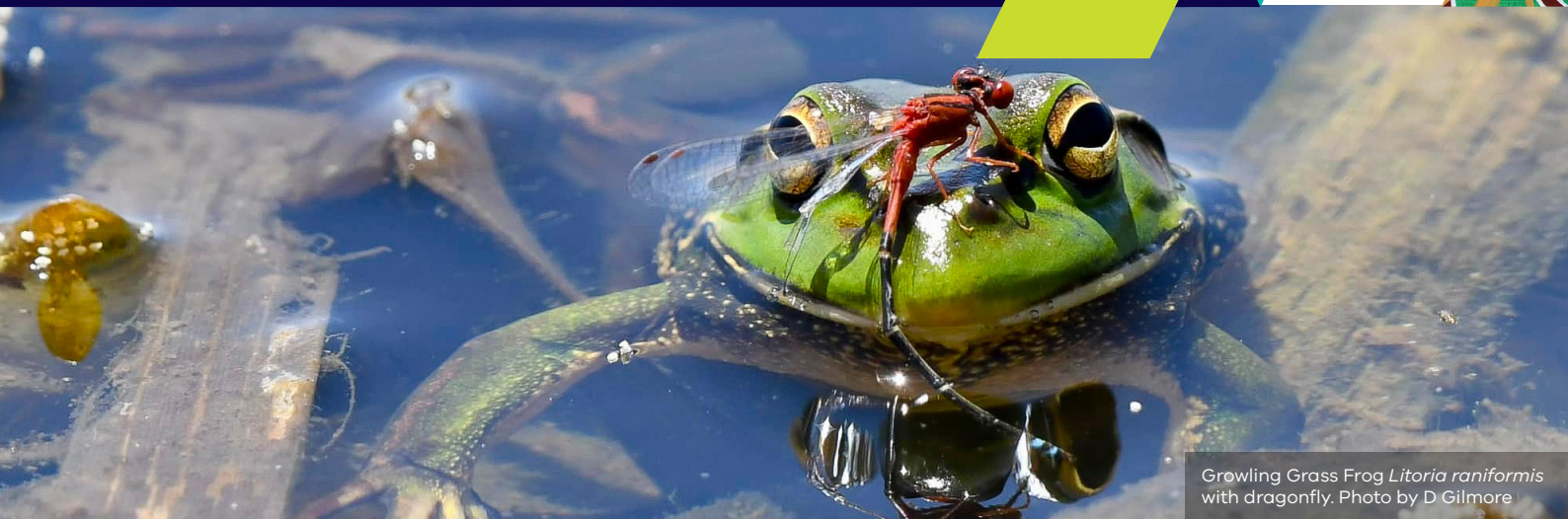


ARI Terrestrial Quarterly Update

OCTOBER 2024



Growing Grass Frog *Litoria raniformis* with dragonfly. Photo by D Gilmore

About us

The Arthur Rylah Institute's terrestrial ecology teams produce high-quality science to support evidence-based decision-making by governments and communities.

Our 50 scientists have extensive expertise in fauna and flora research, ecological modelling and data interpretation. We work collaboratively with national, state and local agencies, universities and the community.

Saving our iconic Hairpin Banksia

The 2019-2020 bushfires burnt almost all Hairpin Banksia (*Banksia cunninghamii*) populations in East Gippsland. The species is killed by fire, takes about a decade to produce seed and has no seed bank in the soil, making it vulnerable to decline when burnt at short intervals.

The Arthur Rylah Institute studied the impacts of the 2019-2020 bushfires on Hairpin Banksia regeneration. This built on previous collaborations with DEECA's Port Phillip and Gippsland Regions to measure Hairpin Banksia seed production and seedling recruitment in response to fire.

The [results](#) showed there was a low chance of Hairpin Banksia seedling regeneration where severe fires destroyed banksia seed cones, or the previous fire was less than twelve years prior. Banksia plants that germinated after the 2019-2020 fires are not expected to reach reproductive maturity for at least a decade, making them vulnerable to recruitment failure and local extinctions if fire returns before 2030.

Based on these findings, guidelines for Hairpin Banksia have been produced in collaboration with burn planners. This includes assessing the persistence of populations; monitoring seed availability before burning; maintaining fire intervals sufficient for seed production and burning when weather is suitable for recruitment.

[ARI Seminar: Saving our iconic Banksias - Annette Muir \(ARI\) & Laura Simmons \(Royal Botanic Gardens Victoria\)](#)



Hairpin Banksia *Banksia cunninghamii*. Photo by Annette Muir

Hog deer abundance and population genetics in Victoria

Hog deer were introduced into Victoria in the 1860s and are now confined to the coastal areas of south and east Gippsland. They are a highly valued game species but there is concern within the hunting community that the population may be in decline. Conversely, the species can have a significant impact on the Australian environment, and is being controlled in Wilson's Promontory National Park as part of a program to eradicate all deer to protect biodiversity values.

ARI staff carried out a study to estimate Hog deer abundance and distribution in Victoria and to understand population structure and connectivity between local populations. Camera traps were deployed to determine presence and estimate abundances. Genetic samples, taken from Hog deer shot during hunting season and local control operations, were used to estimate population structure, dispersal and genetic diversity. The work built on a 2019 study.

No Hog deer were recorded on cameras east of Lakes Entrance. The majority of the population was

recorded on the Gippsland Plains with a density of 1.6 deer/km², and in Wilsons Promontory, which had the highest density at 4.1 deer/km². Three main subpopulations of Victorian Hog deer were identified. All exhibited low genetic diversity and limited dispersal of young deer, likely due to barriers created by agricultural and urban development. Populations on two neighbouring islands in south Gippsland differed in genetic variability; the Sunday Island population had low diversity, suggesting little migration between it and the mainland, while high genetic diversity was recorded on Snake Island, suggesting that migration events are more frequent.

The study highlighted the need for ongoing periodic monitoring of Hog deer across the region to determine population trends and manage Hog deer into the future.

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Hog deer *Axis porcinus* at camera trap

Threatened mammals of the Murray River floodplain

Areas in north-west Victoria that were inundated during the 2022 floods were known to have supported populations of Giles' Planigale (*Planigale gilesi*) and Fat-tailed Dunnart (*Sminthopsis crassicaudata*), some of the smallest marsupials in Victoria. They are tiny ground dwellers that forage for insects and small vertebrates on the floodplain and shelter in cracking clay soils or underneath woody debris. Pre-flood land-use practices had likely degraded suitable habitat, fragmenting populations and reducing their ability to recover from flooding or other extreme events by reducing available refugia habitat.



Giles' Planigale. Photos by Lindy Lumsden

ARI researchers, supported by the Victorian Government's flood recovery program, aimed to establish whether the two species remained on the Murray River floodplain one-year post-flooding. **The study** used both live traps and camera traps deployed in Kulnine East and Lindsay Island, and researchers also conducted manual searches on foot using a thermal camera, to survey for species present in the area. While House Mice represented the vast majority of both live and camera-trapped animals, camera traps did detect one Giles' Planigale and one Fat-tailed Dunnart on Lindsay Island. This is the first record of Giles' Planigale in Victoria for 11 years.

The low detection rates suggest these two species are in low abundance. It is unknown how they survived the flooding event. Further investigation is needed to determine if their means of survival included strategies such as taking refuge in tree hollows, or on areas that remained as dry islands. Their persistence indicates possible immigration back into the flooded area to recolonise the floodplain and it is hoped that these individuals will become founders for a new population in the area.

ARI's Team at the Ecoacoustics Symposium 2024

Sound recorders have become an important survey tool for field ecologists to detect the calls, and therefore the presence, of wildlife including birds, bats, frogs, koalas and other mammals. They provide considerable cost efficiencies including the ability to sample many locations simultaneously over long time periods, which vastly increases our ability to find particularly rare species.

The Ecoacoustics Symposium 2024 was held in February at the Melbourne Museum. A team of ARI scientists presented on their projects and spoke about the benefits of the cutting edge Ecoacoustic approach being used.

Open-sourced software for the rapid validation of acoustic data

Lachlan Francis introduced [custom software developed by the ARI team](#), that identifies the calls of target species within the very large amounts of data recorded on field-deployed sound recorders. Artificial intelligence (AI) is well suited to this task, however training the AI to identify the calls requires a "library" of validated calls representing the range of a species calls with different background noises. This validation was previously a laborious, manual process. The software achieves the task extremely rapidly, is highly flexible for users to customise to suit their own needs and is freely available at zenodo.org/records/10681701

Neural networks design: two-dimensional Vs one-dimensional

Peter Griffioen discussed [two types of machine and deep learning AI techniques](#) to rapidly identify animal calls on audio: two-dimensional models, typically used for image recognition, and one-dimensional models which are often used to classify and identify music. The presentation explored advantages and disadvantages of the models, and whether it is useful to use both and possibly at the same time.

Acoustic monitoring of floodplain frog communities to inform water management

Louise Durkin introduced an [AI modelling framework for automating frog species recognition of calls in large acoustic datasets](#). An AI model was trained using frog calls, choruses and non-frog noises to distinguish target species within an audio file. A secondary tool was also developed to validate the performance of that call recognition model. The tools have successfully confirmed the presence of threatened species such as the Growling Grass Frog in remote north-west Victoria and identified a range extension of the Endangered Sloane's Froglet.

Detecting cryptic waterbirds through novel audio analysis techniques

Traditional survey methods such as in-person waterbird counts can under-record cryptic species including the threatened Australasian Bittern and Lewin's Rail. Harriet Kulich introduced an [AI model designed to detect Australasian Bittern calls](#) in audio recordings. Harriet demonstrated the model's promise as an efficient tool for understanding cryptic threatened species' responses to environmental water management, which is also complementary with surveys for other cryptic vocal taxa such as frogs.

Songmeter deployed to record animal calls

Influencing Change

Feature publications

Good, M.K., ... **Jones, C.S., Moore, J.L., Sinclair, S., White, M.**, ... (and 25 other authors). (2024). A structured approach for building multi-community State and Transition Models to support conservation planning. *Journal of Applied Ecology*, 61, 2294-2307. <https://doi.org/10.1111/1365-2664.14718>

MacDougall, A.S., ... **Chen, Q., Moore, J.L.**, ... (and 84 other authors). (2024) Widening global variability in grassland biomass since the 1980s. *Nature Ecology & Evolution*. <https://doi.org/10.1038/s41559-024-02500-x>

Menkhorst, P., Schulz, M., & Stamation, K. (2024). Impacts of bushfire on the Glossy Black-Cockatoo *Calyptorhynchus lathami* and its single food source in eastern Victoria. *Australian Field Ornithology* 41, 48–55. <http://dx.doi.org/10.20938/afo41048055>

Stamation, K. Rogers, D., and Muir, A. (2024). Victorian Duck Season Priority Waterbird Count, 2024. Arthur Rylah Institute for Environmental Research Published Report for the Wildlife Policy Section, Published Client Report. [gma.vic.gov.au website](http://gma.vic.gov.au/website)

Van Eeden, L., Renowden, C., Hames, F., Bartlett, S., Pearson, E., Dunlop, M., Hatfield, M., Hugman, S., Moon, K., Pérez-Hämmerle, K.V., Lee, K. (2023). The transformative potential of future visioning and reciprocity for nature conservation policy and practice. *Social Innovations Journal* 22. <https://socialinnovationsjournal.com/index.php/sij/article/view/7002/5787>

West, M., Hunter, D., **Scroggie, M.P.**, Johnson, G., Smith, S., McCarthy, M.A. and Gillespie, G.R. (2024) Harnessing historic records and long-term monitoring data to evaluate amphibian extinction dynamics. *Biological Conservation* 292, 110477. <https://doi.org/10.1016/j.biocon.2024.110477>

Knowledge transfer ARI seminars (subscribe [here](#) on the ARI website):

Bail, N., **Lumsden, L.**, Reardon, T., Clissold, P. and Prowse, T. Partitioning of emergence and return times within Southern Bent-wing Bat colonies. Presentation at the 21st Australasian Bat Society Conference, Adelaide. 19 April 2024.

Farmilo, B. Spatial model for native grasslands of the Victorian Volcanic Plains. Presentation at the Victorian Volcanic Plains Conservation Management Network. Ballarat. 26 August 2023.

Farmilo, B. Wiyin Murrup (Cultural burning): Exploring ecological impacts of Wiyin Murrup (Cultural burning) and collaborative partnerships with Wadawurrung Traditional Owners Aboriginal Corporation. Presentation at Victorian Biodiversity Conference, Melbourne, 8 February 2024

Farmilo, B. The future of the Wombat Forest: The aspirations of co-managers. [ARI Fact Sheet](#). 20 August 2024

Gechke, A., McLaren, T., O'Brien T., Geschke A., Machunter J., Cripps, J., Lyon, J. [ARI Virtual Tour](#). ARI, Heidelberg, 12 August 2024.

Khwaja, N., Rogers, D. Protecting birds in a changing environment. [ARI seminar](#), Heidelberg. 15 July 2024.

Lentini, PE, Cripps, J, Bush, A, Lumsden, L. Flood recovery: tracking the South-eastern Long-eared Bat in Gunbower. [ARI Fact Sheet](#). 15 July 2024

Lentini, PE, Stojanovic, D, Durkin, L. Flood recovery: availability of suitable tree hollows for Regent and Superb Parrots. [ARI Fact Sheet](#). 15 July 2024

Lumsden, L., Bail, N., Bush, A., Coetsee, A., Holz, P., Hufschmid, J. and Mitchell, T. Mass mortality events of Southern and Eastern Bent-wing Bats pups at maternity sites in Victoria. Presentation at the 21st Australasian Bat Society Conference, Adelaide. 19 April 2024.

McLaren, T., Todd, J., Nelson, J., White, M. Presentation for Lunchbox Science - Forestry Code review panel - science meets policy. Virtual. 13 August 2024.

Moxham, C., Dabal, R., Farmilo, B., Muir, A. and Kenny, S. Threatened flora flood recovery: Spiny Lignum population assessments. [ARI Fact Sheet](#). 5 August 2024

Moxham, C., Dabal, R., Farmilo, B., Muir, A. and Kenny, S. Threatened flora flood recovery: Stiff Groundsel population assessments. [ARI Fact Sheet](#). 5 August 2024

Villada-Cadavid, T., **Lumsden, L.**, Welbergen, J.A., Wu, N.C., and Turbill, C. Winter torpor patterns of the Eastern Bent-winged Bat in warm and cold climates. Presentation at the 21st Australasian Bat Society Conference, Adelaide. 19 April 2024.

Wu, N.C., Brannelly, L., Hufschmid, J., Langguth, A., **Lumsden, L.**, Villada-Cadavid, T., Welbergen, J.A., Willis, C.K.R. and Turbill, C. Winter hibernation biology of eastern bent-winged bats: an update on research to better understand vulnerability to WNS. Presentation at the 21st Australasian Bat Society Conference, Adelaide. 19 April 2024.

We acknowledge Victorian Traditional Owners and their Elders past and present as the original custodians of Victoria's land and waters and commit to genuinely partnering with them and Victoria's Aboriginal community to progress their aspirations.



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