will be re-surveyed next year to compare changes in restoration and control sites.

It's a collaboration between the WRT, local farmers, local Traditional Owners, Deakin University, the Murray-Darling Wetland Working Group and the North Central Catchment Management Authority. This project received funding from the Australian Government's Future Drought Fund.

About us

The Applied Aquatic Ecology section aims to generate and share knowledge, through world-class, applied, ecological research. This supports and guides sustainable ecosystem policy and management to ensure healthy, resilient ecosystems. We work collaboratively with national, state and local agencies, research institutes, universities, interest groups and the community.

Arthur Rylah Institute for environmental research

VICTORIA State Government | Energy, Environment and Climate Action

World Recreational Fishing Conference

ARI staff participated in the World Recreational Fishing Conference at the Melbourne Convention and Exhibition Centre (20-22 February 2023). The conference theme was *Keeping Pace in a Dynamic and Challenging World with Changing Fisheries*. The three-day event brought together fisheries experts, researchers, policymakers, industry and anglers from around the world. Organised by the Victorian Fisheries Authority and an International Scientific Board, there was a diverse range of themes and workshops.

ARI staff:

- Presented:
  - 10 in TEN: Restocking and recovery of 10 threatened species in TEN years through Conservation (Dr Jarod Lyon)
  - What's the future of recreational fishing in the Murray-Darling Basin? (Dr Charles Todd)
- Participated in a Victorian Environmental Water Holder-led workshop: *Inspiring angler stewardship for healthy rivers: Why water for the environment benefits recreational fishing*.
- Hosted a display with an electrofishing boat, fish tagging and survey equipment, with cardboard cutouts and virtual reality experiences highlighting our survey methods.


Cardboard cutouts proved popular!


ARI staff welcomed actor Robson Green to our display

Welcoming our new staff!

Over the last six months, we've been busy recruiting new staff. They represent a great diversity of skills, knowledge and experience to support our entire Aquatic Ecology Section, as well as assist in many key projects – including VMFRP (Victorian Murray Floodplain Restoration Project), WetMAP (Wetland Monitoring and Assessment Program for environmental water) and the Flood Recovery project.

Fiona Sutton (Scientist): Fiona is a botanist who has worked extensively across south-eastern Australia and has a special interest in floodplain, coastal saltmarsh and grassy ecosystems.

Tim Fernando (Scientist): Tim has worked as a Parks Ranger in Alice Springs as well as previously at ARI on fish surveys and research.

Harriet Kulich (Scientist): Harriet has a background in bird and plant ecology and has recently worked on biosecurity matters in Agriculture Victoria.

Liam Hogan (Technical Officer): Liam has worked in restoration ecology including surveys, mapping, logistics and other field work.

Ruby Stoios (Scientist): Ruby has a background in quantitative ecology investigating rapid evolution and adaptive capacity of fish and shrimp populations.

Ben Iscaro (Technical Officer): Ben has experience in keeping and breeding small-bodied native fish for wild release.

Will Ingram (Technical Officer): Will has worked with the Victorian Fisheries Authority on fisheries education and enforcement, broodstock collection and fish breeding at Snobs Creek.


Fiona Sutton

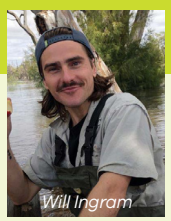

Tim Fernando


Harriet Kulich


Liam Hogan


Ruby Stoios


Ben Iscaro


Will Ingram

Influencing Change

Monitoring fishways and managing Carp

Since 2021, ARI has helped evaluate the ecological and hydraulic performance of two fishways which were constructed at Koondrook and Cohuna to reconnect 140 km of the Gunbower Creek with the Murray River. Improving fish passage is a core part of the North Central Catchment Management Authority's Native Fish Recovery Plan.

ARI has carried out fishway trapping, boat electrofishing, and water level and velocity assessments. Preliminary trapping results (at Koondrook fishway) in 2021 found that small-bodied and juvenile large-bodied native fish were moving through. The 2023 fish surveys at both fishways have however detected large accumulations of juvenile Carp and few native fish.

ARI's work has identified possible refinements to maximise fishway efficiency. These relate to modifying fishway attraction flows, addressing low light levels under the bridge, and reducing build-up of debris and aquatic vegetation.

The monitoring also led to the fishways being closed to help prevent the large accumulations of juvenile Carp from moving into the Gunbower Creek. Additional sampling at both fishways is recommended following the dissipation of the juvenile Carp, as any additional refinements to the fishway operation will be relevant to native fish. This work shows the value of ongoing monitoring to allow adaptive management.


Juvenile Carp in fishway


Juvenile Carp


Fishway at Cohuna Weir

A population model to guide fish reintroductions in Gunbower Forest

ARI is developing a population model to guide reintroductions of Southern Pygmy Perch into Gunbower Forest for the North Central Catchment Management Authority. Southern Pygmy Perch is one of a suite of small-bodied, off-channel specialist fish species historically recorded in the Gunbower-lower Loddon system but are now absent or occurring in low numbers.

Reintroduction programs aim to re-establish these species, but how do you know how many fish to reintroduce and where to reintroduce them? Population modelling is a tool to answer these questions before reintroducing any fish, by comparing predicted population responses under different reintroduction strategies. This approach can be used to identify the reintroduction strategy that maximises the likelihood of success.

This work extends an existing model for Southern Pygmy Perch (developed at ARI) by including a metapopulation structure (i.e., multiple populations connected by movement among waterbodies) within Gunbower Forest.

A recent workshop brought scientists and key stakeholders together to begin construction of the population model and included a field visit to potential reintroduction sites.

ARI has extensive experience in developing and applying fish populations models.


A field visit to a potential translocation site at Gunbower


A workshop to develop a population model for Southern Pygmy Perch

Outputs

- Hladyz et al. (2022) Basin-scale evaluation of 2020-21 Commonwealth environmental water: Fish Flow-MER Program. Commonwealth Environmental Water Office (CEWO): Monitoring, Evaluation and Research Program, Dept. of Agriculture, Water and the Environment.
- O'Connor et al. (2023) Understanding movement and habitat use to guide reintroductions and habitat rehabilitation for a nonmigratory freshwater fish. Restoration Ecology.
- Tonkin et al. (2023). Using multiple lines of evidence to assess recovery potential of a warm water fish population in a cold water impacted river. Frontiers in Conservation Science.
- Yen et al. (2022). Establishing new populations in water-secure locations may benefit species persistence more than interventions in water-stressed locations. Biological Conservation.
- Webb et al. (2022). Can hydraulic measures of river conditions improve our ability to predict ecological responses to changing flows? Flow velocity and spawning of an iconic native fish. Frontiers in Environmental Science.
- Reich et al. (2022). Aquatic invertebrate responses to riparian restoration and flow extremes in three degraded intermittent streams: An eight-year field experiment. Freshwater Biology.
- Dunn et al. (2023). Wetlands Insight Tool: Characterising the Surface Water and Vegetation Cover Dynamics of Individual Wetlands Using Multidecadal Landsat Satellite Data. Applied Wetland Science.


Lauren Johnson


Blackwater event caused fish deaths


Releasing Blackfish


Taking eDNA water sample

Knowledge transfer

Presentations and meetings: ARI seminar- 10 in TEN - threatened species recovery through Victoria's new conservation hatchery program (Lyon); Native Fish Forum, Dubbo – Efforts to recovery fish in Victoria (Tonkin); Living Moorabool Knowledge Forum - Vegetation monitoring to evaluate and inform environmental watering (Jones); Campaspe Environmental Watering Advisory Group - Vegetation and Fish monitoring outcomes and recommendations (Jones); How environmental DNA survey methods are informing management of waterways across Greater Melbourne: From long-term research to routine application (Raadik) (1st Australian and New Zealand eDNA Conference).

Work that ARI has been involved in has also been shared by our collaborators as well as via news channels: Native fish suffocating as parts of the MDB turn toxic from unprecedented floodwaters. (Lyon) (ABC News); flood impact on perch species and Carp populations (Lyon) (ABC Gippsland radio); Kneel before the eel. (Koster) (What the Duck?! ABC podcast); 'Underwater and overlooked': number of critically endangered fish species in Australia doubles (Raadik) (The Guardian); The upstream battle for a tiny Aussie fish with too many enemies (Raadik) (The Age); The EPBC Act listing of multiple galaxiids (Raadik) (ABC Gippsland radio); International Women's Day (Johnson) (DEECA YouTube); Bushfire and Platypus (Crowther) (Platypus News and Views – Australian Platypus Conservancy newsletter); Fish surveys in the Glenelg River as part of VEFMAP (GHCMA Facebook); Does cold water pollution affect native fish differently? (Finterest) (re Raymond et al. paper); Preserving our threatened galaxiids (Finterest) (re ARI's galaxiid work); Developing performance standards for fishways (Finterest) (re O'Connor et al. paper); Healthy native fish numbers in Ovens River (Wangaratta Chronicle).

Sign-up for any of ARI's Updates at www.tiny.cc/ARIsubscribe

ari.vic.gov.au | deeca.vic.gov.au

Compiled by Pam Clunie
Further info: research.ari@delwp.vic.gov.au

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