Using bioacoustics to monitor endangered amphibians and measure translocation success

David Newell* & Liam Bolitho

Queensland National Parks
keep discovering

Australian Government

Southern Cross University

saving our species

The Mountain frogs

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A new species of *Philoria* (Anura: Limnodynastidae) from the uplands of the Gondwana Rainforests World Heritage Area of eastern Australia

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Liam Bolitho

Matt Hollanders

https://phys.org/news/2017-09-baw-frog-charms-extinction.html

Grant Webster

The Red and Yellow Bellied Mountain Frog

(Philoria kundagungan)

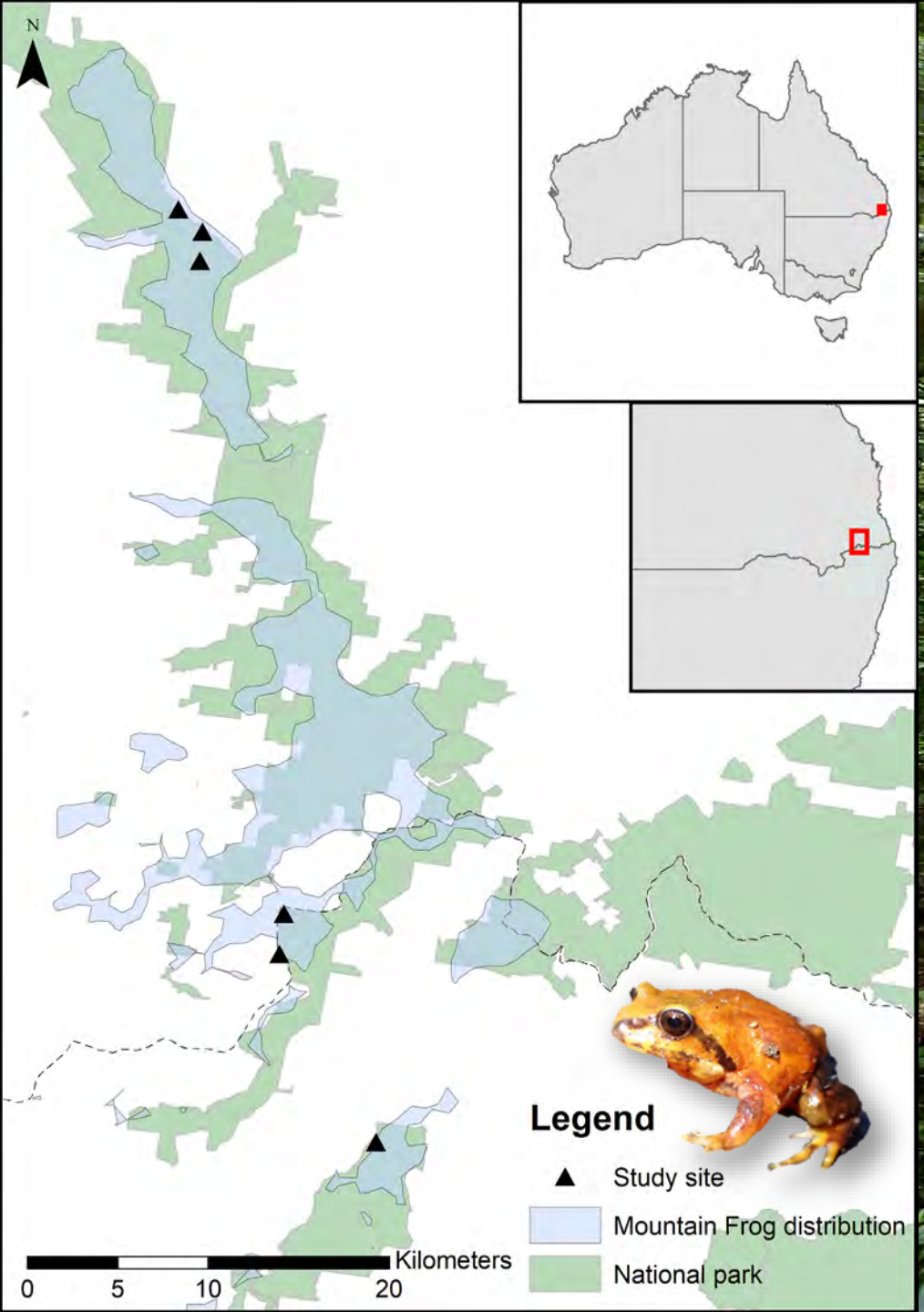
Described in 1975 (Ingram et al 1975)
Until recently, only known from six locations

N

0 10 20 40 60 Kilometers

Overview

- Adults are small (3 cm) and rarely encountered outside of their subterranean breeding chamber (poor dispersal and low fecundity)
- Key threats – Climate change, small population size, pigs and disease
- Detection relies almost entirely upon hearing calls of breeding males in Spring / Summer

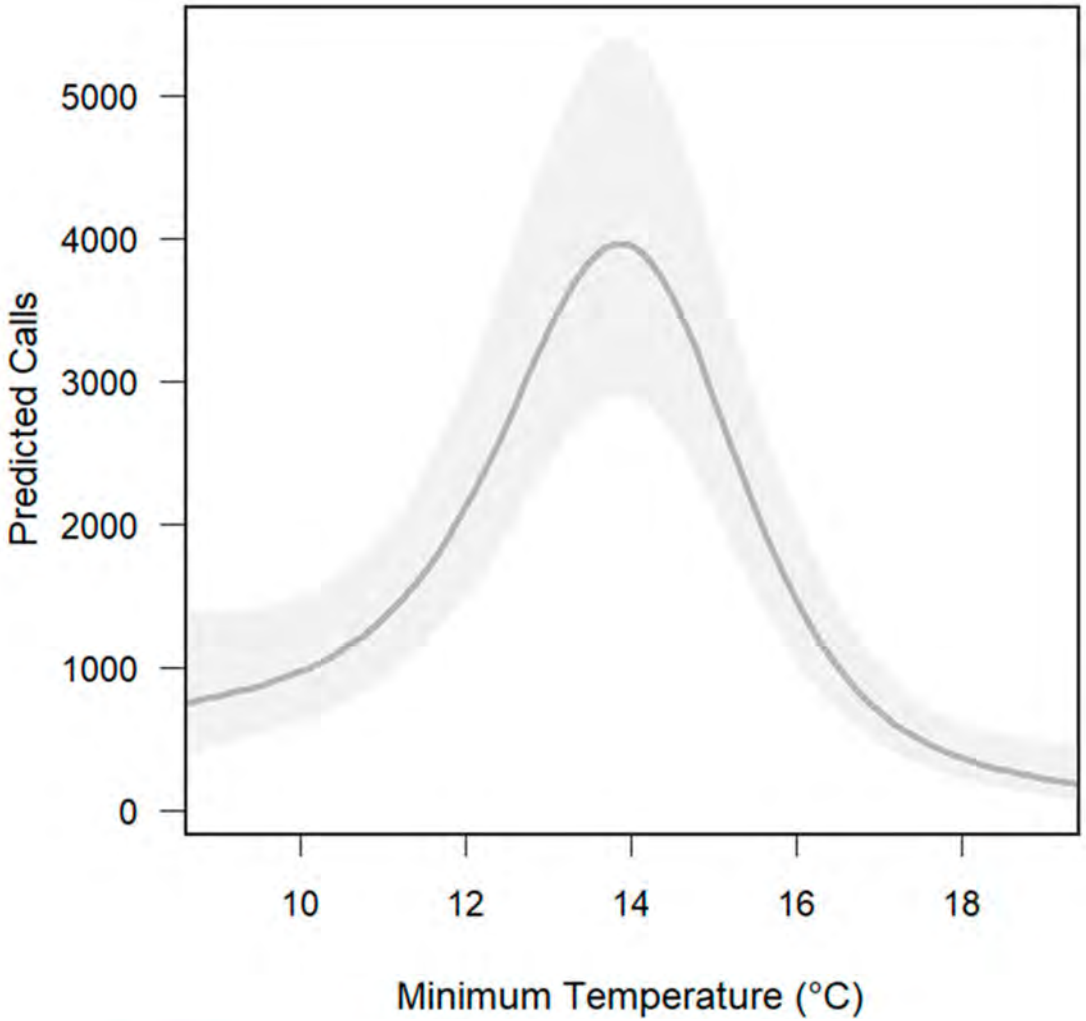


Songmeters deployed at 6 locations recording 10 min per hour over 2 years

54k x 10 min recordings = 9000 hours

Used Kaleidoscope Pro 5.1 to build recogniser (precision of 0.95)

Detected 1,899,682 P. kundagungan vocalisations



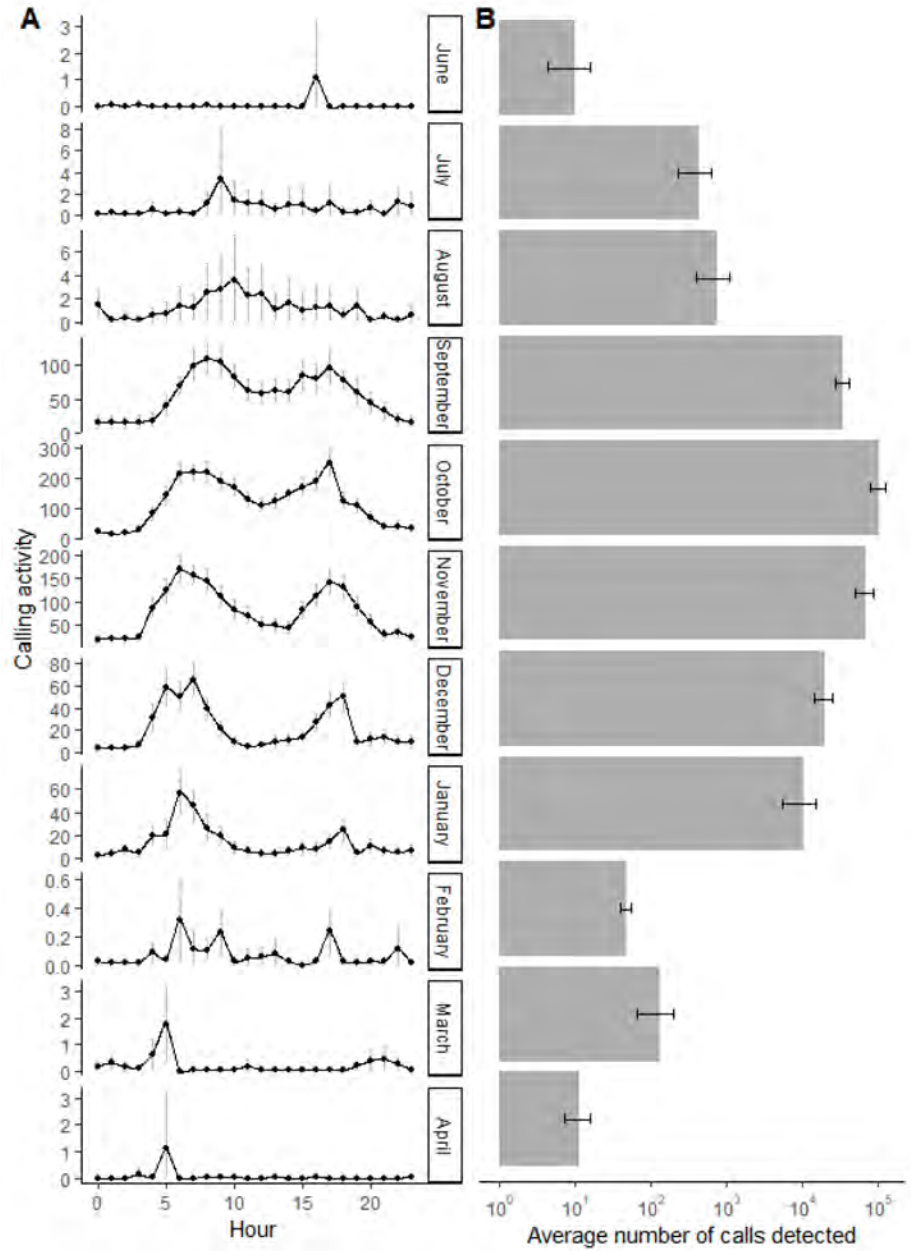
diversity

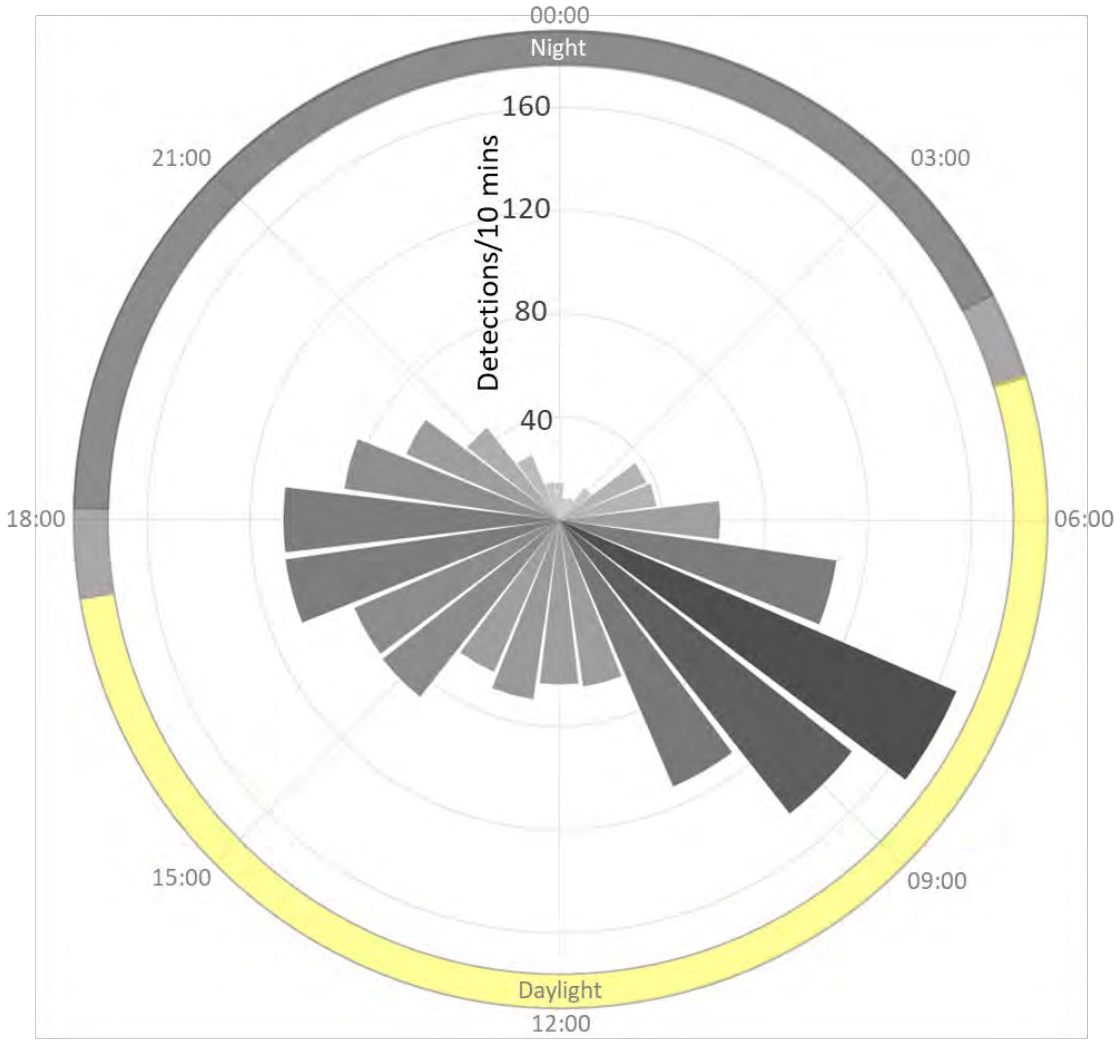
MDPI

Article

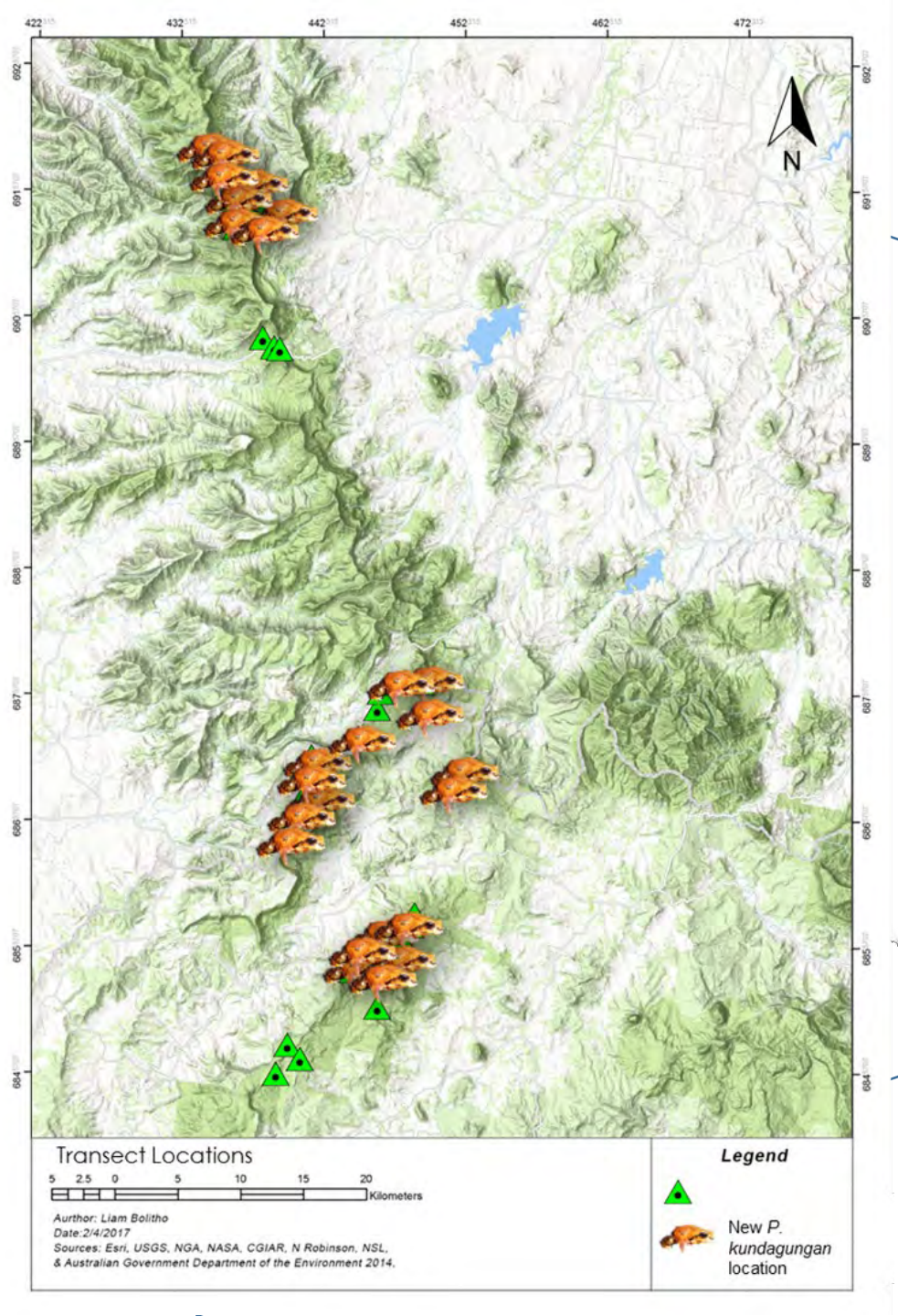
Bioacoustic Monitoring Reveals the Calling Activity of an Endangered Mountaintop Frog (*Philoria kundagungan*) in Response to Environmental Conditions

Liam Bolitho [1], David Newell [1,*] and Harry Hines [2,3]





The mean number of calls detected at hourly intervals at five sites between the 25th of September and the 4th of October in 2016 and 2017. Shaded areas on the perimeter of the graph indicate day and night.

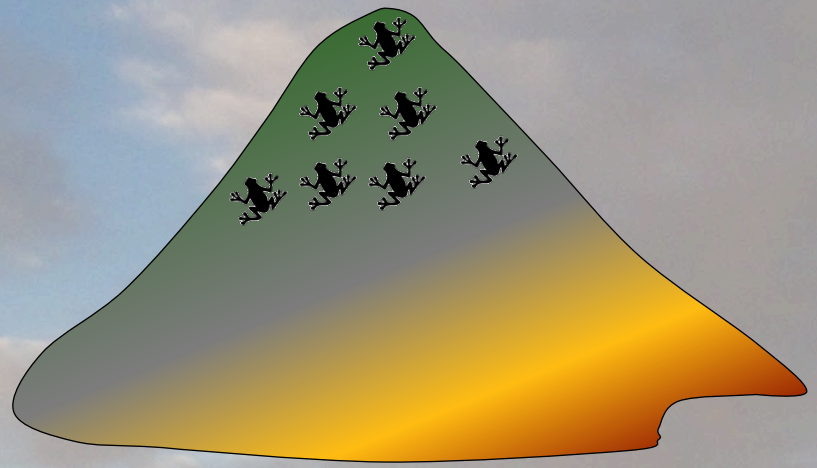


Occupancy models

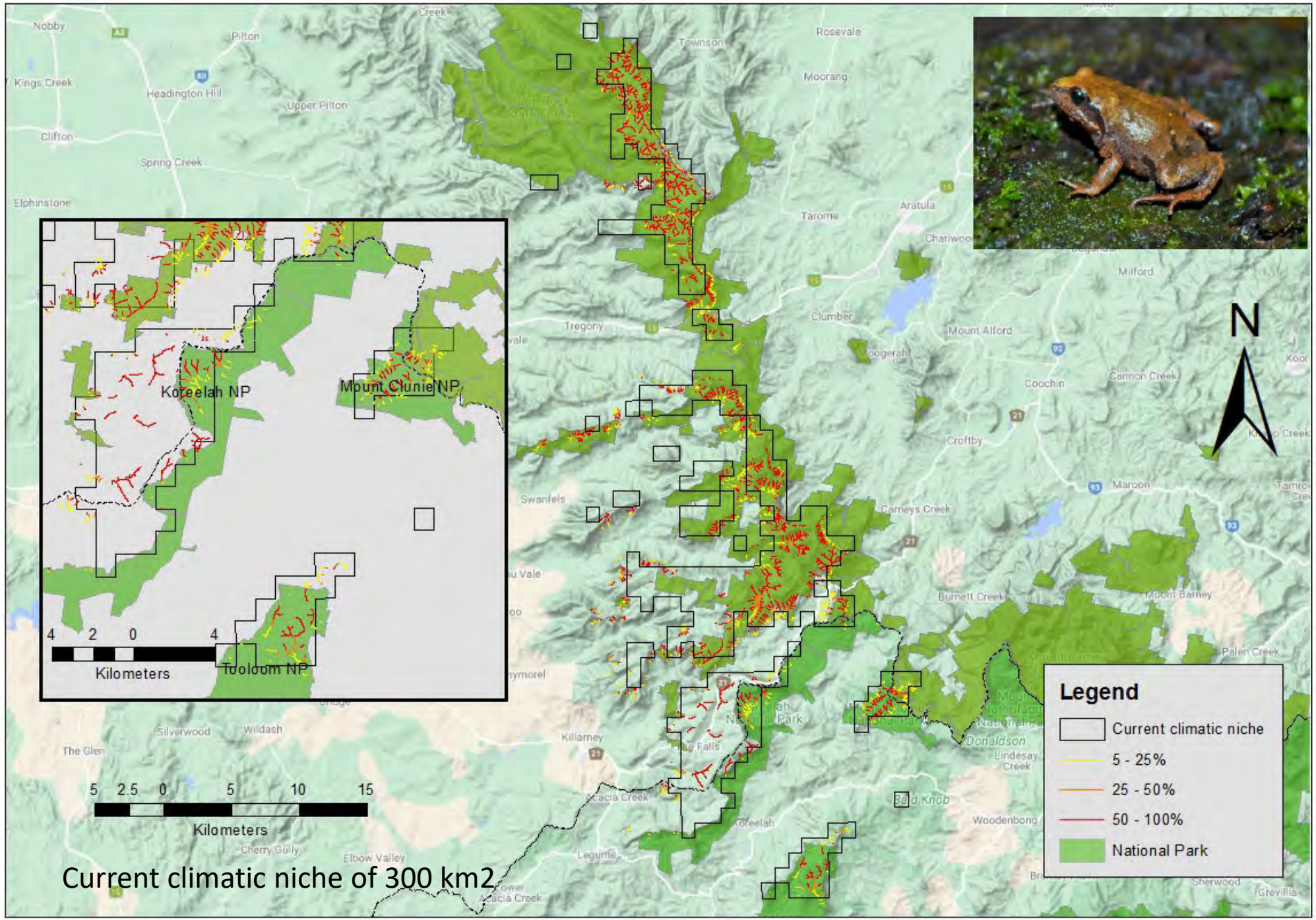
- 32 x 100 m transects searched (diurnally) three times over a single season.
- Covariates measured during surveys (temp, rainfall, humidity) along with site level factors (elevation, aspect)
- Frogs were detected on 52 occasions from 21 of the sites (detection rates >70%)
- The average number of frogs detected was 3.24 +/- 0.54 and detection decreased with increasing temperature
- Elevation was a strong driver of occupancy, with sites >930M having a 0.95 likelihood of occupancy

Queensland

New South Wales

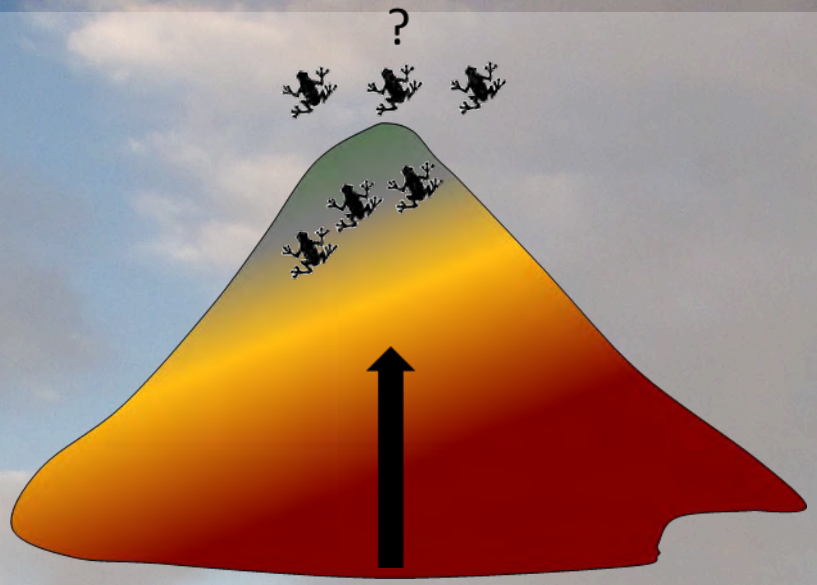


Preferred Climate

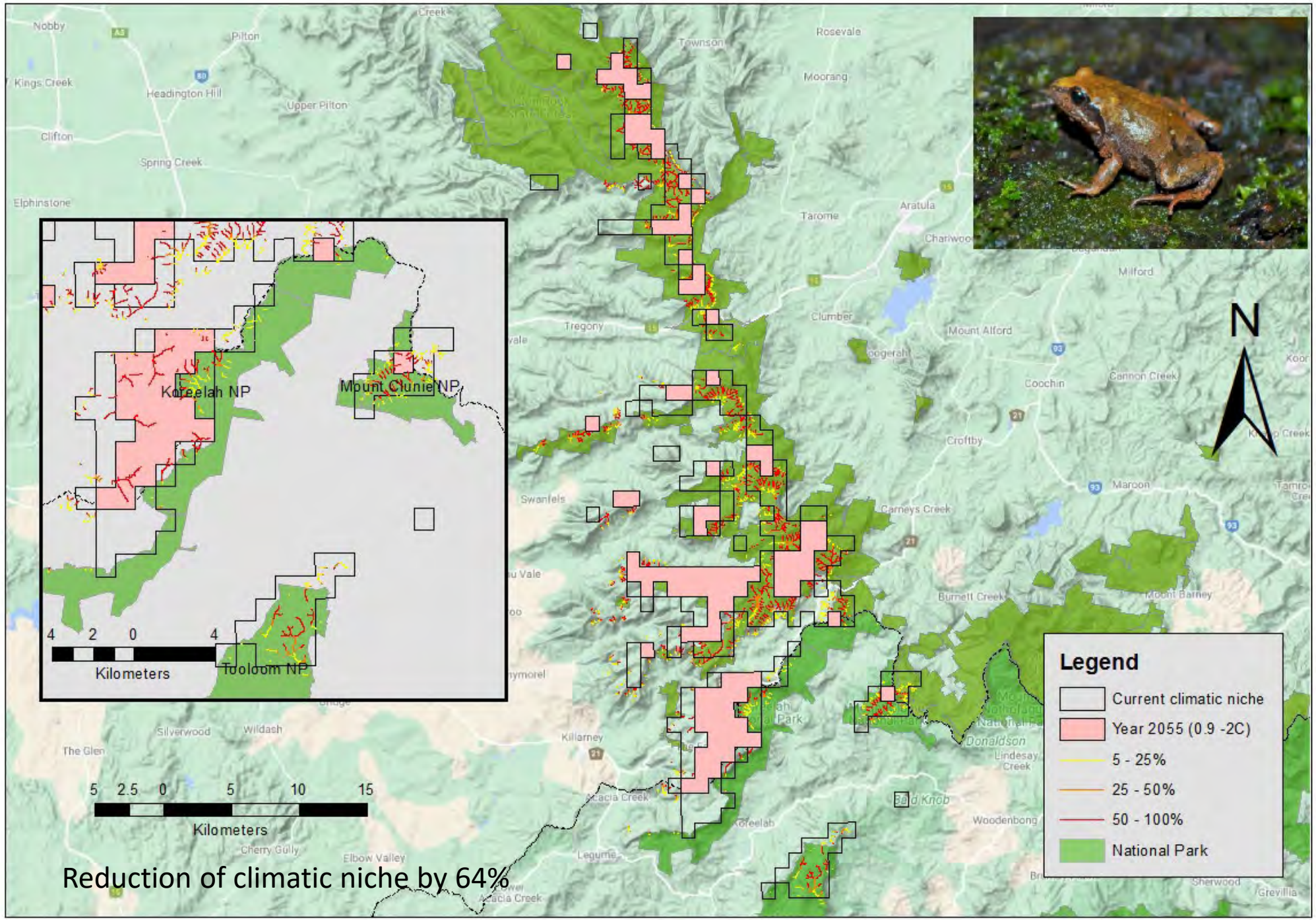


Current climatic niche of 300 km2

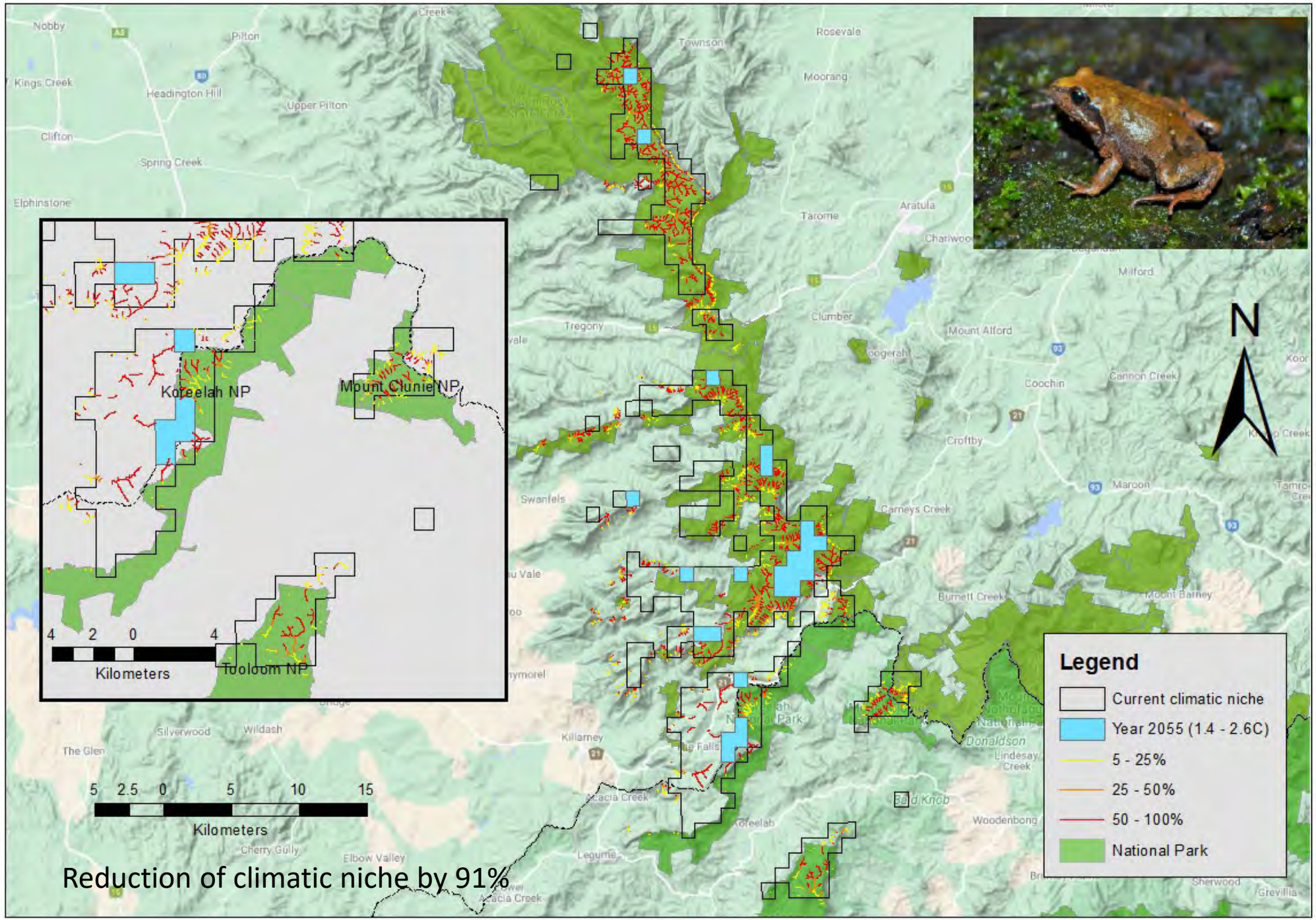
What does the future hold?



Climate Change



Reduction of climatic niche by 64%



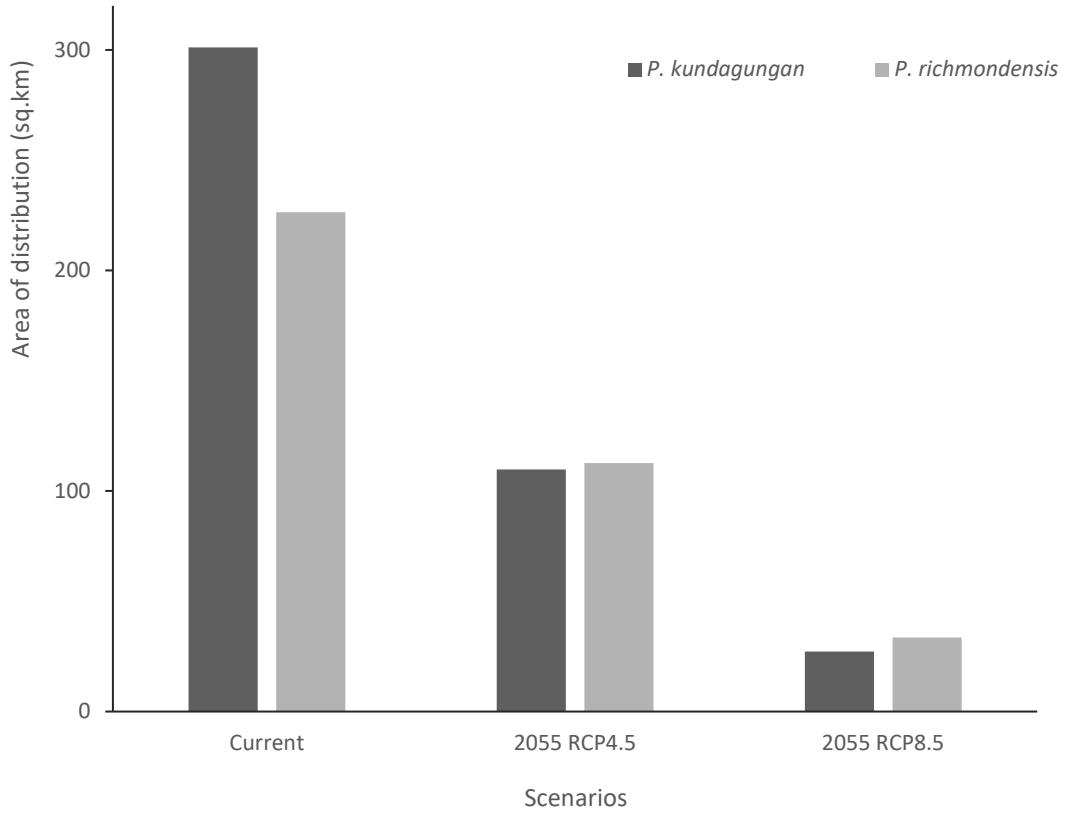
Reduction of climatic niche by 91%

scientific reports

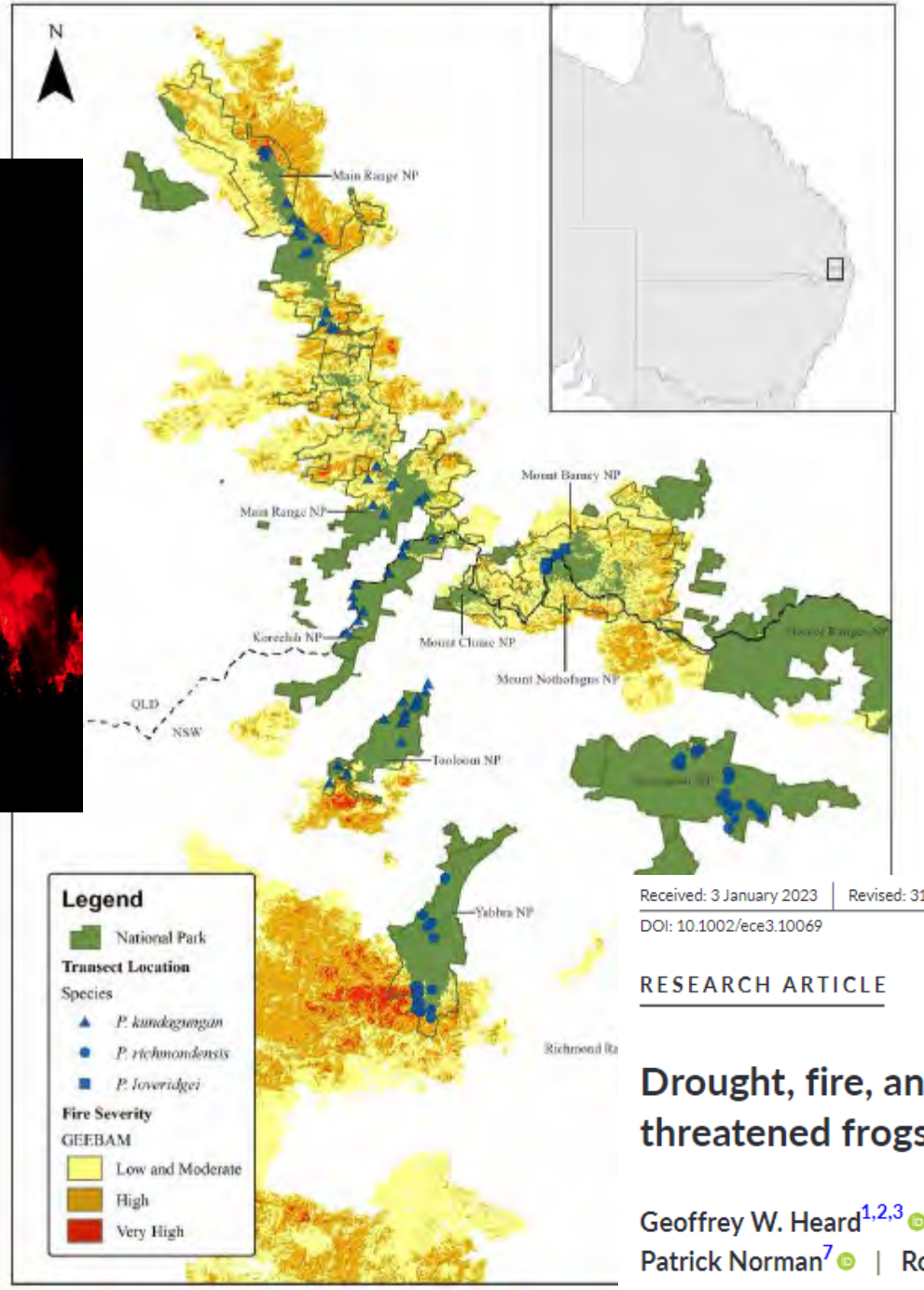
OPEN

Extensive range contraction predicted under climate warming for two endangered mountaintop frogs from the rainforests of subtropical Australia

Liam Bolitho & David Newell



Even under the moderate climate change scenario, the Mountain frogs are on a path to extinction.



Black Summer bushfires burned some 1.8 M Ha of forest in eastern Australia

Following the hottest and driest year on record

The event impacted large areas of habitat occupied by the mountain frogs

Conducted >300 surveys across candidate sites for *P. kundagungan, P. richmondensis* & *P. knowlesi*

Received: 3 January 2023 | Revised: 31 March 2023 | Accepted: 26 April 2023
DOI: 10.1002/ece3.10069

RESEARCH ARTICLE

Ecology and Evolution Open Access WILEY

Drought, fire, and rainforest endemics: A case study of two threatened frogs impacted by Australia's "Black Summer"

Geoffrey W. Heard[1,2,3] | Liam J. Bolitho[1,4] | David Newell[4] | Harry B. Hines[5,6] | Patrick Norman[7] | Rosalie J. Willacy[3,4] | Ben C. Scheele[1]

Post fire surveys revealed that frogs had survived at some of the impacted sites, however burnt sites were significantly less likely to be occupied and they supported fewer calling males.

Increased opportunity for invasive species


19 C 28.18 inHg TRAILCAM01 09/30/2022 08:20:06


DANGER
STAY BACK

Without urgent management intervention, the mountain frogs appear to be on a path to extinction within our lifetimes.

Protection of remaining habitat is crucial but may not be enough.

Conservation translocations may buy more time.

GRASP

Gondwana Rainforests
Amphibian Survival Program

NSW GOVERNMENT

IN PARTNERSHIP WITH
SAVING OUR SPECIES

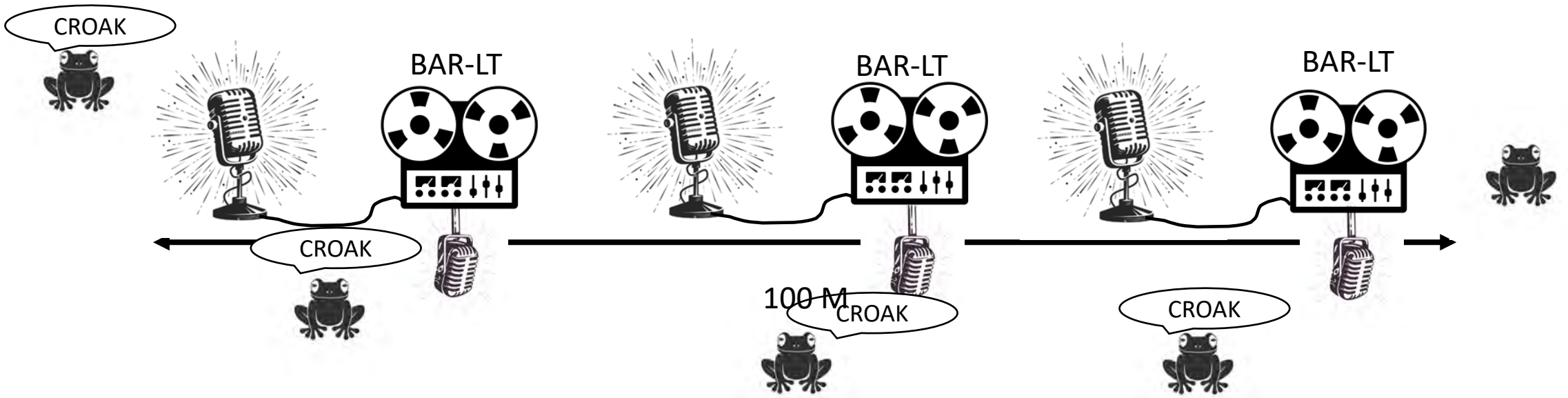
WWF

REWILDING AUSTRALIA

With the support of
the Australian Government's Bushfire Recovery Program for Wildlife
and their habitat


INVERTER
MITSUBISHI


KOR_M_01
KOR_M_02
1000KG

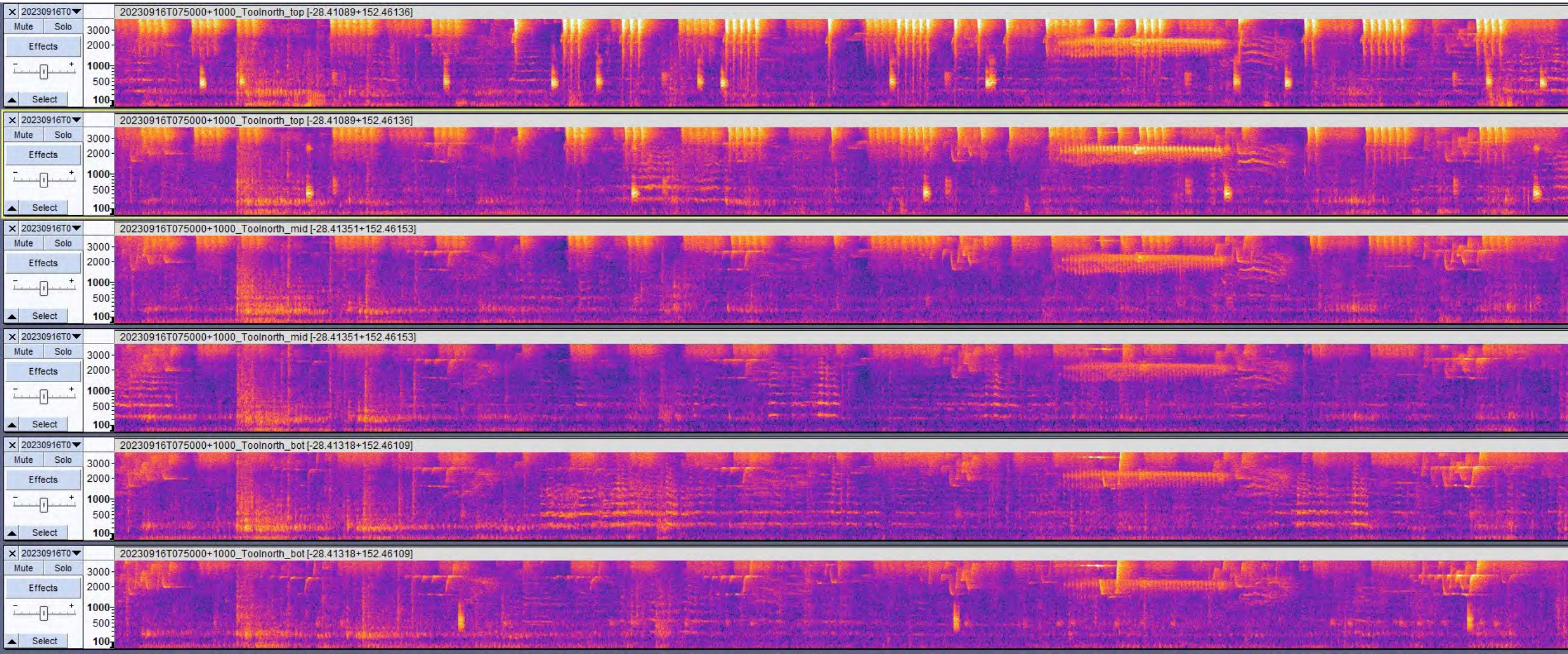


Recording sc 0 min recording every hour across the morning peak 5 am – 11am releases.

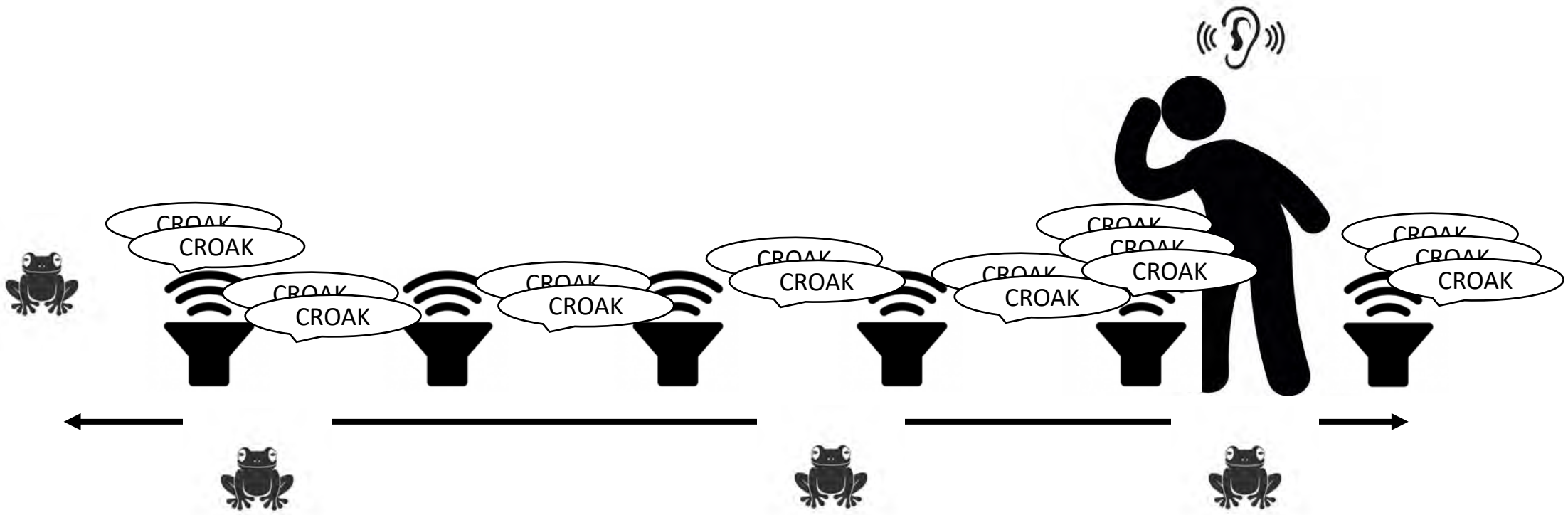
Recording se

Peak calling period analysed from nearly recording data using established call recognition approach (Bolitho et al 2023)

When peak calling period is determined we then use GPS time stamp used to align audio channels and audio PLAYBACK is undertaken in a sound studio and recreates peak calling for manual count.



An Immersive walkthrough sound experience



Thank You

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NATIONAL PARKS & WILDLIFE SERVICE N·S·W

QUEENSLAND NATIONAL PARKS KEEP DISCOVERING

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