



Seasonality and roost site fidelity of a Night Parrot, *Pezoporus occidentalis*, in the western Great Sandy Desert

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The Night Parrot remains one of Australia's most elusive and enigmatic birds, but the discovery of a persistent population in Queensland in 2013 and the release of details of the habitats it occupies (DBCA 2024; Hamilton et al. 2017; Jakkett et al. 2017; Murphy, Silcock, et al. 2017; Murphy, Austin, et al. 2017; Ngururpa Rangers et al. 2024) as well as recordings and detailed descriptions of its call (Leseberg et al. 2019) have unlocked important tools for its detection. This information has been critical in enabling traditional owners (Lindsay et al. 2024) and environmental impact assessment practitioners search for Night Parrots by deploying autonomous recording units (ARUs) recording nocturnal acoustic sounds in habitats matching published criteria for Night Parrots. Passive acoustic surveys have markedly increased the knowledge of the Night Parrot's range and status and confirmed several new locations, particularly in the Great Sandy Desert Region of Western Australia.

Here we apply the use of passive acoustic monitoring to demonstrate that it is possible to track the spatial and seasonal movements of individual Night Parrots over large distances.

In April 2024 Biota Environmental Sciences (Biota), Rio Tinto Copper personnel and Jamukurnu-Yapalikurnu Aboriginal Corporation (JYAC) rangers conducted a targeted assessment for Night Parrot at an area of interest in the western Great Sandy Desert. This involved installing six ARUs for a passive acoustic monitoring survey in areas deemed prospective for Night Parrot. All ARUs referred to in this paper were solar-powered Wildlife Acoustics Songmeter 4 units set to record uncompressed audio (.wav) from 30 minutes after sunset until 30 minutes before sunrise, with a 24 kHz sample rate. To avoid duplicate call detections, the results presented here all refer to the left channel (channel 0) of the stereo recordings only. After one month, acoustic data were retrieved from the ARUs and filtered using custom settings in Kaleidoscope Lite (Wildlife Acoustics) software. The resulting filtered sounds were screened manually for Night Parrot vocalisations by John Graff.

In one month, 394 Night Parrot vocalisations were detected at four locations over an approximately 18 km² area, with timing of calls into the dawn chorus suggesting that two of the locations were used as a roost site. The vocalisations were remarkably consistent, with a pulse pattern matching the 'two-note trill' call of Western Queensland (Leseberg et al. 2019). However, while the Western Queensland call-type has a peak frequency of ~2.2 kHz and note duration of 0.3 s (Leseberg et al. 2019), the vocalisation on these recordings had a significantly higher peak frequency at 3.2–3.3 kHz (Figure 1). Each 'note' had a similar duration to the Western Queensland call-type (0.32 s) and the structure, a series of three prolonged elements punctuated by two double staccato elements, gives the trilling effect when rendered in real time. Of the 394 vocalisations, one Night Parrot was of the 'one-note trill' type (essentially a single note of the two-note trill).

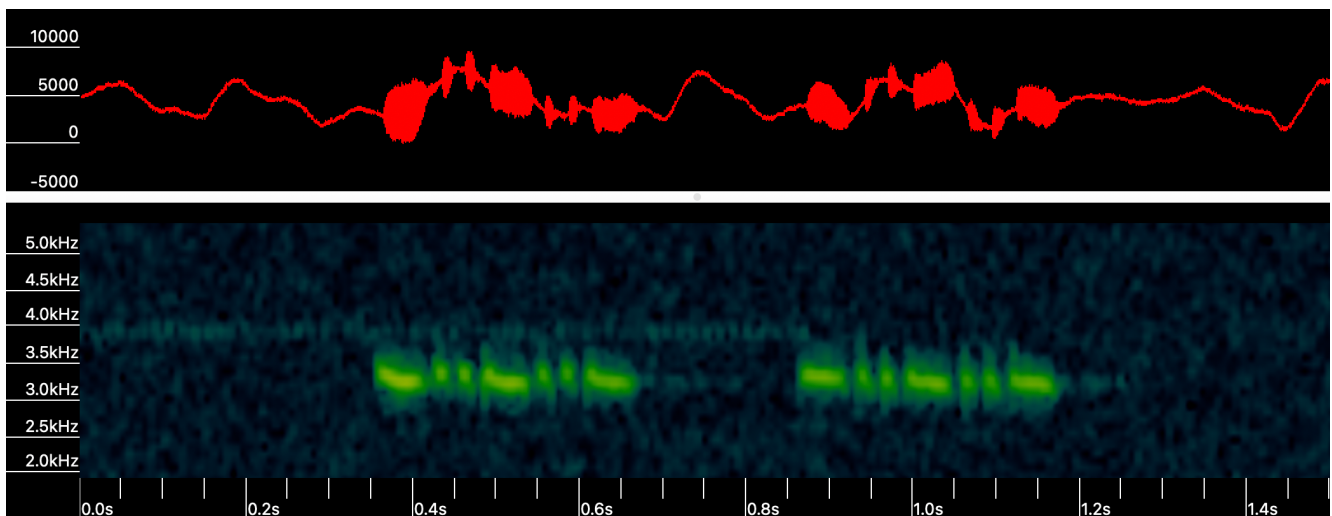


Figure 1: The ‘two-note trill’ call-type with a distinctively high frequency of 3.2–3.3 kHz.

With the presence of Night Parrot confirmed, the monitoring program was expanded. Night Parrot habitat classification was undertaken to determine the extent of potential roosting/breeding and potential foraging habitat in the locality. A draft habitat map was generated based on analysis of aerial imagery at 1:2000 scale across the area of interest, combined with available soil and vegetation mapping. This was refined during a field visit in September 2024 and six ARUs were deployed in mapped Night Parrot habitat as part of an ongoing passive acoustic monitoring program.

Detections of the distinctive ‘two-note trill’ call peaked in May 2024, coinciding with Night Parrot breeding season (Murphy, Austin, et al. 2017), before declining to only occasional detections in June, with no detections after late July 2024. The reasons for this were unknown, but it was considered likely that the Night Parrot was no longer present, potentially due to seasonal movements. By this stage, there had been 1,808 confirmed acoustic detections, with almost all of these being the ‘two-note trill’ call-type (only 20 one-note call-type).

With the potential for seasonal movements in mind, and in order to provide a more regional context for this novel locality for Night Parrot, six additional ARUs were installed in September 2024 to the south of the area of interest, in a region of approximately 460 km² that we considered highly likely to support Night Parrots. We considered this to be the most likely source location for the birds responsible for detections in our area of interest. To determine the best locations for the ARUs, a multi-stage approach was employed. Based on knowledge of Night Parrot habitats and examination of aerial imagery, 18 candidate locations were proposed and visited. Each of these was assessed for the following factors: proximity to our area of interest; similarity to the habitats we had mapped; potential for roosting habitat; proximity to potential feeding habitat; connectivity with other habitat; patch size and a qualitative assessment of habitat quality. Of the top-ranking locations, six were chosen based on whether they represented a potential flyway, a likely roost, or high-quality foraging habitat for Night Parrots. The ARUs deployed in these six locations were the same model and had the same settings as those in the area of interest.

To date, multiple Night Parrot call-types have been recorded on these regional ARUs, with Night Parrots detected at all six locations. However, the number of vocalisations is heavily skewed to two sites (one earmarked as a potential roost site, and one earmarked as a potential flyway). At the roost site the distinctive high-frequency two-note call-type was abundant, with thousands of calls recorded in some weeks over the duration of monitoring (Figure 2).

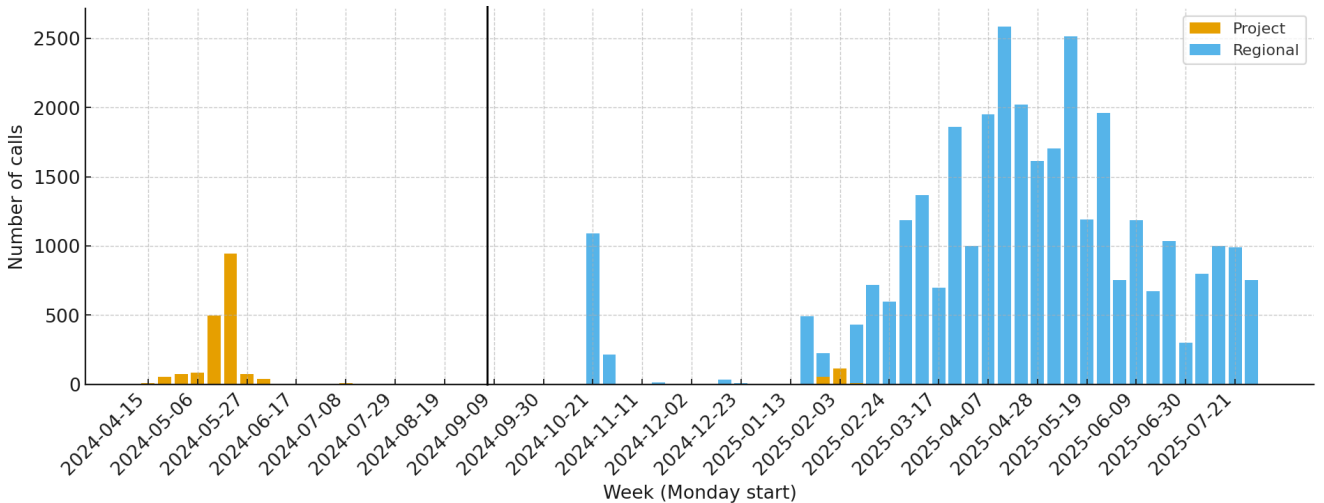


Figure 2: Frequency of ‘two-note trill’ call types detected in the area of interest and region. Vertical bar shows commencement of regional survey program.

Analysing the detection dates and times of the ‘two-note trill’ across the area of interest and regional ARUs revealed a pattern in late January and early February 2025 that indicated they were the vocalisations of a single individual Night Parrot. Figure 3 shows the disappearance of the call from the regional ARUs on the 23rd January 2025 before returning on the 7th February 2025. All of the detections of this call-type between these dates were in the area of interest, over 50 km away. We interpret this as a single Night Parrot moving from the regional roost site to the area of interest before returning to the regional roost site.

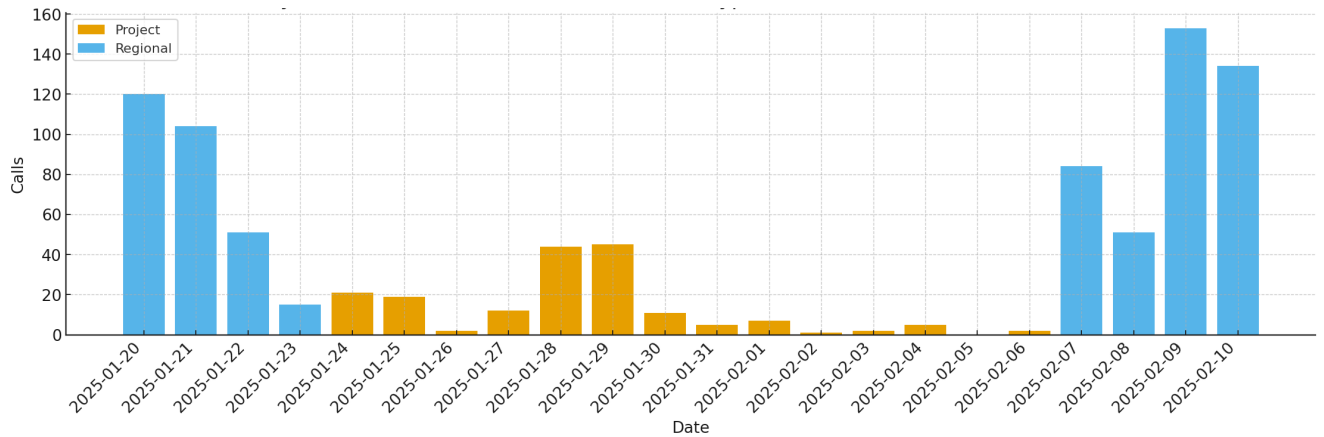


Figure 3: Frequency of ‘two-note trill’ between the area of interest and regional sites.

Table 1, below, details relevant detection times and dates of the individual Night Parrot’s movements. The regional roost site and area of interest roost locations are over 50 km apart, and were consistently used between visits to either location. Reinterpreting Figure 1 as the calls of a single individual, we note that there are many weeks when the bird was not detected and was thought to be roosting elsewhere.

Table 1: Short-term roost movements of a Night Parrot

Date (2025)	Time	Location
23 January	0424	Last detection at regional roost site
24 January	2332	First detection at area of interest
25 January – 03 February		Area of interest, usual roost site
04 February	0438	Area of interest at different roost
05 February	-	Not detected, roosting location unknown
06 February	2057	Last detection in area of interest
07 February	0444	First detection at regional roost site

In summary, we have demonstrated that a particular call type may be attributable to an individual Night Parrot, allowing spatial and temporal monitoring of individuals. While this was particularly notable for the distinctive high-frequency ‘two-note trill’ of the bird initially inhabiting our area of interest, it suggests that individual Night Parrots may each have a subtly unique vocalisation, likely influenced by the parents’ vocalisations.

We have also demonstrated that an individual Night Parrot may use several roosting locations, giving it greater flexibility to respond to seasonal constraints on food and water, as well as breeding opportunities, as suggested by Lindsay et al. (2024). It is also apparent that some locations, such as our area of interest, are infrequently but occasionally visited by Night Parrots, which makes detection during short-duration monitoring programs considerably less likely.

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