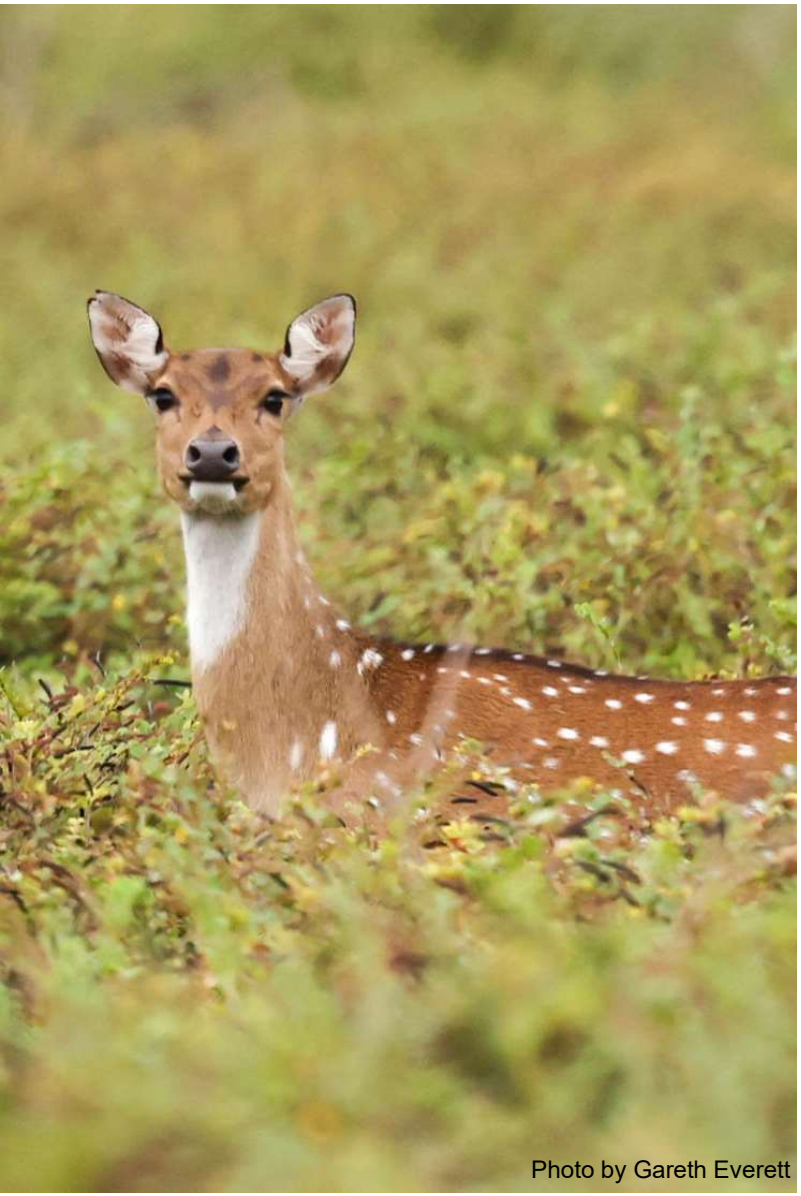

Photo by Gareth Everett

A Sound Strategy

The Efficacy of Monitoring Invasive Chital Deer Using Acoustic Recorders

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Supervised by

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Matthew Quin

Slade Allen-Ankins

National Feral Deer Action Plan

Australian Government
Department of Agriculture, Fisheries and Forestry

JAMES COOK UNIVERSITY AUSTRALIA

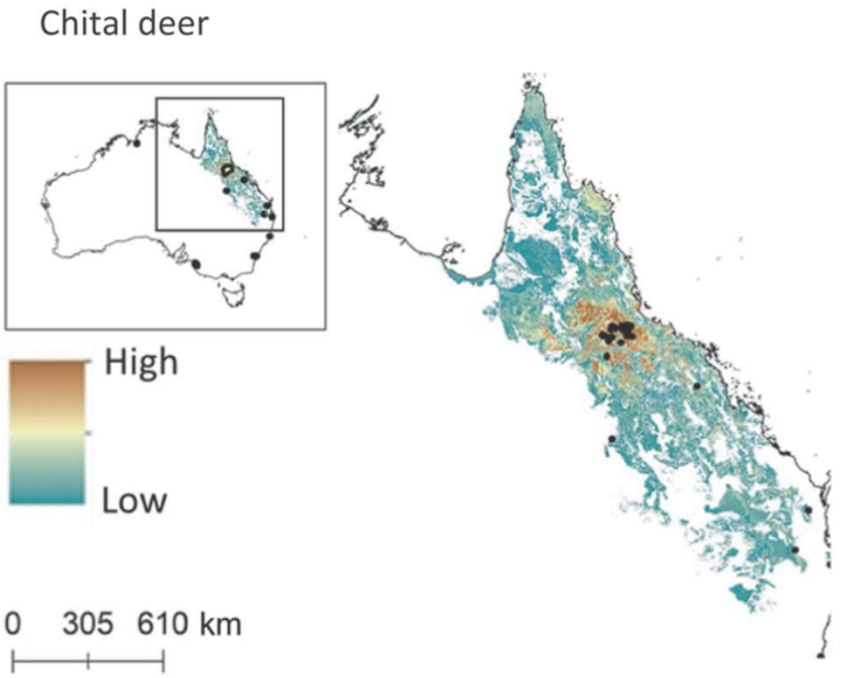
TNQ Drought Hub

Acknowledgement of Country

I acknowledge the Australian Aboriginal and Torres Strait Islander people as the first inhabitants of this country and pay my respects to the Traditional Owners and Elders, past and present, of the land on which we stand today.

I pay my respects to the Traditional Owners and Elders, past and present, of the land on which my work takes place, the Gugu Badhun people

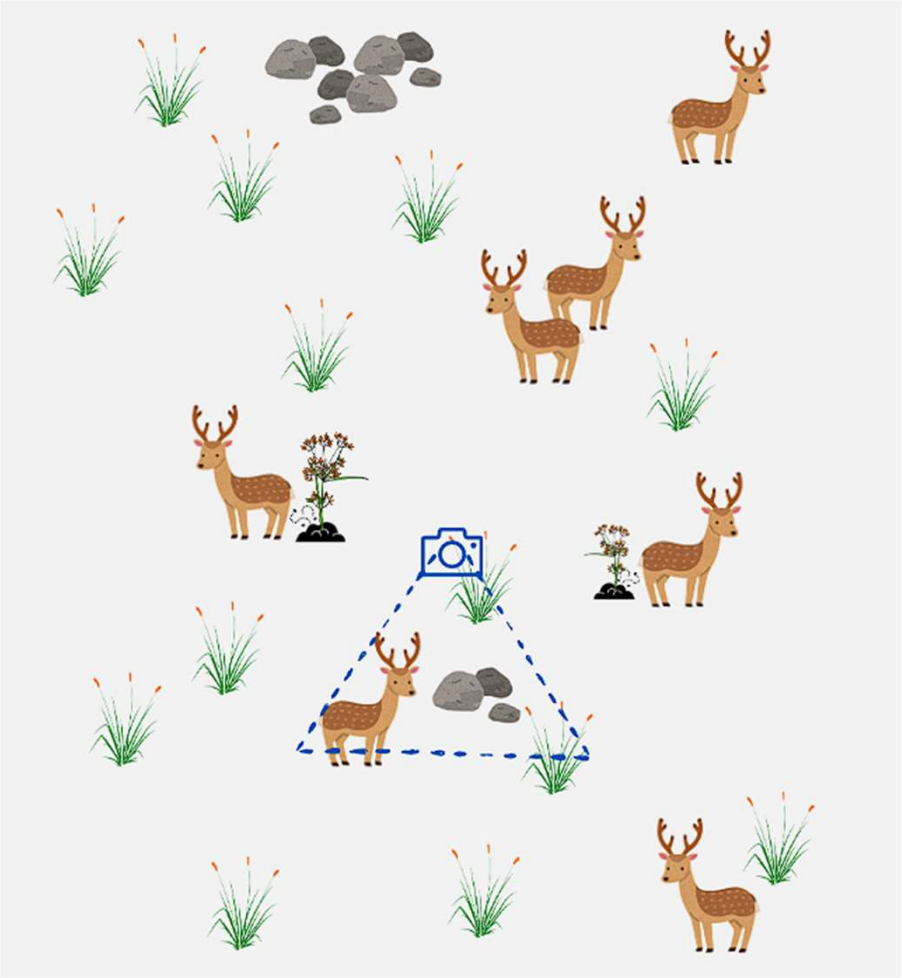
Chital Deer are an Emerging Threat



Kelly et al., 2023


Management Responses
National Feral Deer Action Plan
Goal 1
Stop the spread of large populations and reduce their impact
Goal 2
Control or eradicate small populations before they spread
Goal 3
Protect significant sites from impacts

Camera Trapping



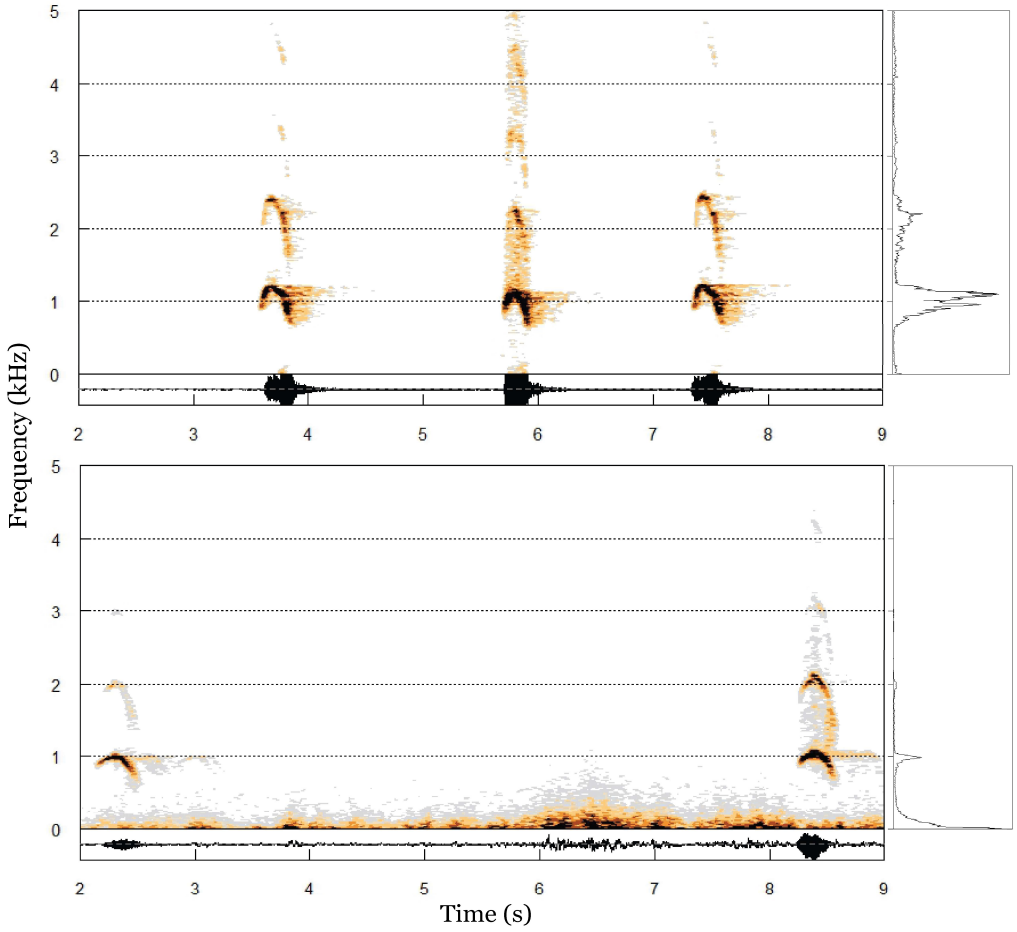
Advantages:

- Enables counting and sometimes identification of individuals

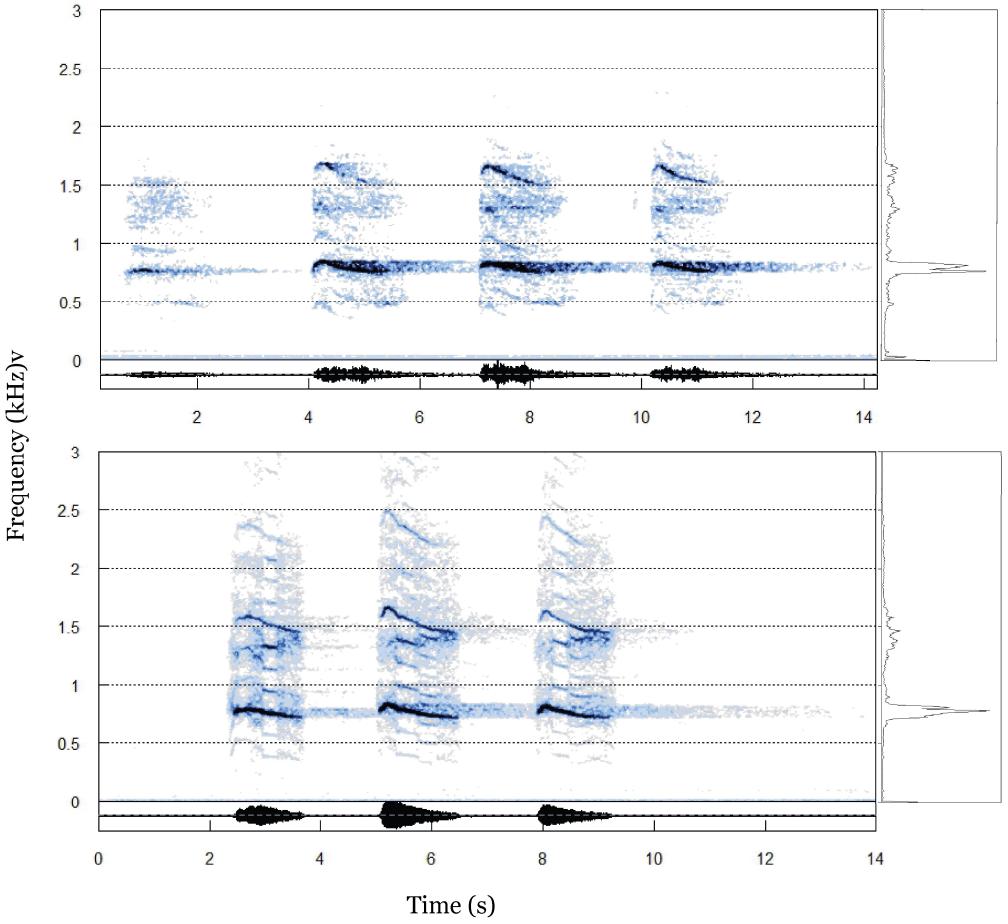
Constraints:

- Field of view is easily obstructed
- Restricted area of detection

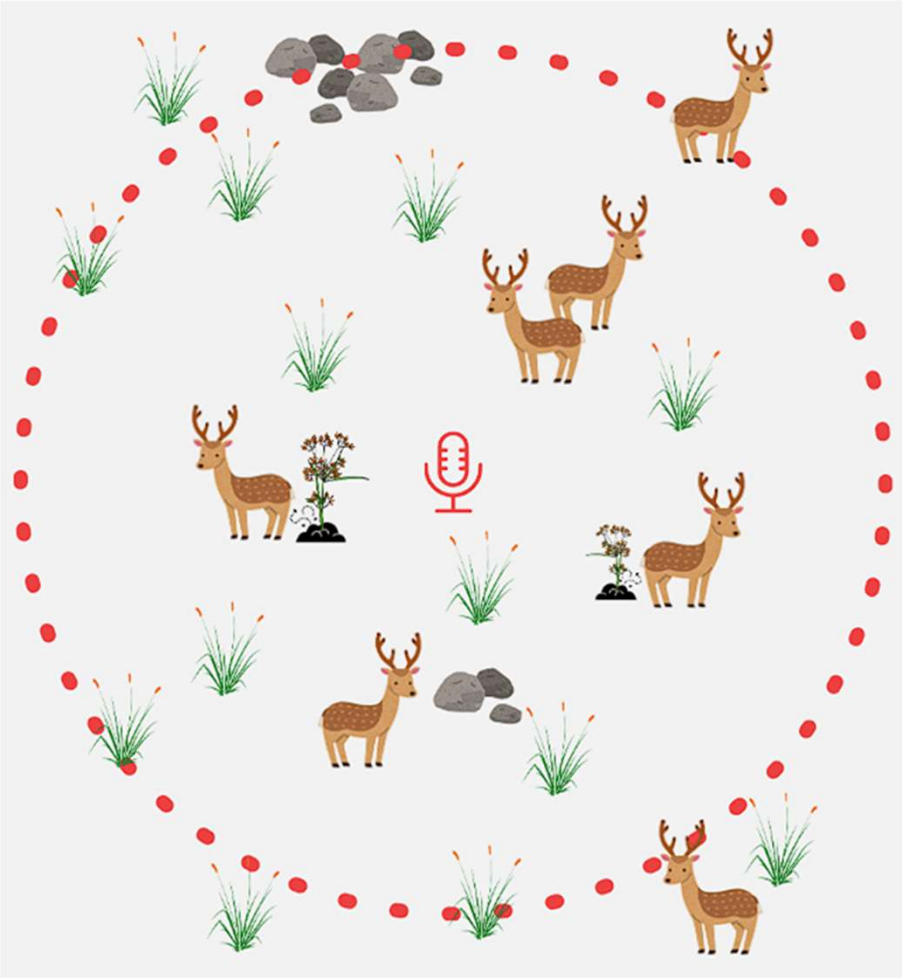
CHIRP



RUT



Passive Acoustic Monitoring

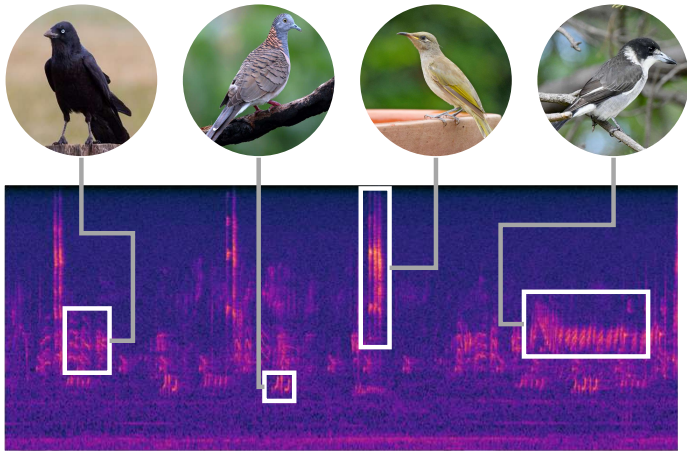


Advantages:

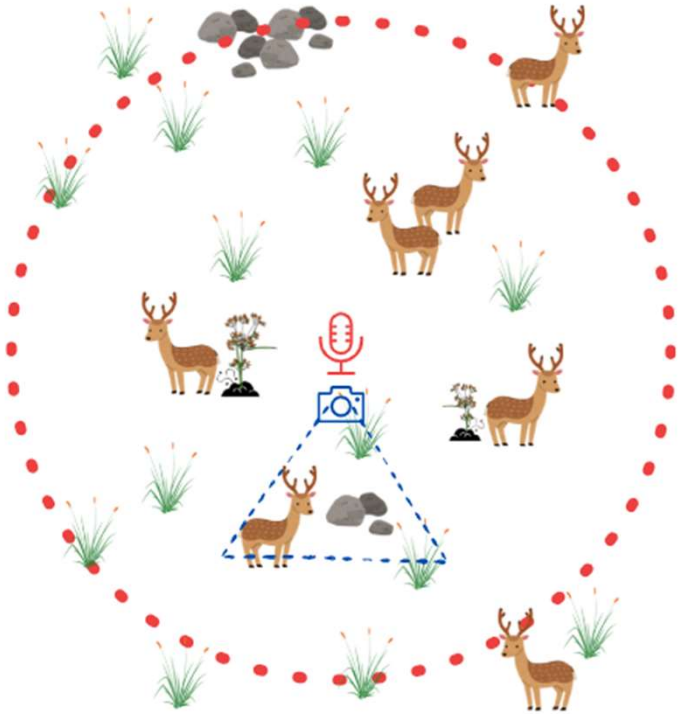
- Sound can be recorded from all directions
- Sound is rarely obstructed

Constraints:

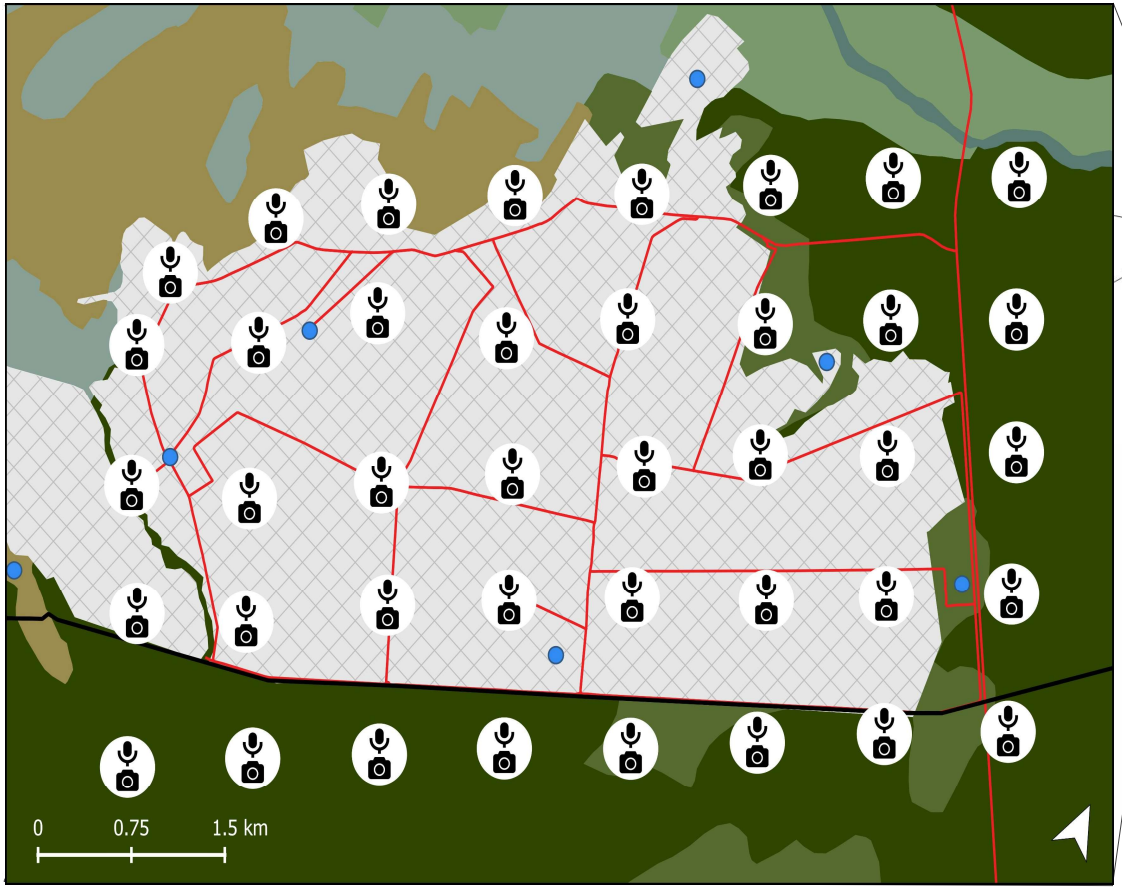
- It is difficult to directly count or identify individuals.
- Target species must vocalise regularly

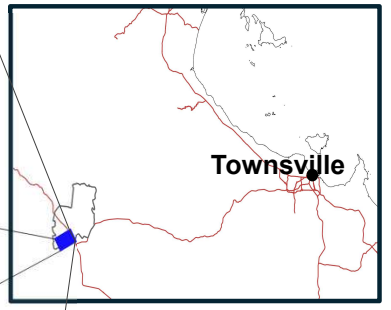


Aim to **evaluate** the **utility** of **acoustic recorders** to **detect invasive Chital deer** compared to **camera traps**



Study Site: Spyglass Beef Research Facility, North Queensland





Cleared Areas

Eucalyptus Woodland on Sand Plains

Eucalyptus Woodland on Red Kandosols

Acacia Low Woodland on Mesas

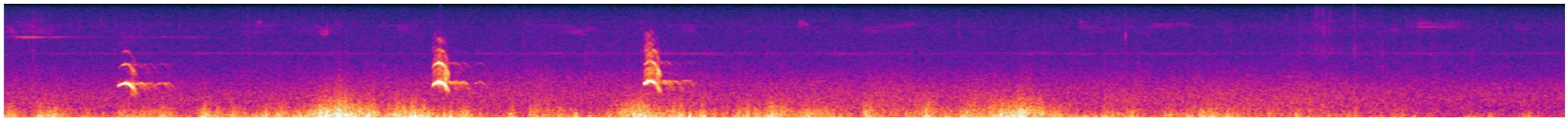
Eucalyptus Woodland on Igneous Rock

Eucalyptus Woodland on Alluvial Levees

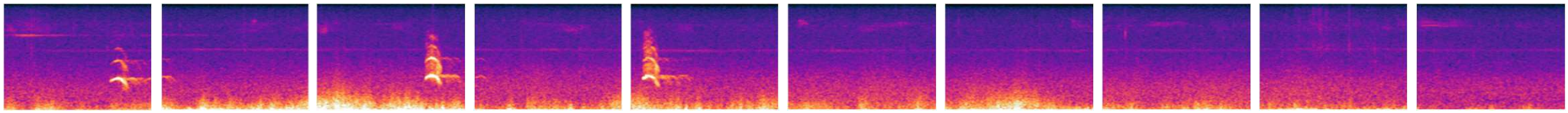
Fringing Eucalyptus Woodland on Water Channels

Automating Chital Deer Call Detection: How does it work?

Raw Audio

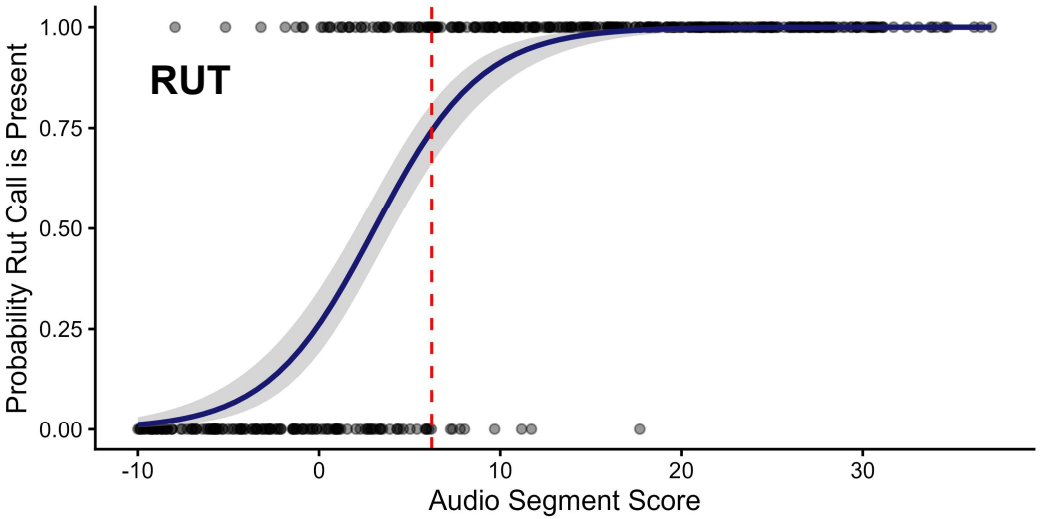


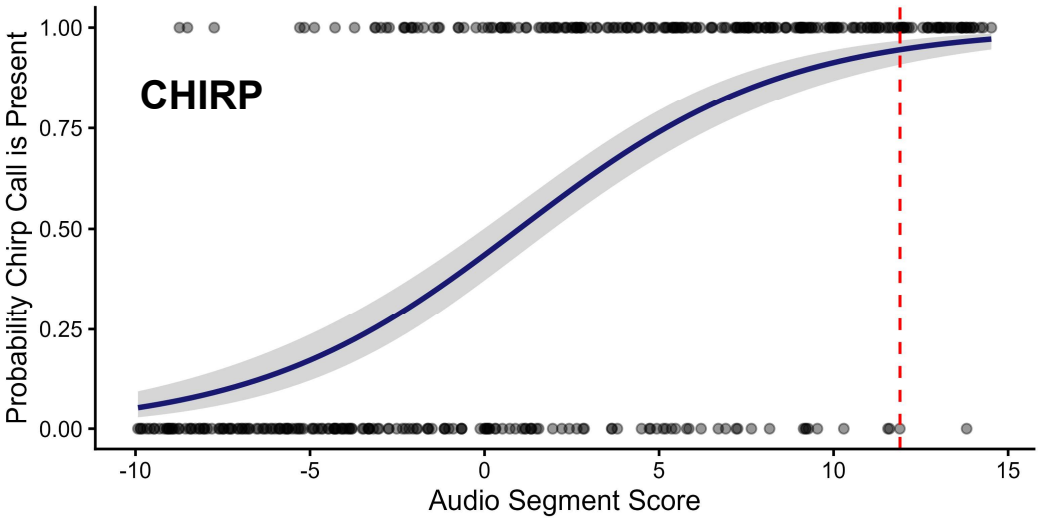
Segment Audio + Quantify Likelihood the Desired Call Occurs within the Segment



8 -1 10 -3 9 -5 -4 -3 -7 -4

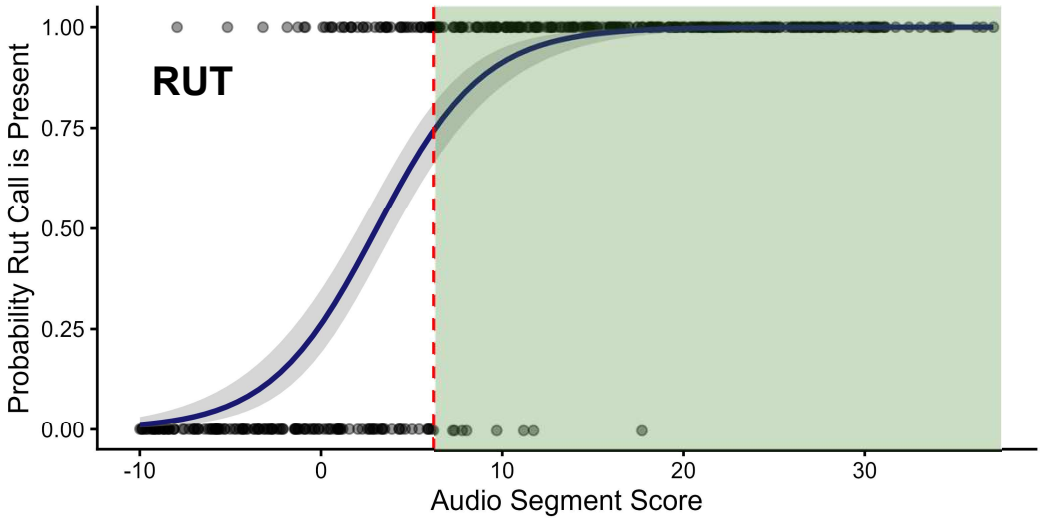
Automating Chital Deer Call Detection: How does it work?

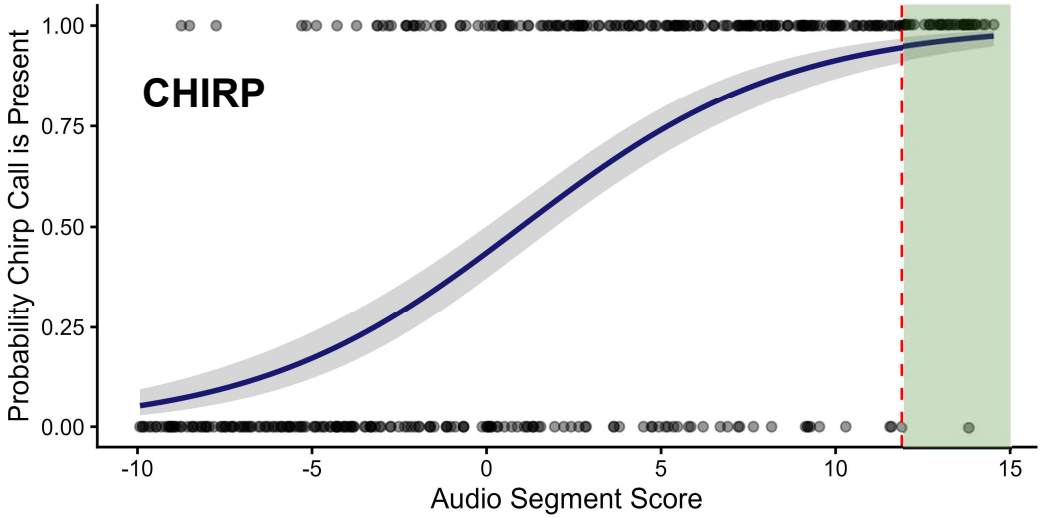




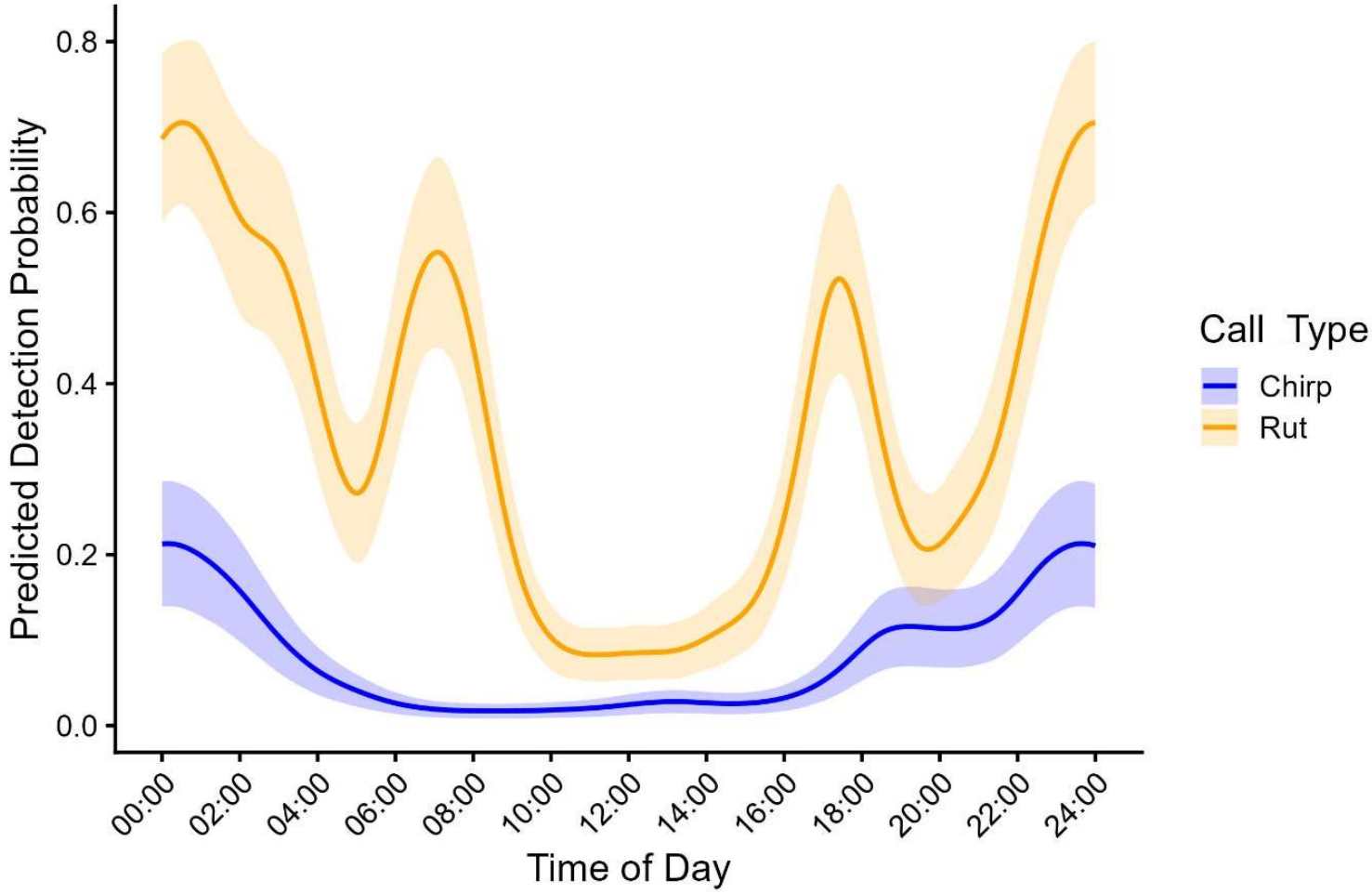
Automating Chital Deer Call Detection: How does it work?

- 98% of detections are true positive for both call types
- Rut classifier performs better than the Chirp classifier



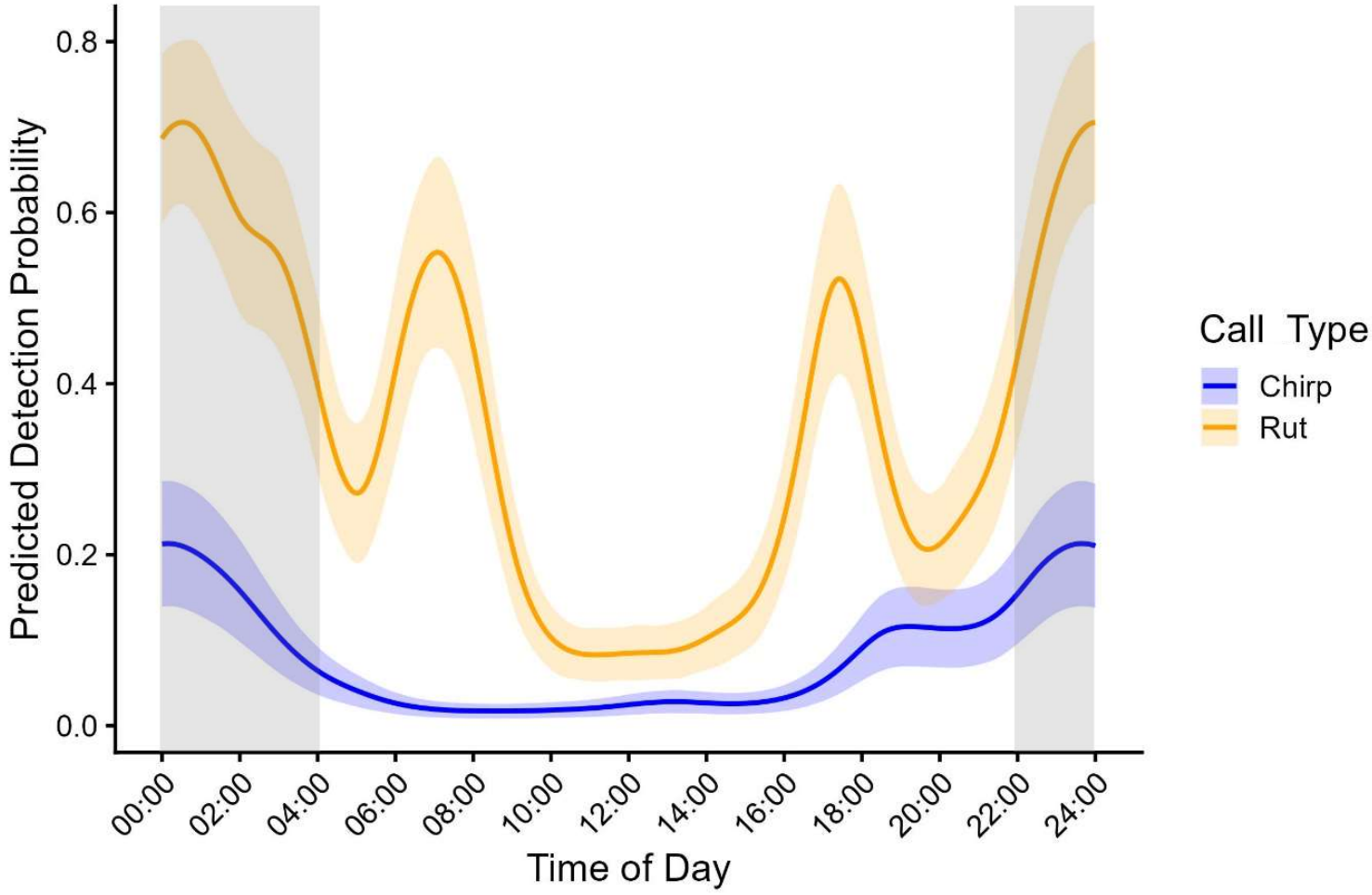


Describing Periods of Peak Acoustic Activity: Diel Patterns



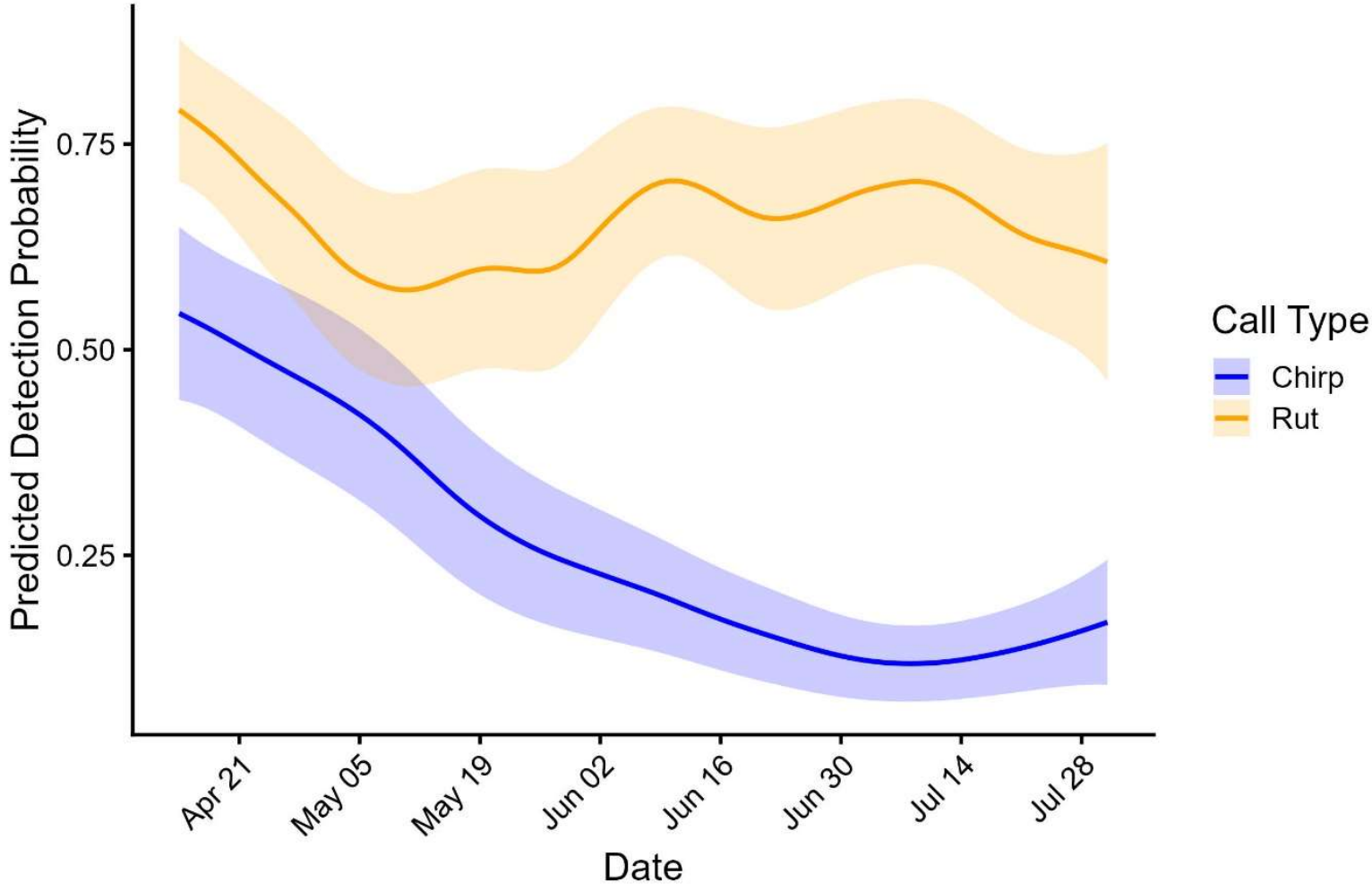
Describing Periods of Peak Acoustic Activity: Diel Patterns

- Diel peak from 10 pm to 4 am
- Continuous operating interval = 3 months

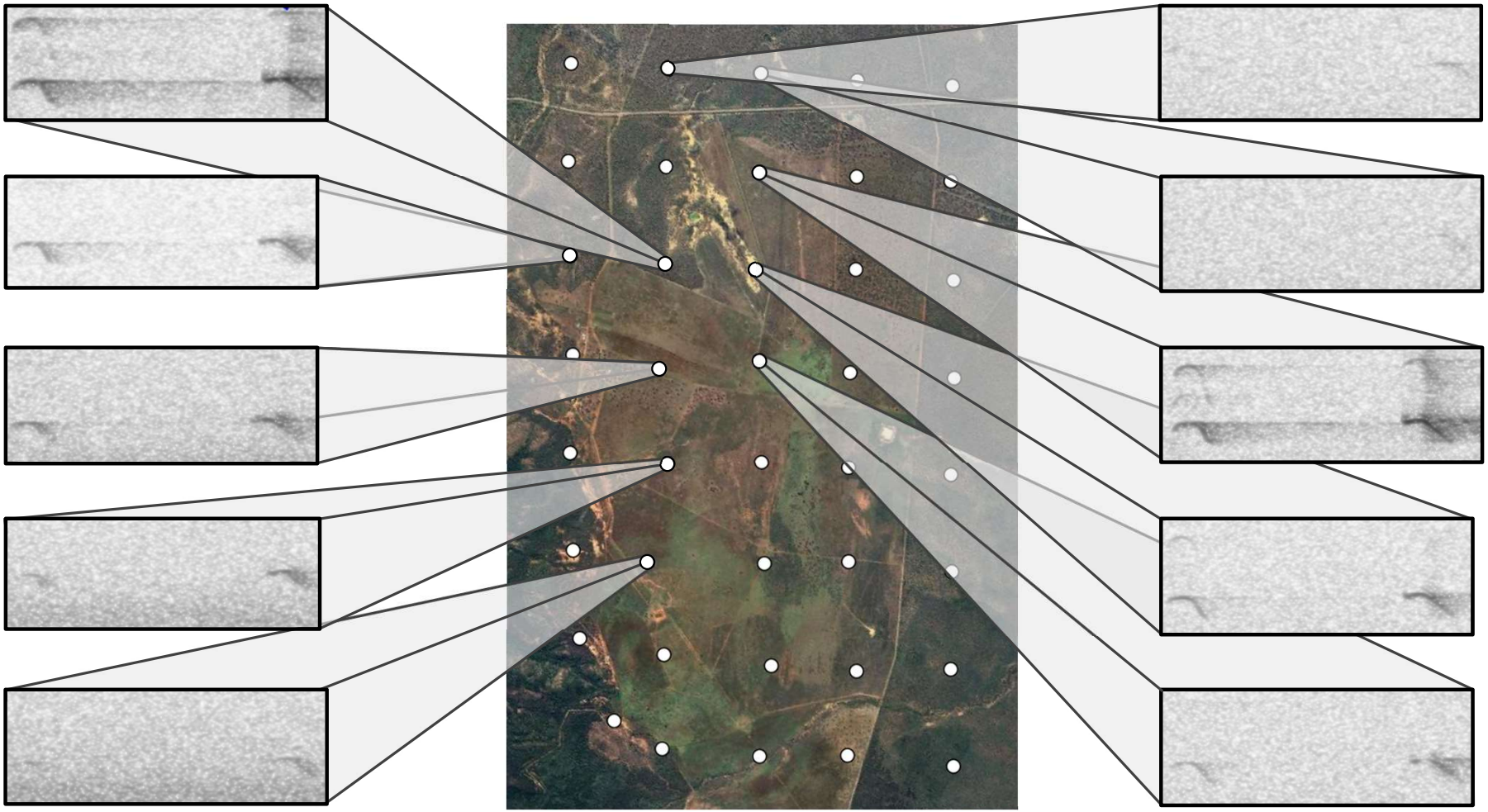


Describing Periods of Peak Acoustic Activity: Seasonal Patterns

- Both Calls Remain Detectable
- Rut is more likely to be detected compared to the Chirp call

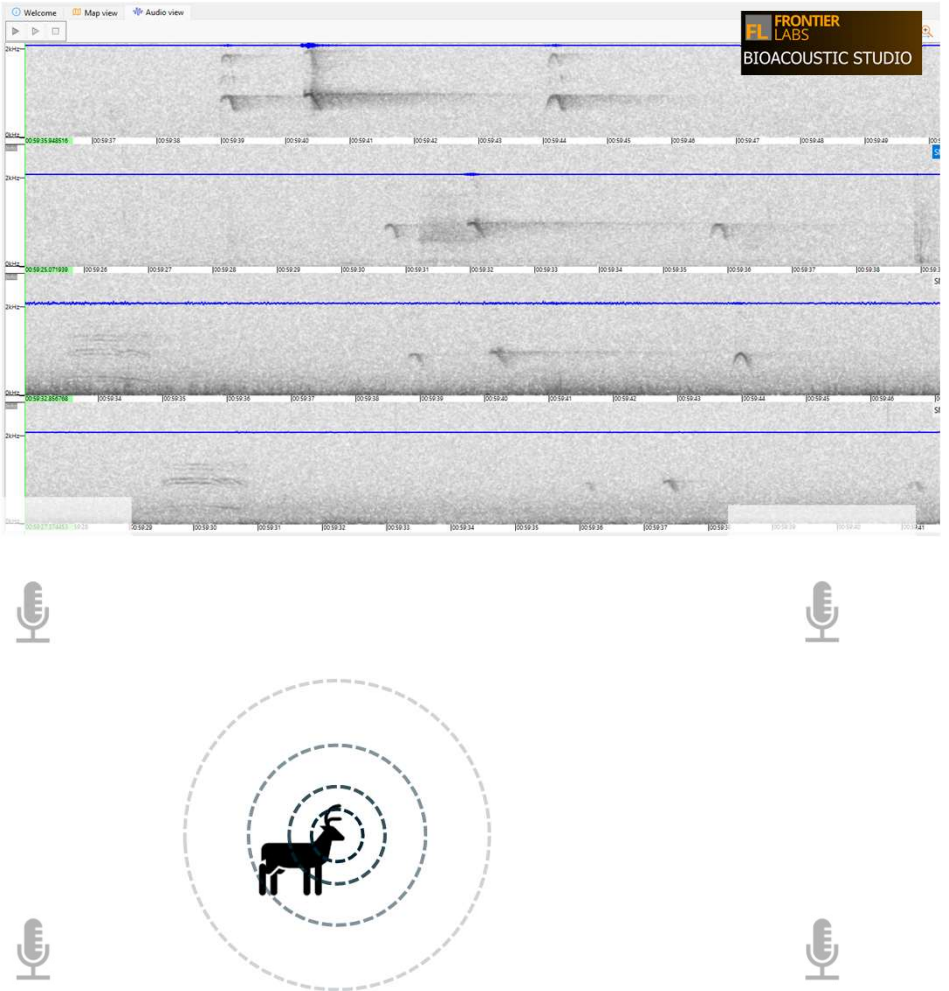


How Far Away Can We Detect a Call?



How Far Away Can We Detect a Call: Acoustic Localization

- Sound travels at ~340 m/s
- Compare the time difference of arrival between pairs of recorders
- Plot potential sources (follows a parabolic shape)



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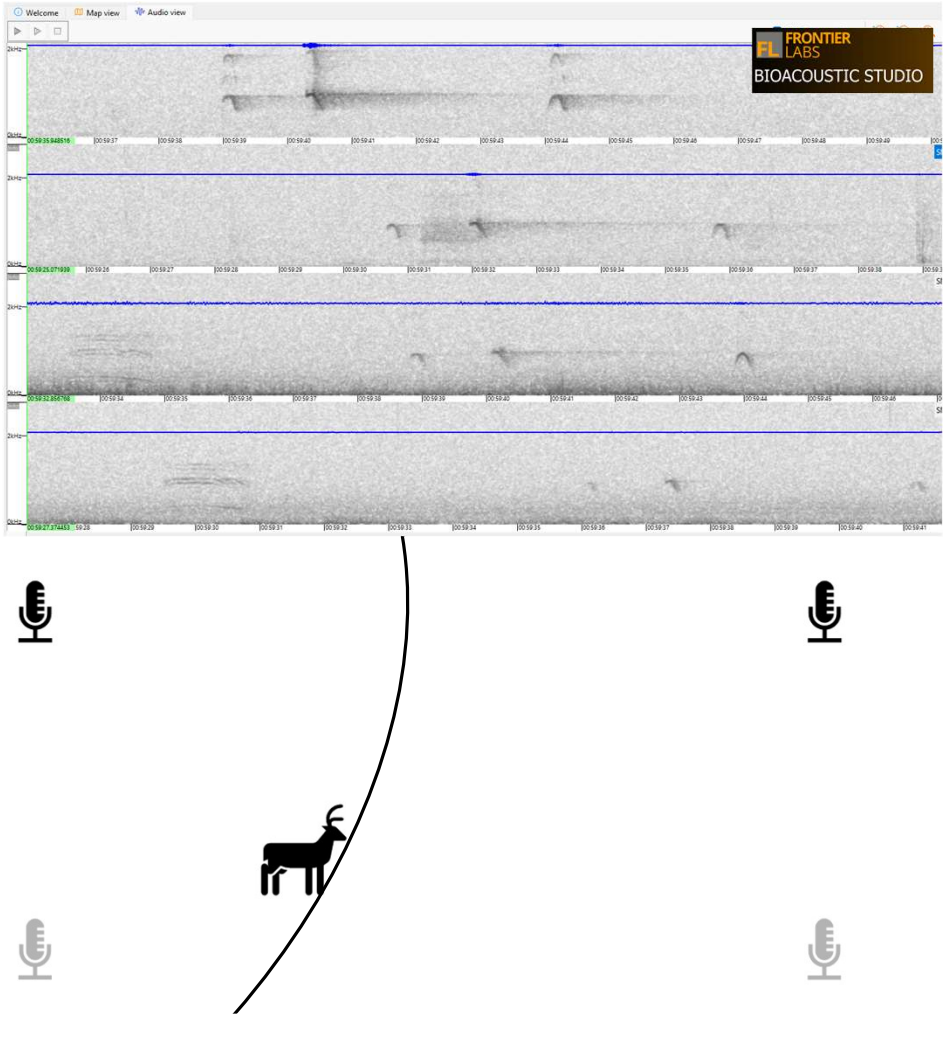

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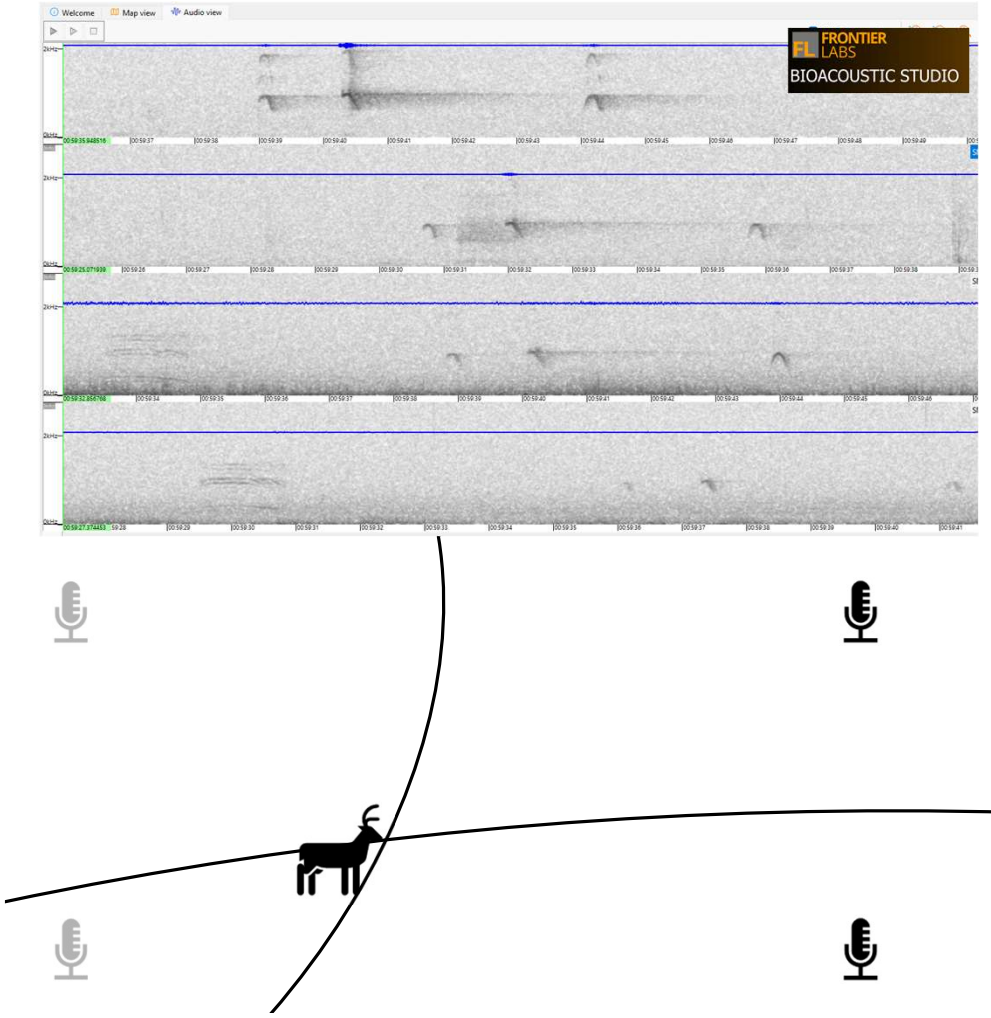

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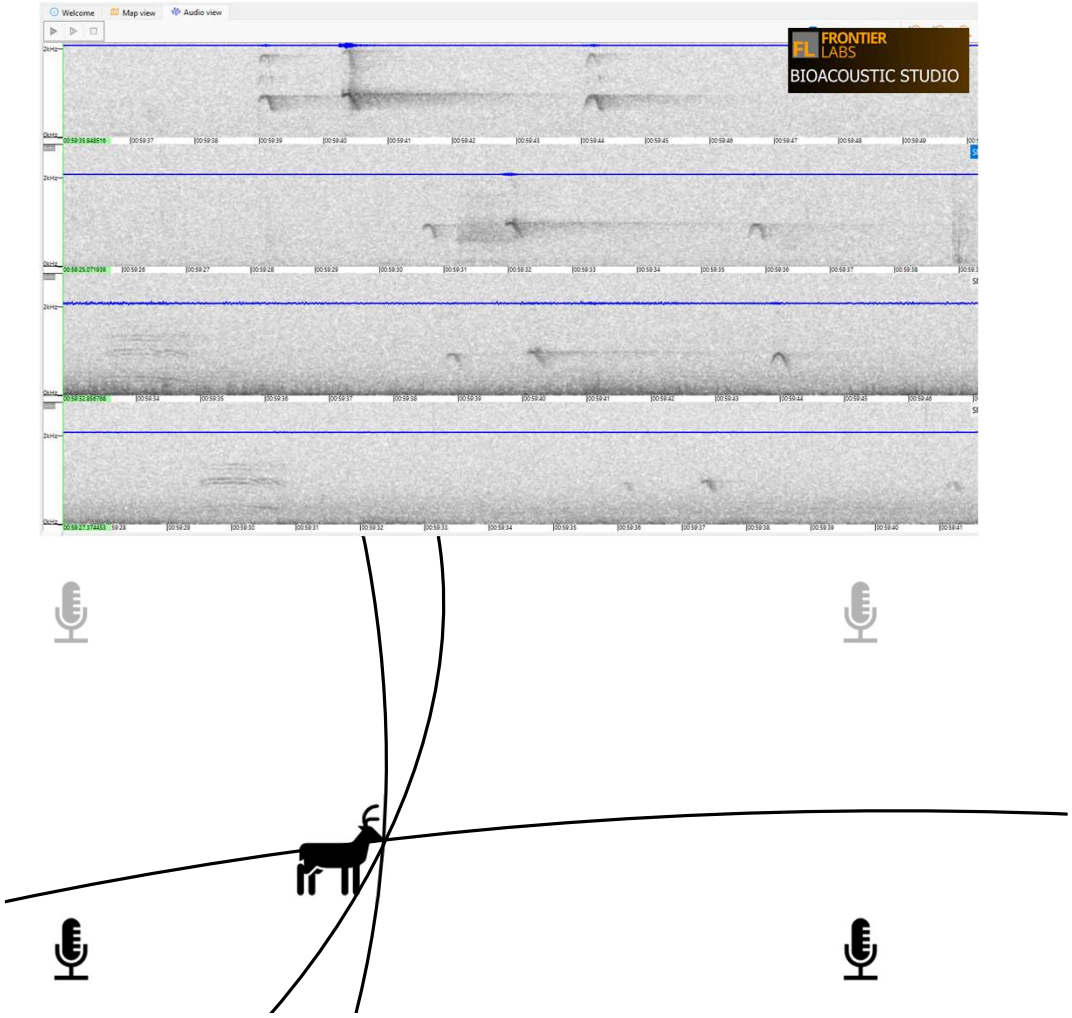

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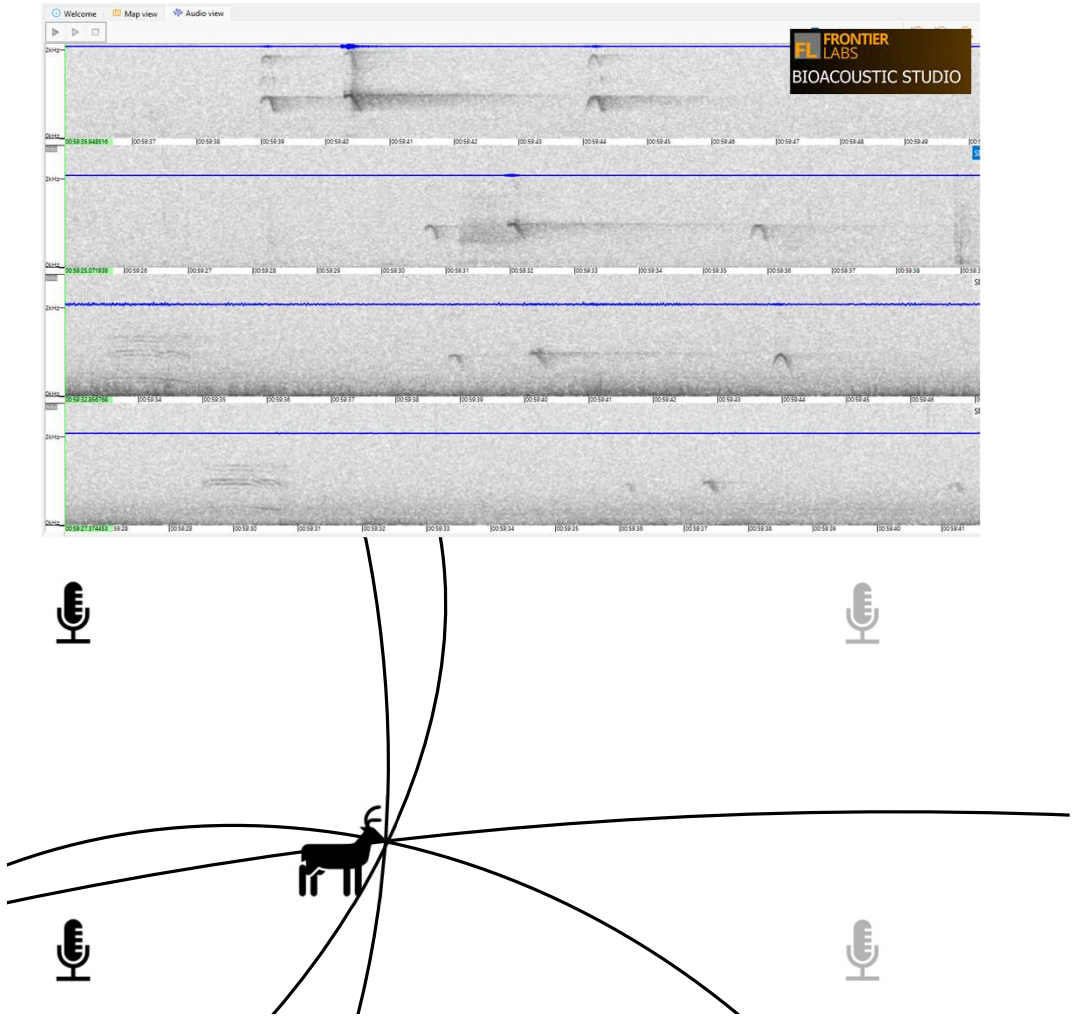
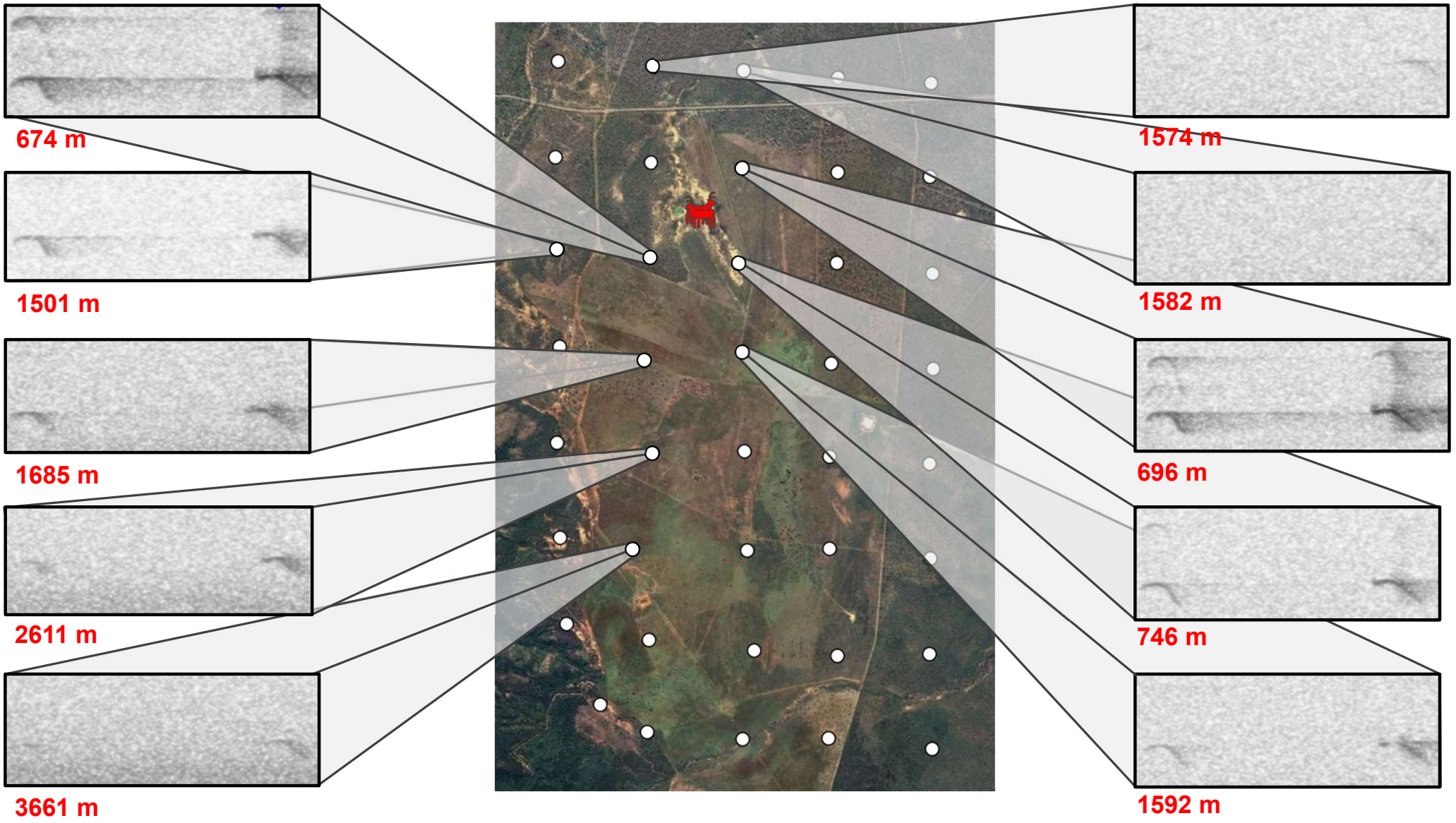
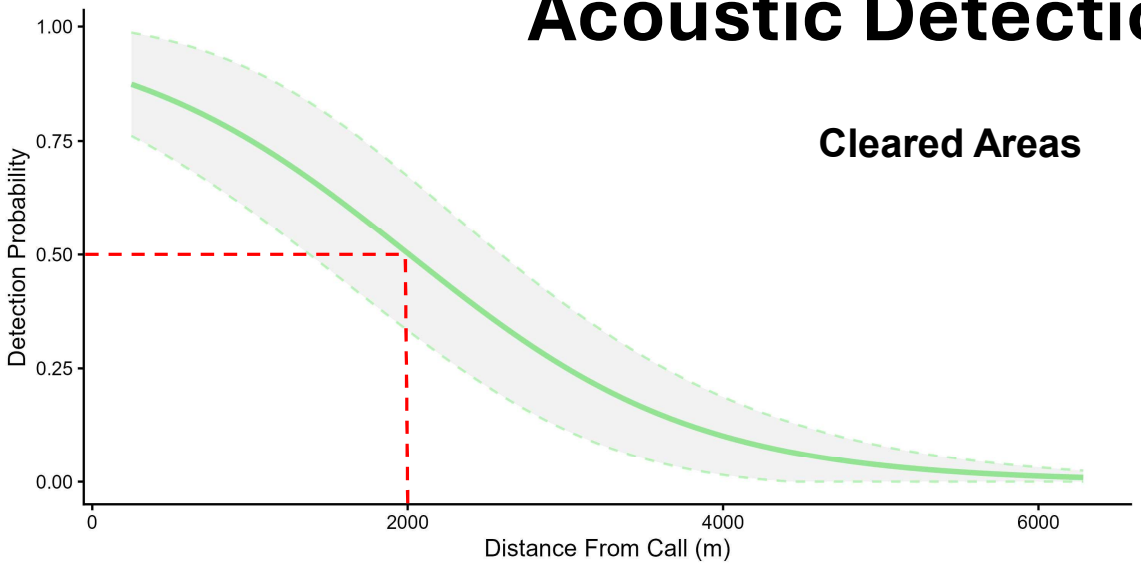
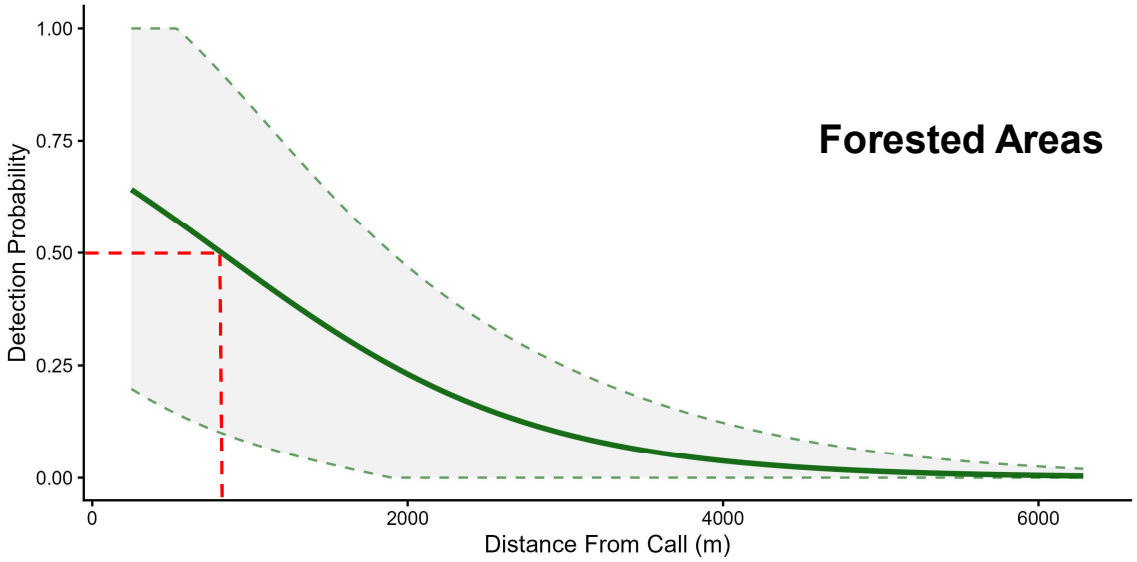



674 m
1501 m
1685 m
2611 m
3661 m
1574 m
1582 m
696 m
746 m
1592 m

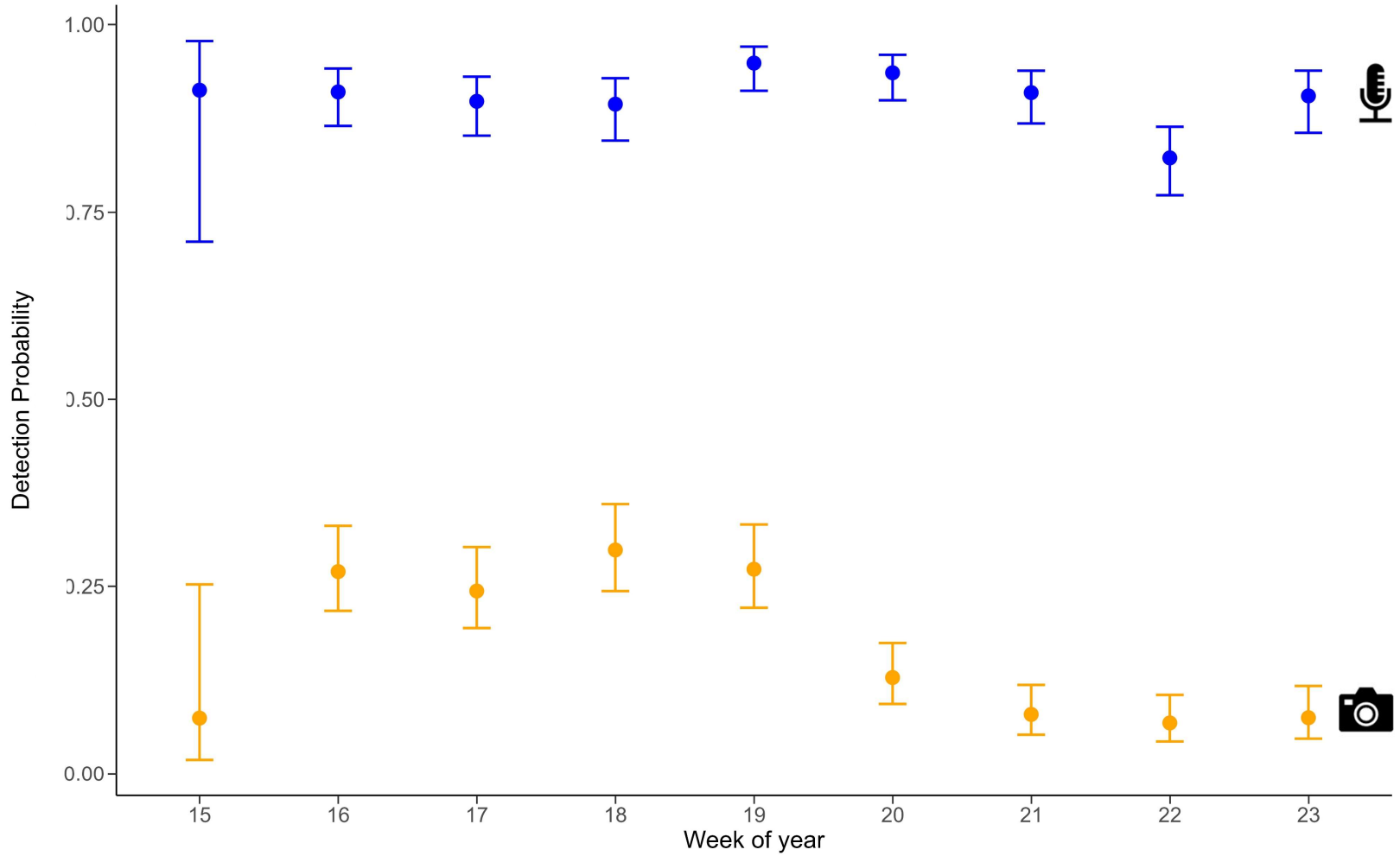
Acoustic Detection Distance

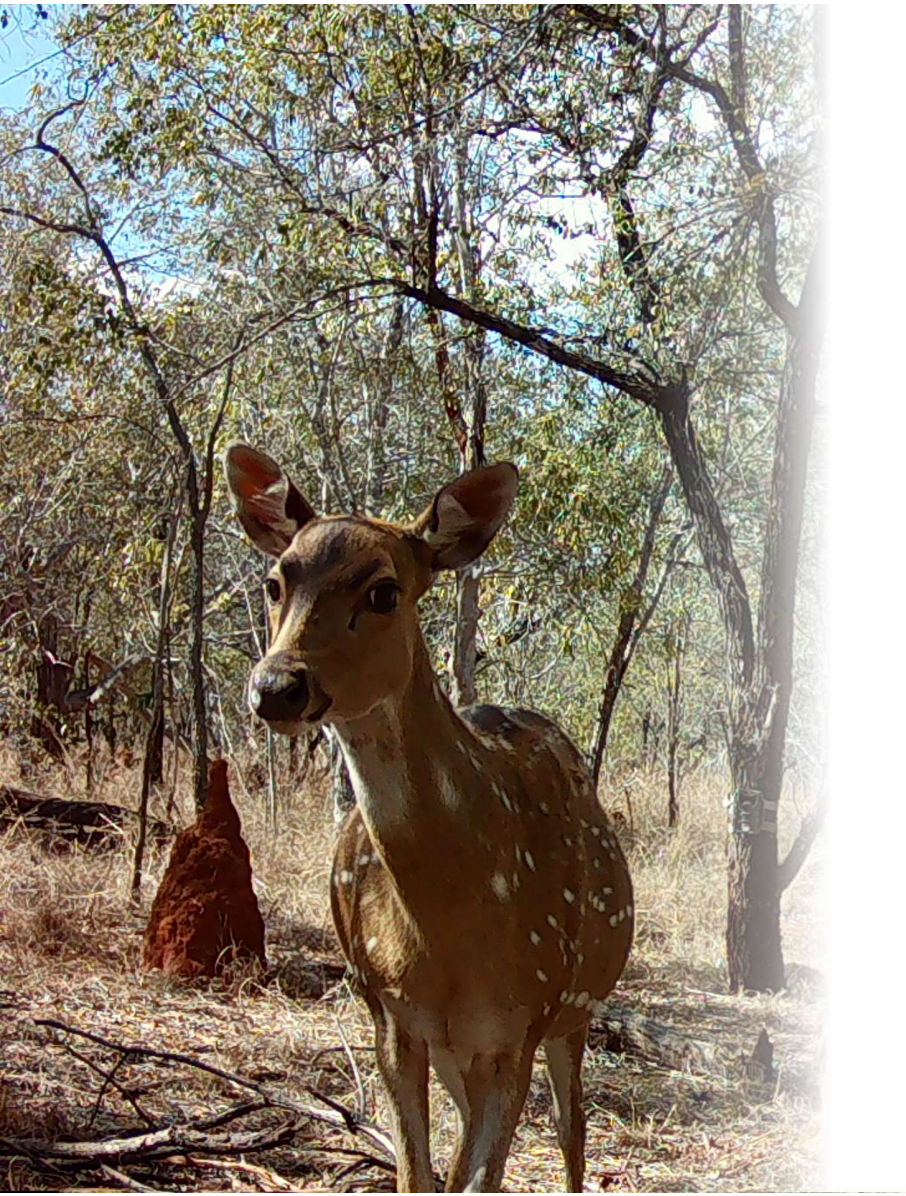




Distance	Detection Probability	Survey Area
1 km	75% - 46%	3.1 km^2
2 km	50% - 23%	12.6 km^2
3 km	25% - 10%	28.3 km^2

Comparing Detection Probabilities





Key Takeaways

1. Acoustic monitoring is an efficient early detection surveillance method for Chital deer

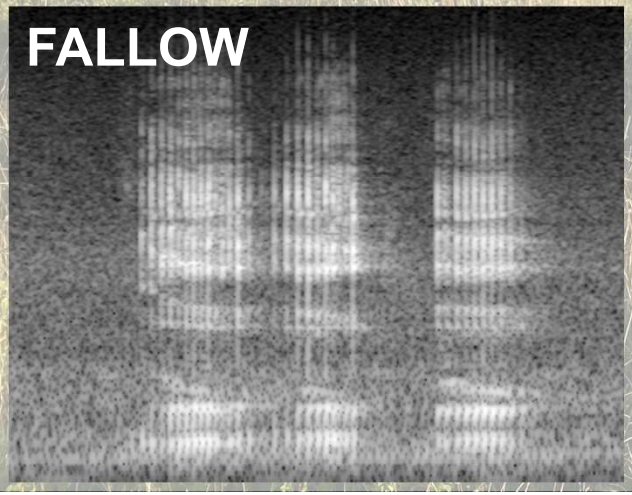
2. The survey area covered by recorders is substantially greater than cameras

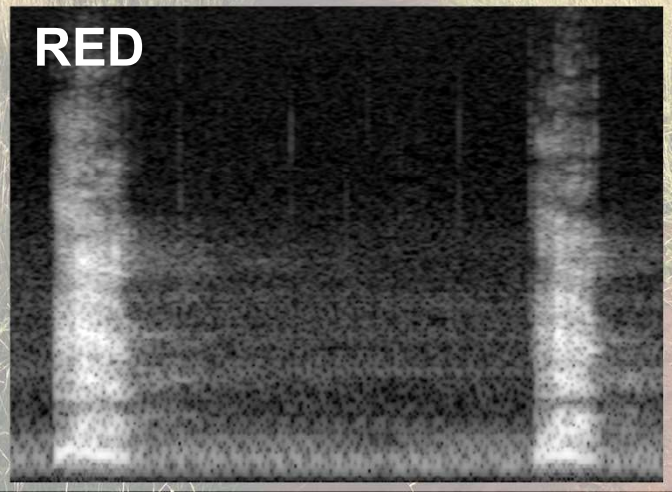
3. Precise locations of vocalizing deer are obtainable using recorder arrays

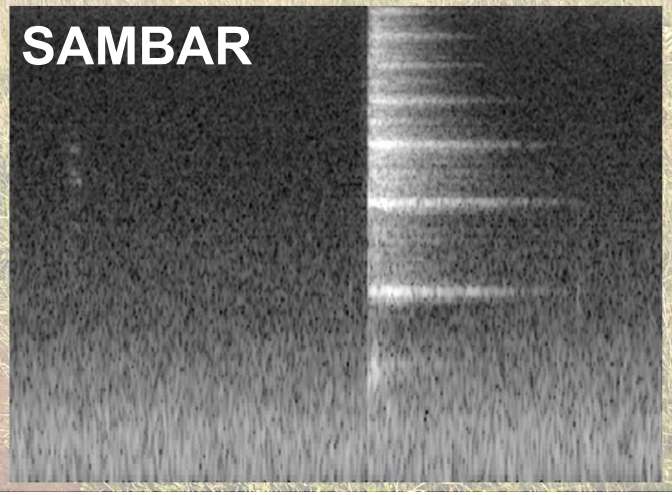
Future Opportunities

Every other invasive Deer in Australia vocalizes

Acoustic Monitoring is potentially more efficient than other early detection methods







Acknowledgements

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Michelle Martinez – Administrative and Field Assistance

Gareth Everett – Field Assistance