

Nests and eggs of the Chestnut-backed Button-quail *Turnix castanotus*: Two new nests and a review of previous descriptions

Patrick T.D. Webster^{1*} , Nigel A. Jackett¹ , Ian J. Mason², Emily R. Rush³,
Nicholas P. Leseberg¹  and James E.M. Watson¹ 

¹Research and Recovery of Endangered Species, School of Earth and Environmental Sciences, University of Queensland,
St Lucia QLD 4072, Australia

²Australian National Wildlife Collection, National Research Collections Australia, CSIRO, Canberra ACT, Australia

³Australian Wildlife Conservancy, Cairns QLD 4870, Australia

*Corresponding author. Email: p.webster@uq.edu.au

Abstract. The Chestnut-backed Button-quail *Turnix castanotus* is a small, cryptic, ground-dwelling species endemic to savanna ecosystems of northern Australia. Due to aspects of its ecology, cryptic plumage and behaviour, and the remoteness of most of its distribution, there are few published observations from the field documenting its breeding biology. The eggs were first described in 1856 and have subsequently been described by other authors. Two nests were detected in the Northern Territory in March 2021. We compare nesting events there with previous descriptions and museum collections. Our findings are mostly consistent with other literature on this species, but are inconsistent with two contemporary accounts, which we suggest are based on misidentification of Painted Button-quail *T. varius*.

Introduction

The Chestnut-backed Button-quail *Turnix castanotus* remains one of Australia's least known species of button-quail, a group of birds that are understudied worldwide (Yarwood *et al.* 2019). It is widely distributed throughout the tropical savanna ecosystems of northern Australia, from the Dampier Peninsula (Western Australia) to the sandstone ranges in the west of the Gulf of Carpentaria (Queensland) (Marchant & Higgins 1993; Johnstone & Storr 1998; Webster & Stoetzel 2021). In this context, the term 'breeding' suggests the period of egg-laying to incubation. This species is regarded as a breeding resident throughout its range (Marchant & Higgins 1993), and laying mostly coincides with the wet season in northern Australia (November–April) (Marchant & Higgins 1993) but may continue into the early dry season when conditions are favourable (Ward & Young 2014).

Six descriptions and/or illustrations of the eggs of the Chestnut-backed Button-quail have been published. The eggs were first described and illustrated by Thienemann (1856), a German ornithologist, although the exact clutch on which he based his description and illustration is unclear. Surprisingly, Gould (1865) did not describe the eggs of this species despite having them in his collection, as noted by Fisher & Calaby (2009). The work of Thienemann was not cited in Campbell's (1901) *Nest and Eggs of Australian Birds*, which stated that the nest and eggs of this species were 'undescribed'. Despite this claim, however, Campbell mentioned in a footnote a clutch of two eggs held by W.H.D. Le Souëf, collected on 21 January 1899. The location of this clutch now is uncertain but, based on examination, the collection period, and clutch size, may be attributable to clutch SAM B14566 at the South Australian Museum. Campbell's (1901) description of these eggs clearly matches Thienemann's description and illustration.

Oates (1901) described the eggs of the Chestnut-backed Button-quail from seven clutches in the J. Gould Oological Collection and one in the H.F. Walter Oological Collection. According to data cards held at the Natural History Museum, Tring, UK, four of these specimens (NHM 1962.1.199, 1852.1.7.26, 1962.1.200 and 1941.4.6.1194) are still held there and were collected from the Port Essington region [Cobourg Peninsula in the Northern Territory (NT)] by J. Gilbert and R. Bankier. Oates recognised the previous descriptions by Thienemann (1856).

Le Souëf (1902) provided descriptions of the eggs and the first description of the nest of the Chestnut-backed Button-quail from the Darwin region (Lower Daly River, NT). This clutch was likely collected by J.H. Niemann (Mason & Pfitzner 2021), based on clutches now held at Museums Victoria (NMV BE55, BE66 and BE6886). His work was accompanied by the first photograph of this species' nest.

The only other authors known to have described the species' nest and eggs are Beruldsen (1980, 2003) and Johnstone & Storr (1998). Neither cited any previous publications. Although the basis of Beruldsen's description was not disclosed, Johnstone & Storr's descriptions were based on a clutch of eggs held in the N. Kolichis Oological Collection. This clutch was obtained from R. Constance, an aviculturist from Perth, Western Australia, who had acquired some specimens from Katherine, Northern Territory (R. Johnstone pers. comm.). Four Chestnut-backed Button-quail were seen in R. Constance's aviary by N. Kolichis, as were Painted Button-quail *T. varius*, which were reportedly separated in a nearby aviary.

Here we describe two new nests and clutches found in the Northern Territory, and the habitats in which they were found. We compare our findings with those of published descriptions and museum specimens.

Study site and methods

The two new nests described in this paper were found in March 2021 during other research activities on the Chestnut-backed Button-quail in the Northern Territory. One nest was located on the outskirts of Pine Creek on 15 March and the other at the Australian Wildlife Conservancy's Wongalara Wildlife Sanctuary in southern Arnhem Land on 17 March. The first was found after analysis of GPS tracking data from a male, which indicated that the bird was routinely visiting a central location. This nest was located by thoroughly searching every grass tussock and small shrub in the vicinity of the GPS fixes. At Wongalara, a nest was found after searching the area from where a male had flushed.

We conducted an extensive review of the literature concerning any notes or descriptions of the nests or eggs of the Chestnut-backed Button-quail. Where descriptions were based on museum clutches, the relevant museums were contacted to gather additional details and photographs of the clutch(es) and data card(s) to ensure authenticity. The following museum collections were examined: Australian Museum (AM), Australian National Wildlife Collection (ANWC), Museum and Art Gallery of the Northern Territory (MAGNT), Museums Victoria (NMV), Queensland Museum (QM), South Australian Museum (SAM), Western Australian Museum (WAM); and Natural History Museum, Tring, UK (NHM), Naturmuseum Senckenberg, Frankfurt am Main, Germany (NMSF), and Western Foundation of Vertebrate Zoology, Camarillo, USA (WFVZ).

Results

Nest sites and composition

The nest at Pine Creek was constructed under a small perennial grass tussock of Mountain Wanderrrie Grass *Eriachne mucronata*, in open savanna and was positioned in an area with sparser groundcover than in the surrounding area. This groundcover was dominated by diverse annual

and perennial grasses and Quinine Bush *Petalostigma quadriculare*. Annual Sorghum *Sorghum timorense* was dominant in the landscape, forming dense stands in the surrounding area, and areas of bare ground and gravel were common. The nest was in a small depression at the base of a perennial grass tussock and was constructed entirely of grass leaves and stems, which appeared to be Wanderrrie Grass. Its domed roof followed the contour of the over-arching leaves of the perennial tussock. Its entrance faced away from the tussock towards an area of open ground. Although located under a small perennial tussock and facing an open area of bare ground, the nest was well hidden and very difficult to observe from above (Figure 1).

The nest at Wongalara Sanctuary was located under a perennial grass tussock of Ribbon Grass *Chrysopogon pallidus*. As at Pine Creek, it was also positioned in an area where the groundcover layer was relatively open with numerous patches of bare ground. This area was also dominated by a diversity of annual and perennial grasses and the small shrub Quinine Bush, though Annual Sorghum was absent. The nest was in a small depression and constructed of leaves and stems of grasses of unidentified species. Leaves of a eucalypt (presumably Darwin Stringybark *Eucalyptus tetradonta*) and of Small-fruited Bloodwood *Corymbia dichromophloia* (the dominant tree species) also formed part of the base of the nest. The exterior of the nest was 10 cm in height and its entrance (6–7 cm wide) faced an area of open ground (Figures 2–3).

Description of eggs

Three eggs were found in the Pine Creek nest and four in the Wongalara nest. The size, shape and coloration of the eggs were similar at the two sites. All eggs were rounded but pyriform in shape, being widest at one end and sharply tapered at the opposite end. The base colour of all eggs was a clean pure white, with a sparse covering of distinct small blotches of dark purple and brown, which appeared almost black. Fine flecks of light brown and greyish purple were present but sparsely scattered on the eggs' surface (Figures 4A–B).



Figure 1. Nest of Chestnut-backed Button-quail at Pine Creek, Northern Territory. Open savanna woodland in which the nest was detected (left), location of nest under perennial grass tussock (centre), and domed nest with three eggs (grass parted for photograph) (right). Photos: P.T.D. Webster



Figure 2. Nest of Chestnut-backed Button-quail at Australian Wildlife Conservancy's Wongalara Sanctuary, Northern Territory. Open savanna woodland in which the nest was detected (left), location of nest under perennial grass tussock (centre) and domed nest with four eggs (grass parted for photograph) (right). Photos: P.T.D. Webster



Figure 3. Adult male Chestnut-backed Button-quail returning to his nest at Wongalara Sanctuary, Northern Territory. Photo: P.T.D. Webster

Review of previous descriptions and museum clutches: Egg shape, colour, and patterning

In total, 19 Chestnut-backed Button-quail clutches were located in museum collections (Table 1). Two of these appeared to be misidentified: clutch NMV BE 6225 and QM O.884. Both of these are *Turnix* clutches, but the species was not ascertained. Based on comparisons with eggs of other *Turnix* species, however, they are probably attributable to Red-chested Button-quail *T. pyrrhorthorax*.

Previous descriptions of the eggs of the Chestnut-backed Button-quail are largely consistent (Thienemann

1856; Campbell 1901; Oates 1901; Le Souëf 1902) (see Figures 4C–H), as summarised in Table 2. Johnstone & Storr (1998) gave no description of the eggs as there were no clutches available from Western Australia at the time (R. Johnstone pers. comm.) but they displayed a photograph of a clutch from the N. Kolichis Oological Collection (see Figure 4I). These eggs from the Kolichis Collection resemble Painted Button-quail eggs (compare Figures 5A–B with Figure 5C). Later, Beruldsen (2003, p. 212) described the eggs of the Chestnut-backed Button-quail as indistinguishable in colour and shape from those of the Painted Button-quail, which he described as “faint buff or greyish white, and finely marked with tiny dots, spots and flecks and a few larger markings”.

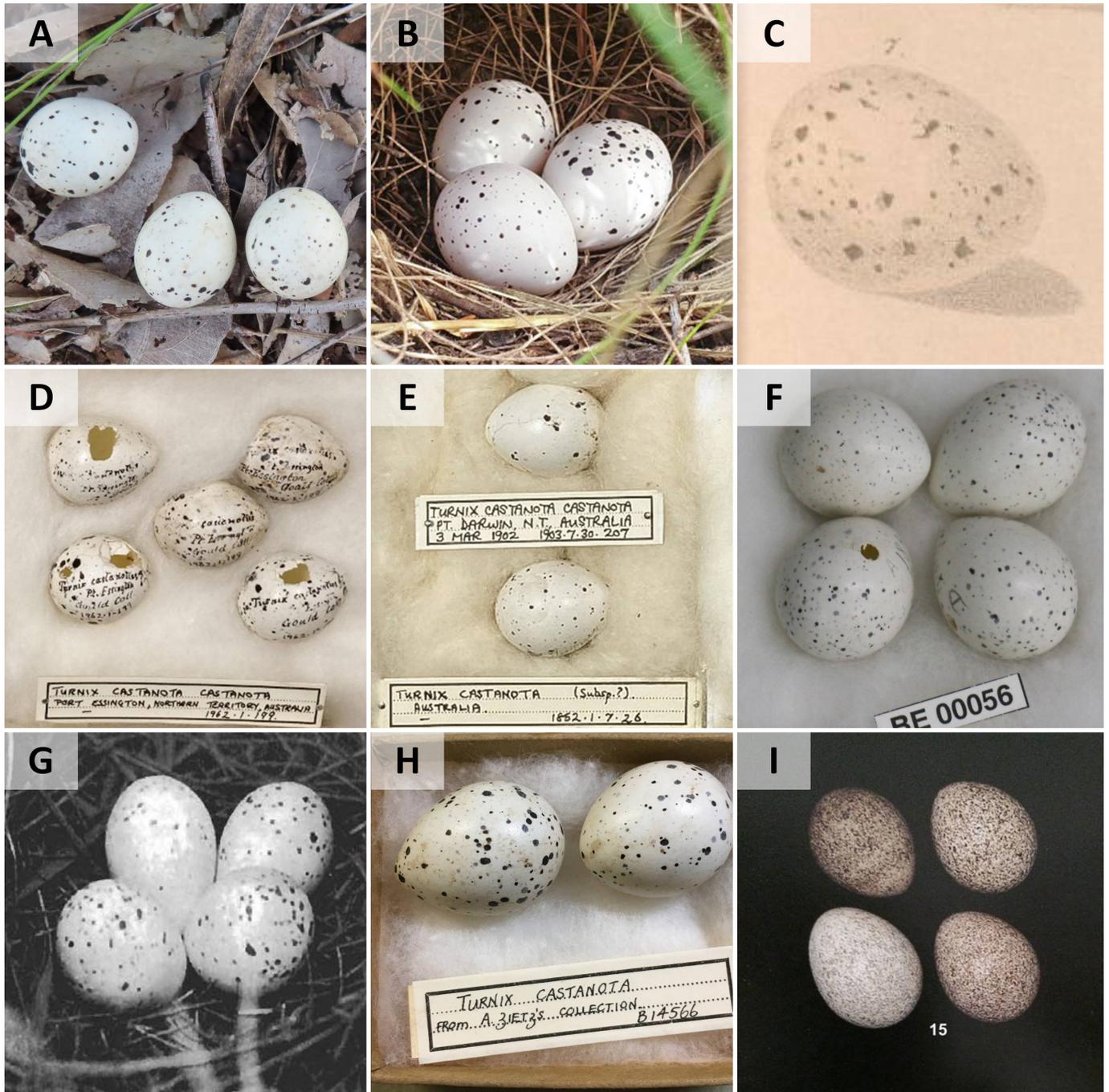


Figure 4. Chestnut-backed Button-quail clutches noted in this paper. (A) Nest and clutch found by PTDW at Wongalara Sanctuary, Northern Territory (NT). (B) Nest and clutch found by ERR at Pine Creek, NT. (C) Illustration by Thienemann (1856). (D) Clutch collected by J. Gilbert, 1840-1841, at Port Essington, NT, partly the basis of Oates' (1901) description; photo: Douglas Russell. (E) Upper egg collected on 3 March 1902 likely by J. Niemann in the Darwin region, NT; lower egg from H.F. Walter Collection (unknown collector and collection site), part of basis of Oates' (1901) description; photo: Douglas Russell. (F) Clutch collected by J. Niemann for W. Le Souëf on the lower Daly River, NT, on 3 January 1901, forms the basis of Le Souëf's (1902) descriptions; photo: Patrick T.D. Webster. (G) First photograph of the nest of a Chestnut-backed Button-quail (Le Souëf 1902); these eggs formed the basis of Le Souëf's description. (H) Clutch SAM B14566, potentially from Le Souëf's collection and the basis of Campbell's (1901) description; photo: Maya Penck. (I) Clutch held in the N. Kolichis Oological Collection (Johnstone & Storr 1998); note that these eggs appear dissimilar to all other specimens of Chestnut-backed Button-quail eggs presented here.

Table 1. Verified clutches of Chestnut-backed Button-quail eggs held in museum collections. NHM (UK) = Natural History Museum, Tring, UK; NMV = National Museums Victoria; SAM = South Australian Museum; WFVZ (USA) = Western Foundation of Vertebrate Zoology, Camarillo, USA. Dates are given as day.month.year; nr = not recorded.

<i>Museum</i>	<i>Specimen no.</i>	<i>Clutch size</i>	<i>Date</i>	<i>Location</i>	<i>Collector</i>
NHM (UK)	1852.1.7.26	1	nr	*Australia	nr
NHM (UK)	1903.7.30.207	1	03.03.1902	Lower Daly River, NT	J.H. Niemann
NHM (UK)	1941.4.6.1194	1	05.03.1841	Port Essington, NT	nr
NHM (UK)	1962.1.199	5	1840–1841	Port Essington, NT	J. Gilbert
NHM (UK)	1962.1.200	2	1840	Port Essington, NT	R.A. Bankier
WFVZ (USA)	934	4	06.03.1841	Port Essington, NT	J. Gilbert
NMV	BE 00055	1	03.01.1901	Lower Daly River, NT	J.H. Niemann
NMV	BE 00056	4	03.01.1901	Lower Daly River, NT	J.H. Niemann
NMV	BE 6886	3	13.01.1902	Lower Daly River, NT	J.H. Niemann
NMV	BE 16107	4	13.04.1937	Glyde River, Arnhem Land, NT	B.N. Tindale
NMV	BE 16108	4	29.04.1937	Glyde River, Arnhem Land, NT	B.N. Tindale
NMV	BE 16109	4	05.03.1937	Crocodile Islands, NT	B.N. Tindale
SAM	B4123	4	12.1921	Groote Eylandt, NT	B.N. Tindale
SAM (missing)	B4124	4	12.1921	Groote Eylandt, NT	nr
SAM	B4125	4	01.1922	Groote Eylandt, NT	D.F.F. Thomson
SAM	B4126	4	01.1922	Groote Eylandt, NT	D.F.F. Thomson
SAM	B14556	2	nr	nr	D.F.F. Thomson

*Labelled 'AUSTRALIA' but almost certainly collected by Gilbert at Port Essington, NT

Table 2. Previously published descriptions of verified Chestnut-backed Button-quail eggs and references to figures in the present study. NA = not available.

<i>Shape</i>	<i>Base colour</i>	<i>Patterning</i>	<i>Colour of markings</i>	<i>Reference</i>	<i>Figure</i>
Pyriform	Pure white	Sparingly spread	Ash-grey, grey-brown, delicate yellow	Thienemann (1856)	4C
Pyriform	White	Sparingly marked	Pale purple and black	Oates (1901)	4D, 4E
Remarkably round (pyriform)	Glossy white	Sparingly marked	Sepia, umber and dull greyish blue	Campbell (1901)	NA
Rounded	Glossy greenish white	Boldly speckled	Very dark brown almost black and smaller fainter purplish brown	Le Souëf (1902)	4G

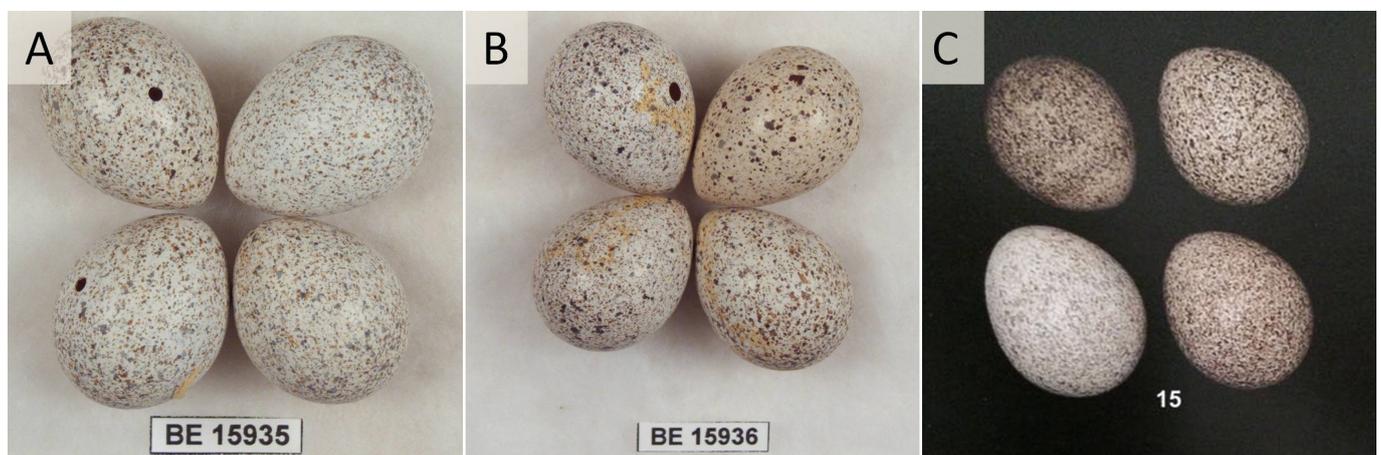


Figure 5. (A) and (B) Clutches of Painted Button-quail eggs held in NMV. (C) Purported clutch of Chestnut-backed Button-quail eggs, depicted by Johnstone & Storr (1998); this clutch is comparable with those of the Painted Button-quail but not with confirmed Chestnut-backed Button-quail clutches (see Figure 4). Photos: (A) and (B)—Rory O'Brien (Atlas of Living Australia 2020), (C)—from Johnstone & Storr (1998).

Discussion

Our descriptions of the two nests of the Chestnut-backed Button-quail, at Pine Creek and Wongalara in the Northern Territory, in March 2021, are consistent with those of other Australian button-quail: shallow depressions lined with fine material of grass and leaves, placed at the base of a grass tussock (Marchant & Higgins 1993). They are consistent with the descriptions and photograph by Le Souëf (1902). Both nests in our study were situated in areas of widely spaced perennial grasses with much open ground in front of them. During incubation, the male at Wongalara Sanctuary sat facing the entrance of the nest, with his back to the grass tussock. Having the nest positioned in these areas of widely spaced grasses and the position of the bird in the nest would enable a clear view of predators but also enable unhindered escape if required.

This species appears typically to have a clutch of four eggs, though a range of one to five eggs has been recorded. The most common clutch size in museum collections is four, but with smaller clutches it is not possible to determine if the eggs were collected before the female had completed the clutch. Ward & Young (2014) presumed the same clutch size when they encountered four hatched chicks, presumably from a single clutch. A clutch of four appears to be common amongst button-quail species (Marchant & Higgins 1993; Debus 1996).

Both of the nests in our study were found in March during the northern Australian wet season, which is probably the peak of breeding activity for this species (Webster *et al.* 2021). Rainfall for 2021 up to the dates of discovery at Pine Creek and Wongalara was 552 mm and 686 mm, respectively (Australian Bureau of Meteorology 2021a,b). Periods of increased rainfall have been noted as triggers for breeding in other button-quail species (McLennan 1922; Hughes & Hughes 1991). All clutches in museum collections where the date was adequately recorded were collected in December–April (Table 1), during the wet season, although it is likely that breeding may continue into the early dry season (May–October), as suggested by Ward & Young (2014).

Early descriptions all noted the particularly rounded shape of Chestnut-backed Button-quail eggs in comparison with other *Turnix* species but still described the shape as pyriform, e.g. “remarkably round in form, sharply nipped off at one end” (Campbell 1901, p. 733), and “quite different from those of all the other species of this group” (Oates 1901, p. 73). These descriptions also note the very glossy, clean or pure-white base colour of the egg and the sparingly marked patterning, another feature that appears to be unique to the Chestnut-backed Button-quail amongst Australian *Turnix* species. The shape, patterning and colour of the eggs that we have described are consistent with earlier descriptions (Thienemann 1856; Campbell 1901; Oates 1901; Le Souëf 1902). In contrast, eggs of other Australian button-quail species have densely scattered fine and large markings, giving the egg a dirty or peppered appearance, as in the Painted Button-quail (Beruldsen 1980, 2003; and see Figures 5A–B). The clutches in Le Souëf’s (1902) description are reliably attributable to Chestnut-backed Button-quail as they were accompanied by a skin of the parent bird collected in the same area at the same time. Such consistency in the morphology of Chestnut-backed Button-quail eggs suggests that there is

likely to be little variation in egg appearance across the species’ distribution.

We argue that the descriptions provided by Beruldsen (1980, 2003) that Chestnut-backed and Painted Button-quail eggs are indistinguishable are inconsistent with both our own findings and with other previously published accounts of Chestnut-backed Button-quail eggs. Similarly, the image of a Chestnut-backed Button-quail clutch by Johnstone & Storr (1998) is inconsistent with our findings, and appears to refer to Painted Button-quail. We propose that as that clutch was sourced from a private avicultural collection, in which both Chestnut-backed and Painted Button-quail were kept (R. Johnstone pers. comm.), it is likely that that clutch was misidentified.

Although the nest and eggs of the Chestnut-backed Button-quail are now well described, the breeding biology remains largely undescribed, as do many aspects of its ecology. Although the species is apparently common and widespread in suitable habitat, the closely related Buff-breasted Button-quail *T. olivii* (Macdonald 1971; Mathieson & Smith 2009) appears to have declined significantly with no clear cause (Garnett *et al.* 2011). There are significant contemporary environmental changes affecting the savannas of northern Australia (Kutt & Woinarski 2007; Woinarski *et al.* 2015), such as changed fire regimes, introduced species and grazing by introduced herbivores. Determining the response of the Chestnut-backed Button-quail to such threatening processes may provide insights into other species of savanna-dwelling button-quail. Further research is required to confirm the true conservation status and population trajectory of the Chestnut-backed Button-quail.

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