Ecoacoustics Symposium 2024

February 20-22

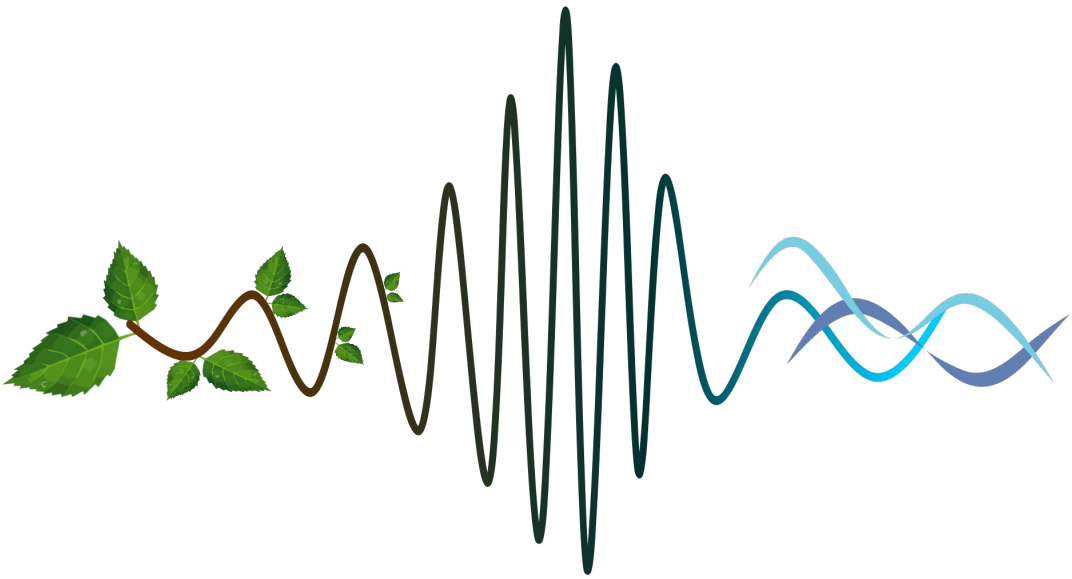
Melbourne Museum

Ecoacoustics Symposium 2024

is hosted by

MELBOURNE MUSEUM

and endorsed by
The International Society of Ecoacoustics



Front cover: *Litoria ewingii*, Brown Tree Frog. Lake Condah, Budj Bim Cultural Heritage Landscape, Victoria. Photographer: David Paul. Source: Museums Victoria.

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Ecoacoustics Symposium 2024

Wominjeka and Welcome to Naarm (Melbourne)!

On behalf of the Organising Committee, we'd like to welcome you to the Ecoacoustics Symposium 2024, hosted by Museums Victoria at the Melbourne Museum. Museums Victoria is situated within Naarm (Melbourne), on the traditional lands of the Woi Wurrung (Wurundjeri) and Boon Wurrung peoples of the eastern Kulin Nations. We pay our respects to elders past, present and emerging, and acknowledge their enduring connection to country.

This is the first year the Ecoacoustics Symposium has been hosted outside of Queensland and we hope you enjoy your time with us in Melbourne. We look forward to an exciting line-up of talks and posters, including the latest developments in acoustic detection and recognition, applications of ecoacoustics to stop the spread of invasive species, and how community groups are using newly acquired skills in soundscape recording to document wildlife in their local region. We'll also have the opportunity to participate in workshops on the latest in recording equipment and acoustic analyses. We'll also hear from traditional owners how ecoacoustics helps them to connect to nature, language and people.

We hope that by bringing together a diverse group of researchers, practitioners, managers and citizen scientists, we can share our collective knowledge and advance the field of ecoacoustics within Australia and abroad. Thank you for contributing to this year's event!

With Regards,
The Organising Committee
Karen Rowe, Bradley Clarke-Wood, Jo Geddes, Lachlan Francis, Simon Casanelia and Matt West

Ecoacoustics Symposium 2024

Rationale & Goal
Ecoacoustics is rapidly becoming a powerful tool for documenting and understanding Australia's unique faunal diversity. Research interest in the field continues to develop rapidly, leading to new approaches and applications. Building on the success of our previous symposia hosted at Queensland University of Technology the Ecoacoustic Symposium 2024 will bring together researchers, practitioners, and managers in a new venue at the Melbourne Museum.

This year's conference will focus on the three key themes including:

1.Next Generation Ecoacoustics: Emerging Methods of Data Collection and Analysis
2.Sound Actions: Translating Ecoacoustic Data into On-ground Management and Decision-making
3.Listening to Country: Incorporating Community and Citizen Scientists into Ecoacoustic Projects

Location
Melbourne Museum, 11 Nicholson St, Carlton, Victoria 3053

Melbourne Museum is located on Wurundjeri Country and Museums Victoria acknowledges the Woi Wurrung (Wurundjeri) and Boon Wurrung peoples of the eastern Kulin Nations where we work.

Information about museum accessibility can be found here.

All activities will take place in the Melbourne Museum Theatre, located on the Lower Level.

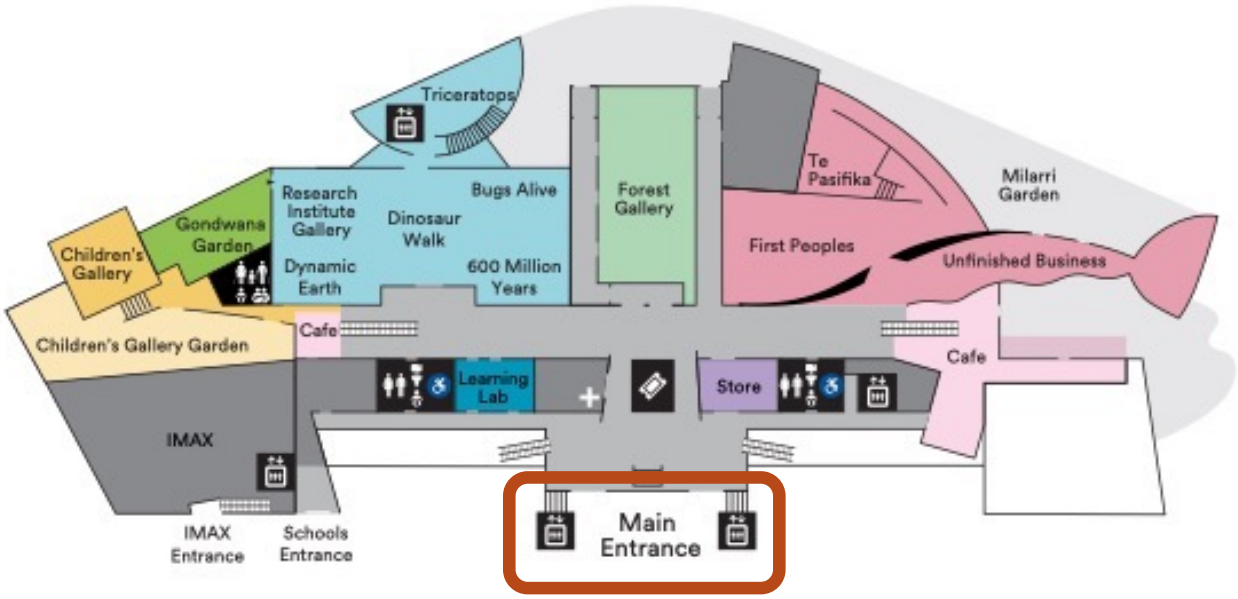
A digital map of the venue can be found here, and on the following pages.

Enquiries
For any enquiries, please contact: ecoacoustics2024@gmail.com

Ecoacoustics Symposium 2024

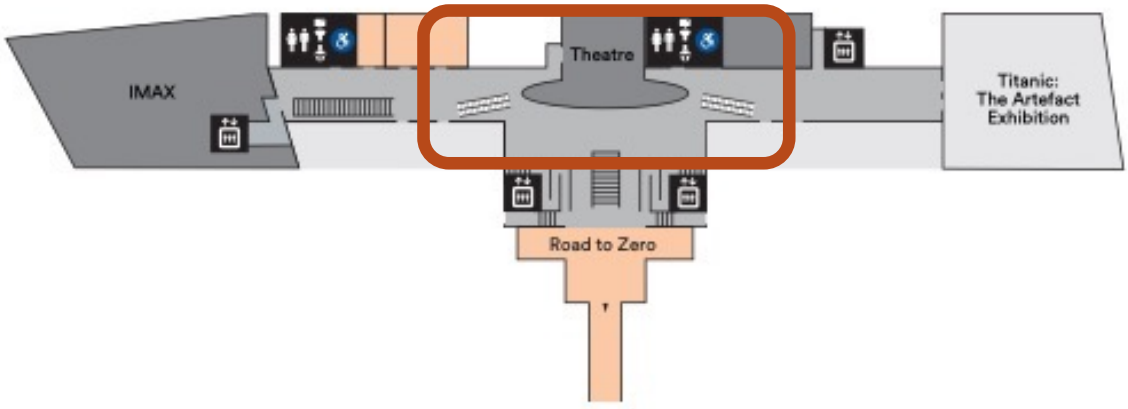
Venue Maps

Melbourne Museum Visitor Map — Ground Level



Enter via the Main Entrance on the Ground Level.
An escalator just to the left of the entrance will take you to the Lower Level and MM Theatre.

Melbourne Museum Visitor Map — Lower Level



All activities will take place in the Theatre and foyer adjacent to the Theatre.

Wifi Access
Melbourne Museum offers **eduroam** wifi access throughout the building. Please consult with your institution's instructions on connecting to and accessing eduroam while away from your home institution.

If you don't have access to eduroam, free wifi is available in the building via the **Museum Visitor** network. Once you've connected to the network, you'll need to click the "I accept" button, and you'll be connected.

Ecoacoustics Symposium 2024

Workshops

Wednesday, 21 February

Faunatech: Next Generation Song Meters
Join the team at Faunatech to learn about the latest release of Wildlife Acoustic Song Meters.

Thursday, 22 February

Lunchtime

Frontier Labs: The Hitchhiker's Guide to Sound Localisation
In this workshop we will demonstrate how to run an acoustic localisation experiment and process the results.
We will cover:

- Recorder setup,
- Array configuration (recorder separation and positions),
- Testing,
- Processing and mapping the results.

We encourage you to bring your own laptop, as software and example data will be provided, however it is not necessary, and everyone is welcome to participate.

Afternoon Session

A2O Unleashed
The Australian Acoustic Observatory has collected 300 years of audio recordings across Australia. What's in this data? How do I get access? What analysis methods work? Come participate in our half-day workshop to learn the answers to these questions, see demonstrations of tools and techniques, and to get guidance from researchers actively working with A2O data.

Program
•A2O Overview
•Lighting talks - *how* are people are using the A2O data
•How to do whatever you want with Ecosounds/A2O
•Practical advice: debugging or analysis strategies (Q/A small group discussions). Bring your code, bring your problems, tell us about your goals. We'll help you work out how to do what you want to do.
•An introduction to the A2O search tool: how to search for any unlabelled data across the A2O

Ecoacoustics Symposium 2024

Program at a Glance

Tuesday, 20 February 2024			
Start	***End***	***Event***	***Location***
15:30	17:30	Registration	MM Foyer
16:00	17:30	Welcome Reception	MM Foyer
18:00	19:00	Public Lecture	MM Theatre

Ecoacoustics Symposium 2024

Program at a Glance

Wednesday, 21 February 2024			
8:00	9:00	Registration	MM Foyer
9:00	9:30	Welcome to Country, Introductions	MM Theatre
9:35	10:45	Session 1 Part 1 – Next Generation Ecoacoustics: Emerging Methods of Data Collection and Analysis	MM Theatre
10:45	11:15	Morning Tea	MM Foyer
11:15	12:25	Session 1 Part 2 – Next Generation Ecoacoustics: Emerging Methods of Data Collection and Analysis	MM Theatre
12:25	12:50	Session 1 Discussion	MM Theatre
12:30	14:00	Lunch	MM Foyer
13:00	14:00	Workshop – *Faunatech: Next Generation Song Meters*	Meet outside the MM Theatre
14:00	15:30	Session 2 Part 1 – Sound Actions: Translating Ecoacoustics Data into On-ground Management and Decision Making	MM Theatre
15:30	16:00	Afternoon Tea	MM Foyer
16:00	17:00	Session 2 Part 2 – Sound Actions: Translating Ecoacoustics Data into On-ground Management and Decision Making	MM Theatre
17:00	17:30	Session 2 Discussion	MM Theatre
18:30	20:30	Poster Session	MM Foyer

Ecoacoustics Symposium 2024

Program at a Glance

Thursday, 22 February 2024			
9:00	9:15	Acknowledgement of Country, Housekeeping	MM Theatre
9:15	10:45	Session 3 Part 1 – Listening to Country: Incorporating Community and Citizen Scientists into Ecoacoustic Projects	MM Theatre
10:45	11:15	Morning Tea	MM Foyer
11:15	11:45	Session 3 Part 2 – Listening to Country: Incorporating Community and Citizen Scientists into Ecoacoustic Projects	MM Theatre
11:45	12:15	Session 3 Discussion	MM Theatre
12:30	14:00	Lunch	MM Foyer
13:00	14:00	Workshop – *Frontier Labs: The Hitchhiker's Guide to Acoustic Localisation*	Meet outside the MM Theatre
14:00	17:00	Australian Acoustic Observatory Workshop – A2O Unleashed	MM Theatre
14:00	17:00	Informal Discussion	MM Foyer
15:30	16:00	Afternoon Tea	MM Foyer
17:30	18:30	Break – head to dinner venue	
18:30	21:00	Dinner	TBC

Ecoacoustics Symposium 2024

Detailed Program

Tuesday, 20 February

Public Lecture
6-7 pm, MM Theatre

Bringing together people, nature and country with ecoacoustics

Daryn McKenny is an Aboriginal man living on Awabakal country on East Coast NSW. Managing an Aboriginal Language Centre allows him to connect with our wildlife in a manner not usually afforded to many, as Daryn says “it’s our old people that teach us our languages and knowledges, but it’s our wildlife that teach our old people”. Daryn will discuss his work to reconnect through the use of both traditional and modern methods and technology to once again listen to our wildlife whether it be with our Whales and Dolphins or our Koalas and Lyrebirds. He will also share some of the amazing moments he has captured that help us once again put voice to our oldest teachers, our wildlife.

Dr Leah Barclay is an Australian artist and researcher who specialises in interdisciplinary research in response to climate change and ecological crisis. Working across ecoacoustics and acoustic ecology, her work focuses on innovative approaches to recording the soundscapes of diverse ecosystems, from the central Amazon Rainforest to the Great Barrier Reef. Barclay’s work explores ways we can use creativity, new technologies and emerging science to reconnect communities to the environment and inspire climate action. Her ecoacoustic installations have been presented across the world from Times Square in New York City to the Eiffel Tower in Paris for COP21.

Drawing from a decade of international research, this presentation highlights how ecoacoustics serves not only as an innovative tool for ecological monitoring and biodiversity conservation but also as a platform for interdisciplinary research, public engagement and creative practice. Listening to ecosystems can inspire and engage communities in new ways and offers accessible and inclusive pathways for conservation and regeneration in times of ecological crisis. This presentation will feature excerpts from a new audio-visual work immersing the audience in the soundscapes of Queensland's biosphere reserves.

Ecoacoustics Symposium 2024

Detailed Program

Wednesday, 21 February AM

No.	Start	End	Title	Speaker
Session 1 Part 1 – Next Generation Ecoacoustics: Emerging Methods of Data Collection and Analysis				
1	9:35	9:45	Listening in: the value of passive acoustic monitoring for mammalian biodiversity assessment in Australia	**Sebastian Hoefer**
2	9:45	9:55	Using BirdNET embeddings to find vulnerable and threatened species in long-duration audio recordings	**Slade Allen-Ankins**
3	9:55	10:05	ARIEL: Flexible, open-sourced software for the rapid validation of acoustic data in your workflow	**Lachlan Francis**
4	10:05	10:15	Audio Convolutional Neural Network Design: 2D vs 1D pros and cons. What about using both?	**Peter Griffioen**
5	10:15	10:25	Real-time bioacoustic monitoring using Edge-AI	**Bernd Meyer**
6	10:25	10:35	Open Ecoacoustics: updates and future directions	**Anthony Truskinger**
7	10:35	10:45	Freshwater soundscapes and the acoustic ecology of tadpoles in urban ponds	**Kirsten Parris**

10:45 – 11:15 Morning Tea

Detailed Program

Wednesday, 21 February AM (cont.)

No.	Start	End	Title	Speaker
Session 1 Part 2 – Next Generation Ecoacoustics: Emerging Methods of Data Collection and Analysis				
8	11:15	11:25	The use of AI to enable timely management of bat populations	**Peter Glorie**
9	11:25	11:35	BoOZ: A TERN-based ultrasound survey and bat call library for the management of microchiroptera	**Simon Robson**
10	11:35	11:45	Building a semi-automated bioacoustic call recognition system for the Yirlinkirrkirr, the white-throated grasswren *Amytornis woodwardi*	**Kyle N. Armstrong**
11	11:45	11:55	Application of passive acoustic monitoring, artificial intelligence and robust analytics to generate landscape trends for forest fauna	**Leroy Gonsalves**
12	11:55	12:05	Acoustically recognising individual animals	**Lifi Huang**
13	12:05	12:15	Using acoustic monitoring and artificial intelligence to identify regional trends in koala populations in the face of major disturbances and climate extremes	**Brad Law**
14	12:15	12:25	Friend or foe? Monitoring avian diversity in vineyards using machine learning and automated acoustic recorders	**Callan Alexander**
	12:25	12:50	***Session 1: Panel Discussion***	

12:30 – 14:00 Lunch

13:00 – 14:00 Workshop - FaunaTech

Ecoacoustics Symposium 2024

Detailed Program

Wednesday, 21 February PM

No.	Start	End	Title	Speaker
Session 2 Part 1 – Sound Actions: Translating Ecoacoustic Data into On-ground Management And Decision-making				
15	14:00	14:10	Harnessing bioacoustics for biosecurity	**Susan Campbell**
16	14:10	14:20	Acoustic monitoring of invasive species and the values they threaten	**Simon Linke**
17	14:50	15:00	Leveraging acoustic technology with insights for adaptive land management	**Marina D. A. Scarpelli**
18	14:20	14:30	Acoustic monitoring of rehabilitated sand mines in south-eastern Australia	**Susan Fuller**
19	14:30	14:40	Using soundscape analysis to detect grazing intensity and land condition in dry tropical savanna country	**Sheryn Brodie**
20	14:40	14:50	Can machine learning help hear kyloring calling ?	**Kyle N. Armstrong**
21	15:00	15:10	Acoustic monitoring of species to inform management decisions in Parks Australia estates	**Jess Williams**
22	15:10	15:20	Effectiveness of call recorders and in-person bird surveys for detecting species post-fire	**Michelle Gibson**
23	15:20	15:30	Detecting cryptic waterbirds through novel audio analysis techniques	**Harriet Kulich**

15:30 – 16:00 Afternoon Tea

Ecoacoustics Symposium 2024

Detailed Program

Wednesday, 21 February PM (cont.)

No.	Start	End	Title	Speaker
Session 2 Part 2 – Sound Actions: Translating Ecoacoustic Data into On-ground Management And Decision-making				
24	16:00	16:10	Acoustic monitoring of floodplain frog communities to inform water management	**Louise Durkin**
25	16:10	16:20	Cane Toad Croons: Unveiling Distribution and Spatio-Temporal Calling Patterns by Machine-Learning Classifier Across Australia	**Ka Wah Leung**
26	16:30	16:40	Establishing acoustic arrays to monitor amphibian translocation success	**David Newell**
27	16:20	16:30	Studying biodiversity: Getting a species list from your ecoacoustic data	**Lin Schwarzkopf**
28	16:40	16:50	Passive acoustic monitoring of swift parrots and Tasmanian masked owls: towards better conservation	**Charley Gros**
29	16:50	17:00	Ecoacoustic Monitoring of the endangered Pink Cockatoo (*Lophochroa leadbeateri leadbeateri*) in Semi-Arid Eastern Australia: Insights into Spatial and Temporal Patterns	**Lola Lange**
	17:00	17:30	***Session 2: Panel Discussion***	

18:30 – 20:30 Poster Session and Reception

Ecoacoustics Symposium 2024

Detailed Program

Thursday, 22 February AM

No.	Start	End	Title	Speaker
Session 3 Part 1 – Listening to Country: Incorporating Community and Citizen Scientists into Ecoacoustic Projects				
30	9:15	9:25	Listening for Life After Fire: insights from a citizen science project monitoring wildlife after bushfire	**Sera Blair**
31	9:25	9:35	Acoustic Monitoring in Nillumbik's Forests	**Eliziane Garcia de Oliveira**
32	9:35	9:45	Bats in Backyards	**Alicia Scanlon**
33	9:45	9:55	We need your help! Drawing on citizen scientists to assist Plains-wanderer call recognition	**Aaron Grinter**
34	9:55	10:05	Imitate to Appreciate: Gestural simulations of wildlife calls	**Andrew Brown**
35	10:05	10:15	Ecoacoustics that Engage with General Audiences – Visually!	**Leah Gustafson**
36	10:15	10:25	CallTrackers: maximising acoustic data gathered and conservation information shared	**Clare E. Hawkins**
37	10:25	10:35	Listening to Sea Country: Beeyali Tallo-Billa and new methods for engaging with marine ecoacoustics	**Leah Barclay, Tricia King, and Lyndon Davis**
38	10:35	10:45	Biosphere Soundscapes Open Microphone Network: Establishing a Live Sound Map of UNESCO Biosphere Reserves in South-East Queensland	**Leah Barclay and Toby Gifford**

10:45 – 11:15 Morning Tea

Detailed Program

Thursday, 22 February AM (cont.)

No.	Start	End	Title	Speaker
Session 3 Part 2 – Listening to Country: Incorporating Community and Citizen Scientists into Ecoacoustic Projects				
39	11:15	11:25	Owls in the Otways and what came next	**Trevor Hodson**
40	11:25	11:35	Immersed in calls of Eastern Ground Parrots on the Sunshine Coast (*Pezoporus wallicus*)	**Lana Prior**
41	11:35	11:45	Key questions to better understand the relationship between the soundscape and the environment	**Katie Turlington**
	11:45	12:15	***Session 3: Panel Discussion***	

12:30 – 14:00 Lunch

13:00 – 14:00 Workshop – Frontier Labs

14:00 – 17:00 Workshop – Australian Acoustic Observatory

17:30 – head to dinner venue (meet in MM Foyer)

Speed Talk Abstracts

Wednesday, 21 February

1 ***Listening in: The Value of Passive Acoustic Monitoring for Mammalian Biodiversity Assessment in Australia***

Sebastian Hoefer*

With Australia leading global mammalian species loss, accurate and efficient biodiversity assessment methods emerge as key components to enhance conservation efforts. To tackle the challenges of biodiversity assessment, we explored and compared eight survey methods across six locations within eastern Australia over two years. These methods encompassed on-the-ground observer-based methods, camera traps, and an innovative approach of Passive Acoustic Monitoring (PAM) used in conjunction with the BirdNET-Analyzer. Using the integrated PAM and BirdNET approach, we successfully detected 26 species of vocalising Australian mammals. Combining PAM with BirdNET proved to detect at least an equivalent number of species compared to traditional on-the-ground observer-based methods, and 20% more species than camera trapping. Moreover, PAM demonstrated compelling cost and time efficiency only taking 30% of the time to generate species inventories. Our findings underscore PAM's potential as a powerful, efficient tool for assessing the biodiversity of vocalising mammals, promising significant implications for advancing conservation action for mammals in Australia.

2 ***Using BirdNET embeddings to find vulnerable and threatened species in long-duration audio recordings***

Allen-Ankins, S.[1]*, Schwarzkopf, L.[1]
[1]College of Science & Engineering, James Cook University, Townsville, Australia

Using passive acoustic monitoring to survey for rare and endangered species has the advantage of being able to obtain data over greater temporal and spatial scales than manual bird surveys. However, it is still challenging to detect vocalisations of rare species from large acoustic datasets, as there are typically no developed recognisers for these species and few available example vocalisations to train a recogniser. Using audio recordings from the Australian Acoustic Observatory, we show how one can use the embeddings of the pre-trained deep-learning BirdNET recogniser to find vocalisations of species that are outside their training dataset. By comparing the distance between the embeddings of example calls and unknown audio samples we can rank unknown audio based on their similarity – the greater the similarity the more likely they are to be our target calls. We will detail how this method can allow users to search for vocalisations using minimal examples and present the detection results of this method on a range of vulnerable and threatened species we have tested to date. We hope this method will allow researchers to use audio recordings to monitor vulnerable and threatened species, providing valuable information for their conservation.

Speed Talk Abstracts

Wednesday, 21 February

3 **ARIEL: Flexible, open-sourced software for the rapid validation of acoustic data in your workflow**

Lachlan Francis*, Peter Griffioen, Arthur Rylah Institute, DEECA Victoria

Passive acoustic recorders have become an important tool for field ecologists as they provide considerable cost efficiencies and provide the ability to sample many locations simultaneously. Recorders can generate large volumes of acoustic data which can be slow to review for the identification of target species even for species experts. The task of identifying fauna from acoustic data is readily suited to the use of artificial intelligence analysis methods, however the performance of these methods requires large amounts of validated and labelled training data that can be used to develop the AI models. Validating and labelling the training data for AI models can be a laborious task that is essential before any analysis can take place. To facilitate the workflow of AI analytics we have developed custom software for the rapid validation and labelling of acoustic data. The software is fully customisable and presents users with audio and visual cues for the rapid labelling of acoustic data, and automates the validation process while retaining ancillary information (e.g. site, survey etc). By using the common data format of .csv files, this allows the software to be flexibly embedded into most existing ecoacoustic workflows as well providing a format to readily share validated species detections. The software also supports the rapid validation of predictive model outputs therefore supports complete analytic workflow for full reporting from large acoustic datasets.

4 **Audio Convolutional Neural Network Design: 2D vs 1D pros and cons. What about using both?**

Peter Griffioen*, Arthur Rylah Institute, DECCA Victoria

A scan of the literature on the identification of species from audio reveals several machine learning and deep-learning techniques. Most researchers utilising Convolution Neural Networks (CNNs) are adopting 2-dimensional neural network designs. For example, TensorFlow's audio recognition sample code is a 2D design. Two-dimensional neural networks are primarily used for image recognition and in effect these models are 'recognising' the spectrogram image to assign the sound to a species. A one-dimensional CNN is a similar but analyses the temporal patterns of frequencies and other parameters. A 1D CNN is often the approach utilised to classify and identify music. So which method is better suited to animal call recognition? Is it useful to do both? At the same time? This presentation examines the advantages and disadvantages of 1D and 2D model designs for species call classification. We then compare models made using each approach with the same training data. Additionally strategies of mixing 1D and 2D model designs to make hybrid ensembles is explored. Also presented is a single model trained to combine both 1D and 2D model layers.

Speed Talk Abstracts

Wednesday, 21 February

5 ***Real-time bioacoustic monitoring using Edge-AI***

Bernd Meyer*[1], MD Mohaimenuzzaman[1], Janaka Kumara Vidanalage Don[1], Daniela Teixeria[2], Rohan Clarke[1], Michael Maggs[3]
[1]Monash University, [2]QUT, [3]Frontier Labs

Long-term real-time population monitoring has significant applications but the use of current bioacoustic methods for this is hampered by two factors, in particular in remote areas. (1) Recordings normally need to be physically retrieved from the field and (2) they are often manually evaluated by human experts. AI-based evaluation provides significant improvements but still requires slow and costly manual data retrieval from the field unless high-speed network access exists. We present an approach to overcome these limitations. It exploits recent advances in Edge-AI to enable real-time monitoring without expensive infrastructure investment. At the core of our approach lies in-situ recognition: running call recognisers directly in the field. This removes the need to retrieve recordings as it requires only minimal data transfer. The drastically reduced data requirements enable us to use ultra-low-power ad-hoc networking to transfer observation data from the field to the lab in real-time using the Internet-of-Things. The core of this method is a toolchain that allows us to automatically derive extremely small call recognisers from existing call recognisers that have been developed for desktop or cloud-based architectures. This compression makes them suitable to run on very small battery-operated monitoring devices comparable to an audiomoth without incurring any significant performance penalties. Our approach forms a cost-effective basis for autonomous long-term and real-time monitoring even in remote settings and it makes PAM significantly more efficient, cheaper and easier to deploy. The talk will discuss this toolchain and the associated workflow as well as its application.

6 ***Open Ecoacoustics: updates and future directions***

Anthony Truskinger*, Paul Roe, Susan Fuller

We'll cover some of the latest updates to the Open Ecoacoustics platform. Tutorials, guides, new software we've developed, and ways you can join in our community.

Speed Talk Abstracts

Wednesday, 21 February

7 ***Freshwater soundscapes and the acoustic ecology of tadpoles in urban ponds***

Kirsten Parris*, The University of Melbourne

Urban areas provide crucial habitat for native biodiversity, including > 400 federally listed threatened species in Australia, such as the growling grass frog (*Litoria raniformis*) in Melbourne. Native wildlife also faces a range of novel stressors in cities. One such stressor is anthropogenic noise from transport, industry and construction. In adult frogs, transport noise impairs hearing and acoustic communication, while prolonged exposure to road-traffic noise is known to increase physiological stress and impair immune function. A recent analysis demonstrated that while on land, adult growling grass frogs experience significant acoustic interference from transport noise at half their remaining breeding sites in Melbourne. However, little is known about the effects of anthropogenic noise on freshwater soundscapes in cities, or its impacts on the acoustic ecology of larval frogs (tadpoles) in urban ponds and streams. I will present results of a study to quantify the contribution of transport noise to freshwater soundscapes in urban ponds in Melbourne, and to assess its impacts on audition in tadpoles.

8 ***The use of AI to enable timely management of bat populations***

Peter Glorie*

This presentation demonstrates the implementation of artificial intelligence (AI) to enable remote monitoring of bat roost populations, for the purposes of managing impacts. Analyzed data is displayed via a dashboard, allowing timely response to changes in activity. Monitoring of bat roost activity is often undertaken using song meters that record social calls and/or echolocation pulses. Legacy monitoring techniques require personnel to travel to each monitoring site every few months to retrieve data. Furthermore, the data must then be manually analysed by a subject matter expert. The delay between a change in animal abundance occurring and being detected can often be 3 to 6 months. The presentation will summarise the benefits, challenges and limitations encountered when implementing an automated solution using acoustics for monitoring of bat populations, including considerations for maintaining accuracy and reliability. Opportunities for implementing automated acoustic monitoring for other species will also be explored.

Speed Talk Abstracts

Wednesday, 21 February

9 ***BoOZ: A TERN-based ultrasound survey and bat call library for the management of Microchiroptera***

Simon KA Robson*

Advances in ultrasound recording means it is now possible to provide long-term constant monitoring of bats, the 'missing 20%' of the world's mammal fauna. Supported by TERN, here we report on the implementation of permanent ultrasound acoustic stations within Australia and SE Asia, along with the development of an open-access library of bat calls and associated analytical tools. With over 500,000,000 bat pulses available, the 'bats of Australia' call library represents a significant advance in our capacity to identify and monitor echolocating bats. Data management represents a growing and significant component of the project.

10 ***Building a semi-automated bioacoustic call recognition system for the Yirlinkirrkirr, the white-throated grasswren*** **Amytornis woodwardi**

Kyle N. Armstrong*[1,2,3],Rick C. Morgans[2], Kelly Dixon[4]
[1]Specialised Zoological, [2]Supersensory Technologies Pty Ltd, [3]School of Biological Sciences, University of Adelaide, [4]Territory Natural Resource Management

Deep Learning outperforms older approaches to sound signal classification, and the best models are trained with thousands of examples of the target signal, good representation of the background soundscape and non-target signals that contribute to the Type 1 error rate (false attributions). We developed a bioacoustic analysis system for rare and seldom-seen vocalising bird species for which very few exemplar calls are available. To process recordings from long-term bioacoustics-based field surveys of the white-throated grasswren Amytornis woodwardi in the Top End of the Northern Territory (a collaboration between Territory Natural Resource Management and the Traditional Owners and custodians of Warddeken, Jawoyn, Mirrar, and Dalabon Countries), our pipeline used a single c. 2-minute song segment containing a diverse range of grasswren syllables, and leveraged the Kahl et al. (2021) BirdNET model for northern American and European birds. While the BirdNET model had not been trained to recognise either the target signals or the many other bird species of the Top End, we could separate grasswren calls from calls of other bird species present in recordings. From 5 study areas (total 39 sites; 1,488 days; 25,767 hours; 6.5 TB of recordings) we detected target signals at six sites, from a total of 838 manually validated 'song sequences'. Playback calls broadcast as an acoustic lure at some sites were detected when these signals were in range of the Frontier Labs recorder microphones (46 song fragments from 8 sites). This approach is now being applied to other conservation significant species of bird.

Speed Talk Abstracts

Wednesday, 21 February

11 ***Application of passive acoustic monitoring, artificial intelligence and robust analytics to generate landscape trends for forest fauna***

Leroy Gonsalves*[1], Brad Law[1], Elsa Kohane[1], Glenyse Villanueva[1], Chris Slade[2]
[1]NSW Department of Primary Industries, Forest Science, [2]Forestry Corporation of NSW

Landscape-scale monitoring is a key approach for assessing the status of fauna populations but is often considered too hard and expensive. Remote acoustic sensors facilitate multi-day sampling of vocalising forest fauna over landscape scales and can generate large volumes of data that are difficult to manually process for multispecies monitoring programs. The use of artificial intelligence to reduce the time required to process large volumes of acoustic data can improve the overall cost-effectiveness of passive acoustic monitoring. Furthermore, by employing robust analyses that account for imperfect detection we can then use these data to accurately generate population trends and identify correlates of change. We developed convolutional neural network recognisers for 12 priority vocalising mammals and birds using open-source software and used these to scan approximately 30,000 hours of field recordings from 180 sites throughout three regions in NSW for a landscape-scale forest monitoring program. Occupancy modelling incorporating validated data was used to generate a trend baseline for priority species. Here, we present summary statistics on the performance of each recogniser and results from year one of the program. Initial results demonstrate that passive acoustic monitoring, coupled with artificial intelligence and robust analytics can make monitoring forest fauna over landscapes scales not only achievable, but also cost-effective.

12 ***Acoustically recognising individual animals***

Lifi Huang*[1], Bernd Meyer[1], Daniela Teixeira[2], Rohan Clarke[1], Andre Chiaradia[3]
[1]Monash University, [2]QUT, [3]Phillip Island Nature Parks

Data at the individual level is a crucial ingredient in managing populations of species at critically low levels. Individual-level data informs population demographics which are central to quantitative analyses of population trajectories and assessment of extinction risk. Acoustically recognising individuals can provide a non-invasive alternative for generating such data as an alternative to intense monitoring techniques, such as frequent field surveys. In addition to being non-invasive, it potentially offers a more efficient, lower-cost alternative to these techniques. Artificial Intelligence support for the acoustic recognition of individuals is even more crucial than for species identification because it is extremely difficult or even impossible for human experts to identify individuals just from audio recordings. To date, however, the development of AI for passive acoustic monitoring has, with a few exceptions, focused on species identification and individual recognition has mostly been explored for mammals (dolphins, whales, and apes). We demonstrate the possibility of automated recognition of individuals in two endangered Australian birds: The south-eastern red-tailed black cockatoo (Calyptorhynchus banksii graptogyne) and the little penguin (Eudyptula minor). We will discuss methods and challenges for individual-based recognition and present feasibility evidence from pilot studies for these two species.

Speed Talk Abstracts

Wednesday, 21 February

13 ***Using acoustic monitoring and artificial intelligence to identify regional trends in koala populations in the face of major disturbances and climate extremes***

Brad Law*, Leroy Gonsalves, Traecey Brassil, Isobel Kerr

Passive acoustics and artificial intelligence provides a cost-effective option to systematically monitor populations of vocal species. We assessed recent trends for the koala Phascolarctos cinereus, based on seven years of acoustic monitoring across 224 forested sites. The study period overlapped a severe drought and extensive megafires in 2019 followed by two years of extreme high rainfall. Different devices and recognisers were used and these were accounted for in the analysis. Dynamic occupancy modelling with a range of covariates at multiple landscape scales found that initial occupancy was related to elevation (-ve), NDVI (+ve) and selective harvesting (16-30-years previous; +ve). Extinction probability increased with the extent of high severity fire. Colonisation probability was related to a range of factors, with the top model showing a decrease with increasing lagged annual rainfall. Using these relationships, koala occupancy was found to be high and stable over the study period. Fire did not influence regional trends because koalas often persisted with low to moderate severity fire and because high severity fire was limited to 11 % of their habitat. Neither timber harvesting nor low severity fire influenced koala occupancy. Given the extensive area of koala habitat in the region, our results point to the presence of a large population in these public forests, and in recent years, stable occupancy (albeit with site-scale reductions in density with high severity fire). Acoustic monitoring is ideal for tracking future changes that are increasingly likely with predictions of more frequent, severe forest fires due to climate change.

14 ***Friend or foe? Monitoring avian diversity in vineyards using machine learning and automated acoustic recorders***

Callan Alexander*, Ayesha Tulloch, Paul Roe, Susan Fuller
Queensland University of Technology

Cost-effective methods for monitoring biodiversity at large spatial and temporal scales are essential to inform land managers, decision-makers, and global biodiversity accounting schemes. Monitoring potential biodiversity co-benefits for agricultural practitioners provides an opportunity to better understand and facilitate mutually beneficial outcomes. Acoustic monitoring provides an ideal framework for expanding the spatial and temporal scale of long-term biodiversity monitoring. It produces verifiable data that is less prone to bias, and allows for cost-effective, concurrent monitoring of multiple sites. Birds are an ideal indicator species for acoustic monitoring, as they are widespread, well-studied and highly vocal. However, there are significant challenges associated with using acoustic recorders for large-scale avian faunal monitoring, primarily associated with the substantial amounts of data collected. The objective of this research is to explore the application of large-scale acoustic monitoring within vineyards to quantify avian populations over time and guide land management choices. This will involve using automated data analysis methodologies with a focus on machine learning. The project will further explore the relationships between landscape factors and avian co-benefits, as well as determine the interactions between vineyard phenology and avian assemblages.

Speed Talk Abstracts

Wednesday, 21 February

15 ***Harnessing bioacoustics for biosecurity***

Susan Campbell*[1], Kyle Armstrong[2], Daniella Teixeira[3], Tracey Kreplins[1], Glen Coupar[4], Jill Shephard[5] [1] Invasive Species and Environment Biosecurity, Department of Primary Industries and Regional Development, [2]School of Biological Sciences, The University of Adelaide, [3]Queensland University of Technology, [4]Regional Response, Department of Primary Industries and Regional Development, [5]Terrestrial Ecosystem Science and Sustainability, Murdoch University

Increases in trade (both legal and illegal), tourism, intensification of agriculture and deliberate releases, all greatly exacerbate the impact of invasive species on global economic, environmental, social and cultural assets. Early detection of incursions is critical to enable effective and affordable control responses. Automated acoustic detection technology is currently assisting ongoing responses to two declared pest birds in Western Australia (WA); *Cacatua galerita* (Sulphur-crested cockatoo, SCC) and *Sturnus vulgaris* (European starling). Conventional control for SCC in WA consists predominantly of ground shooting. However, the efficacy of shooting for population level control is reduced by SCC behaviour. In WA, SCC's are very wary of operators and sentinel birds issue warning alerts that cause the entire flock to scare and take flight. In addition, little detail exists on flock size, distribution, daily and seasonal movements of SCC in WA. Currently, a reference library contains 76 SCC audio segments from the south-west jarrah forest in WA. Performance of a convolutional neural network developed from the reference library will be tested using historical recordings from WA's south coast. Six BAR-Lt recorders (Frontier Lab) placed alongside 4G (Swift Enduro) cameras will also help delineate SCC distribution and behaviour in WA and provide additional data to refine the algorithm. Starlings are not established in WA, however regular incursions require than an efficient early detection and rapid response system is maintained to protect this state's area freedom. Four permanent edge-computing starling acoustic towers currently provide an early detection solution to and were active during a declared response incident in season 2023-24. Roll-out of an additional 15-20 portable towers has commenced, delivering landscape scale, fully automated remote pest surveillance and notification.

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16 ***Acoustic monitoring of invasive species and the values they threaten***

Simon Linke*[1], Nina Scarpelli[2], Jens Froese[2], Stewart Macdonald[2], Maryam Golchin[2], Daniella Teixeira[3], Courtney Melton[3],
[1] CSIRO Environment, [2]CSIRO Health and Biosecurity, [3]Bush Heritage Australia

Invasive species are one of the key threats to Australian landscapes, impairing both agricultural uses as well as biodiversity. Adequate monitoring of invasive species is difficult – often ecologists or land managers can only pay limited visits to survey and manage threats. Monitoring outcomes of invasive species management interventions, such as recovery of threatened species can be even more difficult. Acoustic monitoring is gaining popularity as an autonomous and continuous monitoring technique which can overcome some of the difficulties of temporal and spatial resolution in surveying both the invader and benefits of management. In a large pilot project at CSIRO, we are currently investigating three uses for acoustic surveys: 1) Acoustic detection of soniferous invasive species , 2) 'Novel' sounds in the landscape that potentially indicate new threats, 3) Ecosystem monitoring to detect decline in native fauna and restoration actions. In our joint project with Bush Heritage Australia on Yourka Station, we have installed 50 acoustic recorders at 10 site clusters, producing ~40TB of sound data a year. These are listening for feral pigs (presented by Nina Scarpelli's companion talk), but also for dynamics in native species and soundscapes in areas where pigs are managed and more impacted parts of the property. We will discuss preliminary results from the ecosystem monitoring. This includes a comparison of soundscapes and bird species composition, as well as detection differences between AudioMoths on a strict subsampling schedule and SolarBARs. We will evaluate diverging detections both due to the subsampling schedule, but also device-specific differences.

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17 ***Leveraging acoustic technology with insights for adaptive land management***

Marina D. A. Scarpelli*, Simon Linke, Stewart Macdonald, Maryam Golchin, Jens Froese
CSIRO, Queensland

The reduction in costs for autonomous sensors and data storage coupled with improvements in machine learning and artificial intelligence amplifies the potential of this technology for environmental monitoring. However, data ingestion and management are still a challenge and extracting insights from the data is not trivial especially to non-specialist users. Despite being a ubiquitous big data challenge, this bottleneck hampers land managers' use of the technology preventing it from reaching its full potential in improving conservation outcomes. Following from S. Linke's talk, we have been gathering data in a proof-of-concept study and navigating data ingestion/management using automated workflows to get the data ready for analysis. We have been combining various analytical methods to enable pattern discovery for native species, anomaly detection in both spatial and temporal patterns and threat detection (e.g.: invasive species). In this talk, I'll focus in one of these methods (threat detection) and present the data ingestion workflow along with the envisaged delivery method in an end-to-end solution. By leveraging insights provided by data, land managers will be able to proactively respond to environmental shifts and adapt management strategies based on evidence. Moreover, by automating time-consuming tasks and delivering results in a digestible format, there is more time to be spent investigating and/or acting on direct threats and protecting native biodiversity. By optimizing scarce resource available to many land managers there is a real opportunity to enhance conservation outcomes.

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Wednesday, 21 February

18 ***Acoustic monitoring of rehabilitated sand mines in south-eastern Australia***

Susan Fuller* and Marina Scarpelli Drummond de Almeida

Monitoring plays an integral role in directing successful mine rehabilitation towards a self-sustaining functional state. However, ecosystems are inherently complex and numerous indicators could be monitored to track rehabilitation, but due to time and cost constraints land managers often select only a few. In this study we used passive acoustic monitoring and time-series analysis of insect and bird activity, and background noise, to investigate soundscape patterns at six rehabilitated sand mines and their unmined reference state in south-eastern Australia. Our acoustic analysis results indicate that insect and bird activity varied across sites. Bird activity was greatest in the unmined reference state at the Bongil Bongil and Yarraman sites, which was unsurprising given the lack of active restoration undertaken at Bongil Bongil and the recent rehabilitation (only 7 years old) at Yarraman. However, bird activity at the Fraser Island and Bayside sites was equivalent between rehabilitated and reference areas, reflecting the active restoration undertaken at these sites. Insect activity was higher in the rehabilitation sites at all mine sites except Yarraman and was linked to soil moisture. Finally, sites located near an active mine (Bayside and Yarraman) exhibited high levels of background noise in both the rehabilitated and unmined reference states. In conclusion, we advocate the use of acoustic monitoring to remotely monitor faunal restoration on rehabilitated sand mines, and to identify when rehabilitation deviates from a desired trajectory, thereby promoting a close relationship between monitoring and management intervention.

19 ***Using soundscape analysis to detect grazing intensity and land condition in dry tropical savanna country***

Sheryn Brodie*, Lin Schwarzkopf, James Cook University

Vast areas of northern Australia are used for livestock grazing and this often occurs on land that has high conservation value. There is increased recognition of the importance of managing grazed lands for conserving native biodiversity and environmental values. Land managers investing effort into enhancing biodiversity values want to know whether their management practices are improving biodiversity and, conversely, if biodiversity measures reflect land condition indicators used in the grazing industry. Monitoring native biodiversity across broad spatial scales is time-consuming and expensive, and so land managers are seeking ways to efficiently assess the condition of grazing land using biodiversity measures. We investigated temporal patterns of acoustic indices on several cattle grazing properties in north Queensland to evaluate whether soundscape analysis could be useful in detecting different levels of grazing intensity. The most apparent differences suggested that heavily grazed areas are noisier than moderately grazed areas, and we attempt to relate these results to the composition of the ecological communities.

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20 ***Can machine learning help hear kyloring calling?***

Dr Kyle Armstrong *[1], Sarah Comer[2] , Susan Campbell[3]
[1] SuperSensory Technologies, [2]Department of Biodiversity, Conservation & Attractions,
[3]Department of Primary Industries and Regional Development

Acoustic monitoring has rapidly developed into the primary method to survey, monitor population trends, landscape-scale occupancy and more recently the success of translocation of the Critically Endangered Western Ground Parrot, Kyloring, *Pezoporus flaviventris*. However, the processing of the large volume of acoustic data collected still remains a major challenge for this species, due largely to the overlapping calls of the Tawny-crowned honeyeater. The application of a one-dimensional CNN approach, which builds on the CISS starling detection system, has led to the development of a machine learning model for detecting the Western Ground Parrot. The model has been tested on field recordings from several areas in the limited range of this species to assess performance and allow minimisation of type 1 (false positive attributions) errors and thus the requirement for manual inspection of model output. In the longer term machine learning has potential to increase the efficiency of monitoring for this ground dwelling parrot.

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21 ***Acoustic monitoring of species to inform management decisions in Parks Australia estates***

Jess Williams*[1], Nicholas Macgregor[1], Margarita Goumas[1], Lin Schwarzkopf[2], Sheryn Brodie[2], Paul Roe[3] (QUT), Justin Welbergen[4], Edward Pedersen
[1]Parks Australia, [2]James Cook University, [3]Queensland University of Technology, [4]Western Sydney University

Parks Australia is responsible for managing a large and diverse set of natural and cultural values in both terrestrial and marine ecosystems. Effective monitoring is essential for understanding the status and trends of species populations within our parks and informing our management programs. Passive acoustic monitoring is one of several developing technologies that could extend and improve monitoring in the parks, enabling us to collect long-term data on many species in a more cost-effective way.

Working with research partners Parks Australia is exploring whether acoustics can be integrated into monitoring programs in several parks, including Christmas Island, Uluru-Kata Tjuta, Pulu Keeling and Norfolk Island. As three of these parks are on islands, they possess relatively small assemblages of species many of which are endemic, limiting the complexity of the soundscape and making them a good testing ground for development of robust acoustic monitoring methods. Our programs are primarily targeting bird species, including the forest bird assemblages on Christmas and Norfolk Island, and the Cocos buff-banded rail and the red-footed booby on Pulu Keeling. On Christmas Island we are also working towards acoustically monitoring the critically endangered flying fox, the last native mammal species confirmed to be persisting on the island. For all these projects the end goal is a streamlined process that allows time-poor parks staff to upload data for automatic (or semi-automatic) analysis and obtain useful results to inform management decisions. This talk will discuss some of our approaches, experiences, achievements, and challenges so far.

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22 ***Effectiveness of call recorders and in-person bird surveys for detecting species post-fire***

Michelle Gibson[1], Karen Rowe[1,2], Kevin Rowe[1,2], Matt Swan[1], Trent Penman[1], Luke Kelly[1]
[1] The University of Melbourne, [2]Museums Victoria

Large-scale bushfires are resulting in long term negative declines in ecosystem resilience and ecological values across Victoria. Core to ecosystem resilience monitoring is measuring the effectiveness of current bushfire management actions. Field methods are costly, especially where repeated site visits are required, and recent advances in passive or remote data collection methods such as call recorders (birds) may provide both quality data and reduced field costs. However, there are few studies that explicitly consider this trade-off and explore optimisation of passive monitoring compared to field surveys. To do this, we collected bird species presence/absence data from 40 sites across four Ecological Fire Groups (EFG); Ironbark Box Forest (IB), Grassy Heathy Dry Forest (GH), High Altitude Shrubland/Woodland (HAS), and Tall Mixed Forest (TM). Data were collected between October 2021 through May 2022 using two different methods — acoustic recorders and point counts — to compare effectiveness of each method at detecting species. Results indicate that acoustic listening surveys were more effective at detecting species than on-ground point counts across all EFGs. Sixteen species were detected by acoustics and not by point counts across all EFGs. However, acoustics did not detect 14 species that were only detected by point counts. Many species were detected by both methods across all EFGs. The majority of species were detected at more sites using acoustics than point count methods across all EFGs and functional groups. By identifying variation in survey methods within and among EFGs, our findings provide guidance for ongoing monitoring and research.

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23 ***Detecting cryptic waterbirds through novel audio analysis techniques***

Harriet Kulich*, Nyil Khwaja, Peter Griffioen, Lachlan Francis, Christopher Jones
Arthur Rylah Institute

Water for the environment can provide essential habitat for waterbirds in Victoria, and land managers rely on accurate information about distribution and habitat use to improve watering regimes. Birds are commonly surveyed by ornithologists in the field, for example using the 2 ha 20 min method or by counting waterbirds at wetlands. These traditional survey methods work well for most bird species and produce informative results for evaluating water management, however under-record cryptic species which are difficult to detect. This limits our understanding of how cryptic waterbirds are impacted by watering, despite this including threatened species such as Australasian Bittern (*Botaurus poiciloptilus*) and Lewin's Rail (*Lewinia pectoralis*). This project uses deep learning Convolutional Neural Network (CNNet) models developed by ARI's ecoacoustics team to detect specific threatened species' calls in audio recordings. Recordings can cover longer time periods than field surveys, increasing the likelihood of detecting cryptic vocal species and providing reporting rates that can be used to analyse responses to watering. The waterbird models also open exciting opportunities to use existing audio files for new purposes. For example, we applied them to frog survey recordings taken years earlier, allowing us to establish a baseline from a time before acoustic waterbird monitoring was even considered, and with which we can compare future responses to water regimes. We show that CNNet models for waterbirds are a promising tool for understanding cryptic threatened species' responses to environmental water management and are complementary with assessing responses in other cryptic vocal taxa such as frogs.

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24 ***Acoustic monitoring of floodplain frog communities to inform water management***

Louise Durkin*, Peter Griffioen, Lachlan Francis, Katie Howard

Frog species can be useful indicators of the effect that flooding, both natural and managed, has on floodplain biota. Thus, frogs are often targeted in biodiversity monitoring programs to report against management objectives. Acoustic monitoring has increasingly been adopted as a tool to survey and monitor wildlife. Although this technology allows us to monitor across large temporal and geographical scales, the large volume of data generated are challenging to process and interpret. We developed a modelling framework to automate frog species recognition in large acoustic datasets. Training data, incorporating individual frog calls, frog choruses and non-frog noises were collated and used to train a convolutional neural network model (ARISA) to recognise the calls of all target frog species. To improve efficiency in reviewing results, we developed an accompanying tool (ARIEL) to rapidly validate the performance of ARISA for each target species. This approach is being implemented to evaluate species richness and temporal calling peaks of frog communities along the Murray River and its associated floodplains, where we employ acoustic monitoring at ~150 sites for 4-6 months of the year. The developed workflow has identified the presence of threatened species such as the Growling Grass Frog in remote north-west Victoria, a range extension of the Endangered Sloane's Froglet, and the first records in many years for some species in some areas. This approach has improved efficiency in data processing, interpretation and reporting on frog populations in response to flood events.

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25 ***Cane Toad Croons: Unveiling Distribution and Spatio-Temporal Calling Patterns by Machine-Learning Classifier Across Australia***

Ka Wah Leung*

This study navigates the intricate acoustic landscape of Australia to uncover the distribution and spatio-temporal calling patterns of cane toads (*Rhinella marina*). Harnessing the extensive dataset from the Australian Acoustics Observatory (A2O), featuring 360 recorders in 90+ sites, we employed a cane toad call template for initial identification. Utilizing these call samples as a training dataset for the Birdnet classifier, we trained a robust model for automated cane toad call detection within the A2O's continuous acoustic recordings. This research reveals the spatial-temporal differences in cane toad calling patterns, which serve as a model system for large-scale frogs ecoacoustics study. Beyond ecological insights, our study introduces a time-saving asset – the trained classifier – facilitating future cane toad research and monitoring endeavors. This holistic study not only advances our understanding of cane toad ecology but also equips researchers with a valuable tool for conservation initiatives and ongoing ecological assessments.

26 ***Establishing acoustic arrays to monitor amphibian translocation success***

David Newell*, Liam Bolitho
Southern Cross University

The Mountain frog (*Philoria kundagungan*) is an endangered rainforest frog, known only from a small number of remote mountaintop locations in the World Heritage rainforests of the New South Wales and Queensland border. The species is rarely detected outside of its subterranean habitat within muddy soaks of headwater streams and detection relies entirely upon the vocalisations of males. Despite the high levels of protection afforded their habitats, climate change and introduced species (pigs) are rapidly driving localised extinctions. In response, a captive husbandry and translocation project has commenced (project GRASP) with the first release scheduled for 2024.

Using autonomous acoustic recorders coupled with automated signal detection software, we have determined the call phenology of this species and found calling activity often differs significantly from day-to-day. This creates an issue when trying to obtain reliable abundance data from the remote mountaintop locations where this species occurs. To navigate this issue, we have developed a unique monitoring protocol to assess abundances and translocation success at release sites. The method uses arrays of acoustic recorders to capture the soundscape of 100 x 20 m sections of habitat (our release sites). Using automated signal detection software, we can select soundscapes with the highest calling activity from long term recordings in order to assess abundances. The selected soundscapes can then be reconstructed in a production studio to create an immersive audio environment, in which, vocalising male *P. kundagungan* can be manually counted.

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27 ***Studying biodiversity: Getting a species list from your ecoacoustic data***

Lin Schwarzkopf*, Slade Allen-Ankins

Many biodiversity studies require lists of species present at sites. In our lab, we have been attempting to obtain such lists from acoustic data using a range of different methods, without having to build time consuming recognisers for every species of bird, mammal and frog at each site. We have explored MonitoR templates and used BirdNET and other out-of-the-box methods. I compare the advantages and disadvantages of each method we have used, with a quick visit to indices along the way. All the methods we have used significantly reduce listening time required to obtain correct hits for many species, all require validation to ensure their usefulness.

28 ***Passive acoustic monitoring of swift parrots and Tasmanian masked owls: towards better conservation***

Charley Gros*[1] , Matt Webb[2]
[1]Bob Brown Foundation, [2]Landscape Recovery Foundation

Both Tasmanian masked owls (*Tyto novaehollandiae* subsp. *castanops*) and swift parrots (*Lathamus discolor*) are threatened by the loss of their nesting habitat in Tasmania. Since 2021, we collected acoustic data from areas under imminent threat of habitat loss, within the Tasmanian masked owl (nsite > 80) and swift parrot breeding range (nsite > 40). This dataset comprises thousands of hours of recordings collected across a wide range of vegetation types in Tasmania, in different weather conditions and times of year. We successfully developed, trained and validated a Convolutional Neural Network to recognise the vocalisations of these two species. This approach allows us to conduct large scale acoustic monitoring of these two species and is already providing ecological insights that are increasing our understanding of their spatial distribution, ecology and behaviour. For example, identifying the timing and prevalence of masked owl vocalisations, swift parrot nesting sites and breeding success. This research is already delivering conservation outcomes for these two species.

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29 **Ecoacoustic Monitoring of the endangered Pink Cockatoo (*Lophochroa leadbeateri leadbeateri*) in Semi-Arid Eastern Australia: Insights into Spatial and Temporal Patterns**

Lola Lange*[1], Lance de Vine[1], Helena Stokes[2], Ayesha Tulloch[1], Susan Fuller[1]
[1] Faculty of Science, Queensland University of Technology, [2]Australian Wildlife Conservancy

The Pink Cockatoo (*Lophochroa leadbeateri*) is an iconic bird species inhabiting semi-arid and arid Australia. The eastern subspecies, *Lophochroa leadbeateri leadbeateri*, is Nationally listed as endangered, however, the ecological requirements and population dynamics of this species remain poorly understood. This species faces numerous threats, including habitat loss and climate change, and therefore a comprehensive understanding of their ecology and behaviour is imperative for effective conservation. This research addresses this knowledge gap by employing ecoacoustic monitoring techniques coupled with artificial intelligence to investigate the spatial and temporal dynamics of Pink Cockatoos during the breeding season in semi-arid eastern Australia. Our research seeks to answer two questions: (1) what habitat features (particularly vegetation type and proximity to water) influence the spatial distribution of Pink Cockatoos during the breeding season? and (2) how do climatic factors influence the presence and activity of Pink Cockatoos over a 20-month period coinciding with the end of drought and commencement of La Niña? We used a custom-built convolutional neural network acoustic recogniser and RavenPro to analyse recordings from 26 sensors deployed across 7 different vegetation communities at Bowra Wildlife Sanctuary, located in the Mulga Lands bioregion, from May 2023 to January 2024. Our preliminary results indicate hot spots of activity associated with creek lines with water fringed by coolabah and river red gums. We used the same recogniser to analyse recordings from 6 Australian Acoustic Observatory sensors located at Bowra Wildlife Sanctuary, Naree Station and Fowlers Gap during the period from September 2019 to April 2021. These data will be analysed in conjunction with remote sensing greenness indices and climatic data. The findings from this study hold direct implications for the conservation and management of Pink Cockatoos in semi-arid eastern Australia, offering valuable insights into their habitat requirements and climate-related challenges. Moreover, this research contributes to the growing body of knowledge on ecoacoustics, showcasing its utility in monitoring a remotely distributed, threatened species.

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Thursday, 22 February

30 ***Listening for Life After Fire: insights from a citizen science project monitoring wildlife after bushfire***

Sera Blair*, Victorian National Parks Association

Almost four years ago bushfires roared through East Gippsland, Victoria, burning over 24 million hectares of forest and farmland. For the last three years the VNPA's NatureWatch program has been working with private landowners, and teams of volunteer citizen scientists on public land, to monitor wildlife recovery in our Life After Fire project. Using a combination of camera traps, spotlighting surveys and scat observations and 52 deployments of audio recorders, we pulled together a picture of what wildlife was persisting, and where they were yet to recover in a variety of habitat types across the region. I will present an overview of our findings focusing on the value eco-acoustic data adds to the overall picture, and the joys and occasional challenges working with citizen scientists.

31 ***Acoustic Monitoring in Nillumbik's Forests***

Eliziane Garcia de Oliveira*[1], Doug Evans[2], Karen Rowe[3]
[1] Nillumbik Shire Council, [2]Nillumbik Landcare Network, [3]Museums Victoria Research Institute

Wildlife monitoring plays a crucial role in informing best practices in land management. By implementing standardized methodologies for monitoring wildlife, local governments can effectively assess the impact of land management practices and make informed choices. The Forest Health Monitoring Project in Nillumbik Shire aims to assess the environmental health of wet and dry forests by monitoring a range of indicator species. Using acoustic recorders, we collected approximately 4200 hours of data from 30 sites over two consecutive weeks during the Spring/Summer seasons since 2017. Collaborating with local experts, we identified 16 species that served as indicators of forest health and could be recognized through acoustic analysis. To achieve this, we developed acoustic recognizers using a pattern matching algorithm in the web-based platform ARBIMON. Furthermore, with the involvement of citizen scientists, we were able to validate data for eight of these species. The Southern Boobook and the White-throated Treecreeper were the most common indicator species detected, and the Powerful Owl, the rarest. Three species were only found within Parks Vic managed land, but the other five were present in both public and private land, highlighting the importance of supporting effective land management across private properties. We offer regular training workshops in data collection and analysis and we are exploring the data analysis component as part of Council's strategy to make environmental volunteering more accessible. Challenges we encountered included the amount of training required for people to familiarise with acoustic analysis and the amount of data that needs to be verified.

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32 ***Bats in Backyards***

Alicia Scanlon*[1], Joanna Haddock [1] Anna Lloyd [1], Brad Law[2], Leroy Gonsalves[2], Isobel Kerr[2], Chris Turbill[3]
[1] NSW Department of Planning and Environment, [2]NSW Department of Primary Industries, [3]Western Sydney University

Insectivorous bats are small, nocturnal and cryptic making them unlikely to be seen or encountered by the general public. Many people are unaware of the ecosystem services provided by bats and hold negative attitudes towards them. Bats in Backyards is a collaborative project between the NSW Government Saving our Species program, the NSW Department of Primary Industries and Western Sydney University. It aims to engage citizen scientists in monitoring insectivorous bat species across targeted areas on private land in NSW. The project provides valuable data for bat conservation and educates the community about the ecological significance of these mammals. Through Bats in Backyards citizen scientists survey insectivorous bats on their property by recording full spectrum ultrasonic bat calls over three to five nights using Audio Moths. The recordings are analysed by scientists using automated software and manual validation. Citizen scientists receive a full report detailing each bat species detected, their preferred habitat and food, and recommended actions for bat protection and conservation. In its first year the project engaged over 100 citizen scientists and gathered over 4TB of full spectrum ultrasonic data. This has resulted in 95,000 bat calls from 20 different species of bat, including 7 threatened species. Ultimately, the data will be used in occupancy modelling to create maps of the local species distributions. Citizen scientists involved in the project are contributing valuable data to help scientists build a better understanding of threatened insectivorous bats and where they can be found, especially on private land.

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33 ***We need your help! Drawing on citizen scientists to assist Plains-wanderer call recognition***

Aaron Grinter*[1], Karen M.C. Rowe[2,3]
[1]DEECA, [2]Museums Victoria Research Institute, [3]The University of Melbourne

The Plains-wanderer (*Pedionomus torquatus*) is a small, cryptic ground-dwelling bird that occurs in semi-arid native grasslands through central-eastern Australia, from western Queensland, through central NSW, to northern Victoria. The species is listed as critically endangered under the EPBC Act 1999 and the Victorian FFG Act 1988. A large proportion of the remaining population inhabits the Northern Plains Grasslands of Victoria, itself an EPBC-listed critically endangered ecological community. Population monitoring is hampered by their cryptic nature, making in-person monitoring labour intensive and speculative on a landscape-wide scale. To address this issue, DEECA and Museums Victoria developed a bioacoustic monitoring program, which has been running nearly continuously in 6-monthly rounds since 2017. During this period, 74 sites were monitored on both public and private land, with 66 sites monitored for 1-year or longer. With recorders operating for an hour, twice daily, the amount of data produced from the network over the 6-month round is substantial. While call recognisers are employed, we draw on a cohort of more than 50 citizen scientists to validate potential calls, reducing the time required by researchers, and increasing community investment in Plains-wanderer conservation. These volunteers are invaluable to the program, confirming almost 10,000 Plains-wanderer calls out of a possible 50,000 in the most recent round. This presentation will share our story of building the bioacoustic project and our experiences recruiting and working with citizen scientists to deliver positive outcomes.

34 ***Imitate to Appreciate: Gestural simulations of wildlife calls***

Andrew Brown*, Griffith University

Connecting communities with the environment through deep listening is a well established approach to enhancing appreciation of the natural world. An extension of this approach involves the imitation of wildlife calls as a strategy for enhancing deep listening. This presentation describes the development and implementation of the OnBoard Call, a handheld device that responds to performed gestures to synthesise sounds akin to wildlife calls. The Call is designed to encourage users to imitate the wildlife sounds they hear around them through a limited set of gestural controls. The objective is to facilitate listening to the characteristics of the diverse ecology of wildlife sounds rather than for accurate mimicry of those sounds. Assembled from affordable microelectronic components and a laser cut housing, the device is a handmade electronic project for DIY construction, making is easily replicable by interested makers.

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35 ***Ecoacoustics that Engage with General Audiences – Visually!***

Leah Gustafson*, University of the Sunshine Coast

Ecoacoustics play an important role within natural ecosystems, allowing birds and other animals to communicate and find food. Communicating and contextualising the importance of ecoacoustics to wider audiences, and particularly the general public, can be challenging. The researcher has been developing a series of creative works that accompany audience surveys to discover what makes audiences engage with ecoacoustics. Using ecoacoustic visualisations is thought to increase audience engagement, but to date little is known about the mechanisms of that engagement with the auditory experience. This presentation will discuss the survey results so far, and the insights they provide around engaging audiences with ecoacoustics data. By using ecoacoustics visualisation experiences, the researcher's works aspire to showcase the complexity of natural soundscapes to a broader audience. Enhancing science communication through visualisation is a way to see acoustic information in a new, and more insightful way, blurring the line between art and science.

36 ***CallTrackers: maximising acoustic data gathered and conservation information shared***

Clare E. Hawkins*[1,2], Simon Gillings[3], Stuart E. Newson[3], Jim E. J. Lovell[1,2]
[1]Bookend Trust, [2]University of Tasmania, [3]British Trust for Ornithology

Efforts to conserve a species are commonly constrained by a lack of (1) ongoing population monitoring, to confirm whether those efforts are effective, and (2) communication and engagement with the people living and working around that species, regarding its conservation requirements. Citizen science methods have great potential to achieve both. The NatureTrackers program, established by the Bookend Trust, deploys citizen science to monitor a range of species over the long term in Tasmania. Our new passive acoustic monitoring project, CallTrackers, enables the public to coordinate their annual surveys through a booking map, in order to cover Tasmania effectively, and to borrow recorders from nearby libraries and other outlets. Outreach is achieved through the NatureTrackers website, media and face-to-face presentations. Bookings, data uploads and preliminary analyses through recognisers are managed through the British Trust for Ornithology's (BTO) Acoustic Pipeline, thereby minimising time demands on the human coordinator. Participants are rewarded with an in-depth learning experience, including time in nature, combined with immediate initial results with confidence indicators. Our current call classifiers, developed by the BTO, cover most of Tasmania's bat species (two of which are internationally listed as threatened) and also the endangered Australasian bittern. This wetland-dependent bird is thought to have declined very substantially during the Millennium Drought, but current population trend, numbers and distribution are very poorly understood. All recordings are stored long term for future review as classifiers improve and increase. I outline our use of the Acoustic Pipeline, initial findings and future plans.

Speed Talk Abstracts

Thursday, 22 February

37 ***Listening to Sea Country: Beeyali Tallo-Billa and new methods for engaging with marine ecoacoustics***

Leah Barclay*, Tricia King*, Lyndon Davis*[1]
[1] First Nations Kabi Kabi Traditional Custodian

Beeyali is a research project exploring new methods for visualising the calls of wildlife on Kabi Kabi Country, the traditional lands and waters of the Sunshine Coast in Queensland, Australia. Beeyali Tallo-Billa is a new ecoacoustics work presented for Horizon Festival 2023 that involved a transient dusk performance onboard a boat with live hydrophones in the ocean, mixed into an immersive soundscape with cymatic visualisations of humpback whale songs, projected over Old Woman Island. The project started in Mooloolaba, where the audience boarded Sunreef's Whale One for an augmented reality experience at sunset. This was followed by a Welcome to Country with Lyndon Davis over the ocean as we reached the Island. The research team were grateful to hear whales signing on the hydrophones surrounding the boat for this ambitious performance and once in a lifetime experience for the audience on board. This paper will feature a preview from the final work, including Lyndon Davis' original artwork. Davis paints traditional patterns referencing flora and fauna from the Sunshine Coast and was particularly interested in exploring how the visual representation of wildlife calls correlated with geometric patterns associated with Indigenous designs, to demonstrate ecological interconnection. Working in collaboration with sound artist Dr Leah Barclay and photographer Dr Tricia King, Davis conceived Beeyali as a way to sound an alarm for the multitude of vulnerable species on the brink of extinction in Australia. This research brings together Indigenous knowledge, environmental research, emerging technology, photography, and ecoacoustics to visualise wildlife calls using cymatics, the science of visualising sound. This paper focuses on First Nations perspectives on listening to sea Country, new approaches for engaging communities in ecoacoustics and the value of listening to marine environments.

Speed Talk Abstracts

Thursday, 22 February

38 ***Biosphere Soundscapes Open Microphone Network: Establishing a Live Sound Map of UNESCO Biosphere Reserves in South-East Queensland***

Leah Barclay*, Toby Gifford*, University of the Sunshine Coast

The Biosphere Open Microphones (BIOM) project introduces a pioneering multi-partner initiative to establish a network of open microphones in UNESCO Biosphere Reserves across the planet, relaying real-time sounds and establishing new long-term databases for public engagement and research. The paper reports on the initial phase of development in three Biosphere Reserves in South East Queensland: the Sunshine Coast Biosphere Reserve, Great Sandy Biosphere Reserve, and Noosa Biosphere Reserve. In collaboration with Locus Sonus (Aix-Marseille, France), Biosphere Soundscapes (Australia), Cyberforest (Tokyo, Japan), and SoundCamp (London, UK), BIOM provides a forum for existing work with live environmental sound and supports establishing new live streams from a variety of habitats by developing and sharing technical information, advice, training, and resources. The project aims to create an increasingly detailed and diverse account of planetary soundscapes, available in real-time via an online soundmap, as a public resource for biodiversity monitoring, artists, researchers, and activists. This research builds on the work of Biosphere Soundscapes in Australia, ensuring ecoacoustics is accessible and engaging for communities. The live streams offer an immersive experience that bridges the gap between remote habitats and global audiences, and this collaboration facilitates new possibilities for public engagement, scientific research, and artistic collaboration. Live streaming has emerged as a valuable tool in various fields, including ecoacoustics, sound art, and environmental advocacy. It offers a unique perspective that contrasts traditional remote field recording methods, providing a real-time auditory perspective into remote ecosystems. This initiative is not only aimed at preserving the acoustic diversity of biosphere reserves but also at fostering a deeper understanding of ecological connections and seasonal variations through long-term archival and engagement with soundscapes. The conclusion of this paper focuses on the interdisciplinary possibilities of the live streams, from well-being tools in hospitals and aged care to accessible research data for ecoacoustics and biodiversity monitoring worldwide. This research is situated within the Creative Ecologies research cluster at the University of the Sunshine Coast, a new initiative that explores ecological reciprocity and place-based innovation in the design of interdisciplinary research.

Speed Talk Abstracts

Thursday, 22 February

39 ***Owls in the Otways and what came next***

Trevor Hodson*, Karen Rowe[1]
[1]Museums Victoria

In 2019, the Birregurra Landcare Group partnered with Museums Victoria to explore the use of ecoacoustics to study the Owl population in the Otways. A grant was obtained from the CEP to purchase six Song Meter Mini devices. Our findings will be discussed. Since then, we have used the recorders to explore the Australasian Bittern population in the wider district and have documented the presence of the species over a wide range. It is an example of citizen science making a contribution in an evolving manner and adding to the knowledge base.

40 ***Immersed in calls of Eastern Ground Parrots on the Sunshine Coast (*Pezoporus wallicus*)***

Lana Prior*, Kieran Aland and Erin Horkings

Passive acoustic monitoring (PAM) can provide new insights into a cryptic bird species by providing the opportunities for collecting data in ways that have not previously been possible. These methods allow for the introduction of acoustic recorder arrays to understand simultaneous vocal activity within an area, which can provide fine-scale distribution knowledge. Eastern Ground Parrots (*Pezoporus wallicus*) are challenging to see within its habitat and are typically monitored within the known chorusing periods at dawn and dusk. Coolum and North Shore Coast Care conducted a three-year monitoring project using arrays programmed to record at dawn and dusk, to answer fine-scale distribution questions for Eastern Ground Parrots across the Sunshine Coast in Queensland. The distribution across habitats in this area have been monitored historically, however with increasing concerns over the effects of urbanisation and wildfires, there was a need for an updated monitoring program. The project incorporated community engagement over the entire study through listening walks, workshops on identifying calls within recordings, and annual presentations for locals and stakeholders. The integration of acoustic arrays as the primary monitoring methodology allowed the program to uncover new insights on the species. Additionally, using the acoustic signals of a cryptic species that isn't often seen by the community monitoring it, greatly assists in engaging volunteers, community members and stakeholders in its conservation.

Speed Talk Abstracts

Thursday, 22 February

41 ***Key questions to better understand the relationship between the soundscape and the environment***

Katie Turlington*[1], Andres Felipe Suarez Castro[1], Daniella Teixeira[2], Simon Linke[3], Fran Sheldon[1]

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[2]School of Biology and Environmental Science, Queensland University of Technology,
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There is a deep connection between the soundscape and the environment – in that, put simply, the soundscape is the aural plane of the landscape. Despite this, there is limited empirical evidence to confirm the relationship between the acoustic and physical environments. In order to use sound effectively in ecological monitoring surveys, we first need to comprehensively understand how sound connects with the environment. In the first stage of my PhD research, I performed a quantitative systematic review aiming to better understand the relationship between the soundscape (analysed using any method) and the environment (depicted as variables or indicators physically measured in the field). I compared the study designs and synthesized the results between publications to identify gaps in our understanding of the relationship between the soundscape and the environment. Several key questions emerged from this review that warrant further investigation. These questions revolve around topics such as aquatic acoustic monitoring, incompatible and non-comparable study designs, and the potential to monitor non-soniferous biota and non-sound-producing environmental attributes via sound.

This talk discusses the research gaps identified in the review and presents key questions and avenues for future research. Channeling research efforts toward answering these key questions will help promote a solid conceptual base for future acoustic monitoring programs.

Ecoacoustics Symposium 2024

Poster Abstracts

Wednesday, 21 February

1 ***Automated monitoring of Pilbara bat species of conservation significance with multiple sensor systems***

Kyle N. Armstrong*, Rick C. Morgans, Thomas J. Rowntree, and Jayden O'Brien

Roosting and foraging habitat of Pilbara bat species of conservation significance, the Ghost Bat *Macroderma gigas* and Pilbara Diamond-faced Bat *Rhinonicteris aurantia*, sometimes coincide with economic reserves of minerals such as iron ore and gold. While there have been many field surveys in the past two decades as part of environmental impact assessments (EIA) and post-approval monitoring commitments, there are still many aspects of the biology of these species that are not well understood. To assist both fundamental scientific research and EIA, we have developed a Pilbara Bat Monitoring System that uses multiple sensors to monitor the daily presence, number and activity levels of the Pilbara Diamond-faced Bat at two confirmed diurnal roosts in the eastern Pilbara. Thermal cameras record still images of bats in roost areas, and video of bats in flight; and ultrasonic microphones record echolocation calls. By a combination of both edge and cloud computing, linked by Telstra or Starlink, up to three separate automated and Machine Learning processes count colony size and quantify activity levels. The continuous collection of recordings at these sites since June 2023 has provided the opportunity to document natural patterns of behaviour at roosts, provided information on colony size changes, and documented responses to nearby mining-related activity. Automated continuously recorded systems provide a deeper level of understanding of the lives of enigmatic species.

2 ***To better embed the community in conservation actions for an endangered heron species, we need human geographers***

Bradley Clarke-Wood*, Museums Victoria, BirdLife Australia

Embedding the community in conservation actions for endangered species is critical for reversing downward trajectories. The pertinent conservation action of assembling baselines for such species can be substantially aided by involving the community in citizen science projects. Given their distinct calls and elaborate breeding behaviours, Australasian Bitterns, and likely other endangered heron species, are ideal models for embedding the community in acoustic surveys. These surveys can produce insights into the ecology of Australasian Bitterns and help identify wetlands for conservation. Here, we outline a proposed framework that supports practitioners in implementing similar project using a case study examining the dawn and dusk 'booming' activity of Australasian Bitterns. Importantly, we describe a need for more human geographers in the design of citizen science projects to improve experiences and conservation outcomes.

Poster Abstracts

Wednesday, 21 February

3 ***Using artificial intelligence to identify bat calls***

Peter Griffioen[1], Brad Law[2], Anna Lloyd*[3], Lachlan Francis[1], Isobel Kerr[2]
[1]Arthur Rylah Institute, [2]NSW Department of Primary Industries, [3]NSW Department of Planning and Environment

Traditional bat call analysis is time-consuming, can be subjective and cannot differentiate between some species, leading to acoustic call identification being unsuitable for some species. We believe AI models can remove resource limits on the number of acoustic bat surveys undertaken and unlock acoustics as a viable survey tool for difficult to ID species. Funded under the NSW Saving Our Species program, a collaboration between Victoria's Arthur Rylah Institute, NSW's Department of Primary Industries and Department of Planning and Environment is building and testing Ai-based models to identify bat calls in NSW. Initial results are promising. When compared with expert confirmed Anascheme identified calls, the AI performed well. Twenty four species were provided for testing and an assessment of reliability was undertaken on both withheld exemplars and re-sampled exemplars. Against withheld exemplars, species identified with a reliability over 99% are *Saccolaimus flaviventris*, *Chalinolobus dwyeri*, *Rhinolophus megaphyllus* and *Micronomus norfolkensis*. Those identified with a reliability over 95% include *Miniopterus australis*, *Chalinolobus gouldii*, *Scoteanax rueppellii*, *Myotis macropus* and *Miniopterus orianae oceanensis*. Some of these species are challenging to differentiate. Also of note *Nyctophilus geoffroyi* was reliability identified 90% of the time, with further work required to improve *N. gouldi* and *N. bifax* reliability. Testing and refining is currently underway using "field-fresh" calls that are typically of less quality than those collected as reference calls or identified by experts with confidence. The models will continue to have reference calls from regions across NSW added to the training dataset over the next few years.

Poster Abstracts

Wednesday, 21 February

4 ***Sensory polluted soundscapes: Empirical and experimental evaluation in Queensland***

Pedro C. Rocha*, Paul Roe, Susan Fuller
Queensland University of Technology

Sensory pollutants (i.e. anthropogenic noise and artificial lights at night – ALAN) are a by-product of urbanization and are responsible for the disruption of ecological communities. Traffic noise is a widespread source of noise pollution and a major cause of wildlife and human disturbance. Moreover, roads often glow with road lighting, which can attract and provide misleading information to wild animals, further increasing ecological disturbance and animal mortality. However, most studies on sensory pollution are focused on either light or noise, mainly evaluating single or groups of species at a time, with little information on how both pollutants interact to disrupt a wildlife community. The current research project uses passive acoustic monitoring to evaluate the ecological impacts of sensory pollutants on communities of soniferous animals. Initially, we undertook a study to empirically evaluate the soundscape from a section of Main Range National Park, Southeast Queensland (SEQ) that experiences noise pollution from a major highway. Subsequentially, to disentangle the many factors associated with roads (e.g. traffic collisions, edge effect, road avoidance), we isolated the effects of sensory pollutants by experimentally broadcasting a “phantom road” on an otherwise roadless rural property in SEQ. In this presentation, we will outline our preliminary results relating to noise and light pollution impacts on soniferous fauna. This research has the potential to inform road infrastructure decision-making, particularly in areas where development is planned adjacent to sites of high biodiversity value and will assist land managers in developing strategies for conservation in areas where roads currently exist.

Poster Abstracts

Wednesday, 21 February

5 ***Did you hear that frog? Testing bioacoustic-analysis programs for the detection of the growling grass frog, Litoria raniformis***

Clare Wilson*, The University of Melbourne

Acoustic communication is critical to the survival of many species, including the growling grass frog (*Litoria raniformis*), an IUCN red-list species (IUCN, 2023; Parris & Hinze, 2021). Bioacoustic monitoring enables researchers to monitor species passively, producing large data sets, within which bioacoustic-analysis programs can identify vocalisations of a target species. The results of bioacoustic research hinge on accurately identifying calls within recordings. However, few studies have compared the effectiveness of different bioacoustic- analysis programs, particularly in species with low-frequency calls. In this project, I compared the sensitivity, specificity, precision, negative predictive value and accuracy of Kaleidoscope Pro and Avisoft SAS Lab Pro classifiers, at identifying *Litoria raniformis* calls in recordings with different types of background noise. The programs had similar accuracy, although Kaleidoscope's accuracy was more variable than Avisoft. The Kaleidoscope classifier had higher specificity and precision, whilst the Avisoft classifier had higher sensitivity and negative predictive value. These metrics differed significantly when recordings were dominated by aircraft noise, likely due to differences in how the programs process background noise and acoustic interference. My findings highlight the need to choose an appropriate bioacoustic-analysis program for an individual application and indicate that Avisoft may be more appropriate for monitoring *L. raniformis* in soundscapes dominated by aircraft noise.