Indicators for Buff-breasted Button-quail *Turnix olivii*?

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Received 5 April 2017; accepted 12 October 2017

Abstract

Endangered Buff-breasted Button-quail *Turnix olivii* are cryptic, shy, rare and somewhat difficult to locate. Observations from a site of occurrence provide potentially useful indicators for aiding location. The species occurred in low woodland on metamorphic hills dominated by *Eucalyptus tardecidens* with scattered *E. cullenii* and *Corymbia clarksoniana*, with a mid-canopy including *Melaleuca stenostachya*, *Terminalia platyptera*, *Gardenia vilhelmii* and *Petalostigma pubescens* and with a sparse shrub layer of *Grewia retusifolia* and *Dodonaea physocarpa*. Ground cover was estimated at 50 % or less with significant bare soil exposed. The Regional Ecosystem was R.E. 9.11.25. Forty-seven species of plant in 23 families were identified within this habitat. Twenty-nine plant species, including 17 species of grass (Family Poaceae) and one sedge (Family Cyperaceae), occurred in the ground layer. Most grasses were in seed. Cicadas and grasshoppers were abundant. These insects and presence of nutritious grass seeds from the grass genera of *Eragrostis* sp., *Panicum* sp. and *Setaria* sp., could feasibly constitute food items taken by Buff-breasted Button-quail. A low number of observed circular scrapes could have either been feeding platelets made by Buff-breasted Button-quails or resting locations.

Introduction

The endangered Buff-breasted Button-quail *Turnix olivii* of Cape York Peninsula, north Queensland, Australia, has been most frequently reported from stony and/or grassy woodlands and forests (White 1922a,b, Storr 1984, Squire 1990, M.T. Mathieson and G.C. Smith *pers. obs.*, S. Garnett *pers. comm.*, L. Nielsen *pers. comm.*), commonly with a *Melaleuca* mid-storey (L. Nielsen *pers. comm.*). This habitat is widespread across the Cape, yet Buff-breasted Button-quail are scarce. The species is cryptic and shy, so this may explain rarity, although numbers are thought to have declined over the past century, due to anthropogenic pressures (Mathieson and Smith 2009). The habitat requirements of Buff-breasted Button-quail within the broad vegetation type are also thought to be highly specific, with the amount of ground cover being one important aspect. All sightings have been from very sparsely grassed areas with no sightings from denser grass cover (Nielsen 2015).

Ground vegetation is probably significant for Buff-breasted Button-quail in providing nesting substrate, shelter and a food source. Nests have been typically associated with grass stools and consist of narrow blades of long, dry grass and short, dry grass, with dead leaves from an ironbark and grass in the egg chamber (White 1922a,b, McLennan 1923, L. Nielsen *pers. comm.*). Little research has been invested in determining the food of Buff-breasted Button-quail. This is because observing feeding or acquiring gut samples of Buff-breasted Button-quail are problematic. The gut contents of four birds collected near Coen in the early 1920's were broadly comprised of insects, seeds and coarse sand (McLennan 1923, Marchant and Higgins 1993). Other than this scant historical information, it is known that Australian Button-quail, other than Buff-breasted Button-quail and Black-breasted Button-quail *Turnix melanogaster* (a dry vine forest specialist), feed on plant seeds from the monocot families Poaceae (grasses) and Juncaceae (sedges), and the dicotyledonous families Fabaceae, Geraniaceae, Malvaceae, Mimosaceae (acacias), Polygonaceae and Portulacaceae. Gut contents have also included Orthoptera (grasshoppers), Hemiptera (bugs), Coleoptera (beetles), Diptera (flies), Lepidoptera (caterpillars), Hymenoptera (ants) and Blattodea (cockroaches) (Barker and Vestjens 1990).

Here we describe in some detail the habitat and plant species occurring where Buff-breasted Button-quail were observed in early 2016. We furthermore identify potential food sources in this area in an attempt to address the paucity of information available on the diet of this species. This included an inventory of seeding ground vegetation and some casual observations of insect abundance.

Study Area and Methods

Potential habitat was searched for Buff-breasted Button-quail, on 12-19 January and 24 February-3 March, in locations broadly circumscribed (in clockwise direction) by the townships of Mt Carbine, Mt Molloy, Mareeba, Dimbulah, Petford and the geographic landmark of Mt Mulligan, within the Einasleigh Uplands bioregion (REDD 2013) of north Queensland, Australia. Potentially suitable habitat has been described as stony and/or grassy, sparse woodlands and forests on plains and slopes, often dominated by Melaleuca species (such as *M. viridiflora* and *M. minutifolia*) in the mid storey, well-drained and frequently on slight-sloping bases of hills (Mathieson and Smith 2009; L. Nielsen *pers. comm.*)

We gathered information on habitat characteristics, and collected and identified all plant species over an area of approximately 12 ha in which Buff-breasted Button-quail were seen during January-early March 2016 at Mt

Mulligan Station to the west of Mareeba. Other fauna was noted including bird species and obvious, abundant arthropods.

Results

Buff-breasted Button-quail were observed at Mt Mulligan Station on five different occasions over four days. It is possible that four birds (two males and two females) occurred at this site.

Habitat at the Mt Mulligan site (Plate 1) was comprised of low woodland on metamorphic hills dominated by *Eucalyptus tardecidens* with scattered *E. cullenii* and *Corymbia clarksoniana* also present (Table 1). The mid-canopy included *Melaleuca stenostachya*, *Terminalia platyptera*, *Gardenia vilhelmii* and *Petalostigma pubescens*. The shrub layer was extremely sparse with *Grewia retusifolia* and *Dodonaea physocarpa* the most commonly encountered species. The ground layer was dominated by a wide variety of sparsely distributed grasses. Ground cover was estimated at 50 % or less with significant bare soil exposed. Forty-seven species of plant in 23 families were identified from this locality (Table 1). At this site the mapped Regional Ecosystem polygon contained 9.11.3a and 9.11.25, with 9.11.25 fitting the vegetation most closely (Queensland Herbarium 2013). On the basis of the canopy and sub-canopy species alone, the habitat fits to previous descriptions of Nielsen (2015; *pers. comm.*), albeit with a different species of Melaleuca the structure of the woodlands is essentially identical.

Twenty-nine species of plant comprised the ground layer at the Mt Mulligan site, including 17 species of grass (Family Poaceae) and one species of sedge (Family Cyperaceae). All the grasses were seeding to some extent at the time of our visit.

Two introduced plant species (4.2% of species) included the shrub *Stylosanthes scabra* and one ground-dwelling herb *Mesosphaerum suaveolens*. The introduced stylo *Stylosanthes scabra* was numerically more dominant and appeared to be overtaking native vegetation. This species was introduced to Australia as fodder for cattle.

Two arthropods were particularly evident at the Mt Mulligan site. Cicadas (Order Hymenoptera, Family Cicadidae) and, to a lesser extent, locusts/ grasshoppers (Order Orthoptera, Family Acrididae) occurred in very large numbers in January; although they had virtually disappeared by the end of February.

Sixty-eight bird species other than Buff-breasted Button-quail were seen at the Mt Mulligan site. During January the Melaleucas were in flower and Little Friarbirds *Philemon citreogularis* were a conspicuous component of the

avifauna, although numbers were much reduced by late February. Ten other ground-feeding, granivorous bird species were observed, including: the Australian Brushturkey *Alectura lathami*, Squatter Pigeon *Geophaps scripta*, Common Bronzewing *Phaps chalcoptera*, Peaceful Dove *Geopelia placida*, Bar-shouldered Dove *Geopelia humeralis*, Pheasant Coucal *Centropus phasianus*, Red-backed Button-quail *Turnix maculosus*, Painted Button-quail *Turnix varius*, Black-throated Finch *Poephila cincta* and Double-barred Finch *Taeniopygia bichenovii*.

Discussion

Three of the grass genera observed at the Mt Mulligan site are broadly categorised as millets, which provide a food source for humans (Verma *et al.* 2015). The genera *Eragrostis* sp., *Panicum* sp. and *Setaria* sp. are essential food sources for humans in a number of Asian countries. They are nutritious compared to the major cereals such rice (Verma *et al.* 2015) and wheat (Awadalla and Slump 1974). They contain low phytic acid and are rich in dietary fibre, iron, calcium, and B vitamins (Barbeau and Hilu 1993). Millet seeds are particularly high in percentage soluble carbohydrate (Kelrick *et al.* 1986). Soluble carbohydrate is a water-efficient energy source and its percentage is a good indicator of the digestible energy available in a food item.

Kelrick *et al.* (1986) have also shown that shrubs, such as sagebrush *Artemisia tridentata*, contribute to the diet of shrub-steppe rodents, birds and ants of North America, but the role of shrub seeds as food for Buff-breasted Button -quail remains speculative, even though other Australian button-quail eat the seeds of various shrub species (Barker and Vestjens 1990).

McLennan's analysis of the guts of Buff-breasted Button-quail also showed the presence of arthropods (White 1922 a,b, McLennan 1923). It is likely that arthropods may be key components of the diet and also an easy catch for birds when they are in abundance, a situation that prevailed during our January 2016 field trip. Barker and Vestjens (1990) have recorded grasshoppers in the diets of other Australian button-quail, but not cicadas. Cicadas can constitute a major food source for insectivorous birds, however the factors that cue timing of emergence are not clear and therefore cicadas may be an unreliable food source (Strehl and White 1986; Wolda 1989; Smith *et al.* 2006). Nevertheless records of insectivorous birds converging on seasonal abundances of insects, such as flying termites, moths and psyllids, are well documented (Recher and Davis 1997; 2002; 2013).

Sparse vegetative ground cover, key fruiting grasses, insect abundance and the presence of other granivorous birds are likely to be good indicators for

Buff-breasted Button-quail in their preferred habitat. Platelets are unlikely to be useful signs of Buff-breasted Button-quail (cf. McConnell and Hobson 1995) as there is a distinct lack of depressed circular feeding scrapes, known as platelets, among Buff-breasted Button-quail and Painted Button-quail in the north (Nielsen 2000). However we noted a small number of circular depressions in deep leaf litter at the Mt Mulligan site during January 2016 (Plate 2), while Painted Button-quail and Red-backed Button-quail were absent, which could have been feeding platelets, but which were more likely to have been scrapes associated with resting behaviour. We also flushed a bird from the protective cover of a native shrub *Grewia retusifolia* where after closer inspection a partially cleared circular depression was found (Plate 3; MTM and GCS *pers. obs.*) which also may have been a feeding scrape, but was more likely to have been a retreat from the heat, which can be extreme at this time of year.

Targeted searching of sites that have habitat structure similar to that described in this paper, combined with seed availability and arthropod abundance may assist searches for and monitoring of Buff-breasted Button-quail.

Acknowledgements

Thanks to Lloyd Nielsen for sharing his knowledge and confirming our sightings. Mark Newton of the Australian Tropical Herbarium provided logistic support. We gratefully acknowledge generous funding of the Mohammed bin Zayed Species Conservation Fund and the support of the Queensland Herbarium.

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Plate 1. Habitat at the Mt Mulligan site. Photo M.T. Mathieson.

Plate 2. Circular scrape noted in association with Buff-breasted Button-quail sightings. Photo G.C. Smith.

Plate 3. Grewia shrub where a Buff-breasted Button-quail was found sheltering in the heat of the day. Photo M.T. Mathieson.

Table 1. The plant species recorded at a site of known buff-breasted button-quail occurrence. ‡ = Ground layer plants include low shrubs, herbs and forbs. * = weed. Bold = dominant. + = genera of millets.

Structural Layer	Family	Species
Canopy	Caesalpiniaceae	*Erythrophleum chlorostachys* (F.Muell.) Baill.
	Myrtaceae	*Eucalyptus cullenii* Cambage
		***Eucalyptus tardecidens* (L.A.S.Johnson & K.D.Hill) A.R.Bean**
		Corymbia clarksoniana (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson
Mid-canopy	Celastraceae	*Denhamia cunninghamii* (Hook.) M.P.Simmons
	Combretaceae	***Terminalia platyptera* F.Muell.**
	Myrtaceae	***Melaleuca stenostachya* S.T.Blake**
	Picrodendraceae	*Petalostigma pubescens* Domin
	Pittosporaceae	*Bursaria incana* Lindl.
	Proteaceae	*Grevillea glauca* Banks & Sol. ex Knight
	Rubiaceae	***Gardenia vilhelmii* Domin**
	Santalaceae	*Santalum lanceolatum* R.Br.

Shrub	Euphorbiaceae	*Croton minimus* P.I.Forster
	Fabaceae	***Stylosanthes scabra* Vogel***
	Malvaceae	*Hibiscus meraukensis* Hochr.
	Sapindaceae	***Dodonaea physocarpa* F.Muell.**
	Sparrmanniaceae	***Grewia retusifolia* Kurz**
	Thymelaeaceae	*Pimelea sericostachya* F.Muell. *subsp. sericostachya*
Ground‡	Asteraceae	*Lagenophora sp.* (Forty Mile Scrub R.J.Fensham 1113)
	Caesalpiniaceae	*Chamaecrista longipes* (Domin) Pedley
	Convolvulaceae	*Bonamia media* (R.Br.)Hallier f.
		Ipomoea plebeia R.Br.
		Jacquemontia sp. (Fairview R.W.Johnson 4026)
		Xenostegia tridentata (L.) D.F.Austin & Staples
	Cyperaceae	*Scleria brownii* Kunth
	Fabaceae	*Galactia tenuiflora var. macrantha* Domin
		Tephrosia juncea Benth.
	Helicteraceae	*Helicteres sp.* (Normanby River J.R.Clarkson+ 7697)
	Lamiaceae	*Mesosphaerum suaveolens* (L.) Kuntze*
	Malvaceae	*Melhania brachycarpa* Domin
	Poaceae	*Alloteropsis cimicina* (L.) Stapf
		Aristida calycina var. praealta Domin
		Aristida hygrometrica R.Br.
		Bothriochloa bladhii (Retz.) S.T.Blake *subsp. bladhii*
		Brachyachne convergens (F.Muell.) Stapf
		Chloris lobata Lazarides
		Chrysopogon fallax S.T.Blake
		Enneapogon virens (Lindl.) Kakudidi
		Eragrostis elongata (Willd.) J.Jacq.+
		Eriachne ciliata R.Br.
		Heterachne gulliveri Benth.
		Heteropogon contortus (L.) P.Beauv. ex Roem. & Schult.
		Heteropogon triticeus (R.Br.) Stapf
		Panicum decompositum var. tenuius F.M.Bailey+
		Paspalidium rarum (R.Br.) Hughes
		Perotis rara R.Br.
		Setaria surgens Stapf+

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