

Report on progress to date September 2025: NPAQ Jim Cuthbertson

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Heathland communities as a habitat for Eastern Ground Parrots (*Pezoporus wallicus*)

The purpose of this project is to improve the ability to interpret the information collected through remotely sensed data, so that future monitoring can have improved efficiency and minimal impact on national parks.

The type of work involves:

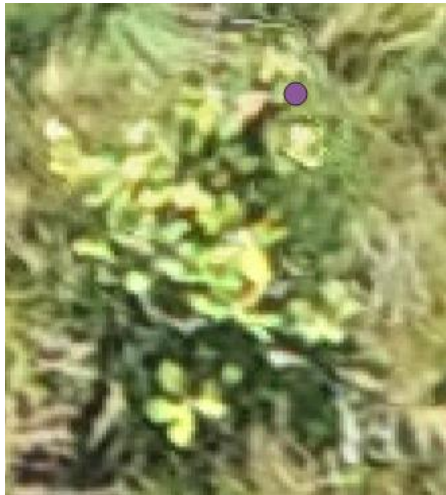
- High-resolution drone mapping (cm's resolution) that is then used to measure the current floristic and structural diversity of the area using machine learning techniques
- Passive and active acoustic recording of Eastern Ground Parrots
- Sequencing DNA of Eastern Ground Parrots
- Environmental DNA (eDNA) sampling to test the use as a tool for identifying Eastern Ground Parrot presence within an area that they may not typically call from
- Communicating the research techniques and results in a way that will be informative to the community and provide use to Queensland Parks for future monitoring and management

The project aims to improve the conservation value of Noosa National Park, by increasing our understanding of the heathland areas and the way in which our threatened species are utilising it as a habitat. The results also allow us to provide scientific evidence that can be used to tailor methods of monitoring Eastern Ground Parrot (*Pezoporus wallicus*; EGP) populations which then allows continued work by any other organisation or parks to be conducted more efficiently, requiring less time and resources, with similar outputs (1, 2, 3). Additional outcomes hope to facilitate the monitoring of changes within national parks to understand how these ecosystems respond to fire, flood and the changing climate.

High-resolution drone mapping with plant community analysis:

Initial drone images were taken of the target area of Marcus Beach Highdune (-26.442, 153.09), alongside images of the wet heathlands south of this location (-26.447, 153.09). From these, key identifying habitat features are being analysed, with a focus on detection of three species of Banksia and their distribution within the national park (*B. robur*, *B. oblongifolia* and *B. aemula*). These species were selected as they were able to be remotely annotated and checked using drone imaging without intensive in-field validation. Two of these species are dominant and an identifying feature of their respective regional ecosystems of closed heath (12.2.12, *B. robur*) and open heath (12.2.13, *B. aemula*), meanwhile *B. oblongifolia* can occur in both ecosystems. The visual representation of these species can be seen in figure 1, depicting the in-field, drone and Nearmap images of the same plant (4).

Figure 1. Aerial images of *Banksia robur* and *Banksia aemula*.

	<i>Banksia robur</i> Gps: -26.44760389, 153.0918053	<i>Banksia aemula</i> Gps: -26.4423747, 153.0967148
In-field Date: <i>Left</i> 4/7/2025 <i>Right</i> 4/7/2025		
Drone Date: Resolution: ~2cm Date: <i>Left</i> 14/7/2023 <i>Right</i> 19/8/2023		
Nearmap Date: Resolution: ~7cm Date: <i>Left</i> 01/7/2023 <i>Right</i> 01/7/2023		

Eastern ground parrot monitoring through Acoustics and eDNA:

Positive Control:

The initial surveys of our positive control site in January for eastern ground parrots resulted in low detectability of vocal activity, precluding our ability to use the site as a positive eDNA control at the time. These vocal activity results align with those found in previous studies, particularly as there was increased periods of high wind speeds and recent rainfall in the days leading up to collecting recordings (2, 3). Following these January surveys, our study sites had undergone periods of rainfall including cyclone activity. At the commencement of our second round of sampling rainfall had resulted in increased levels of standing water across all wet heathland sites, hindering our ability to obtain optimal amounts of soil for eDNA sampling. However, increased activity of EGP was confirmed for June at the positive control site through analysis of spectrograms using Raven Pro (5), and indeed winter has been previously noted as a time of year with increased calling (3). Furthermore, the site was also drying out, and thus our initial environmental sampling was able to commence during winter 2025. Given the decreased detectability of EGP in spring and summer, combined with the increased inundation of water in autumn, it could be suggested in the future that any trials which require a positive control in south-east Queensland should sample within winter when the vocal activity is increased and the standing water has begun to dry out (3, personal observations). Therefore, the timeline of these surveys does not line up with the suggested survey times within the fauna guidelines (1). The locations and dates of this sampling effort were recorded (supplementary material 2), with the results compared to those of the mapping efforts (table 1). We are in the process of identifying the appropriate species-specific primer from sequenced DNA liver, which will be used to target EGP DNA within any environmental samples collected (in collaboration with Frere Lab at University of Queensland).

Negative Control:

The negative control site is in an area where the EGP used to occur within Mooloolah River NP, however they have not been detected within this area in over 5 years. There is still a low chance that the species could still occur within this range, so results will be treated with caution. We conducted acoustic monitoring dawn and dusk in this location to provide further evidence of absence from May-July 2025, with two eDNA soil samples taken alongside these efforts.

New investigated location:

Our team deployed an acoustic recorder within the targeted research area in the Marcus High-dune section of Noosa National Park for May 2025 (RE: 12.2.13, GPS: -26.442, 153.09). The acoustic recordings of May have since been analysed and Eastern Ground Parrots were suspected on two dawn chorus occasions and detected on one dusk chorus (supplementary material 1). The calls were only faint during two days of these detections which could be explained by the calls being from the positive control wet heath to the south and the signal travelling if wind conditions are right, suggested by the same calls found on the positive control recorder 500m away (2). There was one day where the calls showed signs of harmonics which is noted to occur when an individual is closer to the recorder. There was soil and air eDNA samples taken from this site for additional investigation (supplementary material 2).

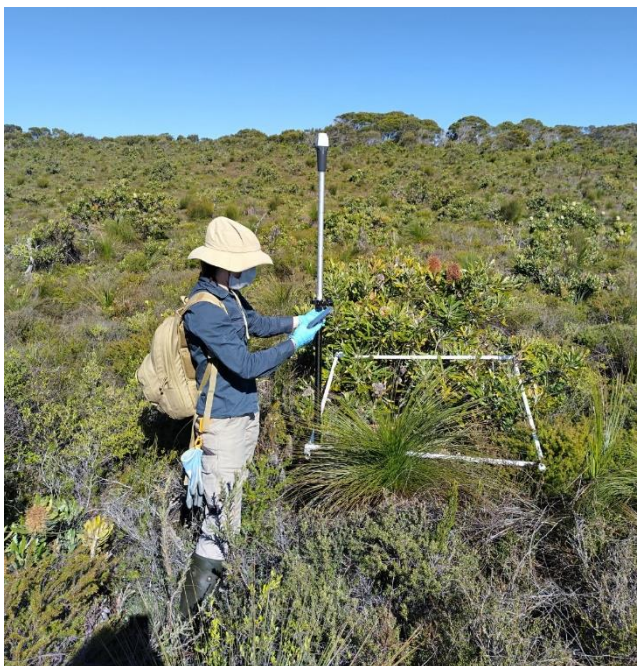
Table 1. Table with Detections and dominant banksia species.

Control	Regional Ecosystem	Acoustic EGP 2025	Dom. Banksia
Positive control	12.2.12/12.2.15	Detected	<i>B.robur</i>
Unknown study area	12.2.13	Detected	<i>B.aemula</i>
Negative control	12.3.13	Unanalysed	<i>B.robur</i>

Remaining:

Our team will next be testing how accurately the Banksia species are mapped using machine learning techniques, before continuing to identify further species within Noosa National Park. The presence and distribution of banksia is expected to provide useful information for the vegetation structure alongside eastern ground parrot detections (6). Further drone imaging will be conducted to investigate changes within the last 2 years, alongside vegetation assessments to look for the presence of species that were not previously identifiable from drone images.

All environmental DNA efforts will be sent for sequencing and then analysed to determine whether our target species was detected using this method. There will then be more research needed to investigate the significance of the area to the birds as a corridor, refuge or extended habitat. The May survey was during increased rainfall and standing water periods for the wet heath, therefore these detections could have been as a refuge during wetter seasons where their food resources may have been inundated in some areas. It is believed that eastern ground parrots can feed on *Caustis recurvata* seeds all year round, which is a species that occurs in the Marcus High-dune study area. We did not note any *C. recurvata* in seed during the May-July surveys for this section. The Noosa National Park had two controlled burns in the section east of Weyba during July 2025, while the study was being conducted. Given the acoustic results, our team is intending on leaving the Marcus Beach High-dune recorder out until the following May to further investigate if these were only occurring at times of increased rainfall or as a refuge following controlled burns in the area.



Acknowledgements:

Our team would like to acknowledge the following contributions to this research in addition to the funding from the National Parks Association Queensland.

Kieran Aland for the ongoing support, feedback and advice based on shared experience for tracking detections of Eastern Ground Parrots within Noosa National Park.

The Frontier Labs team, including Michael Maggs, for supplying access and training for their firmware and software on call localisation to improve accuracy of detection areas (<https://www.frontierlabs.com.au/post/acoustic-localisation>).

Dr. Nicola Jackson and Jarred Moreno from the Frere Lab at the University of Queensland, for their contributions and assistance in conducting environmental DNA surveys over the whole project with the inclusion of DNA sequencing, generating primers, conducting fieldwork and data analysis.

We would like to thank John McQueeney for communications around access and notice of any planned burns in the national park surrounding our targeted research section.

Fieldwork assistance by Simone Forman, Grace Smith, Lucy Goodridge-Gaines and University of the Sunshine Coast volunteers.

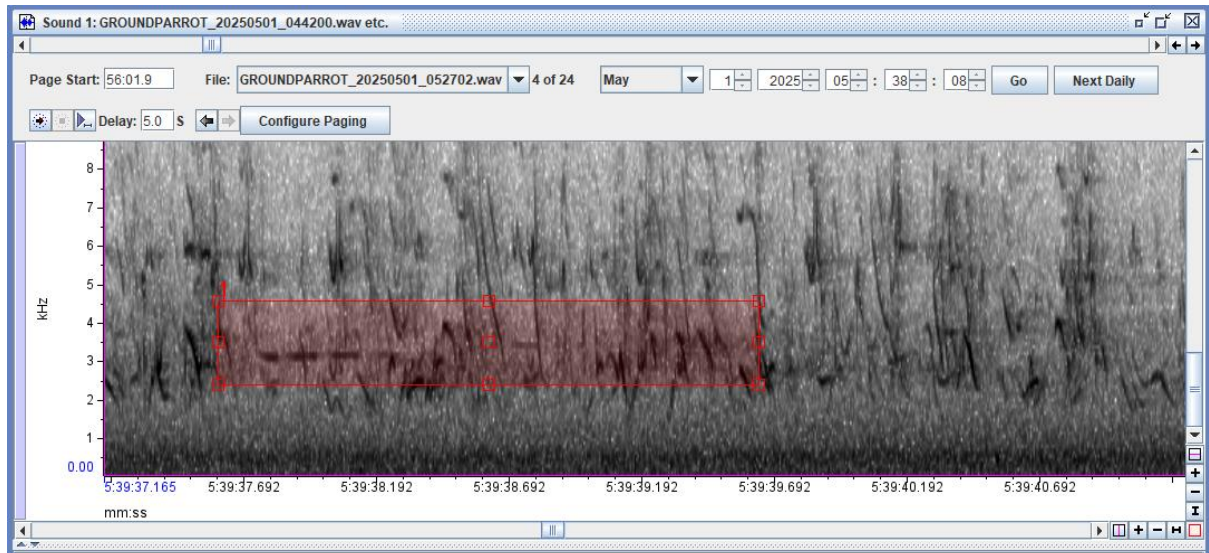
Reference List:

1. Eyre, T.J., Ferguson, D. J., Smith, G. C., Mathieson, M. T., Venz, M. F., Hogan, L.D., Hourigan, C. L., Kelly, A. L. & Rowland, J. (2022). Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland, Version 4.0. Brisbane: Department of Environment and Science, Queensland Government. https://www.qld.gov.au/_data/assets/pdf_file/0022/68224/fauna-survey-guidelines.pdf. Accessed 27 July 2023.
2. Thomas, A., Speldewinde, P., Roberts, J. D., Burbidge, A. H., and Comer, S. (2020). If a bird calls, will we detect it? Factors that can influence the detectability of calls on automated recording units in field conditions. *Emu* **120**(3), 239-248.
3. Prior, L., Aland, K., Levengood, A. L., & Potvin, D. A. (2023). Vocal activity of the Eastern Ground Parrot (*Pezoporus wallicus wallicus*) and implications for acoustic monitoring efforts. *Emu* **123**(4), 364-369.
4. Nearmap Australia, https://www.nearmap.com/au?utm_source=google&utm_medium=organic, accessed April 2024.
5. K. Lisa Yang Center for Conservation Bioacoustics. (2025). Raven Pro: Interactive Sound Analysis Software (Version 1.6.5) [Computer software]. Ithaca, NY: The Cornell Lab of Ornithology. Available from <https://ravensoundsoftware.com/>.
6. McFarland, D. C. (1991). The biology of the Ground Parrot, *Pezoporus wallicus*, in Queensland. III. distribution and abundance. *Wildlife Research* **18**, 199-213.

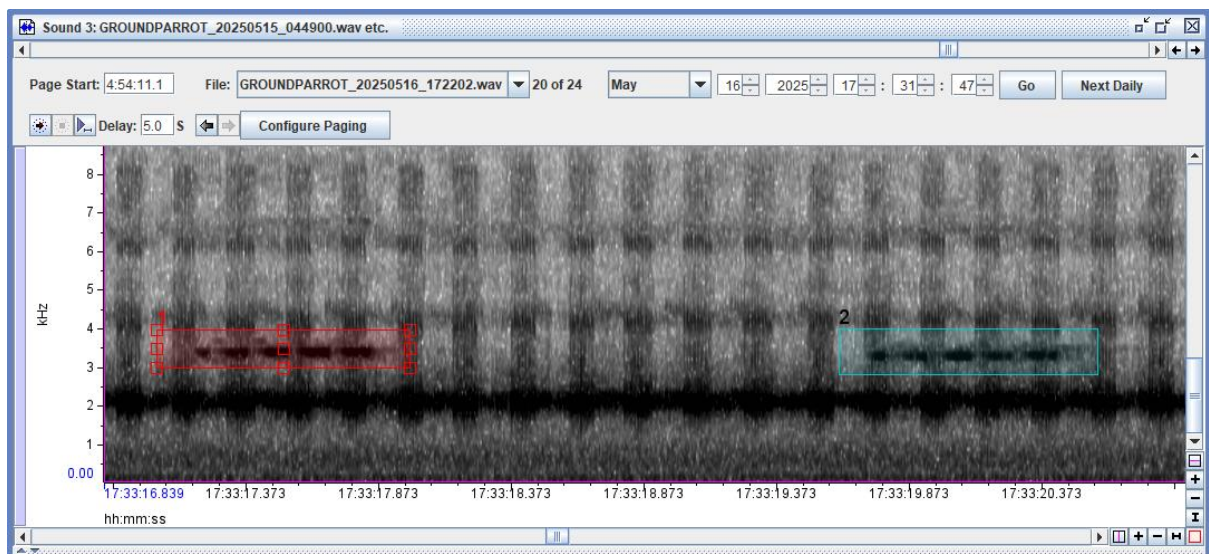
Supplementary Materials:

1. Acoustic recording snapshots from Raven Pro (5), Marcus Beach high dune open dry heath (RE: 12.2.13).

- a. Faint call which is most likely coming from any another nearby wet heathland patch (12.2.12/12.2.15) or an individual facing away from the recorder.



- b. Close call which appears to be coming from a bird flying over the open dry heathland (RE: 12.2.13).



2. Documentation of drone, acoustic and eDNA surveys across the study:

The highlighted areas are to be completed, with estimated time of arrival (eta) recorded.

Reference	Method	Latitude	Longitude	Ellipsoidal height	Date Deployed	Date Collected	Date DNA Extracted	EGP Detection Results
HAW Air 50	Air eDNA	-26.4476	153.0918	53.329	2/07/2025	4/07/2025	7/07/2025	Eta. Jan 2026
HAW Air 100/RecSouth	Air eDNA	-26.4476	153.0924	53.163	2/07/2025	4/07/2025	7/07/2025	Eta. Jan 2026
HAW Air 150	Air eDNA	-26.44723	153.0928	52.866	2/07/2025	4/07/2025	7/07/2025	Eta. Jan 2026
HAW Air RecEast	Air eDNA	-26.44755	153.0932	52.919	2/07/2025	4/07/2025	7/07/2025	Eta. Jan 2026
Marc Air filter 1	Air eDNA	-26.44239	153.0966	78.235	2/07/2025	4/07/2025	7/07/2025	Eta. Jan 2026
Marc Air filter 2	Air eDNA	-26.44237	153.0967	78.45	2/07/2025	4/07/2025	7/07/2025	Eta. Jan 2026
Marc Air filter 3/RecMarcusHD	Air eDNA	-26.44243	153.0967	78.058	2/07/2025	4/07/2025	7/07/2025	Eta. Jan 2026
RecMarcusHD	Acoustic Recorder	-26.44243	153.0967	78.058	1/05/2025	Every 3 months until 01/05/2026	NA	EGP Calls detected
HAW RecSouth	Acoustic Recorder	-26.4476	153.0924	53.163	30/05/2025	4/07/2025	NA	EGP Calls detected
HAW RecEast	Acoustic Recorder	-26.44755	153.0932	52.919	30/05/2025	4/07/2025	NA	EGP Calls detected
HAW RecWest	Acoustic Recorder	-26.44692	153.092	53.236	30/05/2025	4/07/2025	NA	EGP Calls detected
HAW RecNorth	Acoustic Recorder	-26.44684	153.0928	53.108	30/05/2025	4/07/2025	NA	EGP Calls detected
HAW50 Soil	Soil eDNA	-26.4476	153.0918	53.346	NA	2/07/2025	23/07/2025	Eta. Jan 2026
HAW100 Soil	Soil eDNA	-26.44759	153.0924	54.785	NA	2/07/2025	23/07/2025	Eta. Jan 2026
HAW150 Soil	Soil eDNA	-26.44735	153.0929	53.203	NA	2/07/2025	23/07/2025	Eta. Jan 2026
MARHD 1 Soil	Soil eDNA	-26.44222	153.0966	79.445	NA	4/07/2025	23/07/2025	Eta. Jan 2026
MARHD 2 Soil	Soil eDNA	-26.44245	153.0967	77.896	NA	4/07/2025	23/07/2025	Eta. Jan 2026
MRNP 50 Soil	Soil eDNA	-26.72464	153.0952	48.343	NA	5/08/2025	28/08/2025	Eta. Jan 2026
MRNP 100 Soil	Soil eDNA	-26.72438	153.0948	48.551	NA	5/08/2025	28/08/2025	Eta. Jan 2026
RecMRNP	Acoustic Recorder	-26.72446	153.0948	48.691	16/05/2025	5/08/2025	NA	Eta. September 2025
RecDolph	Acoustic Recorder	-26.40069	153.093	61.672	15/07/2025	31/08/2025	NA	Eta. September 2025
HAW 2023 Wet Heathland	High resolution drone image	-26.447	153.09	Ground+ 30m	NA	14/07/2023	NA	NA
MarcHD 2023 Dry Heathland	High resolution drone image	-26.442	153.09	Ground+ 30m	NA	19/08/2023	NA	NA
WDr RecNorth	Acoustic Recorder	-26.47002	153.0831	47.388	24/01/2025	12/02/2025	NA	EGP Calls detected
WDr RecEast	Acoustic Recorder	-26.47069	153.084	47.687	24/01/2025	12/02/2025	NA	EGP Calls detected
WDr RecSoutheast	Acoustic Recorder	-26.47144	153.0838	54.883	24/01/2025	12/02/2025	NA	EGP Calls detected
WDr RecSouthwest	Acoustic Recorder	-26.47161	153.0827	48.819	30/01/2025	12/02/2025	NA	EGP Calls detected
WDr RecWest	Acoustic Recorder	-26.47086	153.0827	47.244	30/01/2025	12/02/2025	NA	EGP Calls detected
WDr RecNorth2	Acoustic Recorder	-26.47002	153.0831	47.388	12/02/2025	16/04/2025	NA	EGP Calls detected
HAW 2025 Wet Heathland	High resolution drone image	-26.447	153.09	Ground+ 30m	NA	Eta. September 2025	NA	NA
MarcHD 2025 Dry Heathland	High resolution drone image	-26.442	153.09	Ground+ 30m	NA	Eta. September 2025	NA	NA
WD 2023 Wet Heathland	High resolution drone image	-26.471	153.08	Ground+ 30m	NA	21/07/2023	NA	NA