

## A new peacock spider from Australia displays three 'sapphire gems' on a field of gold (Araneae: Salticidae: Euophryinae: *Maratus* Karsch 1878)

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**Abstract.** One new species within the Australian genus *Maratus* Karsch 1878 is described: *M. purcellae* from the Australian Capital Territory and New South Wales. Male display behaviour appears to be relatively simple, including elevation and movement of the opisthosoma from side to side in front of a female.

### Introduction

A number of new species of the endemic Australian genus of peacock spiders, *Maratus* Karsch 1878, have been described in recent years (e.g., Otto & Hill 2011, 2012c, 2012d), and many more remain to be discovered and described. To this group we now add a new species that is notable for its very small size and vivid colouration. As with other recently described species, the discovery of this new peacock spider, easily overlooked in a natural setting, owes much to a growing level of amateur interest in the observation and macrophotography of terrestrial arthropods.

### *Maratus purcellae*, new species

**Type specimens.** The holotype male was collected in Weston Creek southwest of Canberra, ACT (35° 20' 56.87" S, 149° 01' 53.29" E, 24 NOV 2012, M. Purcell coll.). This specimen will be deposited in the Australian Museum, Sydney. A paratype male, collected at Grafton, New South Wales (29° 41' 10.14" S, 152° 56' 19.24" E, 5 JAN 2013, I. Macaulay coll., AUS-592), is in the collection of Robert Whyte and will be deposited in the Queensland Museum.

**Etymology.** The species name (*purcellae*, genitive, feminine singular) is a Latinised word derived from the last name of Michaela Purcell who discovered the male holotype of this species in her backyard. The corresponding common name for this spider in English is *Purcell's Peacock Spider*.

**Diagnosis.** Like *Maratus robinsoni* Otto & Hill 2012 and *M. spicatus* Otto & Hill 2012, this is a small (~2.5-3 mm body length) *Maratus* (Otto & Hill 2012a, 2012c). As in those species, legs III are not decorated and are not known to be used by males as they display to females. In all three species extension of legs III powers each jump, but legs III are otherwise close to legs IV in length with a slightly longer femur and patella. In other, larger *Maratus* (e.g., *M. mungaich*, *M. pavonis*, *M. speciosus*, *M. vespertilio*, *M. volans*), legs III tend to be much longer in males, and decorated for use in display (Dunn 1957, Hill & Otto 2011, Otto & Hill 2010, Girard *et al.* 2011, Otto & Hill 2012a-e). The male pedipalp of *M. purcellae* also resembles that of *M. robinsoni* and *M. spicatus* with respect to the shape of the embolus, but it is much closer to *M. spicatus* with respect to the presence of a relatively thick embolus. The long and narrow white line of setae on the dorsum of each pedipalp of a male *M. purcellae* distinguishes this from the other two species,

as does its unique pattern of decorative setation on the carapace and dorsal opisthosomal plate. Unlike *M. robinsoni* and *M. spicatus*, the legs of *M. purcellae* are uniform in colouration without segmental rings.

*Description of male.* The male of this small species (holotype 2.85 mm, paratype 2.6 mm body length without spinnerets; Figure 2:1) has a unique appearance allowing easy identification (Figures 1-3).



**Figure 1.** Living holotype male *Maratus purcellae* from Weston Creek, southwest of Canberra. **1**, Feeding on a small cycadellid. **7**, Pre-jump position with legs III cocked. Narrow dorsal stripes of white setae stand out on the otherwise dark pedipalps. Bright yellow-orange or gold scales cover most of the face, eye region at the top of the carapace, and the dorsal opisthosoma. Two longitudinal stripes, one behind each AME, interrupt the scale cover of the eye region. Three deep blue (sapphire) spots within the field of gold scales mark the dorsal opisthosoma. Legs are light in colour, with white setae and darker macrosetae.



**Figure 2.** Details of the male holotype of *Maratus purcellae*. **1**, Dorsal view of preserved spider. **2**, Postero-dorsal view of living spider. **3**, Detail of eye region (*ocular quadrangle*) of living spider. **4**, Dorsal opisthosoma of living spider. **5**, Another view of the dorsal opisthosoma, showing expansion of the edge of the the dorsal plate (arrow) which might accomodate either feeding or flattening of the opisthosoma. **6**, Left lateral view of preserved spider. **7**, Detail of left lateral view of opisthosoma showing shrinkage during prolonged preservation resulting in flattening of the opisthosoma and folding of the flexible lateral margins of the plate down around the sides. The operculum (arrow) is dark. **8-11**, Medio-ventral, ventral, latero-ventral, and lateral views of the left pedipalp. The cuticle of the pedipalp, including the tegular surface, is quite dark. The curved embolus has a thick medial process and two distal processes converging at the apex. The RTA (**10**, arrow) is light-coloured and difficult to see. **12**, Ventral view of living spider.



**Figure 3.** Details of the male paratype of *Maratus purcellae* from Grafton, northern New South Wales. **1-3**, Three views of the living spider. As in the holotype, a single long black seta emerges from the central sapphire spot of the opisthosoma. Perhaps as a result of less feeding, the margins of the dorsal opisthosomal plate of this individual were folded down on each side of the opisthosoma, not visible from above. **4**, Dorsal view of preserved spider, showing loss of gold colour of the pigmented scales, and the brilliant blue-green colour of the submerged iridescent scales of the three sapphire spots on the dorsal opisthosoma. **5**, Left lateral view. **6**, Face, showing small chelicerae and lighter cuticle at the front of the carapace. Much of the underlying pigment of the carapace fades with preservation, and areas that are light brown in the living spider, including the legs, lose their colour. **7-9**, Ventral, latero-ventral, and lateral views of the right pedipalp. In (8) an arrow points to the transparent RTA. Photographs by Robert Whyte, used with permission.

The carapace of the living spider is dark brown to black, but lighter brown in front. When preserved in alcohol, the light brown colour of the living spider fades, and the front or face of the spider beneath the first eye row then becomes ivory-white. The arrangement and greenish colouration of the eyes agrees with that of other *Maratus*. The PME are small, closer to the PLE than to the ALE. The eye region occupies the front half of the carapace as viewed from above. Behind the PLE the carapace slopes downward to the rear. Half-way between the PLE and the posterior margin of the carapace this slope increases sharply and becomes almost vertical. There are some gold or yellow-orange scales below the anterior eye row, but the

clypeus itself and the sides of the carapace are mostly glabrous and devoid of setae. The carapace has no marginal band of scales, but there is a white lateral band of scales extending to the rear from beneath each PME. Each anterior eye is encircled by long, flanking gold or yellow-orange scales and, except for a dark stripe proceeding to the rear behind each AME, the eye region is completely covered with wide, pigmented yellow-orange or gold scales. These scales are aligned from base to apex in an anterior direction. The two dark stripes are partly covered with very thin, iridescent purple to dark-blue to blue-green scales also aligned anteriorly, and beneath these the shiny black surface of the carapace can be seen, its brightness varying according to the relative directions of illumination and observation (Figure 2:3). Behind each of these, a less distinct stripe of white setae runs to the rear of the eye region, converging near the midline at the rear of the otherwise glabrous, black carapace.

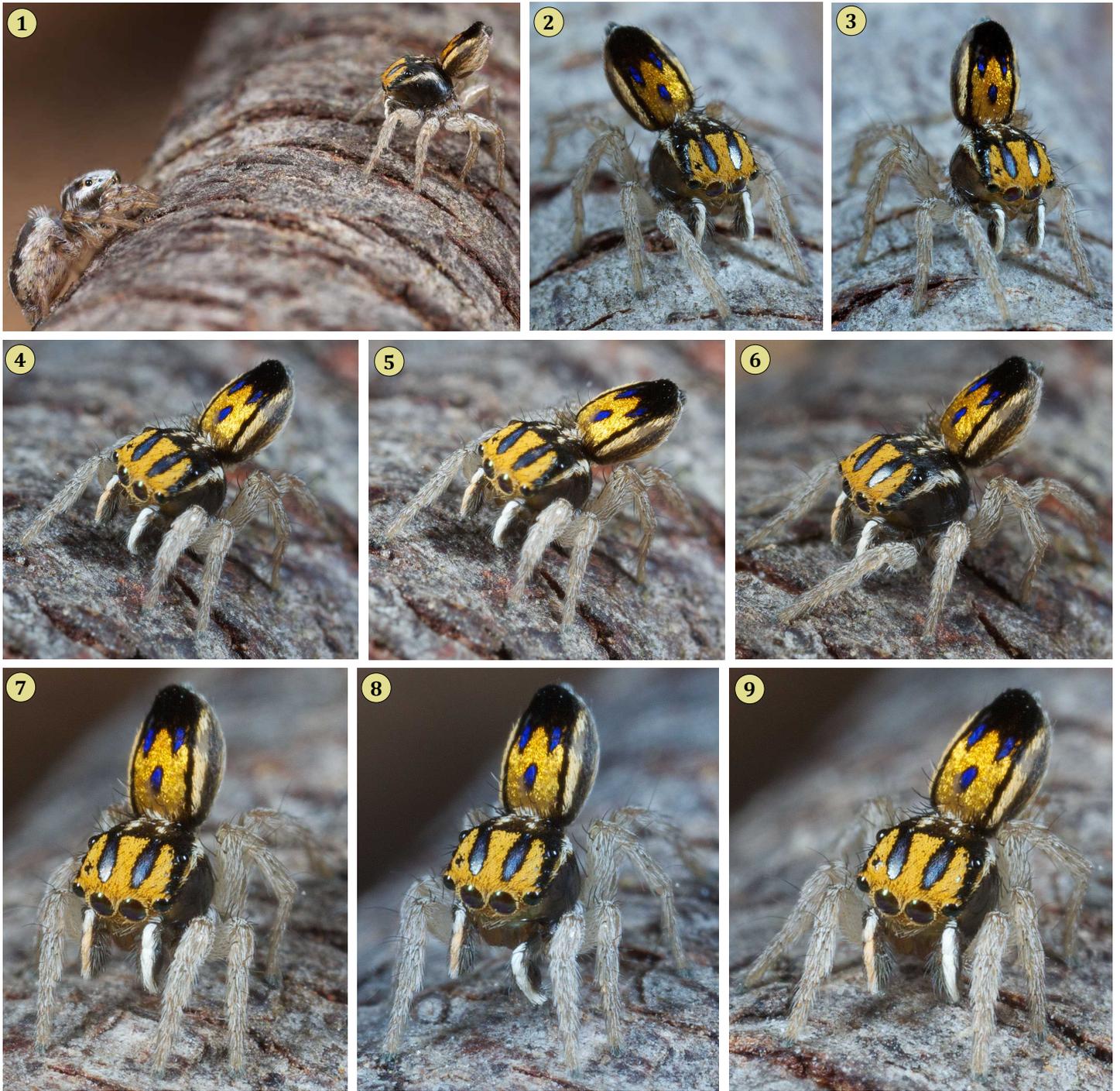
The dorsal opisthosoma is covered with a plate, the margins of which bear no setae and may be folded at the sides or extended laterally, depending on the dorso-ventral compression and relative inflation of the opisthosoma as a result of feeding (Figure 2: 4-5). Inside of each plate margin is a lateral stripe comprised of large ivory-white scales, aligned from base to apex toward the rear, and inside of this stripe on either side is a narrower black stripe separating it from the dense field of gold or yellow-orange scales covering the dorsum. At the front of the dorsal opisthosoma is a tuft of long, mostly white setae projecting forward above the pedicel. These long setae may contact the prosoma. To either side of this tuft is a tuft of darker setae, also long and projecting. At the center of the dorsum is a relatively small elliptical (longer than wide) patch of iridescent deep blue or sapphire-coloured scales, and there is a single long, black, recurved median seta projecting from this spot. Behind this is a pair of mid-lateral patches of the same size and deep-blue scale colouration, in contact at the rear with a patch of black setae that covers the rear 1/5 of the dorsal opisthosoma. The spinnerets are of normal size, black with grey setae. The underside of the opisthosoma is light coloured, except for the dark opercula that cover the book lungs and several spots of darker pigment.

Legs I and II are about the same length and shorter than legs III and IV. Legs III are only slightly longer than legs IV, with longer femora and patellae. All legs are uniform in colouration, with no obvious modification of legs III for display. The legs are very light brown to translucent (ivory-white when preserved in alcohol), covered with light setae and darker macrosetae. There is no segmental banding. The setae of the foot pads (tenae) are grey.

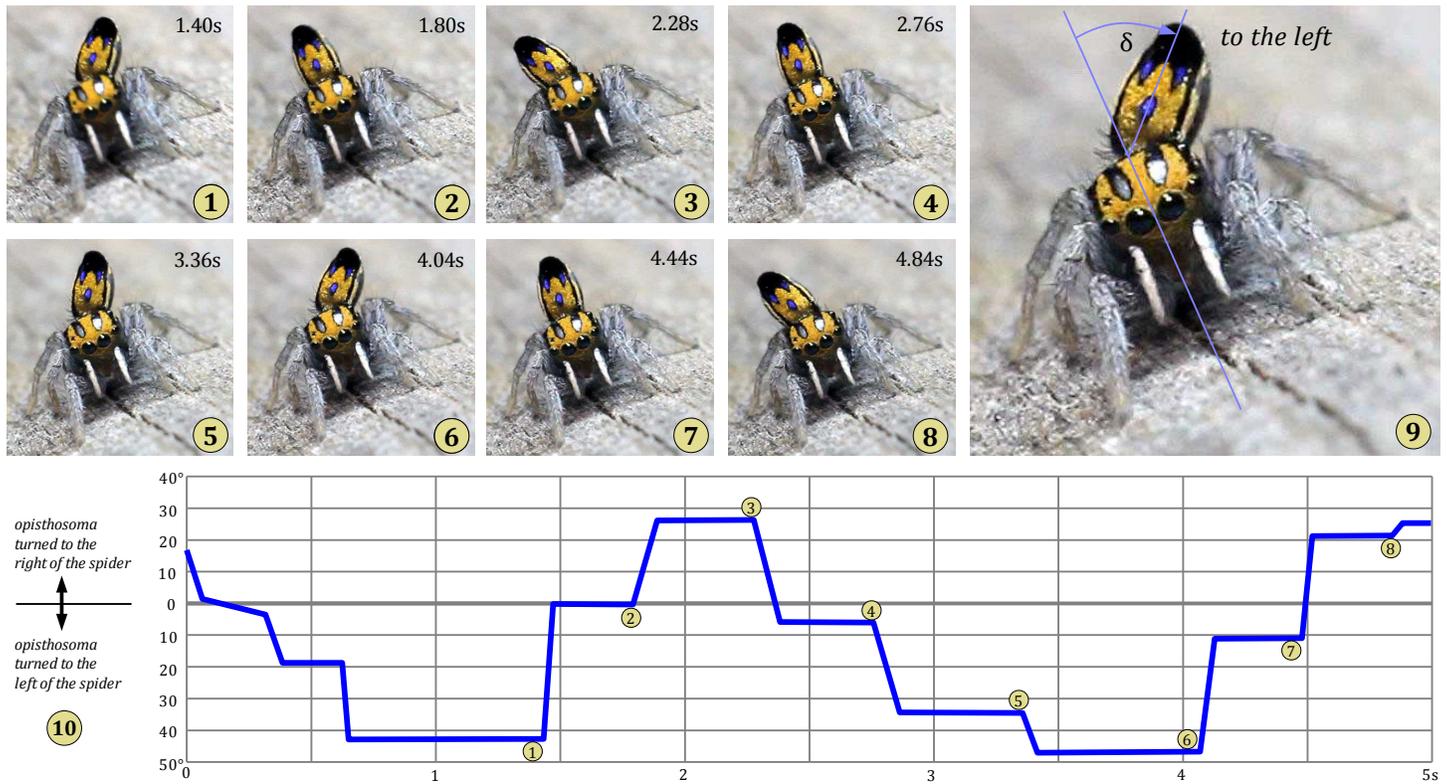
The chelicerae are narrow and relatively small, together almost as wide as both AME proximally, but much narrower distally. They are rounded and glabrous in front, brown in the living spider but whiter in preserved specimens. The endites and labium are brown and glabrous, the sternum and all coxae dark brown with scattered white setae.

Pedipalps of the living spider are dark brown (lighter in preserved specimens), each with a prominent long dorsal stripe comprised of dense, bright white setae. The RTA is light and translucent, difficult to observe (Figures 2:10, 3:8). The tegulum is unusually dark. The thick, sclerotized outer ring of the embolus originates with an inner and thicker outer medial process, and terminates in two sclerotized processes that converge at the apex (Figures 2:8-9, 3:7-8). This is similar to the embolus of both *M. robinsoni* and *M. spicatus* (Otto & Hill 2012c, 2012e).

*Courtship display by the male.* Courtship display behavior of the holotype male was observed by placing it near a female *M. robinsoni* of comparable size (Figures 4-5). Movement of legs III representing an important part of the display of other *Maratus* species (Otto & Hill 2010, 2012b, Hill & Otto 2011) was not observed. After moving to a location facing the female, this male rotated its elevated opisthosoma from side to side quickly (~0.05 s for each discrete movement), then held that position for about 0.3-0.9 s. The vertical elevation of the opisthosoma varied during these displays.

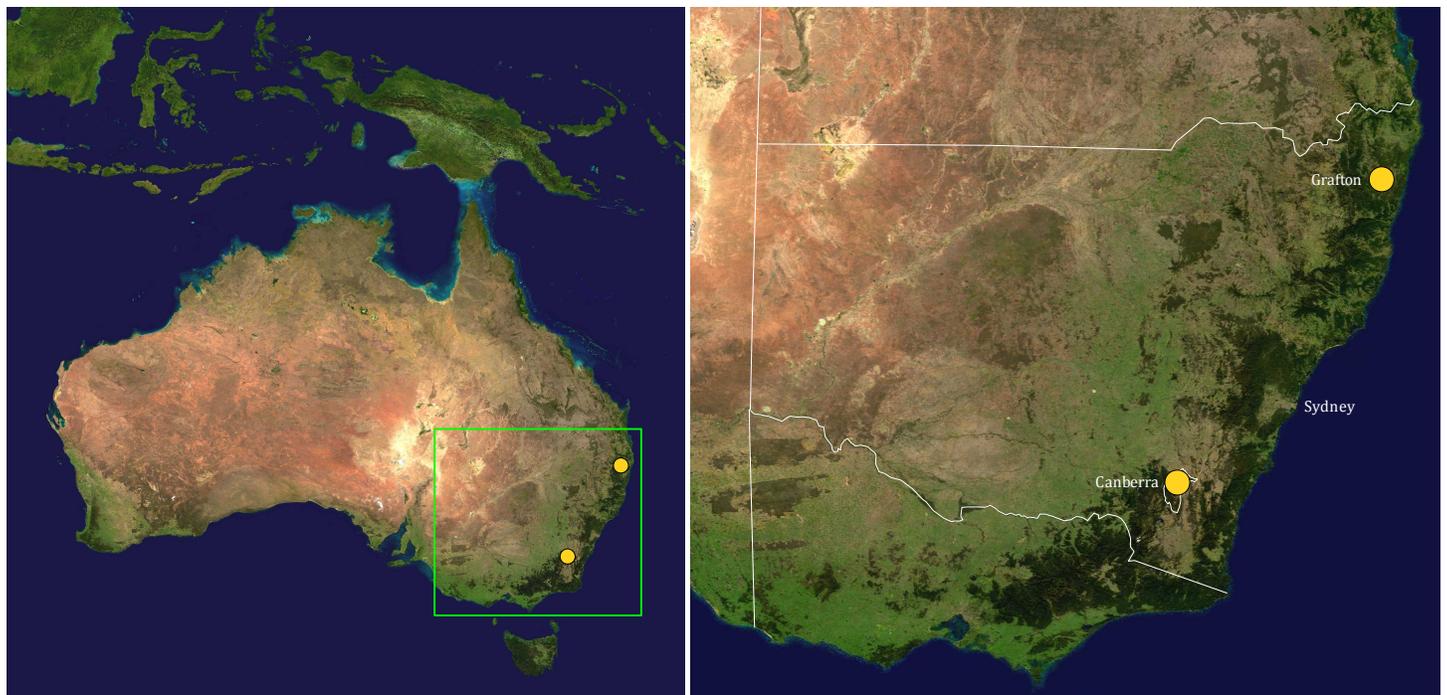


**Figure 4.** Display of the holotype male *Maratus purcellae* to a female *M. robinsoni* of comparable size. **1**, Male (right) with female. **2-3**, Two different display positions, showing (2) lower opisthosoma rotated to the right and (3) raised opisthosoma in a centered position. The pedipalps were not moved but were held in a vertical, parallel orientation, displaying the bright white stripe of setae on their dorsal surface, framed by darker setae on either side. There was no indication of movement of the unornamented legs III as part of this display. The sharp vertical lines of the pedipalps, leading to the vertical lateral lines of the elevated opisthosoma, frame the brightly coloured dorsal scale cover that dominates this display. **4-6**, Three images showing the opisthosoma in a lower position. **7-9**, Three images with the opisthosoma in more elevated position.



**Figure 5.** Opisthosomal rotation by the holotype male during courtship display. **1-8**, Selected frames from the 25 FPS video used to study this display. The position of each frame is indicated by number in the chart below (**10**). **9**, Convention used to measure the angle of rotation of the opisthosoma ( $\delta$ ), in a vertical plane projection, from each frame during this sequence. **10**, Chart showing positions of the opisthosoma during a 5 s sequence of display at a resolution of 25 FPS. Each rotational movement can be described as rapid and discrete, followed by a stationary position of short duration.

*Habitat and distribution.* Both the holotype and paratype were found in settled areas, so nothing can be said at this time of the natural habitat of *Maratus purcellae*. The two records suggest that it has an extensive range inland from the southeastern coast of Australia (Figure 6).



**Figure 6.** Localities where *Maratus purcellae* has been found (solid gold circles). Satellite image by NASA Visible Earth.

The holotype for *M. purcellae* was first seen on a metal Colorbond® fence mounted on a small wooden wall made of light timber. It dropped into tall, dry grass growing below and adjacent to this fence when approached (M. Purcell, pers. comm.). The paratype was found on a fence surrounding a cricket ground (I. Macaulay, pers. comm.). This built habitat may provide a useful starting point in future searches for this and related species.

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