King Island Scrubtit and Brown Thornbill Survey Results

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The survey was designed and undertaken by the ANU. This allowed a far more comprehensive survey to be undertaken than would have otherwise been achieved.

Background

The King Island scrubtit *Acanthornis magna greeniana* and King Island brown thornbill *Acanthiza pusilla archibaldi* are two small birds at extremely high risk of extinction. Both are island endemic subspecies of the mainland Tasmanian scrubtit and brown thornbill (Higgins and Peter 2002). The King Island scrubtit is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*). The King Island brown thornbill is listed as Endangered under the *EPBC Act 1999*, while other assessments have considered it Critically Endangered (Garnett et al. 2011). Population estimates for each of the King Island scrubtit and King Island brown thornbill are fewer than 50 mature individuals (Garnett et al. 2011; Webb et al. 2016). There is no information on population trends. A recent assessment ranked the King Island brown thornbill and King Island scrubtit as the first and third (respectively) most likely Australian avian extinctions to occur within the next 20 years (Geyle et al. 2018).

The King Island Biodiversity Management Plan (Threatened Species Section 2012) was prepared under the provisions of the *EPBC Act 1999*. The Management Plan was adopted by the Commonwealth as the national recovery plan for the King Island brown thornbill and King Island scrubtit in 2012. The Management Plan recognised that a substantial area of King Island had been cleared for agriculture and drained since European settlement and that a key threat to these species is habitat loss through land clearance and fire. Other identified threats can be directly linked back to extremely small population sizes and the area of suitable habitat (Threatened Species Section 2012; Webb et al. 2016).

This document reports on deliverables outlined in a contract between the DPIPWE and Cradle Coast NRM, a business unit of the Cradle Coast Authority. Deliverables required by the DPIPWE aimed to:

- To address the poor state of knowledge of the current distribution and abundance of two King Island threatened birds, *Acanthornis magnus greenianus* and *Acanthiza pusilla archibaldi*, and to improve understanding of the habitat requirements of these species.
- Survey potential habitat and determine baseline distribution and density of King Island Scrubtit and King Island Brown Thornbill.

Methods

Study Area

King Island covers 1100 km^2 and is situated in the Bass Strait between mainland Australia and Tasmania. Native vegetation cover on King Island has been reduced to approximately 33% of the island's area, with 73% of remaining native vegetation being comprised of non-forest communities (Barnes et al. 2002). Extant vegetation cover is highly fragmented and generally occurs in small isolated patches within the agricultural matrix. Historically, the King Island scrubtit was likely widespread in *Melaleuca ericifolia* swamp forests and dense wet sclerophyll forests (Higgins and Peter 2002). It is now thought to be confined to relict patches of *M. ericifolia* forest and is extremely vulnerable to loss of this habitat (Donaghey 2003, 2011; Garnett et al. 2011; Webb et al. 2016). The King Island brown thornbill was suggested to prefer Eucalypt woodland (*E. globulus, E.obliqua*) with a dense, shrubby understory (Green and McGarvie 1971), but could also co-occur with King Island scrubtit in *M. ericifolia* forest (Garnett and Crowley 2000). Given the paucity of historical and contemporary sightings, knowledge of the King Island brown thornbill's habitat requirements is very limited.

Survey Design

The King Island scrubtit is a habitat specialist and strongly associated with *M. ericifolia* (Webb et al. 2016). The King Island brown thornbill has been assumed to be largely associated with Eucalypt forest. Because it was not possible to survey the entire island, previous records of each bird and the presence of *M. ericifolia* or Eucalypts was used to guide

the spatial location of survey effort. After locating the King Island brown thornbill (18/3/2019) the allocation of resources was reassessed based on the new information this provided. Primarily, this allowed all field workers to rapidly become familiar with key physical features (particularly bill length) and vocalisations necessary for field identification. This in turn allowed the development of a standardised sampling protocol and survey design and intensive sampling effort was directed towards a comprehensive assessment of Pegarah State Forest. The primary features used to identify the brown thornbill were its call and long bill length relative to its body size.

Sampling protocol (i.e. method used when each site was visited)

We used a similar sampling protocol to that of Webb et al. (2016). Repeated 5-minute site visits were undertaken at over 250 sites for King Island scrubtit and King Island brown thornbill. At sites where habitat was deemed possibly suitable for both species a separate 5 minute 'site visit' was undertaken for each bird. Greater than 200 sites were sampled for each bird. To increase the detectability of each bird during their respective surveys, scrubtit and brown thornbill song recordings were broadcast using portable speakers approximately every 20-30 seconds. For the brown thornbill a combination of calls recorded during the survey and recordings of Tasmanian mainland brown thornbill were used. Presence-absence and estimated abundance of each bird was recorded during each site visit. Where we detected scrubtits or brown thornbills, we recorded the detection type as visual or audible. We avoided surveying in rain or during periods when local wind speeds exceeded ~20 km per hour.

Site selection

Site selection built upon 150 survey sites established by Webb et al. (2016) which focussed on King Island scrubtit habitat (Figure 1). Based on the results of Webb et al. (2016) several of these sites were not included if they clearly did not support scrubtit habitat and/or were considered a lower priority. New monitoring sites were established based on the following criteria: (1) nearby to known scrubtit or brown thornbill locations, (2) remote inspection of satellite imagery, (3) accessibility and landowner consent, and (4) on ground validation of the presence of *M. ericifolia* or Eucalypts.

A site was defined as a 50 m radius around a fixed GPS location. Sites were spaced a minimum of 100 m apart. This design was as a trade-off between maximising the possibility of detecting of birds (if present) and minimising the non-independence of adjacent sites. We sampled adaptively (Smith et al. 2004) by establishing new sites in potentially suitable habitat adjacent to already established sites. We continued this approach until either potentially suitable habitat ceased or access was not possible. Simple habitat covariates were recorded for each site (see APPENDIX A).

Within a three week window commencing 12th March 2019, we attempted to sample most sites at least twice (with over 70 sites visited 3 or more times for each bird). Repeated surveys allow the detectability of the target species to be estimated and quantify confidence in absences (MacKenzie et al. 2006).

At key locations efforts were made to achieve a high spatial intensity and a relatively even spatial stratification of sites. This naturally resulted in sampling a range of vegetation communities and variation in structural characteristics; however, 'pure' scrub communities were not a focus of this study.

It is important the results of this survey are considered in the context of the overall survey design and spatial location of sampling efforts (see Figures 2 and 3). The findings should not be used as definitive habitat descriptions for either bird.

Results

King Island Scrubtit

The King Island scrubtit was detected at 51 sites. Using the maximum number of birds counted at a site from all repeated visits to a site the mean number of birds recorded at occupied sites was 1.48 (range 1-3 birds). Spatially clustered sites where the scrubtit was detected (Figure 2 and 4) can almost certainly be attributed to the same bird(s) (or territory). At sites where scrubtits were detected: *M. ericifolia* was present in the canopy at 80% of sites; canopy cover was >30% at all sites; only 46% of sites supported any notable midstorey vegetation (i.e. >20% cover); and 88% supported a moderate to dense understorey (i.e. >30%).

Scrubtits were recorded at several new sites in Pegarah State Forest (i.e. not previously surveyed). Based on current knowledge (including this survey), the identification of King Island scrubtit habitat at fine scales should be based on the presence of *M. ericifolia* (including some relatively mature specimens), and structural complexity of the understorey and/or forest debris (eg. fallen trees and branches). These features can be patchy or relatively continuous. During this survey, the presence of scrubtits at a small proportion of sites where *M. ericifolia* was not recorded or not a canopy species is notable; however, *M. ericifolia* was present close by to these sites. This further reinforces the fact that the King Island scrubtit occupies sites that would not be identified as *M. ericifolia* Swamp Forest using standard on ground or remote vegetation mapping techniques and accepted vegetation classification systems. *Melaleuca ericifolia* often occurs as a subdominant species, or in small patches (eg. <1 ha) embedded within other vegetation communities (Barnes et al. 2002). To accurately identify potential King Island scrubtit habitat, vegetation mapping needs to be undertaken at a very fine resolution and consider the context within the surrounding environment.

King Island Brown Thornbill

The King Island brown thornbill was recorded at 38 sites, mostly in Pegarah State Forest but also in remnant forest patches within the agricultural matrix at two other locations 2 km and 7 km distant from Pegarah State Forest (Figure 3 and 5). These records suggest the King Island brown thornbill is very likely to occur in suitable habitat elsewhere on the island. Using the maximum number of birds counted at a site the mean number of birds recorded at occupied sites was 1.68 (range, 1-3 birds).

At sites where the brown thornbill was detected: Eucalypts were present at all sites (including *E. brookeriana, E. viminalis, E. globulus, E. obliqua* and possibly *E.ovata*), either dominating the canopy or occurring as a subdominant component of the canopy; midstorey and understorey cover varied from zero to >50% cover.

The King Island brown thornbill appears to be linked to the presence of Eucalypt forest/woodland and other communities where *Eucalyptus* species are present, including the abandoned *E. obliqua* plantations in Pegarah State Forest. Birds were regularly observed feeding on the trunks and limbs of Eucalypts probing their long bills into crevices and under bark. Foraging was also observed in other tree species (e.g. *M. ericifolia, Banksia marginata*). Structural complexity in the understorey or midstorey may be an important factor influencing habitat quality or functionality for particular purposes (e.g. nesting, feeding, predator avoidance). Further research is required to determine the importance of these factors and vegetation communities where Eucalypts are absent.

The discovery of brown thornbills in remnant Eucalypt forest in the agricultural matrix is an extremely important finding. Sampling intensity outside of Pegarah State Forest was minimal, but visual and remote assessments of unsampled remnant vegetation both nearby to Pegarah and elsewhere on the island suggest that these areas warrant urgent surveys.

Vegetation mapping and bird habitat

On King Island, TASVEG (DPIPWE 2013) can be useful to assess the extent of vegetation cover and identify the presence of some forest communities. However, it is not useful to assess the presence or absence of specific habitat elements associated with occurrence of the King Island scrubtit or the King Island brown thornbill. An instructive

example of why TASVEG mapping is of limited use for identifying habitat or the occurrence of either bird is shown by contrasting King Island scrubtit and brown thornbill records in Pegarah State Forest during this survey (Figures 4 and 5) and TASVEG mapping of the same area (Figure 6). Although some Eucalypt forest is identified, fine scale occurrence of *M. ericifolia* and *Eucalyptus* spp. is not captured, and no *M. ericifolia* forest is identified. However, both birds were widely distributed across this area. Another example of these issues is the over mapping of scrub communities. One of the locations where the King Island brown thornbill was detected (>7km from Pegarah) is mapped as a scrub community (in TASVEG) but on ground assessment found predominantly Eucalypt forest. Similarly, another location mapped as a scrub community (in TASVEG) supports high quality habitat for the King Island scrubtit (Figure 7). These examples are not small areas or isolated errors.

Synthesis of Results

The survey results for the King Island scrubtit and the King Island brown thornbill can be viewed in a positive context. For the scrubtit, no local extinction events have occurred in the three known locations (Nook Swamps, Pegarah State Forest, and Collier's Swamp) since the surveys reported by Webb et al. (2016). Scrubtits were also detected at several new survey sites within Pegarah State Forest, and in the far southern end of the Nook Swamps. For the King Island brown thornbill, the survey results have provided a far more positive indication, than previously thought, that averting their extinction is possible. While the results are positive in these respects, the King Island scrubtit and brown thornbill are severely limited by habitat as evidenced by the extent of remaining native vegetation.

The results of this survey should be considered as a snapshot of the occurrence and habitat use of each bird during a 3 week period in the non-breeding season within the areas surveyed, and noting that much of King Island was not surveyed. Spatially clustered sites where either bird was detected can almost certainly be attributed to the same bird(s) (Figures 4 and 5). Therefore, the number of sites birds were detected should not be interpreted as an estimate of abundance of either bird. Nevertheless, based on all available data the abundance of both birds is estimated to be <50 mature individuals of each species, and possibly much less.

Habitat associations presented in this report do not provide definitive descriptions of either bird's distribution or requirements. Further systematic surveys for both birds (particularly the King Island brown thornbill) are required to gain a more comprehensive picture of their current distribution, refine habitat definitions, and identify ecologically relevant scales at which to assess occupied habitat and predict the occurrence of habitat elsewhere. Habitat suitability is also likely to be strongly linked to variables such as vegetation age, patch size, fragmentation and connectivity at multiple spatial scales. Further work is required to robustly assess these and other variables. Available vegetation mapping (e.g. TASVEG) is of very limited use to predict the occurrence of the King Island brown thornbill or the King Island scrubtit, and their habitats.

Based on current knowledge, the identification of King Island scrubtit habitat at fine scales should be based on the presence of *M. ericifolia* (including some relatively mature specimens), and structural complexity of the understorey and/or forest debris (eg. fallen trees and branches). These features can be patchy or relatively continuous. While *M. ericifolia* swamp forest provides important habitat for the scrubtit, other vegetation communities also provide habitat where *M. ericifolia* and a sufficient understory are present. The spatial resolution at which vegetation mapping is generally undertaken does not account for the fine scale habitat requirements of King Island scrubtit.

The occurrence of King Island brown thornbill appears to be primarily associated with the presence of Eucalypts. As for the scrubtit, there is certainly a mismatch between King Island brown thornbill habitat and the spatial scale(s) at which vegetation mapping is routinely undertaken and classified. As a result, defining King Island brown thornbill habitat is not possible at present. A preliminary description of currently known habitat could be 'Eucalypt forest and other vegetation communities where Eucalypts are present'. Further research is required to determine the relative importance (or not) of understorey and/or midstorey structure, floristics and other variables. Importantly, targeted surveys including scrub vegetation communities on King Island are required to develop accurate habitat definitions.

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APPENDIX A

EUCALYPTUS spp.

Absent - 0

Present – 1

Melaleuca ericifolia

Absent - 0

Present – 1

CANOPY HEIGHT

<10 - 0

<15m - 1

15-20m - 2

>20m – 3

CANOPY COVER

Low (<30%) – 1

Medium (30-50%) – 2

Dense (>50%) – 3

MIDSTOREY

Little/none (0-20%)- 0

Moderate (20-50%) - 1

Dense (>50%) - 2

UNDERSTOREY

None or very sparse (0 – 10%) - 0

Some (10-30%) - 1

Moderate (30-50%) – 2

Dense (>50%) - 3

FIGURES 1 – 5

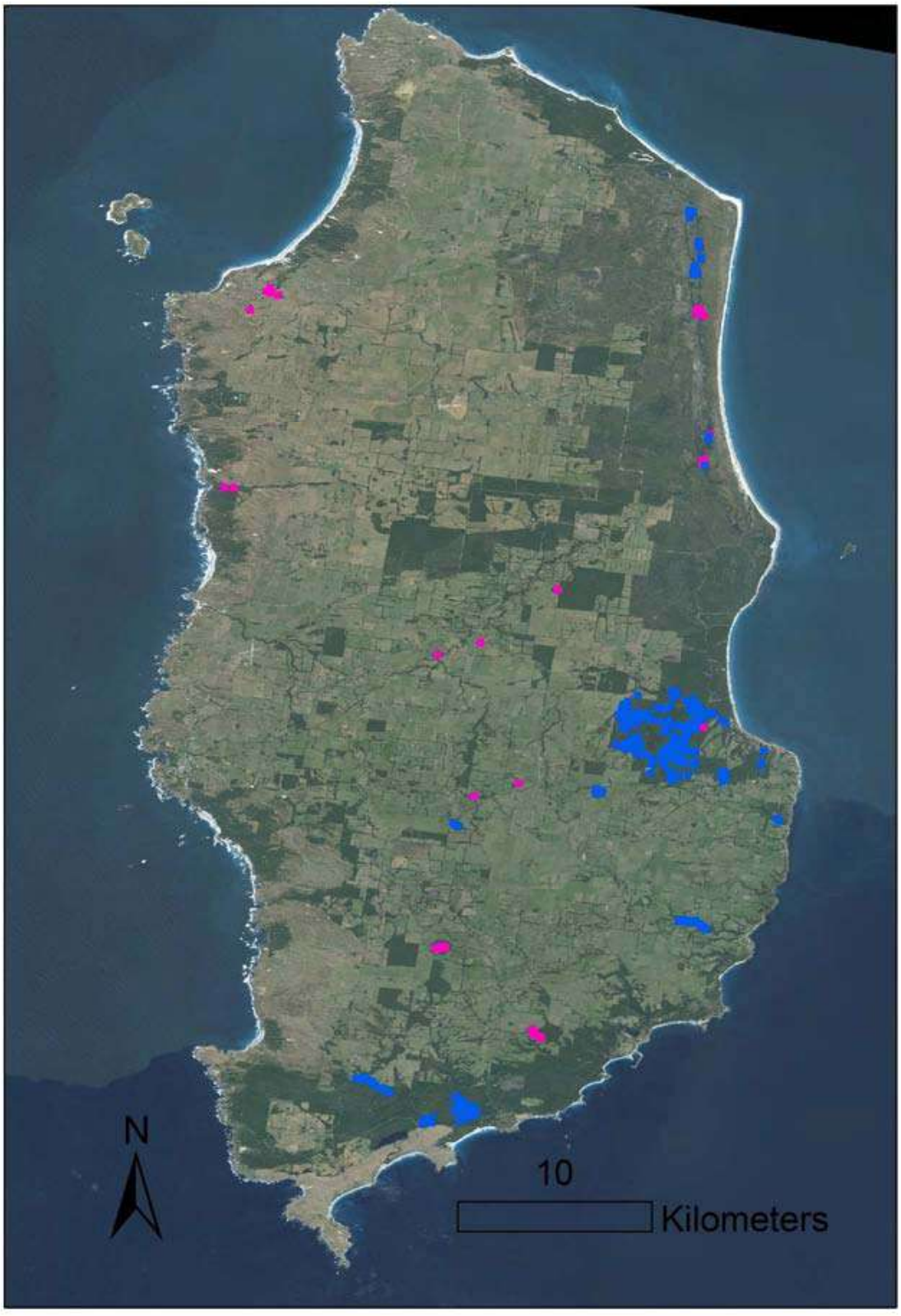

Figure 1. Sites surveyed during this study in March 2019 (blue) and sites surveyed by Webb et al. (2016) that were not visited in this study (pink).

Figure 2. King Island Scrubtit detections (yellow) and other surveyed sites (blue) during this study, March 2019.

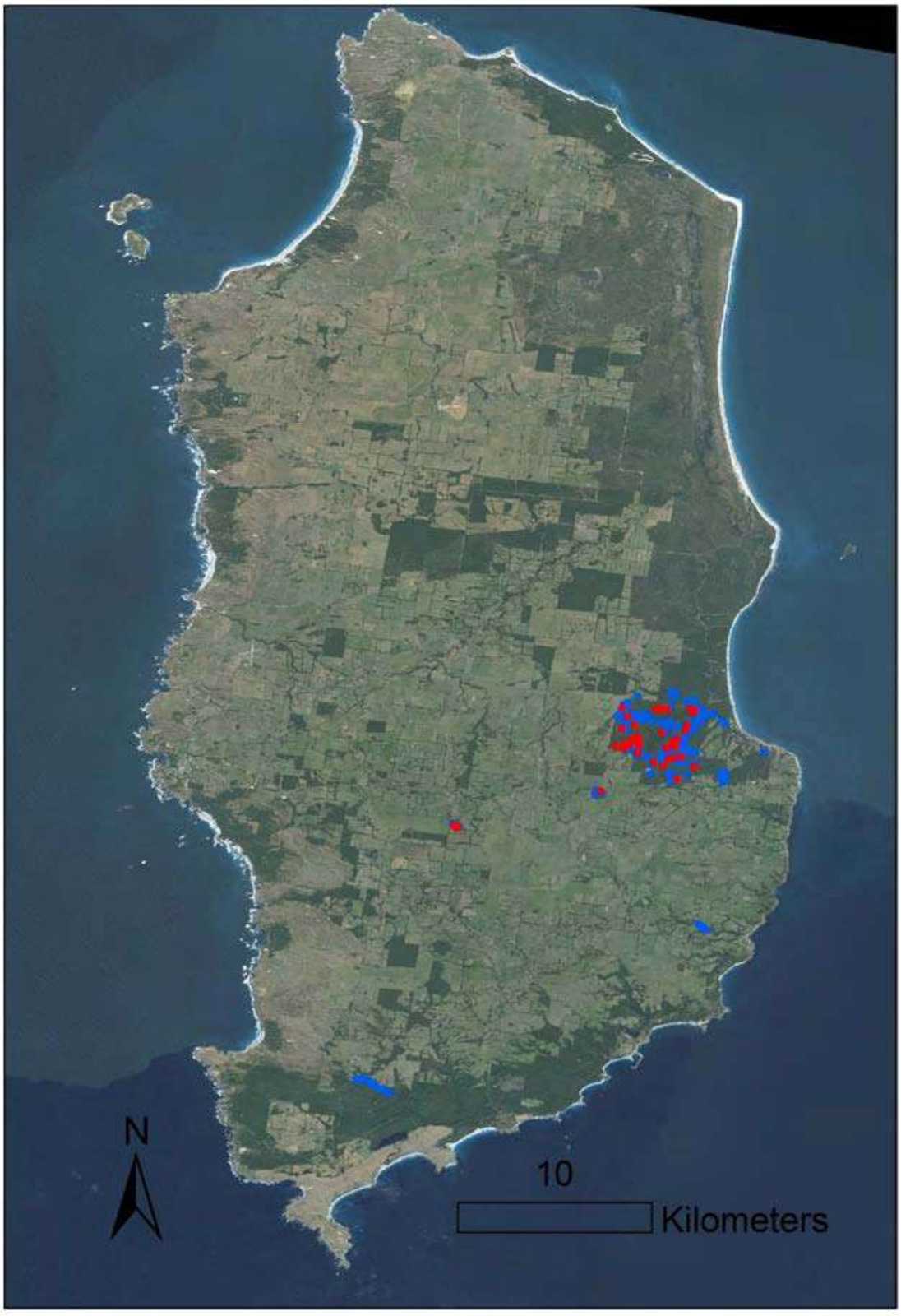

Figure 3. King Island Brown Thornbill detections (red) and other surveyed sites (blue) during this study, March 2019

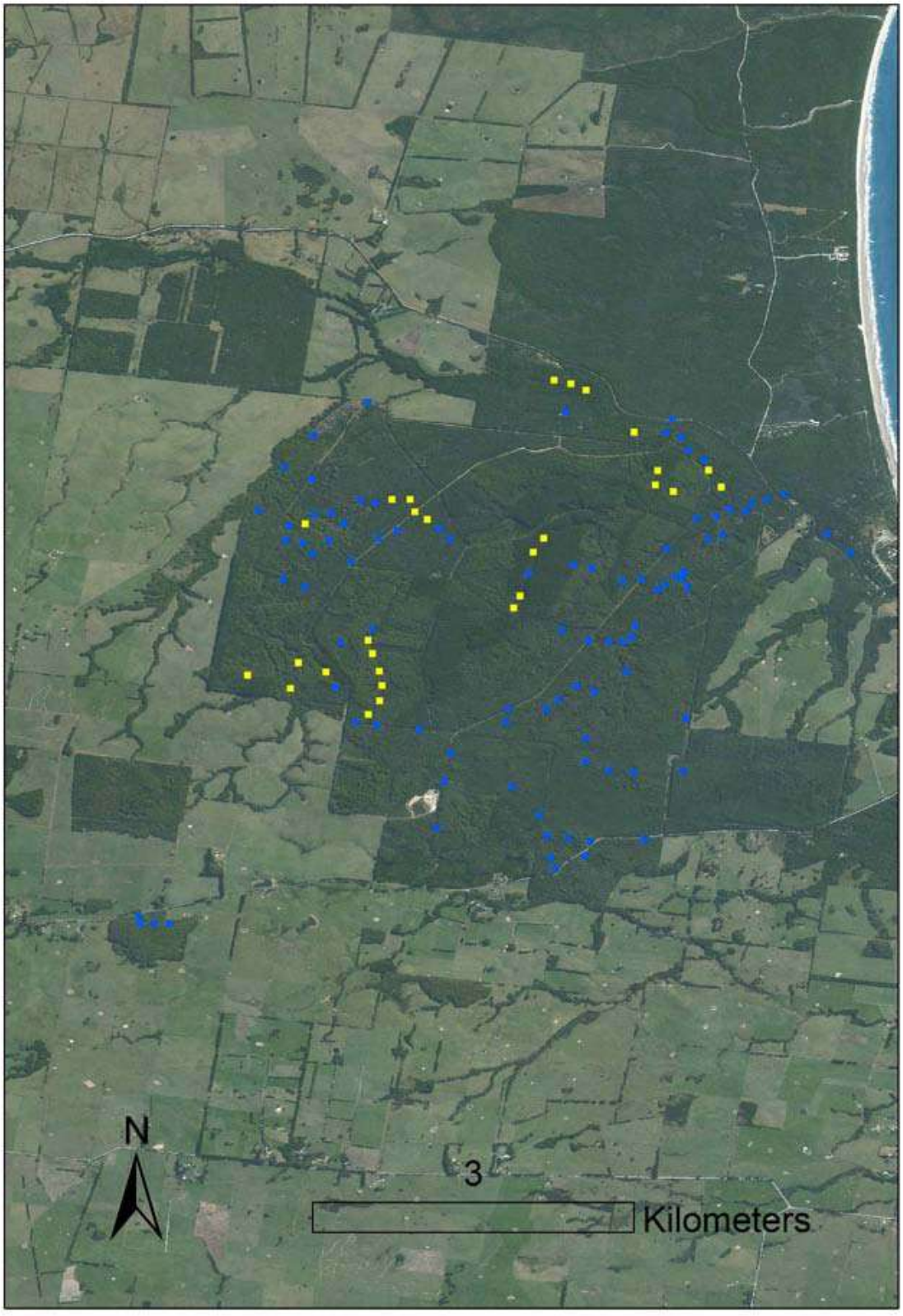

Figure 4. King Island Scrubtit detections (yellow) and other surveyed sites (blue) in Pegarah State Forest and surrounds, March 2019.

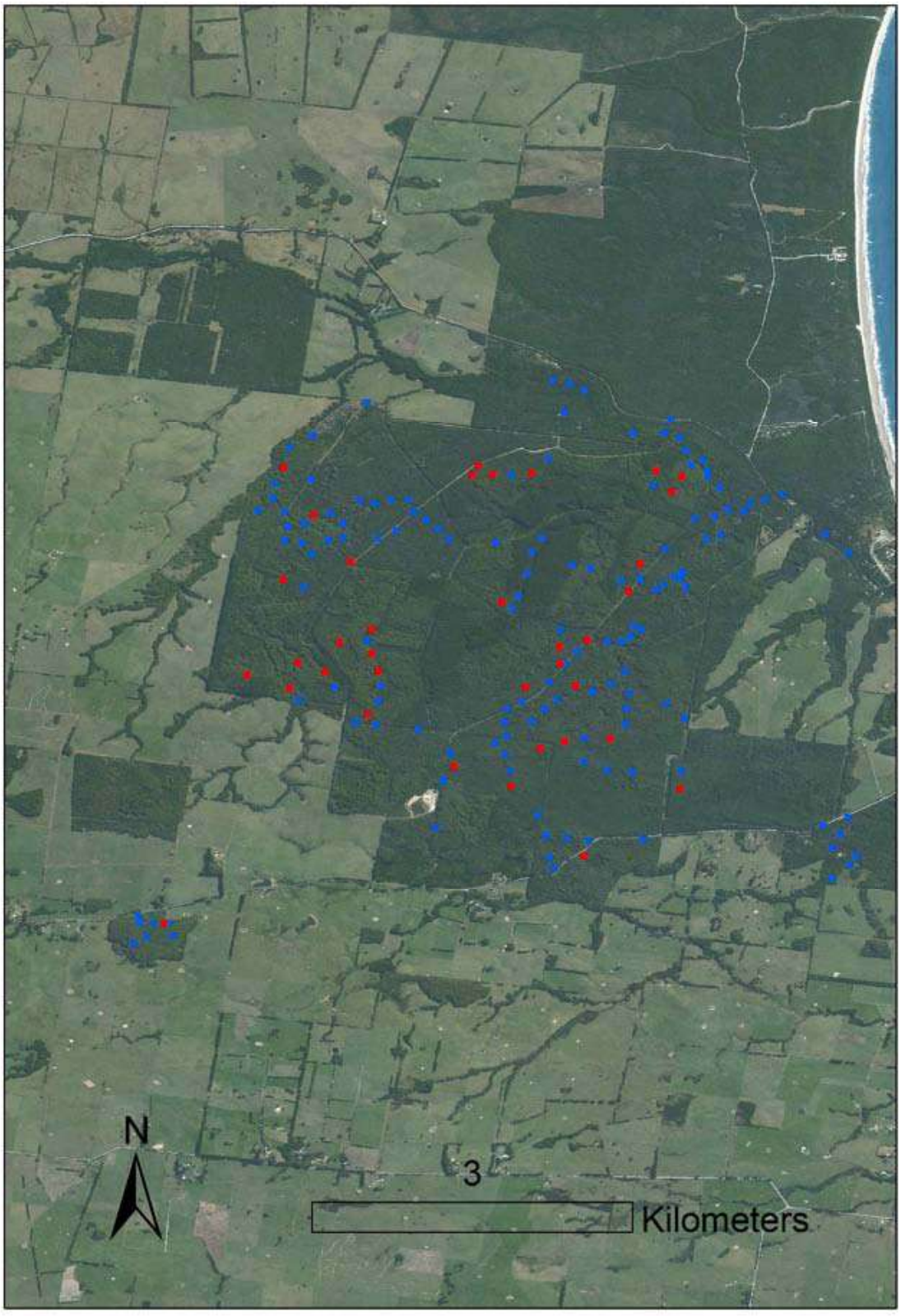

Figure 5. King Island Brown Thornbill detections (red) and other surveyed sites (blue) in Pegarah State Forest and surrounds, March 2019.

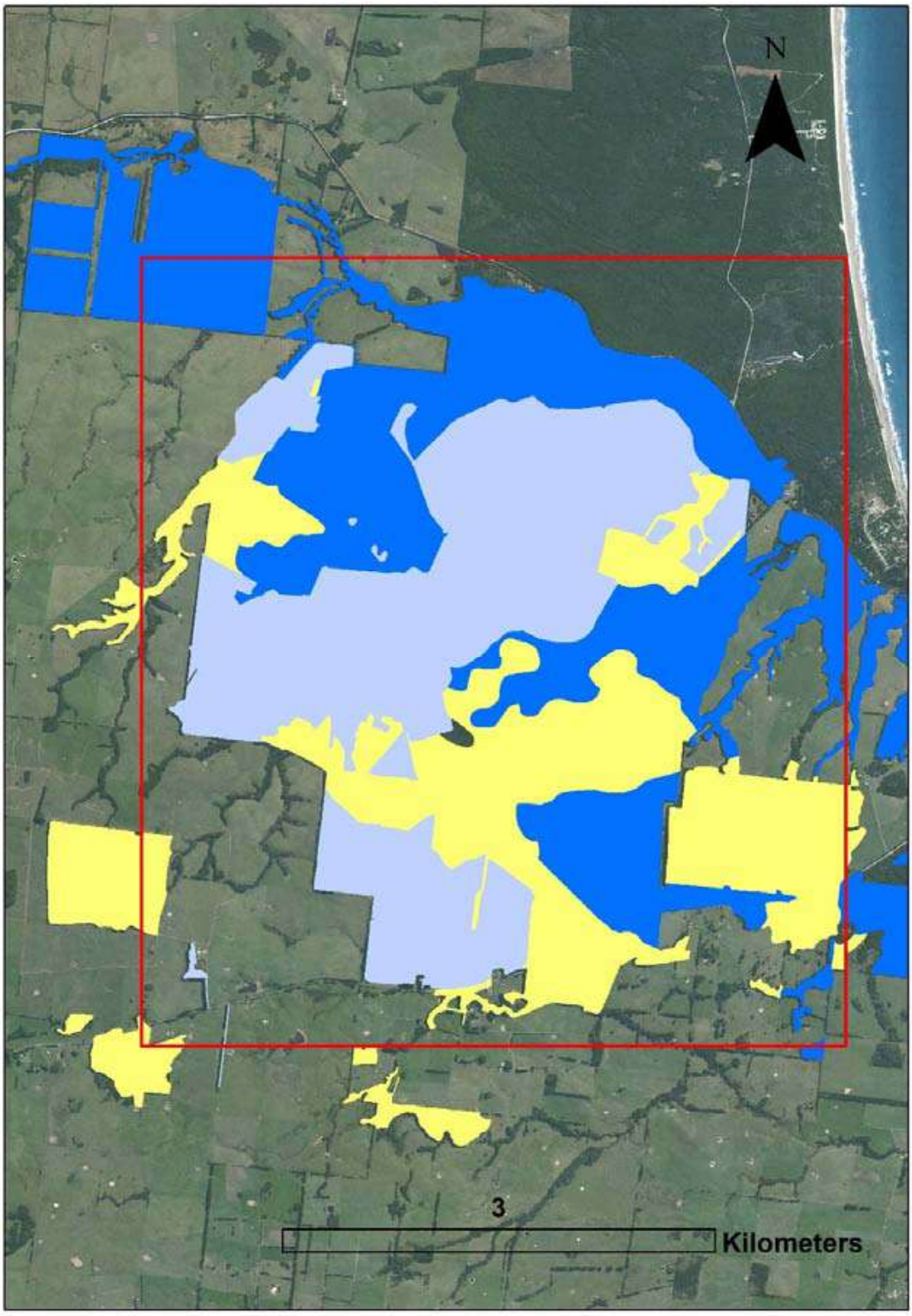

Figure 6. Mapping of forest communities and plantations in Pegarah State and surrounds (red box); *Leptospermum* forest (dark blue), Plantation (light blue), Eucalypt forest (yellow).

Figure 7. *Melaleuca ericifolia* forest mapped as a scrub community in TASVEG 3.0.

Note: This location supports high quality habitat and is currently proposed to be cleared and converted to pasture. Many other similar examples exist across the island.