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Front cover: Bomaderry Creek downstream of weir (survey site 5). Riffle zone in foreground and pool in background. Habitat of Long-finned Eel, Australian Smelt, Australian Bass and Cox's Gudgeon. Photo MJ Murphy, October 2016. See page 108.
Back cover: *Correa reflexa.* Photo Jurrie Hubregtse.

The Brown Toadlet *Pseudophryne bibronii* (Anura: Myobatrachidae), at Bald Hill Reserve, Kyneton, Victoria

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Abstract
Surveys for the threatened Brown Toadlet *Pseudophryne bibronii* were undertaken at Bald Hill Reserve near Kyneton from April to June 2016. Surveys employed the Amphibian Calling Index technique, and the species was detected at five sites in the Reserve. Peak activity occurred during April and May, while no *P. bibronii* were recorded calling in June. A full chorus of *P. bibronii* was recorded at two sites, which suggests this population is of a very large size. This may be one of the largest extant Victorian populations of *P. bibronii*, making it an important site for research and conservation of this threatened species. (*The Victorian Naturalist* 134 (4), 2017, 96–100)

Keywords: Brown Toadlet, *Pseudophryne bibronii*, Bald Hill, Kyneton, Amphibian Calling Index

Introduction

The Brown Toadlet *Pseudophryne bibronii* is a terrestrial frog with a body length up to 32 mm (Fig. 1). It can be identified by its brown or grey dorsal surface, with or without black spots or squiggles. While coloured tubercles tipped with brown or orange can be present, the ventral surface has a striking, black or grey and white marbled pattern. There is an orange or yellow patch on the upper foreleg, back of thighs on the hindlegs and sometimes groin and front of thighs on the hindlegs (Anstis 2013).

Pseudophryne bibronii can be found in dry forest, woodland, shrubland and grassland. Adults take refuge under leaf litter and debris. Calling is initiated after heavy rain between Feburary and April. Eggs are laid in moist sites under rocks, logs, leaf litter, amongst vegetation and in burrows in damp soil. The eggs hatch when they are inundated or washed into adjacent ponds, and the tadpoles then undergo normal aquatic development. Metamorphosis takes three to seven months (Hero *et al*. 2004; Anstis 2013).

Pseudophryne bibronii is the most widespread of its genus and occurs along the east coast of Australia from southern Queensland to Victoria and South Australia (Hero *et al*. 2004; Anstis 2013). In Victoria, *P. bibronii* is listed as Threatened under the *Flora and Fauna Guarantee Act 1988*. The Victorian Government classifies the species as Endangered under the Advisory List of Threatened Fauna. The species was listed as Near Threatened by the IUCN in 2004 with a significant population decline, believed to be due to widespread habitat loss (Hero *et al.* 2004).

The species was once widely distributed across central Victoria (Fig. 2a); however, the majority of these records date back over 40 years from the present. There are very few records from the last decade (Fig. 2b). According to Howard *et al.* (2010), the species' elusive behaviour is likely to contribute to the lack of records.

In September 2015, a pair of *P. bibronii* was discovered under loose corrugated iron at Bald Hill Reserve, near Kyneton in central Victoria. Future surveys for the species were subsequently planned for the following autumn when *P. bibronii* would initiate breeding (Howard *et al.* 2010). This research aimed to document the extent of the *P. bibronii* distribution and abundance in the Bald Hill Reserve using an acoustic survey method.

Methods

Study Area

Bald Hill Reserve (Fig. 3) is located just east of the central Victorian township of Kyneton (-37.240296, 144.499338). The land is owned and managed for conservation by Macedon Ranges Shire Council. Bald Hill Reserve is approximately 100 hectares in size, has two farm dams and a seasonal creek that can inundate the lower sections of the reserve during heavy rainfall (Fig. 4). Ecological Vegetation Classes in the reserve consist of Grassy Woodland, Granitic Grassy Woodland, Valley Grassy Forest and a modified grassland. There is extensive

Fig. 1. Brown Toadlet *Pseudophryne bibronii* from Bald Hill Reserve.

Fig. 2 (a). All Victorian Biodiversity Atlas records (November 2016) showing the known Victorian distribution of *Pseudophyrne bibronii*; **(b)** the last 10 years of Victorian Biodiversity Atlas records of *Pseudophyrne bibronii*. The star indicates the position of Bald Hill Reserve.

historical evidence of damaging land use activities in the Bald Hill Reserve including stock grazing, recreational horse activity, quarrying and logging. The site was also used as a rifle range by the Australian Defence Force before Council ownership commenced in the 1980s (Atlas Ecology 2010).

Frog Surveys

Surveys were conducted on three separate evenings immediately after rain. Transects were identified and slowly walked to ensure adequate coverage of the reserve. The emphasis was on surveying areas most likely to contain *P. bibronii,* based on the availability of standing water. Areas of particular interest included drainage lines and old farm dams. Areas were surveyed using a standard, replicated approach. First, surveyors would listen in silence for five minutes. Subsequently, if no calls of *P. bibronii* could be heard, calls (Hoskin *et al.* 2015) were broadcast from a digital device in an attempt to trigger calling. All frog species encountered during surveys were recorded, along with air temperature and daily rainfall. Frogs were not

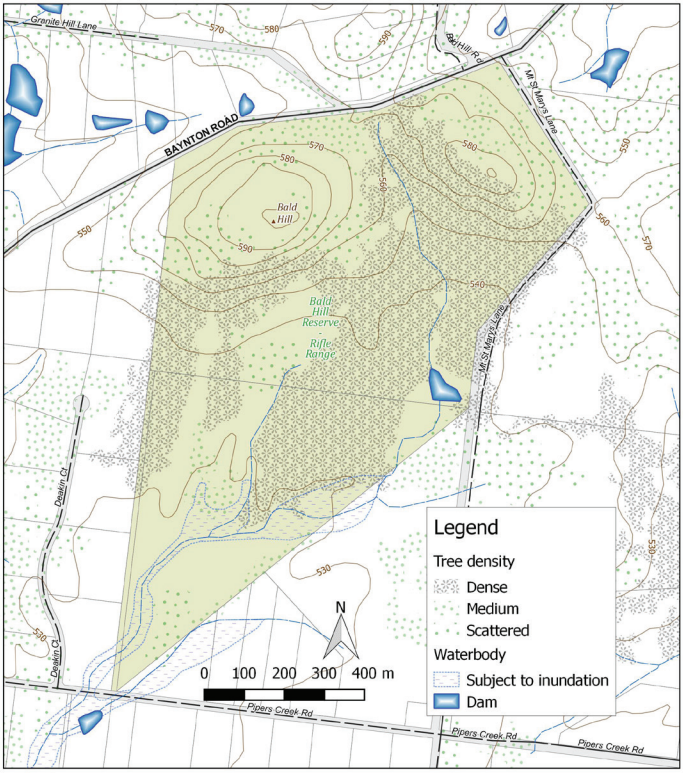

Fig. 3. Map of Bald Hill Reserve.

captured but photographs were taken to confirm correct identification (Fig. 5).

The surveys were undertaken on April 29, May 9 and June 30 in 2016. All surveys were undertaken at dusk (6 pm) and continued for a few hours thereafter.

On several occasions, *P. bibronii* were heard calling from burrows, so visuals were often not a true indication of actual numbers. It was not possible to record each calling male as at times there was a chorus of *P. bibronii* calling from burrows or beneath debris. Instead, an estimate of calling activity was recorded using the Amphibian Calling Index (ACI) (Weir and Mossman 2005; Table 1). During each survey, an index was agreed on by all participants undertaking the survey.

An obvious weakness of the ACI method was that the intensity of calling would vary with the duration of individuals calling. However, *P. bibronii* has a very short call (<0.5 sec) and therefore constant and continuous calling would be a genuine indication of a large population.

The number of survey participants varied from two to six people; however, the same project coordinator remained throughout the surveys to ensure methodological consistency. The sites chosen were far enough apart to preclude neighbouring frog communities being heard. Each site also had access to separate water bodies such as farm dams and wet ephemeral pools.

To avoid accidental introduction of pathogens, such as the Chytrid fungus, to frog populations, hygiene protocols were implemented as per recommendations by Murray *et al.* (2011). Immediately prior to surveys, all footwear was washed down with a solution of 1% sodium hypochlorite mixture.

Fig. 4. Inundated grassland habitat at site 2, lower section of Bald Hill Reserve, in September 2016.

Fig. 5. Male *Pseudophryne bibronii* calling from burrow entrance at Site 2 in April 2016. Photo M Clancy.

Table. 1. Amphibian Calling Index (Weir and Mossman 2005)

Index	Description
0	No individuals can be heard
1	Individuals can be counted, there is space between calls
2	Calls of frogs are distinguishable, but some calls overlap
3	Full chorus, calls are constant, continuous, and overlapping

Results

Pseudophryne bibronii was present at five sites on the transect. Site 1 was not included in the April survey, but apart from this, the species was recorded at all sites in the April and May surveys. *P. bibronii* was not detected during the June survey. Peak activity occurred at Site 2 in April and Site 4 in May, with ACI scores reaching 3 at these times, but otherwise indexes varied between 1 and 2. This is indicative of a significantly large population of *P. bibronii*.

Temperature on survey days ranged from 6 to 15°C; rainfall from 2 to 12 mm. Other frog species recorded close to *P. bibronii* breeding sites were the Eastern Banjo Frog *Limnodynastes dumerilii*, Common Spadefoot Toad *Neobatrachus sudelli*, Southern Brown Tree Frog *Litoria ewingii*, Plains Froglet *Crinia parinsignifera* and Common Froglet *C. signifera*.

Discussion

This study detected a significantly large breeding population of *P. bibronii* in central Victoria. The Victorian Biodiversity Atlas (November 2016) shows that there are very few records in Victoria where large numbers of *P. bibronii* have been recorded in a specific area. The Bald Hill Reserve should be considered high-quality breeding habitat for *P. bibronii* and could represent an important site for research on this threatened species.

Despite the limitations of the Amphibian Calling Index to measure population abundance, its advantages were obvious in this study. The typically cryptic calling sites of male *P. bibronii* make visual survey methods difficult; using the ACI also avoids trampling damage to the site and disruption of breeding activity. Given the variability of calling activity, it is clear that repeated acoustic surveys of an area, as practised in this study, increased the probability of detection of frog presence. This also may be achieved by installation of automated recording stations (A Hamer pers. comm.).

Taking into consideration the conservation status of *P. bibronii*, its disappearance from much of its former range, and the results of recent surveys which encountered very few individuals (Howard *et al.* 2010), the discovery reported here is both surprising and encouraging. That this population is apparently thriving in a modified and somewhat degraded habitat suggests that the kind of focused and repeated survey methodology that was employed here may possibly reveal the existence of other local populations in parts of the species' original range.

Acknowledgements

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