Eastern Pygmy-Possum Program Report 2020

Ku-ring-gai Council

1. Acknowledgements

The Eastern Pygmy-possum Program relies on the input of a team of 11 volunteers to monitor nest boxes located throughout the Ku-ring-gai Local Government Area (LGA). This long-term threatened species monitoring program has been running for over six years, during which time it has expanded and adapted to improve outcomes and efficiency. Council recognise the significant contributions by our team of volunteers who have dedicated their time and knowledge, as well as donating nest boxes to the program. We are also grateful to members of Ku-ring-gai Men's Shed for their creative design and construction of additional nest boxes for the program.

2. Introduction

The Ku-ring-gai LGA is bound by Ku-ring-gai Chase National Park to the north, Garigal National Park to the east, Lane Cove National Park to the west and spans three major catchments (Middle Harbour, Lane Cove River and Cowan Creek). Ku-ring-gai's natural areas are associated with 24 vegetation communities, which provide habitat for more than 700 native plant species and over 300 vertebrate species, including many species listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

One of the threatened species occurring in Ku-ring-gai is the Eastern Pygmy-possum (*Cercartetus nanus*) listed as Vulnerable under the BC Act. The Eastern Pygmy-possum (EPP) is a small nocturnal marsupial, known to inhabit multiple vegetation types from heath to rainforest and is rarely observed outside formal surveys.

The Eastern Pygmy-possum Program is part of Ku-ring-gai Council's ongoing biodiversity monitoring program. The key aims of the EPP monitoring program are to:

- Improve our understanding of the:
  - distribution and abundance of EPP; and
  - habitat preference of EPP.
- Provide supplementary habitat for EPP in areas where appropriate hollows are scarce.
- Effectively engage the community and decision makers in biodiversity conservation.
- Promote better management of habitat, and the consideration of EPP in development, or other management/bushland management activities.
- Displaying best practice and providing guidance for other projects.

The program utilises remote cameras and nest boxes and is conducted under Scientific Licence number 100881. The program supports the objectives of Council's Biodiversity Policy and Fauna Management Policy, and is aligned with tasks N2.1.1 and N2.1.2 of Council's Delivery Program 2018-2021 and Operational Plan 2020-2021.

This report summarises the key results from the program for the 2020 calendar year, and provides recommendations for the future direction of the project.

3. Eastern Pygmy-possum (*Cercartetus nanus*)

Eastern Pygmy-possums are small diprotodont marsupials of the family *Burramyidae*. Eastern Pygmy-possum are native to south-eastern Australia, distributed from southern Queensland to eastern South Australia and Tasmania including Flinders and King Islands. In NSW, EPP distribution extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. EPP are associated with a broad range of habitats including temperate rainforest, sclerophyll forest, woodland and heath, but in most areas, where woodlands and heath are present they appear to be preferred habitat.

Eastern Pygmy-possums weigh 15 - 43 grams and have a head to body length of 70 - 110 millimetres with a tail length between 75 - 105 millimetres. They are light-brown on top, white underneath with an almost naked, prehensile tail. They have big, forward-facing ears, long whiskers, and large, bulging eyes.

Eastern Pygmy-possum feed primarily on nectar and pollen collected from banksias, eucalypts and bottlebrushes, making them important pollinators of heathland plants. When flowering is scarce, they supplement their diet with arthropods and soft fruit. Eastern Pygmy-possums shelter in a spherical nest of bark and leaves in a tree hollow or cranny. They appear to be mainly solitary, each individual using several nests, with males having non-exclusive home ranges of about 0.68 hectares and females about 0.35 hectares.[2] Whilst young can be born whenever food sources are available, locally, it appears there are two main breeding events in June-September and another in November-February (Cassie Thompson, pers. comm.). Eastern Pygmy-possums can enter periods of torpor to reduce energy expenditure, particularly in winter, with their body curled, ears folded and internal temperature dropping to match their surroundings.[1]

Factors threatening the survival of the Eastern Pygmy-possum include habitat loss and fragmentation leading to isolated sub-populations with little opportunity for dispersal, inappropriate fire regimes that remove nectar-producing understorey plants, the loss of nest sites due to land clearing, and predation by foxes and cats[2]. Fires may include prescribed burns (hazard reduction and ecological burns) or wild fires. Within the LGA, prescribed burns for either ecological or hazard reduction purposes are generally restricted in their frequency (depending on the vegetation type and proximity to residential areas), intensity and size (to ensure fauna connectivity of habitat to unburnt areas), however in some circumstances actions determined necessary to protect life and property are unavoidable.

4. Methods

In 2020, one additional nest box was installed for the EPP program giving a total of 38 boxes throughout the LGA. Nest boxes were placed in areas with a dense mid storey including species from the Proteaceae family and with general heathy character where highest observation rates were expected.[3] Monitoring was conducted at all nest box locations throughout the LGA, with presence or absence of EPP determined via direct nest box checks and/or remote cameras (focused on the nest box or nearby *Banksia ericifolia* spikes when in flower).

Nest box checks were conducted quarterly within the first week of the monitoring month, ie. 1st-7th March, June, September and December, to be repeated annually to ensure consistency of the data. Indirect observations such as fresh nesting material in nest boxes were also recorded as evidence of habitation (Figure 1), though only direct observations (i.e. a photo/video of an EPP or an EPP directly observed in a nest box) have been reported as indicating presence. Where fresh nesting material was

[1] *Turner, J.M., Körtner, G., Warnecke, L. & Geiser, F. (2012) Summer and winter torpor use by a free-ranging marsupial, Comparative biochemistry and physiology. Part A, Molecular & integrative physiology,* ***162*** *(3), 274-280.*

[2] *DPIE (2020) Eastern Pygmy Possum Profile, accessed online: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10155*

[3] *Law, B., Chidel, M., Britton, A. & Brassil, A. T. (2012) Response of Eastern pygmy-possums, Cercartetus nanus, to selective logging in New South Wales: home range, habitat selection and den use, Wildlife Research*, **40**, 470–481

found, if available, a camera would be installed at the nest box in attempt to capture remote footage to confirm EPP presence.

The period of time cameras were left in place varied between monitoring events based on numerous factors related to staff or volunteer availability, the success or failure of the monitoring location, weather, security of cameras and controlled burning, but generally were left for a minimum period of two weeks.

Other species sighted or heard during nest box inspections or in remote camera footage were also recorded.

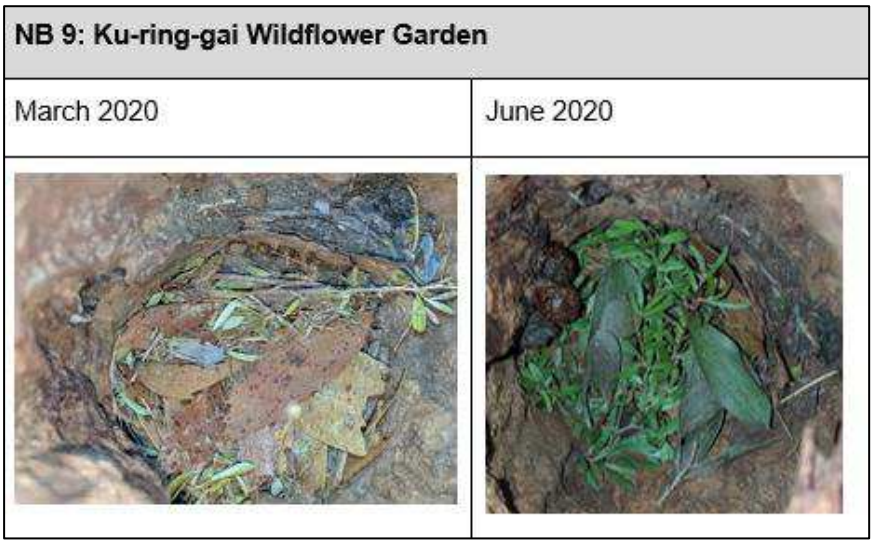


Figure 1. Example of evidence of recent EPP habitation

Nest box maintenance

A number of nest boxes were replaced during this monitoring period due to gradual deterioration over time. Nest box numbers were also added to lids of nest boxes where old numbers had detached. Many nest boxes were also reattached using a tree friendly design (wire through hose, Figure 2), as it was noted that the wire attachments on a number of boxes had started impacting the host tree.

Figure 2. Nest box attachment using tree friendly design

5. Limitations

At various times throughout the year, some nest boxes were impacted by ant colonies, either requiring the lid to be left open for a short period to encourage dispersal, or significantly damaged boxes required replacing. In some cases this may have impacted the detectability of EPP where the box was uninhabitable.

Where multiple nest boxes are considered to be within a typical home range for EPP[4], or located within a single reserve, the nest boxes have been grouped into 'unique' sites to inform presence/absence data (Table 1).

As is the case for all fauna monitoring, presence is confirmed by direct observation while absence is not confirmed through the lack of observation.

6. Results

Distribution of EPP throughout the LGA

Eastern Pygmy-possums were detected at 12 of 38 (32%) monitoring sites in the 2020 calendar year. The distribution of nest boxes and EPP records is provided in Figure 3. Of the unique sites/reserves in the LGA (Table 1), Eastern Pygmy-possum were detected at seven of the 15 reserves (47%). The peak detection of EPP activity, either via nest box checks, camera detection or 'signs of visitation' occurred during winter (Figure 3).

Reserves in the north and east of the LGA with connectivity to either Ku-ring-gai National Park or Garigal National Park remain a stronghold for Eastern Pygmy-possums. In 2020, EPP were detected at four of five reserves surveyed in the east of the LGA and three of five reserves to the north. Of the reserves surveyed in the east of the LGA, St Ives Green Tip and Surgeon White Reserve appear to be hotspots for EPP activity.

Despite continued survey effort, EPP remain undetected in reserves to the south west of the LGA with connectivity to Lane Cove National Park. A comparison of presence/absence data since 2015 monitoring is summarised in Table 1.

[4] *Harris, J. M., Goldingay, R. L., Broome, L., Craven, P. & Maloney, K. S. (2007) Aspects of the Ecology of the Eastern Pygmy-Possum Cercartetus Nanus at Jervis Bay, New South Wales. Australian Mammalogy **29** (1), 39–46*

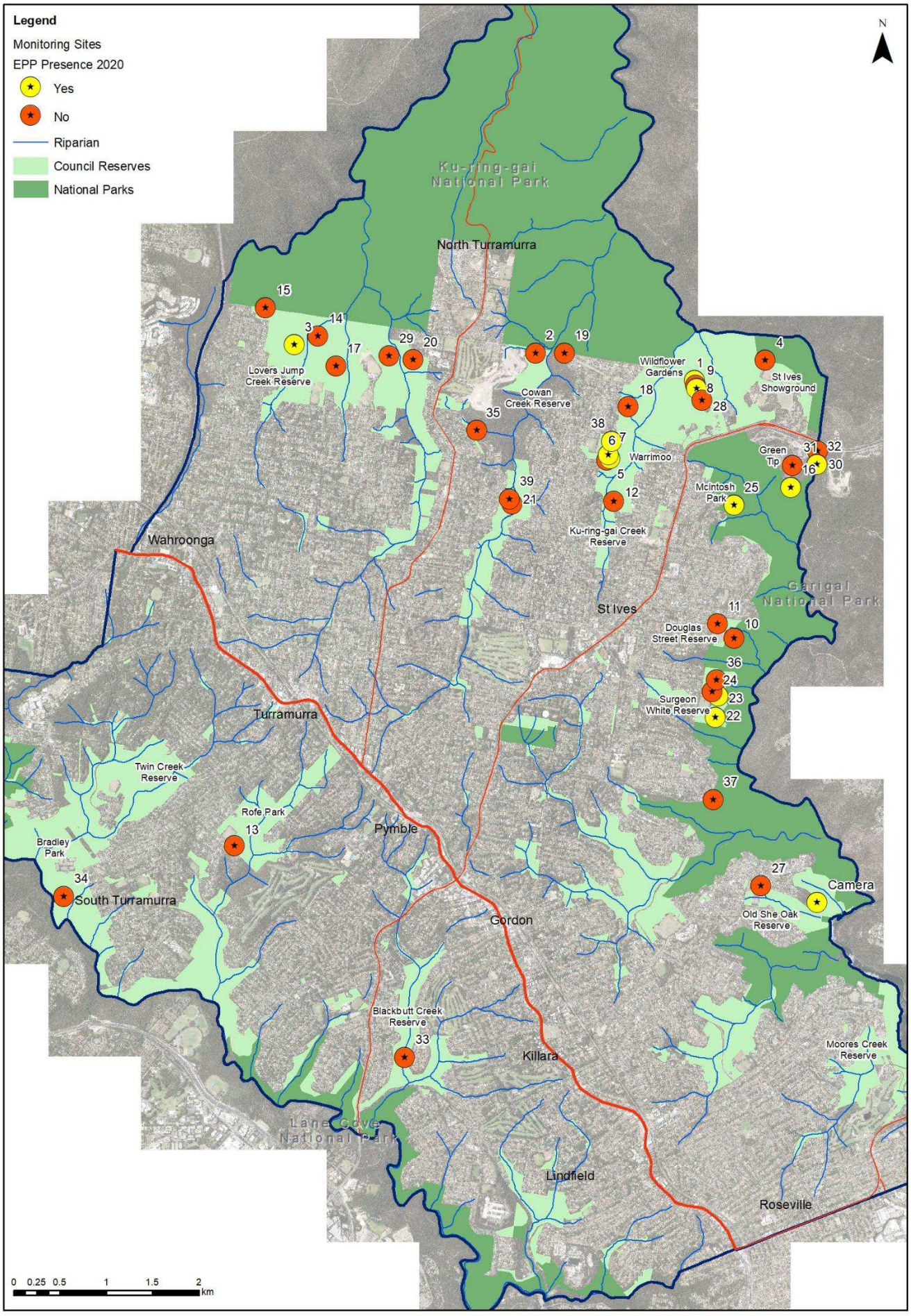


Figure 3 Eastern Pygmy-possum sightings - 2020

Table 1. Distribution of EPP observations throughout the LGA, 2015-2020

Area/reserve name	Presence 2015-2016	Presence 2016-2017	Presence 2017-2018	Presence 2019	Presence 2020
North of LGA (connectivity to Ku-ring-gai NP)					
Cowan Creek Reserve	Yes	Yes	Yes	Yes	No*
Ku-ring-gai Creek Reserve/ Warrimoo	Yes	Yes	Yes	Yes	Yes
Ku-ring-gai Wildflower Garden	Yes	Yes	Yes	Yes	Yes
Lovers Jump Creek Reserve	Yes	Yes	No*	Yes	Yes
St Ives Showground	Yes	Yes	No	Yes	No
East of LGA (connectivity to Garigal NP)					
Douglas Street Reserve (Acron Oval)	Yes	No	Yes	No	No
Green Tip	Yes	Yes	No	Yes	Yes
McIntosh Park	Not surveyed	Yes	No**	No	Yes
Old She Oak Reserve	Not surveyed	Not surveyed	No	No	Yes
Surgeon White Reserve	Yes	Yes	Yes	Yes	Yes
South west of LGA (Lane Cove NP)					
Bradley Park	No	No	No	No	No
Rofe Park	No	No	No	No	No
Sir Phillip Game Reserve North	Not surveyed	No	Not surveyed	Not surveyed	Not surveyed
Twin Creek Reserve	Not surveyed	No	Not surveyed	Not surveyed	Not surveyed
Blackbutt Creek Reserve	Not surveyed	Not surveyed	No	No	No

*NSW Atlas records show EPP presence north of the monitoring site
**Nest box was removed due to risk of hazard burns in the area, inactive between March and June 2018

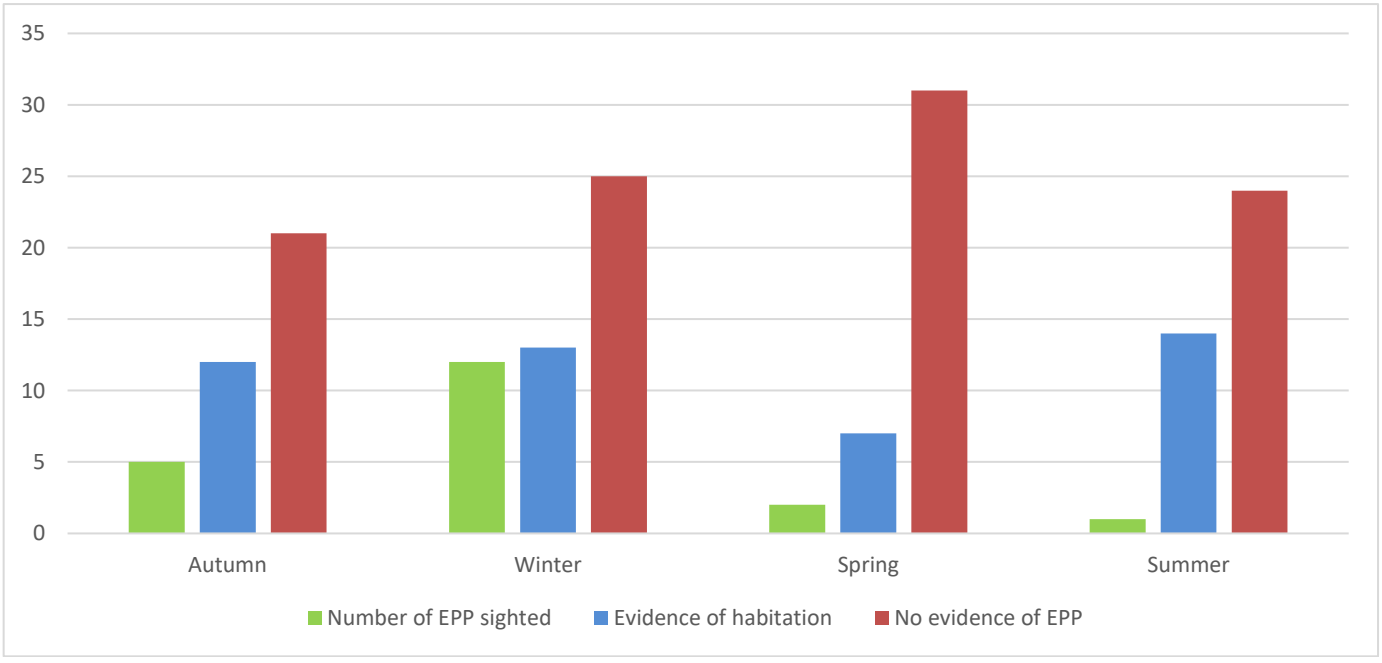


Figure 4. Results of 2020 monitoring (camera records and nest box observations combined)

Vegetation communities surveyed

Monitoring sites were located in a range of vegetation communities, including:

- Coastal Upland Swamp*
- Duffys Forest**
- Sydney Sandstone Gully Forest
- Sydney Sandstone Ridgetop Woodland

*Endangered ecological community under the state BC Act 2016.
** Endangered ecological community under the state BC Act 2016 and federal EPBC Act 1999.

Eastern Pygmy-possums were recorded in all vegetation communities other than Duffys Forest. Key flora species successful in capturing foraging EPP via remote cameras were *Banksia ericifolia* and *Banksia serrata*.

Breeding records

Sub-adult EPPs were recorded via remote camera footage at the Wildflower Gardens, Warrimoo, McIntosh Park and Green Tip, indicating successful breeding in these areas. A photographic record of nest development throughout the seasons is provided in Appendix 1.

Other species observations

A range of other native species were detected during surveys, including 18 bird species, eight mammals and one reptile (Table 2). Invertebrates (mostly ants and spiders) were often found utilising the nest boxes. A gallery of remote camera footage and other species observations is provided on the following page.

Table 2. Other species detected during EPP monitoring

Scientific name	Common name	Observation type
Birds		
Acanthiza lineata	Striated Thornbill	Camera monitoring – *B. ericifolia*
Acanthiza pusilla	Brown Thornbill	Camera monitoring – *B. ericifolia*
Acanthorhynchus tenuirostris	Eastern Spinebill	Observed and heard call – daytime
Accipiter fasciatus	Brown Goshawk	Camera monitoring – near nest box
Alectura lathami	Australian Brushturkey	Camera monitoring – foraging on ground
Anthochaera carunculata	Red Wattlebird	Camera monitoring – *B. ericifolia*
Anthochaera chrysoptera	Little Wattlebird	Camera monitoring – *B. ericifolia*
Corvus coronoides	Australian Raven	Camera monitoring – near nest box
Eopsaltria australis	Eastern Yellow Robin	Camera monitoring – near nest box
Gerygone mouki	Brown Gerygone	Heard call – daytime
Lichenostomus chrysops	Yellow-faced Honeyeater	Camera monitoring – *B. ericifolia*
Malurus cyaneus	Superb Fairy-wren	Camera monitoring – near nest box
Meliphaga lewinii	Lewin's Honeyeater	Camera monitoring – *B. ericifolia*
Menura novaehollandiae	Superb Lyrebird	Heard call – daytime
Pardalotus punctatus	Spotted Pardalote	Heard call – daytime
Ptilonorhynchus violaceus	Satin Bowerbird	Camera monitoring – near nest box
Sericornis frontalis	White-browed Scrubwren	Heard call – daytime
Zosterops lateralis	Silvereye	Camera monitoring – *B. ericifolia*
Mammals		
Acrobates pygmaeus	Feathertail Glider	Camera monitoring – near nest box
Antechinus stuartii	Brown Antechinus	Camera monitoring – utilising nest box
Petaurus breviceps	Sugar Glider	Camera monitoring – near nest box
Pteropus poliocephalus	Grey-headed Flying-fox	Camera monitoring – *B. ericifolia*
Rattus sp.		Camera monitoring – near nest box
Tachyglossus aculeatus	Short-beaked Echidna	Observed along fire trail
Trichosurus vulpecula	Common Brushtail Possum	Camera monitoring – near nest box
Wallabia bicolor	Swamp Wallaby	Camera monitoring – foraging on ground
Reptiles		
Varanus varius	Lace Monitor	Observed along fire trail

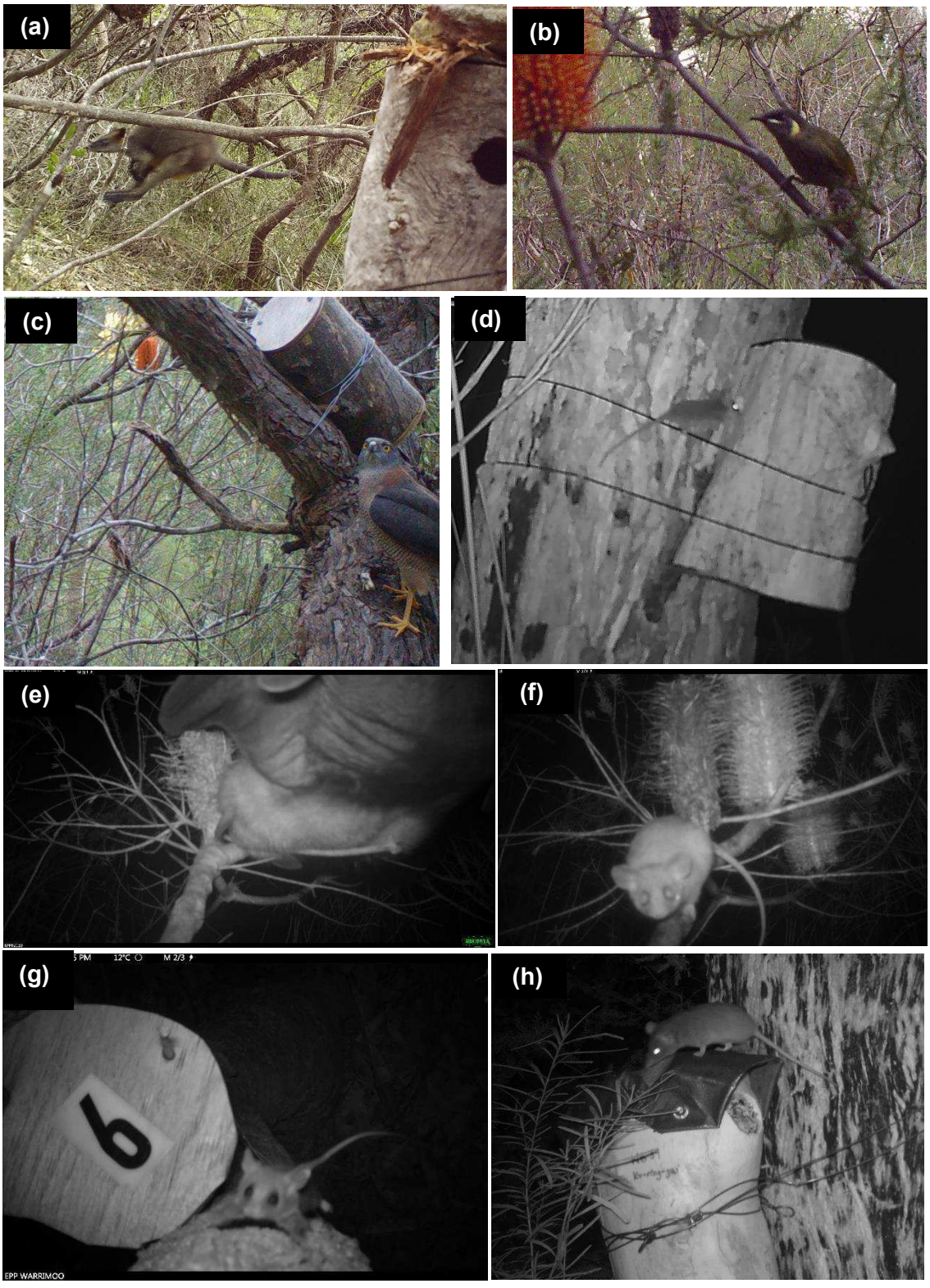


Figure 5. Gallery of remote camera footage and other species observations during 2020: (a) Swamp Wallaby, (b) Lewin's Honeyeater, (c) Brown Goshawk, (d) sub-adult Eastern Pygmy-possum, (e) Grey-headed Flying-fox, (f, g) Eastern Pygmy-possum, (h) Brown Antechinus

7. Discussion and recommendations

Bushland reserves with large intact remnant vegetation adjoining Ku-ring-gai Chase National Park and Garigal National Park remain a stronghold for the population of Eastern Pygmy-possums in the Ku-ring-gai LGA. The peak detection of EPP activity, either via nest box checks, camera detection or 'signs of visitation' began in autumn and peaked in the winter period, coinciding with the flowering of *Banksia* species on which they feed. Remote cameras focused on flowering *Banksia ericifolia* aided the detection of possums in 2020. The use of remote cameras continues to be a key component of the monitoring program, allowing for the detection of EPP activity throughout the year outside of the quarterly physical nest box checks.

This year, EPPs were detected at McIntosh Park and Old She Oak Reserve, two sites which have lacked records of EPP activity since 2017. Recovery of flowering Proteaceae species two years on from widespread hazard reduction burns in Garigal National Park between McIntosh Park and Green Tip has provided good foraging habitat in 2020, encouraging EPPs back into these areas. Abundant flowering *Banksia ericifolia* in Old She Oak Reserve between May and June aided the detection of EPP at this site, which is the furthest southern extent of known pygmy-possum presence in the Ku-ring-gai LGA.

There was no EPP activity recorded during 2020 at Cowan Creek Reserve or the lower Ku-ring-gai Creek Reserve, both areas which have previously had EPP presence. Signs of presence were noted at nest boxes Cowan Creek Reserve, and given this site has previously recorded breeding events, it is likely this is a reflection of a lack of camera monitoring effort rather than EPP absence. Additionally, records from the NSW Atlas confirm EPP presence immediately north of the monitoring site in 2020. Vegetation in the lower Ku-ring-gai Creek Reserve area appears to be recovering well following hazard reduction burns conducted in May 2019, however there was a noticeable lack of flowering Proteaceae species to provide suitable foraging habitat. This area will continue to be monitored to assess for signs of EPP activity as the vegetation recovers post-burn.

During 2020, construction of the improved downhill mountain bike track was completed, with a focus on balancing recreational use with the protection and rehabilitation of an endangered ecological community in the area, as well as mitigating potential impacts to threatened species including the EPP. Monitoring this year has found Eastern Pygmy-possums remaining present at two of three nest box sites that are located in the vicinity of the tracks.

The construction of a number of illegal mountain bike track were reported to Council during the 2020 period, damaging vegetation in bushland reserves throughout Ku-ring-gai including areas of EPP habitat. Council continue to monitor this activity and have begun rehabilitation in these areas.

The EPP monitoring program will continue in 2021 with implementation of the following:

- Monitoring of nest boxes will continue on a quarterly basis (March, June, September and December 2021), with the adjustment that where there is clear evidence of recent EPP activity (i.e. fresh nesting material recently brought into the nest box), a second visit within a couple of days of the initial nest box inspection may be undertaken. This second visit is optional only, depending on the volunteer's availability.
- Council staff will continue the use of remote cameras at nest box sites to capture EPP activity outside of the quarterly monitoring events. Cameras may be made available on request by volunteers for monitoring within proximity of an assigned nest box for a specific site.
- Nest boxes impacted by ant colonies will continue to be monitored for deterioration and replaced or relocated if necessary.
- Data will continue to be collected via Council's data collection application, accessed via smart phones or internet browser.
- All records will continue to be uploaded to relevant databases quarterly as per data licence agreements.

8. Conclusion

Bushland reserves with connectivity to Ku-ring-gai Chase National Park and Garigal National Park to the north and east of the LGA remain a stronghold for the population of Eastern Pygmy-possums in Ku-ring-gai, with continued evidence of successful breeding events. This long-term monitoring program continues to provide valuable insights into the distribution and ecology of pygmy-possums, as well as highlighting the unique diversity of other pollinators and native fauna in Ku-ring-gai. The program has benefited from the team of volunteers involved, providing local knowledge and increasing community awareness of this unique threatened species.

If you would like to find out more about the program, please contact Council's Natural Areas Officer, on (02) 9424 0000 or naturalareas@kmc.nsw.gov.au.

9. References

DPIE (2020) Eastern Pygmy Possum Profile, accessed online: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10155

DPIE (2020) NSW BioNet. Atlas of NSW Wildlife. Accessed online: https://www.environment.nsw.gov.au/

Harris, J. M., Goldingay, R. L., Broome, L., Craven, P. and Maloney, K. S. (2007) Aspects of the Ecology of the Eastern Pygmy-Possum Cercartetus Nanus at Jervis Bay, New South Wales. *Australian Mammalogy,* **29** (1), 39–46.

Law, B., Chidel, M., Britton, A. and Brassil, A. T. (2012) Response of Eastern pygmy-possums, Cercartetus nanus, to selective logging in New South Wales: home range, habitat selection and den use*, Wildlife Research,* **40**, 470–481.

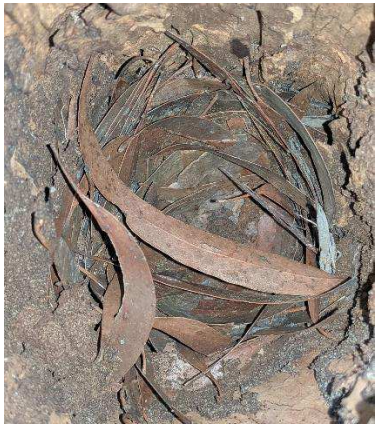
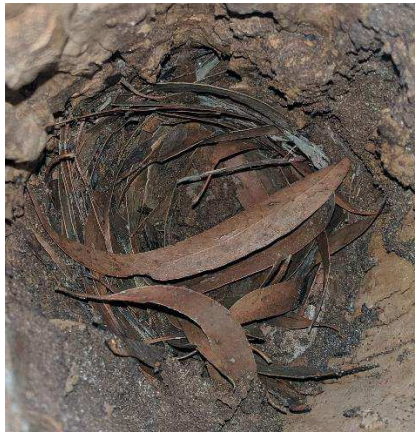
Turner, J. M., Körtner, G., Warnecke, L. and Geiser, F. (2012) Summer and winter torpor use by a free-ranging marsupial*, Comparative biochemistry and physiology*, **162** (3), 274-280.

Appendix 1 – Nest box monitoring photos

NB1: Ku-ring-gai Wildflower Gardens			
March 2020	June 2020	September 2020	December 2020
			
NB2: Cowan Creek Reserve			
March 2020	June 2020	September 2020	December 2020
Box had deteriorated. Replaced with new nest box. Future inspections require WIFI camera.			

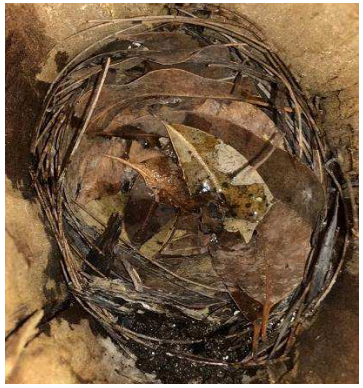
NB3: Lovers Jump Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			
NB4: St Ives Showground			
March 2020	June 2020	September 2020	December 2020
			

NB5: Ku-ring-gai Creek Reserve (Warrimoo)			
March 2020	June 2020	September 2020	December 2020
			
NB6: Ku-ring-gai Creek Reserve (Warrimoo)			
March 2020	June 2020	September 2020	December 2020
			

NB7: Ku-ring-gai Creek Reserve (Warrimoo)			
March 2020	June 2020	September 2020	December 2020
			
NB8: Ku-ring-gai Wildflower Garden			
March 2020	June 2020	September 2020	December 2020
			

NB 9: Ku-ring-gai Wildflower Garden			
March 2020	June 2020	September 2020	December 2020
			
NB 10: Douglas Street Reserve			
March 2020	June 2020	September 2020	December 2020
			

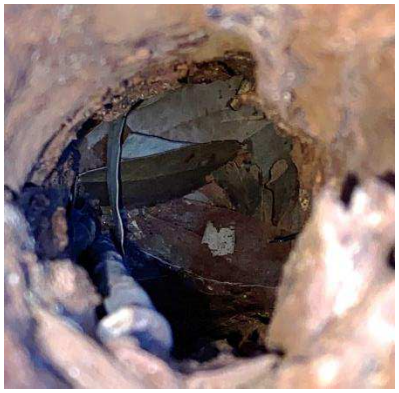
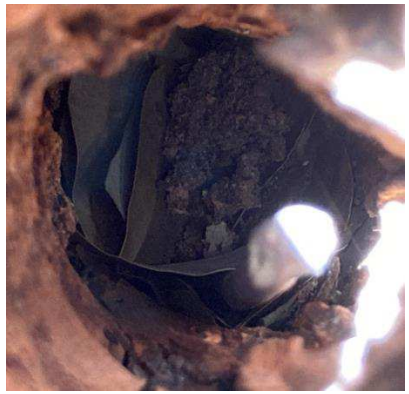
NB 11: Douglas Street Reserve			
March 2020	June 2020	September 2020	December 2020
			
NB 12: Ku-ring-gai Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			

NB 13: Rofe Park			
March 2020	June 2020	September 2020	December 2020
			
NB 14: Lovers Jump Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			

NB 15: Lovers Jump Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			
NB 16: St Ives Green Tip			
March 2020	June 2020	September 2020	December 2020
			

NB 17: Lovers Jump Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			
NB 18: Ku-ring-gai Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			

NB 19: Cowan Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			
NB 20: Lovers Jump Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			

NB 21: Cowan Creek Reserve			
March 2020	June 2020	September 2020	December 2020
			
NB 22: Surgeon White Reserve			
March 2020	June 2020	September 2020	December 2020
			

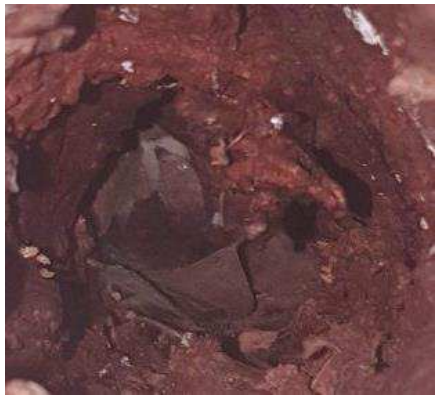
NB 23: Surgeon White Reserve			
March 2020	June 2020	September 2020	December 2020
			
NB 24: Surgeon White Reserve			
March 2020	June 2020	September 2020	December 2020
			

NB 25: McIntosh Park			
March 2020	June 2020	September 2020	December 2020
			
NB 27: Old She Oak Reserve			
March 2020	June 2020	September 2020	December 2020
			

NB 28: Ku-ring-gai Wildflower Garden			
March 2020	June 2020	September 2020	December 2020
			
NB 29: Lovers Jump Creek Reserve			
March 2020	June 2020	September 2020	December 2020 (new nest box)
			

NB 30: HART			
March 2020	June 2020	September 2020	December 2020
			
NB 31: Green Tip			
March 2020	June 2020	September 2020	December 2020
			

NB 32: Green Tip			
March 2020	June 2020	September 2020	December 2020
			
NB 33: Blackbutt Reserve			
March 2020	June 2020	September 2020	December 2020
NA- spider			

NB 34: Step track			
March 2020	June 2020	September 2020	December 2020
			
NB 35: Darri track			
March 2020	June 2020	September 2020	December 2020
			

NB 36: Surgeon White Reserve			
March 2020	June 2020	September 2020	December 2020
			
NB 37: Bungaroo Track			
March 2020	June 2020	September 2020	December 2020
			

NB 38: Warrimoo			
March 2020	June 2020	September 2020	December 2020
			
NB 39: Cowan Creek Reserve			
June 2020	September 2020	December 2020