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Front Cover: Male Albert's Lyrebird displaying in a patch of sunlight – image from A. Fearnley, captured on camera trap as part of the research reported here.

Display platforms of Albert's Lyrebird *Menura alberti*, Part 1. Influence of habitat on location and characteristics

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Abstract

Male Albert's Lyrebirds perform multimodal displays on platforms to attract potential mates during their winter breeding season. We documented the characteristics of 62 display platforms belonging to seven males within 40 ha of cool-subtropical rainforest and wet sclerophyll forest with a mesic understory and we used time-lapse photography and video to record Lyrebird behaviour over 12 months. Display platforms were categorised by physical features into four types, largely reflecting habitat. The platforms were actively prepared and maintained by the male up to two months before display activity peaked. All platforms were elevated above ground level, either due to mounding (in wet sclerophyll) or the presence of vines (in rainforest). In the rainforest, the majority of platforms were situated directly under narrow openings in the canopy; if not, the canopy openings were mostly northeast-ENE of the platform, aligning with the azimuth of the sun at sunrise during winter. In the wet sclerophyll, however, display platforms were invariably situated directly below large canopy openings, as expected in well-lit, semi-open habitat. During displays, males in rainforest rapidly raised and lowered the vines on their platforms with their feet, causing the entwined surrounding vegetation to shake. All display platforms were surrounded by a screen of vegetation. Of the 25 vegetative screening species in the rainforest, nine were also present on the platforms and were predominantly vines of the genera *Cissus* (43%) and *Parsonsia* (33%). In the wet sclerophyll, platforms were composed of plant material from only four species, none of which were vines.

Based on our observations, we propose that male Albert's Lyrebirds in the rainforest select display sites that enhance visualisation of their display performances through elevation of the platform by mounding, focussed lighting from canopy openings, and the rapid movement of screening vegetation entangled by platform vines. These findings contrast strongly with those of a recent study that concluded that there were no differences between display platforms and nearby random points in ground height, canopy openings or vegetative screening. We suggest that the disparate findings of the two studies are partly due to differences in the habitats sampled. Our study was conducted mostly in cool subtropical rainforest, where the uneven multi-layered canopy prevents most light from reaching the forest floor, and vines are abundant, whereas the previous study was conducted mainly in temperate rainforest, where the flora is less diverse and the thinner, less complex canopy results in much greater illumination.

Introduction

The Albert's Lyrebird *Menura alberti* occurs in fragmented populations confined to rainforest and wet sclerophyll forest with a mesic understory in south-east Queensland and north-east New South Wales. During the breeding season (May to August; Higgins *et al.* 2001), males perform multimodal displays on platforms to attract potential mates, and each

male territory contains multiple display platforms. However, there has been little documentation of display behaviour partly due to the shy and wary nature of the species, which makes direct observation difficult (Curtis 1972; Robinson & Curtis 1996), except at some well-visited locations (Tamm 2014).

After observing and audio-recording displays of male Albert's Lyrebirds at several

locations in southeast Queensland, Curtis (1972) noted that their display platforms comprised several thin crossed vines or vines and fallen branches, lying on scratched ground. During the latter stage of the display the bird used its powerful feet to depress the vine platforms, then release them, resulting in simultaneous shaking of surrounding vegetation while singing. Curtis (1972) noted that at Tamborine Mountain, the display platform and surrounding vegetation (hereafter called vegetative screening) was predominantly comprised of Lawyer Cane *Calamus muelleri*, a common vine-like climbing palm. AMG (in Higgins *et al.* 2001) also noticed that display platforms were often close to dense foliage and below openings in the canopy that allowed more light to reach the otherwise shaded floor of the rainforest, suggesting the possibility that males selected display sites based on these features.

Recently, Backhouse *et al.* (2024a) studied the display platforms of Albert's Lyrebirds in three habitat types (warm-subtropical rainforest, temperate rainforest and wet sclerophyll forest) occupied by five populations across the species range. They compared the characteristics of display platforms with nearby random points and found no significant differences in the height of vegetative screening, cleared ground or canopy openings. However, platforms had more vines and fallen sticks and branches than expected, leading them to conclude that site selection was only influenced by the number of vegetative structures.

Since 2017, we have been conducting a longitudinal study to determine the characteristics of display platforms, temporal and spatial patterns of use and long-term site fidelity, and display behaviour of seven male Albert's Lyrebirds at a site near the border between south-east Queensland and north-east New South Wales. In this paper, we compare the characteristics of display platforms in cool-subtropical rainforest with those in wet sclerophyll forest and the ecotone between those two habitats. We describe the vegetation on and around the platforms, the height of platforms, and the position of openings in the canopy above the platform. The spatial arrangement, ownership and temporal patterns

of use of the display platforms will be described in a separate paper.

Methods

Study area and habitats of species

Albert's Lyrebird inhabits rainforest and wet sclerophyll forest with a mesic understory on Main Range, McPherson Range, Tweed Range and Richmond Range, with an isolated northern population at Tamborine Mountain. The rainforest habitat in this region comprises four types: warm (lowland) and cool (upland) subtropical rainforest, and warm and cool temperate rainforest (Harden *et al.* 2014). Subtropical rainforest is floristically diverse with an uneven, non-uniform canopy comprising up to 60 species in three layers (up to 40 m deep), with abundant palms, strangler figs and notophyll (medium-leaved) vine species, and little light reaches the forest floor. On poorer soils and at higher (cooler) elevations subtropical rainforest is replaced by temperate rainforest. Temperate rainforest has fewer tree species (up to six species in warm temperate rainforest and only one to three in cool temperate rainforest), a uniform, even, shallow canopy (up to 30 m deep) typically with only two layers, and includes microphyll (small-leaved) as well as notophyll vine species with a higher frequency of canopy gaps (Lowman 1986; Hunter 2003; Harden *et al.* 2014).

The study was conducted on a population of Lyrebirds at a site near the confluence of Main and McPherson Ranges (930–1040 m above sea level) on the eastern fall of an isolated remnant (~40 ha) of cool subtropical rainforest and wet sclerophyll forest with a mesic understory. The rainforest was floristically diverse but dominated by Black Booyong *Argyrodendron actinophyllum*, Yellow Carabeen *Sloanea woollsi*, Rosewood *Didymocheton fraserianus*, and *Acmena* spp. Common vines were *Cissus* spp., *Parsonsia* spp, Yellow-flowered Wonga Vine, *Pandorea floribunda* and Cockspur Thorn *Maclura cochinchinensis*. The understorey typically included Common Socketwood *Daphnandra apatela*, Orange Thorn *Pittosporum multiflorum*, *Neolitsia* spp. and Brush Pepperbush *Tasmannia insipida*, with a sparse ground cover mostly of ferns and

Lomandra spicata. The wet sclerophyll forest was dominated by tall New England Blackbutt *Eucalyptus campanulata*, Tallowwood *E. microcorys* and Turpentine *Syncarpia glomulifera*, and had a rainforest understorey with similar plant species but few vines. The ground cover mainly comprised Native Raspberry *Rubus probus*, Common Ground Fern *Calochlaena dubia* and *Pollia crispata*. There was a narrow transition zone (ecotone) between the wet sclerophyll forest and rainforest with a mixture of plants species from both habitats. The exact location of the site is withheld to minimise human disturbance.

Description of display platforms

Display platforms were located by binaural mapping, in which the locations of Lyrebirds were determined by listening to the source, times and amplitudes of calls at a series of points during the dawn chorus. This enabled us to determine calling behaviour consistency and temporal overlap and therefore the location of different individuals. Once located, all display platforms were mapped with the 'Gaia GPS' app and photographed.

We recorded the following physical characteristics of 62 display platforms in use between 25 June 2023 and 30 June 2024: (1) vegetative structures on the platform (twigs, stems, sticks, and/or vines); (2) the species and number of vines (if present) along the shortest and longest axis of the platform; (3) the height, area and composition of mounds; (4) the extent and density of vegetative screening; and the direction (5) and width (6) of any canopy opening above the platform. To estimate the area of display platforms, we noted the extent of mud on the vegetative structures as evidence of display use (Curtis 1972). As the display platforms were circular or elliptical in shape, we measured the shortest radius (a) and longest radius (b) of "muddied" vegetative structures and calculated the area using the formula $area = \pi ab$. The direction of canopy openings was measured from display platforms using a compass (Silva Compass Ranger MS 37465). The maximum width of the openings was measured using a pitch-and-angle locator with a 1.2 m builders' level. The locator and level were held together vertically (with the locator indicating 0°), then moved towards the right until the edge of the level visually aligned with

right edge of the opening, when the angle was noted (R°). The process was repeated on the other side to measure the angle between the vertical plane and the left edge of the opening (L°). The width of the canopy opening was the sum of the two angles (L° and R°).

The characteristics of each platform type, and width of canopy openings, were compared using two-tailed t-tests. A Chi-Square test was used to determine if the direction of canopy openings from platforms differed from expectation. Most display performances occurred in June and July (Fig. 2), so the range of sunrise directions in this period at the study site was determined using the NOAA web site for dates 22 June (solstice) and 31 July.

Monitoring of display platforms

The presence of Lyrebirds at display platforms was recorded using time-lapse photography (>1.44M photographs assessed), and their behaviour recorded using motion-activated video ($n=180$ h). Initially eight Reconyx Ultrafire XR6 cameras were deployed, with a maximum video length of 2 min in daylight and 30 sec (infra-red imagery) in low light. Subsequently we used 23 Reconyx Ultrafire XP9 cameras, which recorded 10 min of video regardless of light level. The infrared illumination range of these cameras was 24 m. The cameras were positioned c.2 m from the display platform edge and 1.5 m above the ground with the silhouette of the camera trap broken by surrounding vegetation. Camera SD cards and batteries were changed after 5 -7 days, during times when no Lyrebirds were present.

Monitoring was discontinued at 51 of the 62 sites after the males' use of the display platform had been confirmed by video. Of the remaining 11 display platforms, five were monitored continuously by time-lapse photography and video for 12 months, while another five were monitored for 30 consecutive days from 26 June to 25 July 2023, and the remaining one for 12 days (14-25 July). The cameras were programmed to take one photo per min and maximum video length between 06:00 and 18:00 hrs each day. All photos (8MP) and videos (1080P, 30fps) were stamped with location, time and date, and all camera trap clocks were synchronised throughout the study. Using QuickTime Player,

videos were examined for behaviour suggesting display, maintenance and performance. When the males manipulated vines during their display, we recorded the duration of such behaviour, the lateral radius (from the centre of the display platform) and height of vegetation movement, and noted whether the sound made by the movement of vines was “loud knocking” or “soft rustling”.

Results

Physical characteristics of display platforms

Display platforms were predominantly elliptical (66%) and were categorised into four types based on the variety of platform materials and the presence of mounding (Table 1; Plate 1). The two types found in rainforest consisted of a platform of vines either above the ground with no mounding (Type 1; 46.8%) or in contact with mounded soil (Type 2; 24.2%). In contrast, display platforms in the wet sclerophyll forest consisted of mounds of humus covered by twigs, sticks and/or bent-over stems of surrounding or ground cover vegetation, with no vines (Type 4; 24.2%) (Table 1; Plate 1). Similarly, platforms in the ecotone consisted of vines, sticks, twigs and/or stems in contact with a mound of soil and humus (Type 3; 4.8%).

All platforms in our study were elevated, but Type 1 platforms, consisting of vines, were significantly more elevated than platforms with mounds ($t = 4.16$, $df = 57$, $p < 0.001$), while mound height between Types 2 and 4 was similar ($t = 1.53$, $df = 28$, $p > 0.1$; Table 1). In the rainforest, Type 2 display platforms tended to be larger, and have fewer vines than Type 1, but the differences were not significant

($t = 1.28$, $df = 42$, $p > 0.1$ and $t = 2.01$, $df = 42$, $p > 0.1$, respectively). Platforms in wet sclerophyll forest (Type 4) were marginally larger than those of Type 1 ($t = 1.99$, $df = 42$, $p = 0.05$) but similar in area to those of Type 2 ($t = 0.05$, $df = 28$, $p > 0.1$). The small sample size of Type 3 platforms precluded analysis.

As observed by Curtis (1972) elsewhere, males displaying in the rainforest at our site often used their feet to depress and release the vines on their platforms, causing the surrounding foliage to shake. In our study, such movements of vegetation radiated up to 2.3 m horizontally and 1.9 m vertically. Lateral movement of foliage was greater at Type 1 than at Type 2 platforms ($t = 3.94$, $df = 86$, $p < 0.001$), with a similar, but non-significant, trend in vertical movement ($t = 1.85$, $df = 42$, $p = 0.07$) (Table 2). The reduced movement of surrounding vegetation at Type 2 platforms reflected the resistance caused by platform vines being in contact with the mounded soil.

All display platforms were situated under openings in the canopy. In the rainforest, all canopy openings were narrow (means, 24.3° to 27.3° ; Table 2) and the majority (63%) were situated directly overhead. Of the remaining openings, most (62.5%) were oriented between North and ENE of the display platform (Fig. 1). Dividing the compass into three equal segments of 120 degrees showed that significantly more openings were oriented between East and NNW than the other two segments ($\chi^2 = 9.98$, $df = 2$, $p = 0.007$). The azimuth of the sun at sunrise on 21 June and 31 July 2024 was 63.5° and 68.9° east of true north, respectively (NOAA 2025), very close

Table 1. Characteristics of display platforms of Albert’s Lyrebirds in different habitats (n=62).

Type	Habitat	n	Mean (\pm SD) no. of vines		Sticks, twigs, stems	Mean (\pm SD) height (cm)	Mean (\pm SD) area (m ²)
			Short axis	Long axis			
1	Rainforest	29	8.2 \pm 1.2	9.4 \pm 1.3	0	17.1 \pm 12.0*	0.38 \pm 0.29
2	Rainforest	15	6.7 \pm 1.1	7.4 \pm 1.2	0	8.5 \pm 4.4	0.54 \pm 0.18
3	Ecotone	3	1.5 \pm 0.7	1.5 \pm 0.7	+	6.5 \pm 3.1	0.28 \pm 0
4	Wet Sclerophyll	15	0	0	+	7.5 \pm 3.3	0.55 \pm 0.24

+ present

* height of vines above ground



Plate 1. Examples of the four types of display platforms and micro-habitat.

to ENE (67.5°). Canopy openings above Types 1 and 2 platforms in the rainforest were similar in width ($t = 0.90$, $df = 42$, $p > 0.1$), but narrower than those above Type 4 platforms in the wet sclerophyll forest ($t = 23.07$, $df = 42$, $p < 0.001$; $t = 18.38$, $df = 28$, $p < 0.001$, respectively) (Table 2).

All display platforms were screened by the foliage of the surrounding vegetation, but this screening varied markedly in extent and density. The growth habit of screening species

varied from climbing vines (11 species) to ground cover/lilies/palms (9), shrubs/trees (9) and Tree Ferns (1) (Tables 3, 4). Of the 25 screening species in the rainforest, nine were also present on the platforms (Types 1 and 2; Table 3). The predominant platform species in rainforest were vines of the genera *Cissus* (43%) and *Parsonsia* (33%). In the wet sclerophyll, platforms were composed of plant material from only four species: the bent fronds of young Treeferns *Dicksonia*

Table 2. Vegetation movement and canopy opening at 11 display platforms ($n = 62$)

Type	Movement of vegetation ($n = 11$)		Canopy opening width, mean \pm SD (degrees)
	Lateral, mean \pm SD (cm)	Vertical, maximum, mean \pm SD (cm)	
1	1.4 \pm 0.4	1.5 \pm 0.2	24.3 \pm 10.7
2	1.1 \pm 0.3	1.3 \pm 0.5	27.3 \pm 9.9
3	n/a	n/a	24.7 \pm 11.5
4	n/a	n/a	119.9 \pm 16.8

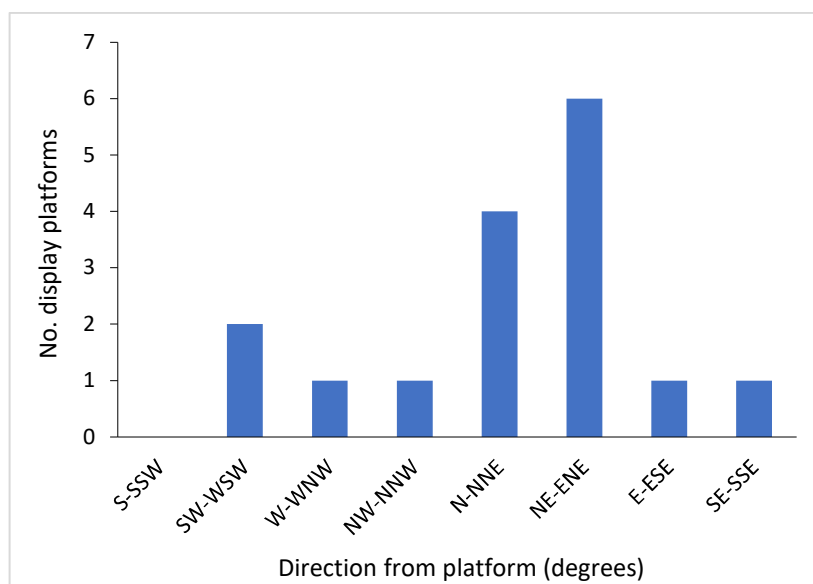


Figure 1. Direction of canopy openings from display platforms, excluding those directly overhead (n=16)

antarctica and stems of three ground cover species, including *Rubus probus*, which has a scrambling habit to a height of 3 m (Table 4). Screening was limited to eight plant species. Screening and platform plant species in the ecotone were common to both rainforest and wet sclerophyll habitat, with two platform species having climbing habits (Table 4).

Preparation of display site

The three primary behaviours of mature male Lyrebirds at display platforms comprised performances, platform preparation or maintenance activities and simply walking through (transitory visits). All preparation or maintenance activities involved the birds using their feet, and comprised the pulling of platform vines towards the bird's body, mounding of soil/humus by scratching from the edge to the centre of the display site, pulling vines up to the soil surface (if covered by freshly mounded soil/humus) and shaking them before lowering them onto the mound, removing ground cover, and bending stems of surrounding vegetation to ground level by grasping and systematically walking on or along the stems towards the base. Once bent to ground level, soil was raked over the stems (Plates 2-4). In one instance, a male Lyrebird filled a sun-bath depression created by an Australian Brush-turkey *Alectura lathami* by pulling over adjacent vegetation (Plate 5).

Table 3. Plant species of display platforms and vegetative screening in Rainforest (Types 1 and 2). Headings: **GH:** Growth Habit; **Scr:** Screening; **Plat:** Platform. Growth Habit abbreviations: V, vine; G ground cover; L, lily; P, palm; S, shrub; T, tree.

Species	GH	Scr	Plat
<i>Adiantum aethiopicum</i>	G	+	
<i>Alocasia brisbaneensis</i>	L	+	
<i>Argyrodendron actinophyllum</i>	T	+	
<i>Bosistoa transversa s. lat.</i>	T	+	
<i>Cissus antarctica</i>	V	+	+
<i>Cissus hypoglauca</i>	V	+	+
<i>Claoxylon australe</i>	T	+	
<i>Cordyline rubra</i>	L	+	
<i>Daphnandra apatela</i>	T	+	
<i>Deeringia arborescens</i>	V	+	
<i>Hibbertia scandens</i>	V	+	
<i>Linospadix monostachyos</i>	P	+	
<i>Lomandra spicata</i>	G	+	
<i>Maclura cochinchinensis</i>	V	+	+
<i>Melodinus australia</i>	V	+	+
<i>Neolitsea australiensis</i>	T	+	
<i>Neolitsea dealbata</i>	T	+	
<i>Palmeria foremanii</i>	V	+	+
<i>Pandorea floribunda</i>	V	+	+
<i>Parsonia fulva</i>	V	+	+
<i>Parsonia straminea</i>	V	+	+
<i>Piper h. hederaceum</i>	V	+	+
<i>Pittosporum multiflorum</i>	S	+	
<i>Tasmannia insipida</i>	S	+	
<i>Todea barbara</i>	G	+	
Total species		25	9

Table 4. Plant species of display platforms and vegetative screening in the Ecotone (Type 3) and Wet Sclerophyll (Type 4). Abbreviations as per Table 3; TF, treefern.

Species	Growth habit	Type 3		Type 4	
		Screening	Platform	Screening	Platform
<i>Adiantum aethiopicum</i>	G			+	
<i>Alocasia brisbaneensis</i>	L			+	
<i>Calochlaena dubia</i>	G	+	+	+	+
<i>Cissus antarctica</i>	V	+	+		
<i>Dicksonia antarctica</i>	TF			+	+
<i>Maclura cochinchinensis</i>	V	+			
<i>Neolitsea dealbata</i>	T			+	
<i>Pandorea floribunda</i>	V	+	+		
<i>Pittosporum multiflorum</i>	S	+			
<i>Pollia crispata</i>	G			+	+
<i>Rubus probus</i>	S			+	+
<i>Urtica incisa</i>	G			+	
Total species	12	5	3	8	4

Preparation of new platforms and maintenance of previously-used platforms peaked in March-April and December, while transitory visits peaked in November and April (Fig. 2). Displays were performed in summer, as well as winter (Fig. 2). The combined number of records of preparation/ maintenance

activities and transitory visits was strongly correlated with the number of display performances two months later (Pearson's Correlation $r = 0.7942$, $p = 0.002$).

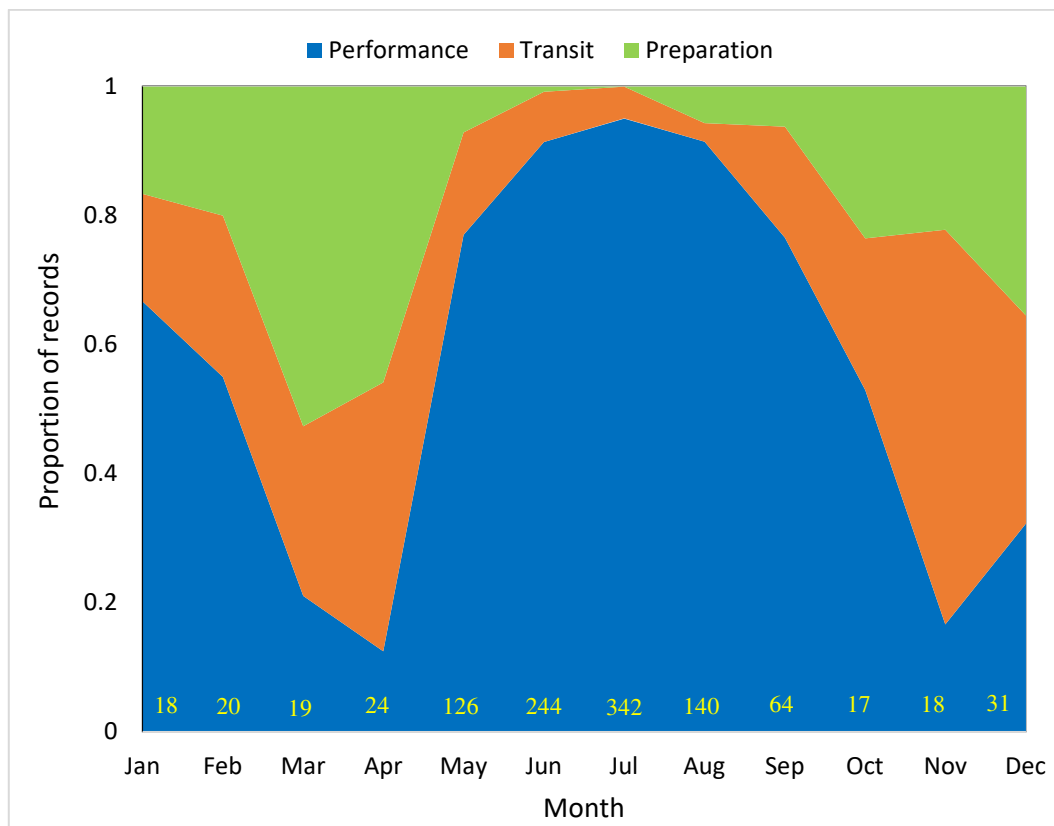
**Figure 2.** Monthly variation in the activity of one male Albert's Lyrebird over one year (January-June 2024; July-December 2023). Values above months are total number of records.



Plate 2. Male Lyrebird bending and breaking the stems of plants adjacent to the display platform (A, B) and covering them with soil/humus (C).



Plate 3. Male grasping, bending and breaking stems of screening plants. The arrows indicate the positions of each foot as it is grabbing the stem.



Plate 4. The reduction of visual screening around a display platform (a looped vine) over time (left to right: April, May, June 2024).

Evidence of inanimate sound accompaniment

We examined display videos recorded at 11 display platforms (June – July 2023) for inanimate sounds as a result of rapid foot movement of vines during the “gronking song” (as described by Robinson & Curtis (1996). Inanimate sounds occurred during 82 min (4%) of video-recorded display time and involved seven display platforms (Types 1 and 2). The

sounds produced in synchrony with the male’s foot movement were categorised as “loud knocking” or “soft rustling”. Loud knocking sounds ($n = 7$ min) occurred at only one display platform and ceased with re-positioning of the camera. Soft rustling sounds ($n = 10$ min) were also recorded at this and one other display platform. Both display platforms were composed of *Cissus* spp vines, entwined with dense, proximal, lateral vine screening. No inanimate sounds were recorded during rapid



Plate 5. The “repair” of a display site by a male Albert’s Lyrebird by grasping bent stems of surrounding vegetation to cover a sun-bath depression created by an Australian Brush-turkey the previous day. The platform is the looped vine.

foot movement (65 min) at the other nine display platforms.

Discussion

Display platform characteristics

Our study quantified the characteristics of display platforms used by male Albert’s Lyrebirds in three habitats of the Border Ranges of southeast Queensland. These characteristics suggest that local males select display sites that enhance visualisation of their display performances through (1) elevation of the platform above ground level, (2) focussed lighting from canopy openings, and in rainforest, (3) the movement of platform vines which results in the shaking of entangled adjacent vegetation. One territory encompassed all habitat types and contained three platform types (Types 1, 3 and 4), demonstrating the versatility of an individual male in selecting sites according to different habitat features.

Elevation of the display platform above ground level was a universal feature (Table 1) either as a raised vine platform (47%), or as vines, twigs, stems or sticks atop a mounded base (53%). In rainforest, raised vine platforms were more prevalent (66%) and twice as elevated as the mounded equivalent (means, 17.1 cm and 8.5 cm, respectively, above the ground), whereas all platforms in wet sclerophyll were mounded. The closely related Superb Lyrebird *M. novaehollandiae* also

creates mounds for display, yet these consist of bare soil (Robinson & Curtis 1996; Robinson & Frith 1981; Maisey & Nimmo 2018; Maisey *et al.* 2023). Recent parapatric speciation of Albert’s Lyrebird from its congener (Mitchell *et al.* 2021) in wetter habitat may have resulted in a partial replacement of the simple mound structure by a more sophisticated display platform, as first proposed by Curtis (1972).

Canopy openings above the display platform were also universal at our study site, although their size (Table 2) and position varied according to habitat. In the rainforest, 63% of openings were directly overhead. Of the remaining openings, 62.5% were oriented NE – ENE of the display platform, the latter direction (67.5° east of true north) aligning with the azimuth of the sun at sunrise during winter, when the Lyrebirds display. This suggests that males in this rainforest were selecting sites that exploited focussed lighting through small openings in the uneven canopy from sunrise until early afternoon to increase the conspicuousness and quality of the display, as occurs in court site selection by the Satin Bowerbird *Ptilonorhynchus violaceus* (Doucet & Montgomerie 2003) and bower orientation by the Great Bowerbird *Chlamydera nuchalis* (Eguchi *et al.* 2019).

In rainforest, the climbing and entangling habit of vines on platforms resulted in an impressive visual effect when male Lyrebirds raised and lowered them. Movement of the platform radiated up to 2.3 m horizontally and

1.9 m vertically in the surrounding vegetation, creating a three-dimensional dome-like extension of the bird's performance, markedly exaggerating his physical presence. Lateral movement of vegetation was greater at Type 1 than Type 2 platforms, despite similar vine numbers and species on both types. The reduced movement of vines at Type 2 platforms was probably due to contact between the vines and the mounded soil beneath them, despite the preparatory behaviour of shaking soil off the vines before laying them down. The predominant vine species on platforms were *Cissus* spp. (43%) and *Parsonsia* spp. (33%), common notophyll vine species in cool subtropical rainforest (Harden *et al.* 2014). All nine platform vine species (Table 3) are opportunistic, vigorous climbers of surrounding vegetation, using adventitious roots, strong twining or anchoring leading stems, leaf-opposed tendrils and/or axillary spines to entwine and attain heights of 20-30 m, with *P. floribunda* capable of reaching high into the canopy (Harden *et al.* 2014). Although the climbing Lawyer Cane is common in warm subtropical and temperate rainforests and has been identified as a preferred constituent of display platforms of Albert's Lyrebirds at other locations (Curtis 1972; Higgins *et al.* 2001), it was not present at our study site.

Robinson & Curtis (1996) postulated that the shaking of vines by the male during his display may create a rhythmic tapping to accompany the male's song. At one display site we recorded loud, knocking sounds during rapid foot movement, which ceased on camera repositioning, suggesting the sound was an artefact created by vine striking the camera support tree. We recorded soft rustling sounds during only 13% of video showing rapid foot movements. These sounds were likely due to shaking of foliage in the vegetation entangled by platform vines, so we consider them an artefact of the display rather than an additional display element.

Vegetative screening was present at all display platforms, with a larger number of screen plant species in the rainforest, reflecting its higher floristic diversity (Tables 3, 4). The extent and density of screening was highly variable, suggesting its characteristics did not play an important role in platform site

selection. However, at one platform, dense foliage screening was deliberately removed possibly to reduce the visual barrier prior to the breeding season (Plates 4, 5).

Comparison of findings with other quantitative studies

Backhouse *et al.* (2024a) quantified the characteristics of 19 display platforms of male Albert's Lyrebirds in temperate rainforest (n = 14) and warm subtropical rainforest (n = 1), as well as wet sclerophyll forest (n = 4) at five study sites across the species' range. Importantly, no display platforms in cool-subtropical rainforest were studied. Comparing these characteristics with those at nearby random points, they found more vegetative structures (vines, and fallen sticks and branches) at display platforms, but no difference in the height of vegetative screening, cleared ground, canopy closure or maximum openings. The authors concluded that the selection of platform sites by males was based solely on the presence of vegetative structures that could be directly incorporated into their platforms.

Consistent with our observations of display platforms in rainforest, Backhouse *et al.* (2024a) found that the main vegetative structures on the majority (79%) of platforms in temperate rainforest were climbing vine species, while the vegetative structures on platforms in wet sclerophyll forest were consistently non-climbing species. The vegetative structures on the single platform examined at their warm subtropical rainforest site comprised sticks at the base of a *Lantana camara* shrub. Curtis (1972) observed that Lawyer Cane was the main vegetative structure on display platforms in warm subtropical rainforest of Tamborine Mountain. The presence of *Lantana*, which is a scrambling exotic species usually present in semi-open, degraded or marginal rainforest (Harden *et al.* 2014), suggests that the platform examined by Backhouse *et al.* (2024) was atypical.

Both studies recorded the lateral movement of platform structures that radiated into surrounding vegetation, but Backhouse *et al.* (2024b) did not record vertical movements or compare lateral movements between habitats due to restrictions of their camera's

field of view. Vertical movement of surrounding vegetation may be a feature specific to subtropical rainforest with its prevalence of climbing species. Further study of the influence of platform vine species and their climbing mechanisms on the effect and function of display platform manipulation are desirable.

In contrast to our finding that most display platforms were situated either directly below obvious openings in the canopy (63%) or where canopy openings were close to the azimuth of the sun at sunrise, Backhouse *et al.* (2024a) found no difference in canopy cover above the platforms and that above nearby random points. This different finding may be due to the nature of the canopy in the habitats they sampled. The canopy of temperate rainforest is typically uniform and even, and the one site they sampled in warm subtropical rainforest was in degraded or marginal habitat. In cool subtropical rainforest as little as 0.25% of sunlight may penetrate the multi-layered canopy to reach the forest floor, with small flecks of light responsible for 50% of illumination (Lowman 1986). In contrast, the thinner, less complex, canopy of cool temperate rainforest results in much larger areas of direct illumination (Lowman 1986), and the orientation of canopy openings from display platforms might be expected to be close to random.

All display platforms were conspicuously elevated at our study site (Table 1; Plate 1), in contrast to the study locations of Backhouse *et al.* (2024a), where raised platforms were not universal, and mounding was not noted. The presence of mounding in one population of Albert's Lyrebirds and its absence in five other populations as well as the general literature, is perplexing. Differences between the ground cover species in the wet sclerophyll forest of the study sites may offer a partial explanation. The main display platform structure of three of the four platforms in wet sclerophyll forest studied by Backhouse *et al.* (2024a) was Bogrush *Shoenus sp.*, which grows as dense ground cover in areas of high rainfall on shallow rhyolite-derived soil, and its matted root system may preclude mounding (AMG pers. obs.).

Another possible explanation for the building of mounded platforms (except Type 1) at our sites, independent of habitat, relates to genetic differences between Albert's Lyrebird populations. Nielsen (2010) observed differences in nest design and location, plumage colour and tone of song between the population on the isolated Tamborine Mountain, where he resided for 21 years, and that in the Main Range-McPherson Range. Genetic differences between these populations have not been investigated but there is genetic evidence of relatively recent contact between Albert's Lyrebirds and Superb Lyrebirds (Mitchell *et al.* 2021; de Mel 2025), and the innate behaviour of mounded display platforms of our study population may be an expression of recently acquired nuclear DNA from the latter species.

Our year-long study also quantified behaviour associated with the preparation of new display platforms and the maintenance of previously-used platforms, which peaked in the two months preceding the onset of display performances in both winter and summer (Fig. 2). This is the first time preparation and maintenance behaviour has been documented for the Albert's Lyrebird, and the first time that summer displays have been recorded. The details of this behaviour will be described in a separate paper.

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