



Lauren Johnson and Jason Lieschke electrofishing on Cudgewa Creek (Photo: Andrew Briggs, NECMA)

A novel approach to tracking eel migration

Eels have significant cultural values to Traditional Owners and support commercial and recreational fisheries. Both Long-finned Eels and Short-finned Eels have amazing lifecycles, travelling thousands of kilometres. Adults spawn somewhere in the Coral Sea, and their eggs, and larvae, drift with the currents. They grow into glass eels and then elvers, which move into freshwater to become adults and then one day return to sea.

In 2018 ARI began a project, using innovative technology, to identify the eels' migration routes and spawning areas and describe the environmental conditions experienced during migration. Satellite tags were attached to adult migratory stage eels, to track them over large distances and to record environmental data such as temperature, depth and light.

Highlights included:

- Some eels were tracked for up to five months and travelled about 3000 km from their release site.
- Tags were detected as far north as 22° latitude, including to near a presumed spawning area in the South Pacific Ocean.
- The eels moved up and down in the water; mainly between depths of 700–900 m in the day and 100–300 m at night, probably to avoid predators and for thermoregulation.
- Many migrations ended soon after the eels' release, probably due to shark predation, which highlights their role as a food source.

This is a collaboration between DELWP, the Gunditjmara Traditional Owners, the Glenelg Hopkins Catchment Management Authority, Melbourne Water and a Danish eel expert. The findings can help assess and mitigate interactions between eels and human activities in the marine environment. See [ARI website](https://www.ari.vic.gov.au) for further details

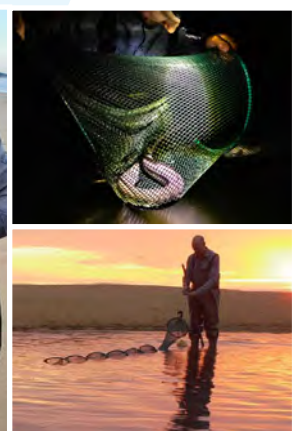
[ari.vic.gov.au](https://www.ari.vic.gov.au)

▶ About us

The Applied Aquatic Ecology section aims to generate and share knowledge, through world-class, applied, ecological research, which 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.

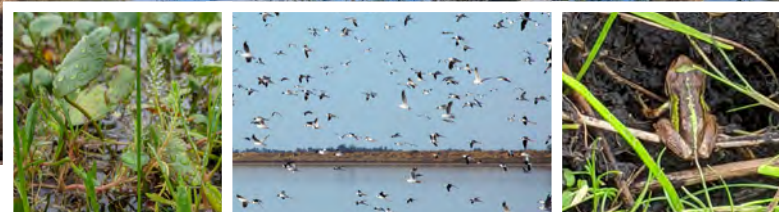


Wayne Koster with a tagged eel



Fyke net with an eel (top)
Setting a fyke net (bottom)

News



WetMAP – supporting wetland watering to benefit biodiversity

WetMAP (Wetland Monitoring and Assessment Program for environmental water) is a statewide, long-term monitoring program measuring the response of wetland vegetation, frogs, fish and waterbirds to natural water regimes that are supplemented by environmental water. Stage 3 (2017-2020) of the program aimed to help to: use environmental water more effectively; prioritise watering locations in Victoria; identify the types of water regimes needed to support wetland biodiversity; and assist with reporting for the Murray-Darling Basin Plan.

Overall, positive responses of native biota to environmental water were detected, including:

- Increased native wetland plant cover and richness and reduced terrestrial plant cover.
- Greater leaf tip growth in both River Red Gum and Black Box that had been inundated by environmental water, compared with those that had not been inundated for >9 months.
- Increased frog species abundance and richness, with analyses showing habitat variables, especially tall emergent vegetation, can significantly affect frog occurrence and abundance.
- Increased abundance and richness of wetland bird species, with analyses showing the responses of waterbirds were influenced by season, availability of habitats, hydrological regime and surface water availability in other parts of Australia. Breeding was only observed at watered sites.
- Boosted seasonal fish numbers compared to wetlands not receiving environmental water.
- Movement of fish between wetlands and rivers due to increased connectivity.
- Survival of the critically endangered Murray Hardyhead supported by providing appropriate salinity levels for successful breeding.

Stage 3 represented a starting point, since the responses of many biota to environmental water and water regimes are complex and influenced by longer time periods, and multiple watering events. Planning for Stage 4 has commenced.

Fish Passage Community of Practice group kicks off

A new group has been set up to foster a collaborative approach across Victoria to promote best-practice approaches and use current knowledge in the design, construction, and operation of Victorian fish passage projects. This is a valuable step in ensuring that those involved in fish passage efforts share their experiences and skills as well as learn from each other to maximise the benefits to fish communities.

The group includes staff from catchment management authorities, Melbourne Water and the Victorian Environmental Water Holder, DELWP Waterways program and ARI (Chair). Other independent experts and representatives from other agencies, including other states and federally, may be invited to participate as required.



Matt Jones on site during the construction of the Maribyrnong rock ramp fishway



The new Reedy Lake outlet fishway

Influencing Change

Understanding how wetland plants respond to grazing

Grazing is sometimes used to manage introduced plants, prevent dominance of competitive species, and reduce plant litter levels to help native plants to establish. The Wetland Intervention Monitoring Program ([WIMP](#)) aims to:

- provide strong scientific evidence of the responses of wetland vegetation to different grazing management practices
- better understand the site and landscape factors which influence responses and the timeframes over which changes occur.
- promote awareness and involvement of land managers and landholders to identify, understand and adopt appropriate grazing practices.

WIMP sites are temporary freshwater wetlands that represent a range of current grazing practices. Grazing practices differ in the type of livestock, stocking density and the duration and timing of grazing.

At each site a pair of fenced (i.e. ungrazed) and open (i.e. grazed) plots have been established and vegetation is surveyed before fencing and every year for 3-5 years after fencing.

One year after fencing, we found that while sites differed in their responses:

- Grazing reduced plant biomass (plant height and litter depth and increased bare ground cover).
- Grasses were grazed more than herbs, and herbs were grazed more than sedges and rushes.
- Diversity did not differ between grazed and ungrazed sites at this early stage.

Two years after fencing, surveys have been completed for most sites and suggest that differences in responses to grazing exclusion among sites are becoming more evident. At some sites, differences in vegetation between grazed and fenced plots appear minor. At other sites, livestock exclusion has allowed some species to become more abundant and to flower and set seed. In some cases, competitive grasses have become more dominant, which has the potential to reduce diversity.



Estimates of Carp numbers provide a valuable tool for managers

ARI led a five-state collaborative project with La Trobe University to determine how many Carp are in eastern Australia. Carp are now the most abundant large freshwater fish in south east Australia, causing substantial social, environmental, and economic impacts.

The study was undertaken across a range of habitat types including rivers, lakes, billabongs, and estuaries, and allowed for fluctuating Carp numbers through time. Using cutting edge modelling, we estimated across Australia:

- 199.2 million Carp in an 'average' year
- 357.5 million Carp in a 'wet' year
- 96% of Carp biomass on the east coast where they occupy over 54% of wetlands and 97% of large rivers.

The project brought together Australian researchers, managers and commercial fishers to consolidate a national database of 574,145

Carp caught over the last 20 years. Our findings will help managers prioritise national and local Carp control strategies, set appropriate objectives and track river recovery. Modelling efforts continue, which will help to build our ability to predict Carp biomass over different hydrological scenarios. This work was part of the National Carp Control Plan (NCCP).

See [ARI website](#) for further information, including recent media interest.



Outputs

- [Stuart et al.](#) (2021) Continental threat: how many common carp (*Cyprinus carpio*) are there in Australia? *Biological Conservation* 254.
- [Amtstaetter et al.](#) (2021) Environmental flows stimulate the upstream movement of juvenile diadromous fishes. *Marine and Freshwater Research*.
- [Amtstaetter et al.](#) (2021) Elevated river discharge enhances the immigration of juvenile diadromous fishes into temperate coastal rivers. *Journal of Fish Biology*.
- [Pereira, Greet and Jones](#) (2021) Native riparian species dominate the soil seedbank of in-channel geomorphic features of a regulated river. *Environmental Management* 67.
- Videos: [Murray Crayfish surveys](#); [ARI The new generation electrofishing team IFish](#).

PLEASE NOTE that this Update incorporates activities during the COVID-19 pandemic. Any fieldwork and presentations undertaken by ARI during this time have aligned with government protocols.



Juvenile galaxiids moving upstream



VEFMAP Soil seedbank experiments



Pea Mussel (*Corbicula australis*)
(Photo-Tarmo A Raadik)



Trout Cod in the King River

Knowledge transfer

Presentations and meetings; Victorian Biodiversity Conference: Using environmental water to support the critically endangered Murray Hardyhead (Gabriel Cornell); VEFMAP Stage 6 final presentations; [fish](#), [vegetation](#) and project overview (Zeb Tonkin, Chris Jones, Pam Clunie); Northern Basin Toolkit workshop, NSW Constraints Project – Murray Cod and Golden Perch workshops (multiple staff); Campaspe Environmental Water Advisory Group meeting - VEFMAP results (Zeb Tonkin, Chris Jones); Loddon Environmental Water Advisory Group meeting - VEFMAP results (Justin O'Connor); Flow MER fish meeting (multiple staff).

The plight of our native eels as well as our research has garnered much recent interest, including [The Eels of Dandenong Creek](#) video; [One eel of a story](#): the slippery truth of a fishy underground migration (The Age); [Eel be back](#) (Gippslandia); 3MGB Far East Gippsland Radio; ABC Gippsland interview.

Work that ARI has been involved in has also been shared by many of our collaborators:

[Macquarie Perch spawning aggregations](#) (VFA); [Sevens Creek fish surveys](#) and [Goulburn River Flow-MER surveys](#) (GBCMA); [Grayling in the Glenelg](#) and [Pea Mussels](#) and [Seasonal Herbaceous Wetlands virtual field day](#) video (GHCMA); [Macquarie Perch broodstock collection](#) and [Cudgewa fish surveys yields signs of fire recovery](#) and [King River fish surveys yield encouraging fish finds](#) (NECMA); Southern Purple Spotted Gudgeon – [Zombie fish back from the dead](#) (NCCMA); [Tupong in the Thomson River](#) (WGCMA); [Travel plans for Wimmera River fish](#); [Lake Burrumbeet research continues](#)

DELWP media releases: Celebrating UN's International Day of Women and Girls in Science – [Why Lyndsey loves her scientific career](#); [Surveys to determine fire impacts on critically endangered fish](#)

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