



Suitability Study for the Reintroduction of Krefft's glider
(*Petaurus notatus*) to the Merri Creek



Prepared by Merri Creek Management Committee for Friends of Merri Creek

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1. Project overview

Commissioned by the Friends of Merri Creek (FoMC) with funding from the Inner North Community Foundation, this study will assess the potential for the reintroduction of a breeding population of Krefft's Gliders (*Petaurus notatus*) to the urbanised lower Merri Creek.

2. Biology and ecology of Krefft's Glider

2.1 Appearance and anatomy

Krefft's Gliders are small possum-like marsupials belonging to the family Petauridae. They primarily reside within the tree canopy of forests and woodlands, using a membrane which extends from their elbow to their ankle to glide between trees. Krefft's Gliders have thick grey fur, a black stripe which extends from nose to back, and cream coloured fur on their bellies and chests. Head and body length of adult males are approximately 17cm, with a long prehensile tail of approximately 19cm which is used for stabilisation during flight. Krefft's Gliders are sexually dimorphic, with males being slightly larger than females.

2.2 Distribution

Krefft's Gliders are closely related to Sugar Gliders (*Petaurus breviceps*) and the two species have long been taxonomically confused. Recent genetic and morphological investigations (Cremona et al., 2021) have identified three distinct species: *Petaurus breviceps* (Sugar glider), *Petaurus notatus* (Krefft's glider) and *Petaurus ariel* (Savannah glider), all previously considered to be a single species. While once classified as a species of "least concern", the three separate species each have smaller distributions compared to the single taxon, making each species more vulnerable to habitat destruction than previously thought (Cremona et al. 2021). Krefft's Gliders have the largest range of the three species (Figure 1, taken from Cremona et al. 2021) occurring in coastal forests and woodlands throughout eastern Australia, ranging from southern Queensland to South Australia; the species has also been successfully reintroduced to Tasmania, where it is now considered a pest (Allen et al. 2018).

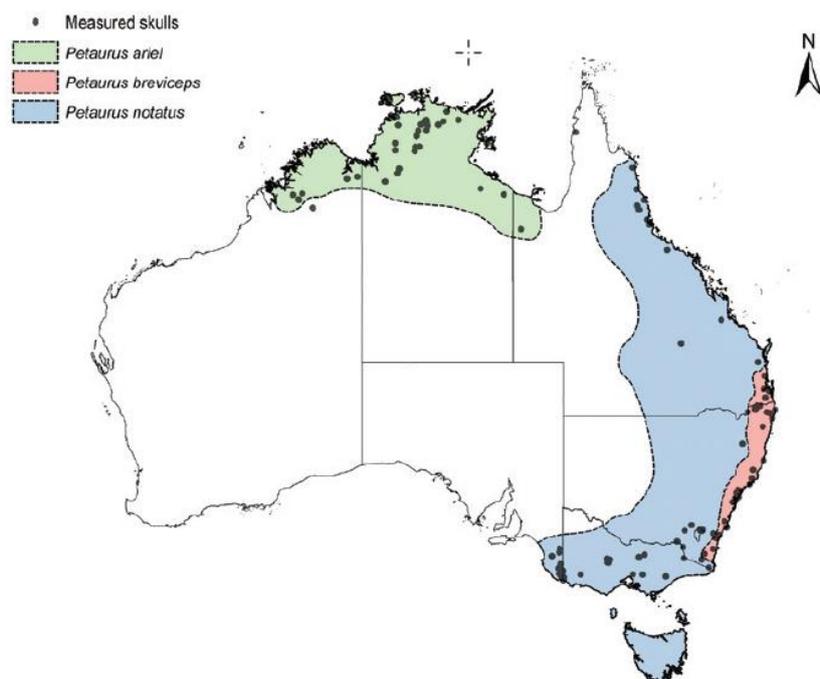


Figure 1 Species distribution map for *P. ariel*, *P. breviceps* and *P. longicadus*

2.3 Habitat

Krefft's Gliders are common in well treed areas of Melbourne and are particularly abundant in areas that contain a tree canopy dominated by *Eucalyptus* species such as Red Stringy Bark *Eucalyptus macrorhyncha*, Yellow Box *Eucalyptus melliodora*, Messmate *Eucalyptus obliqua* and River Red Gum *Eucalyptus camaldulensis*. Understorey vegetation mostly consists of *Acacia* species such as Silver Wattle *Acacia dealbata*, Black Wattle *Acacia mearnsii* and Blackwood *Acacia melanoxylon*. Krefft's Gliders primarily feed on the gum from *Acacia* and *Eucalyptus* trees, as well as insects. Gliders prefer to stay within the tree canopy as they are particularly vulnerable to predation when moving along the ground. While they are capable of gliding up to 50 metres (Suckling 1995), they prefer to glide to trees less than 20 metres apart (Jackson 2015), indicating that a relatively closed tree canopy with gaps less than 20 m between trees is preferable habitat.

Krefft's Gliders nest in tree hollows, and a group will typically use several different nests. Krefft's Gliders create a distinctive nest within hollows made of eucalyptus leaves formed into spheres approximately 15 cm in diameter (Suckling, 1984). Gliders in captivity have been observed to build similar nests on the ground.

2.4 Reproduction

Krefft's Gliders reach sexual maturity at approximately 12 to 18 months. They begin breeding in winter (June-July) with a gestation period of 15 to 17 days, and a typical litter size of two young (Atlas of Living Australia, 2022). The young will remain in the pouch for 70 days before nesting for a further 50 days (Smith 1971). Juveniles leave the nest to forage from around four months of age (Suckling 1984). Males are normally forced to disperse from the group at around 10 to 12 months, before they reach sexual maturity (Suckling 1984). In the wild, Krefft's Gliders have a typical lifespan of up to nine years but can live up to 12 years when kept in captivity (Atlas of Living Australia, 2022).

2.5 Population dynamics

Krefft's Gliders normally nest in dens consisting of two to seven adults, although social groupings as large as 12 have been observed (Suckling, 1984). On average, male movement is greatest during breeding season, whilst female movements undergo little variation throughout the year, foraging radius of groups ranges from 90 to 150m. Jewell (1966) defined the home range of Krefft's Gliders as the area travelled during routine activities. The average male home range is 0.7ha, whilst the average female home range is 0.5ha; Suckling (1984) found that home ranges were inversely proportional to the abundance of *Acacia mearnsii* within the area. Dispersal, defined as the movement of individual Krefft's Gliders to a new home range as they reach sexual maturity, is 0.6 ± 0.3 km for males and 0.7 ± 0.6 km for females (Suckling, 1984).

2.6 Current status along Merri Creek

Currently, Krefft's Gliders are not known to be present along the Merri Creek. Krefft's Gliders are currently present on the Yarra River at Kew (ALA, 2022) and have expanded their territory along the Darebin Creek to Fairfield and Heidelberg in recent years (M. Perry, pers. comm. July 2022). Closer to the Merri, the species has been recorded at Yarra Bend Park in the 1980s. Given the continuity of habitat along the Yarra between Fairfield and Kew, it is reasonable to assume that Krefft's Gliders continue to persist at Yarra Bend.

3. Nest Boxes and Artificial Hollows

The tree hollows Krefft's Gliders rely on for nesting can take up to 100 years to form naturally, meaning that successful reintroduction programs may require the installation of nest boxes to ensure sufficient habitat for a breeding population. Traill and Lill (1997) found that the use of nest boxes with entrances too small for larger possums increased the abundance of Krefft's Gliders. Invasion of nest

boxes by species such as Indian myna and European honeybees have been found to decrease Krefft's Glider abundance; nest box designs which limit the ability of these species to enter are preferable.

4. Components of successful reintroduction programs

In the dynamic environment surrounding reintroduction programs it can be difficult to determine the precise factors affecting the relative success or failure of an individual project. However, some studies point to a few critical factors that will influence success rates.

Broader studies into the outcomes of a range of mammal reintroductions suggest that habitat quality is likely to be a significant factor in the success of a reintroduction programme. Griffith *et al* (1989) found very high success rates for translocations corresponding to 'excellent' habitat, with a corresponding decline in success with declining habitat quality. In conjunction with habitat quality, size of the release area and factors in the environment surrounding the area will likely impact the success rate. Smaller areas, reduced connectivity, and the introduction of predation stressors from proximity of to surrounding housing and roads, are likely to negatively impacts reintroduction success. With predation often being a major contributing factor in reintroduction failures, considerable thought should be put into the type and degree of predation in the area.

Both the size of the release group and the health of the individuals may also influence success. Griffith *et al* (1989) suggested that larger groups may have a greater chance of success. Their study also suggested that wild-caught animals were more likely to successfully establish in new areas than captive-bred individuals.

With Krefft's Gliders specifically, thought should be put into the type of nest boxes used; are they prone to being taken over by bees, other small mammals, or birds, and ensuring that there are sufficient nest boxes to provide the required nesting hollows.

In general, the likely success of any attempted reintroduction will be significantly enhanced by a thorough knowledge of the ecology of the species involved, details of the environment into which it is to be relocated, habitat quality, structure, and threats. Detailed planning and sufficient monitoring post reintroduction will give the project its best chance of success.

5. Examples of previous reintroductions

There have been several attempts to reintroduce Krefft's Gliders in Victoria, successful and otherwise. This section summarises the results and lessons of three reintroductions: Organ Pipes National Park, Blackburn Lake Sanctuary and Tower Hill State Game Reserve.

5.1 Organ Pipes National Park

In 1989, 13 Krefft's Gliders were reintroduced into the Organ Pipes National Park. The gliders were captured in the Pyrete Range, Toolern Vale by attaching traps to Eucalypt and Wattle trees with a mixture of oats and honey used as bait. The captured animals were held in enclosures for 10 days to allow group interrelationships to form and ensure the animals were healthy. The animals were transferred to Organ Pipes National Park within three nest boxes as "family" groups, these three nest boxes were installed on trees with the gliders inside; an additional 21 nest boxes were installed. This initial release was followed up with a further 24 gliders in 1990. Between 1989 and 1992, an additional 56 nest boxes were installed, bringing the total to 70.

A monitoring program was set up immediately after reintroduction, using a combination of nest box inspections, spotlighting, and trapping. Monitoring results showed that the gliders began breeding immediately after reintroduction, which had somewhat managed to offset predation by owls. In June

1993, trapping yielded 43 gliders, indicating that the reproduction rate was sufficient to offset predation.

5.2 Blackburn Lake Sanctuary

In 1984, 43 captive-bred Krefft's Gliders were reintroduced into Blackburn Lake Sanctuary, a 25ha reserve in a suburban area surrounded by large roads. 32 nest boxes were placed throughout the sanctuary. Subsequent monitoring involved a combination of trapping, nest box monitoring, spotlighting, and hair sampling. No evidence of Sugar Gliders was detected by any of the four monitoring methods.

Juzva and Peeters (1992) speculated that the apparent failure of the reintroduction was due to the small size of the 25ha reserve and a higher rate of predation by domestic and feral animals due to the suburban location. Juzva and Peters also commented on the sparse overstory, suggesting that the tree canopy was not dense enough to prevent predation as the gliders dispersed throughout the reserve. The Krefft's Gliders reintroduced at Blackburn Lake Sanctuary were also captive bred. In comparison, the successful reintroduction at Organ Pipes National Park involved the capture of gliders which were then held in a staging area to form group interrelationships.

Another factor contributing to the failure of the Blackburn Lake Sanctuary reintroduction was sub-optimal nest box design. Juzva and Peeters observed that the entrance hole for nest boxes were large enough to allow for larger arboreal mammals such as Common Ringtail Possums to enter. Additionally, feathers were found within nest boxes, suggesting both birds and Possums were making use of nest boxes, excluding Krefft's Gliders.

In comparison to the successful reintroductions at Tower Hill and Organ Pipes, the Blackburn Lake Sanctuary installed fewer nest boxes. This was the only reintroduction where the ratio of glider to nest box was less than 1:1.

5.3 Tower Hill State Game Reserve

A total of 72 captive bred Krefft's Gliders were introduced to the Tower Hill Game Reserve, a 130ha reserve in Victoria, over three years from February 1979 to February 1981. The mixed canopy of planted Manna Gum *Eucalyptus viminalis*, Swamp Gum *Eucalyptus ovata*, and Early Black Wattle *Acacia decurrens* contained no mature tree hollows so 70 artificial hollows were provided for shelter. A combination of box type hollows, terra-cotta pipes, and hollows with hinged lids were used at a suggested optimum density of 3-5 artificial hollows per ha of suitable habitat (Suckling and Macfarlane, 1983).

An early study in 1981 by Suckling and Macfarlane (1983) suggested a population had been established. A subsequent survey in 1986 by Suckling and Goldstraw using trapping and nest box inspections yielded 39 gliders, all in apparent good health, and a high proportion of females with evidence of young in their pouch. This survey suggested that the population had persisted for more than 8 years, was successfully breeding, and was occupying a larger area than in 1981, with indicators that the total population was likely to be far higher than that detected (Suckling and Goldstraw, 1989). However, the study also identified that a large proportion of the box type hollows were occupied by bees, possibly contributing to a reduction from 24 % to 13% in the use of artificial hollows between the two surveys. Suckling and Goldstraw (1989) suggested that the hollow limb type may be less susceptible to being occupied by bees.

6. Suitable reintroduction sites

6.1 Criteria for a suitable reintroduction

Based on the literature review above, a successful reintroduction of Krefft's Gliders will have the following attributes:

- Dense tree canopy with gaps less than 20 metres, consisting of some combination of River Red Gum, Red Stringybark, Messmate, Silver Wattle, Black Wattle and Blackwood.
- Number of tree hollows and/or installation of nest boxes before reintroduction. Previous reintroductions suggest that success rate is likely to be higher if nest boxes exceed the number of Krefft's Gliders reintroduced.
- Nest boxes which are designed to exclude birds and larger arboreal mammals.
- Trapping wild Krefft's Gliders as opposed to releasing a captive-bred population. Rehoming gliders captured by wildlife rescuers could also be an option (van der Ree, pers. comm. July 2022)
- Successful reintroductions are also correlated with the size of the reintroduction area. The size of Blackburn Lake Sanctuary (25ha) may have contributed to the failure of that project.
- However, smaller areas of high-quality habitat may be preferable to large areas of poor habitat (van der Ree, pers. comm. July 2022)
- Potential for glider populations to disperse into other bushland fragments via the installation of road crossing structures or strategic revegetation of trees and shrubs.
- Many failures may be attributable to lack of on-going management and failure to replace Wattles as older plants die (van der Ree, pers. comm. July 2022)

7.1 Merri Park

Merri Park, located in Northcote between Arthurton Road and St Georges Road, has been identified as a suitable site for potential reintroduction. The site is approximately 12ha (Figure 3), consisting of a dense tree canopy of Silver Wattle, Blackwood, and River Red-Gum. This reserve is actively managed by Merri Creek Management Committee under an on-going funding agreement with Darebin City Council, allowing for additional revegetation to improve habitat quality.

Installation of road crossing structures at Arthurton Road would allow for a potential Krefft's Glider population to spread north to Northcote Golf Course and adjoining bushland, approximately 53ha in size. There is further potential for a reintroduced Krefft's Glider population to disperse into bushland south of St George Road, providing an additional 18ha of habitat. Whilst Merri Park is probably too small to support a viable population of Krefft's Gliders on its own, it provides excellent habitat, and its connection to further bushland to both the north and south allow for a total potential habitat of 63ha which, with ongoing management, replacement of food plants as older plants senesce (van der Ree pers. comm., July 2022)

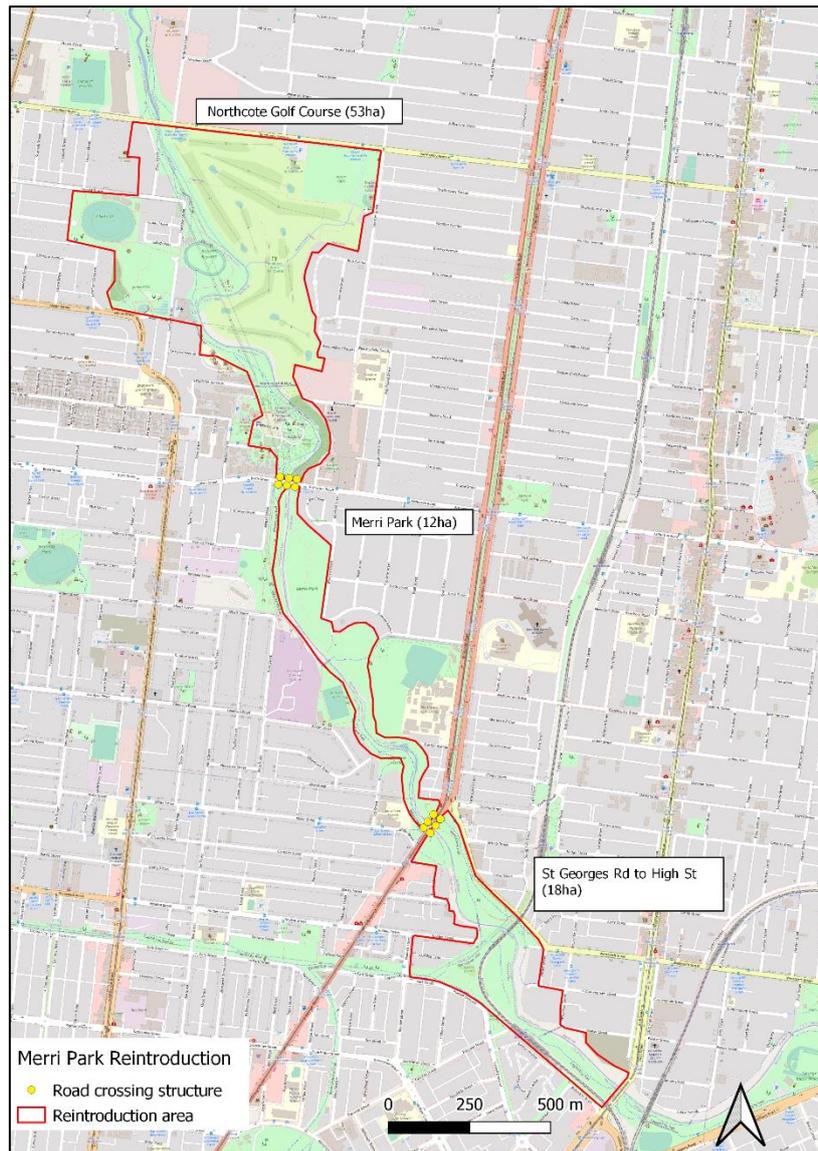


Figure 2 Map of Merri Park, potential reintroduction area

7.2 Moomba Park

Moomba Park, located in Fawkner south of Mahoneys Road, had been identified as a potential reintroduction site. The reintroduction area is approximately 73ha in size (Figure 4) and is the larger of the two potential reintroduction sites. Habitat quality is poor compared to Merri Park, with a less dense tree canopy, poor connectivity throughout the site and lower abundance food plants such as Silver Wattle. Mahoneys Road and the Metropolitan Ring Road form a significant barrier to Krefft's Gliders dispersing further north, as both roads are too wide for Krefft's Gliders to cross, even with the installation of road crossing structures.

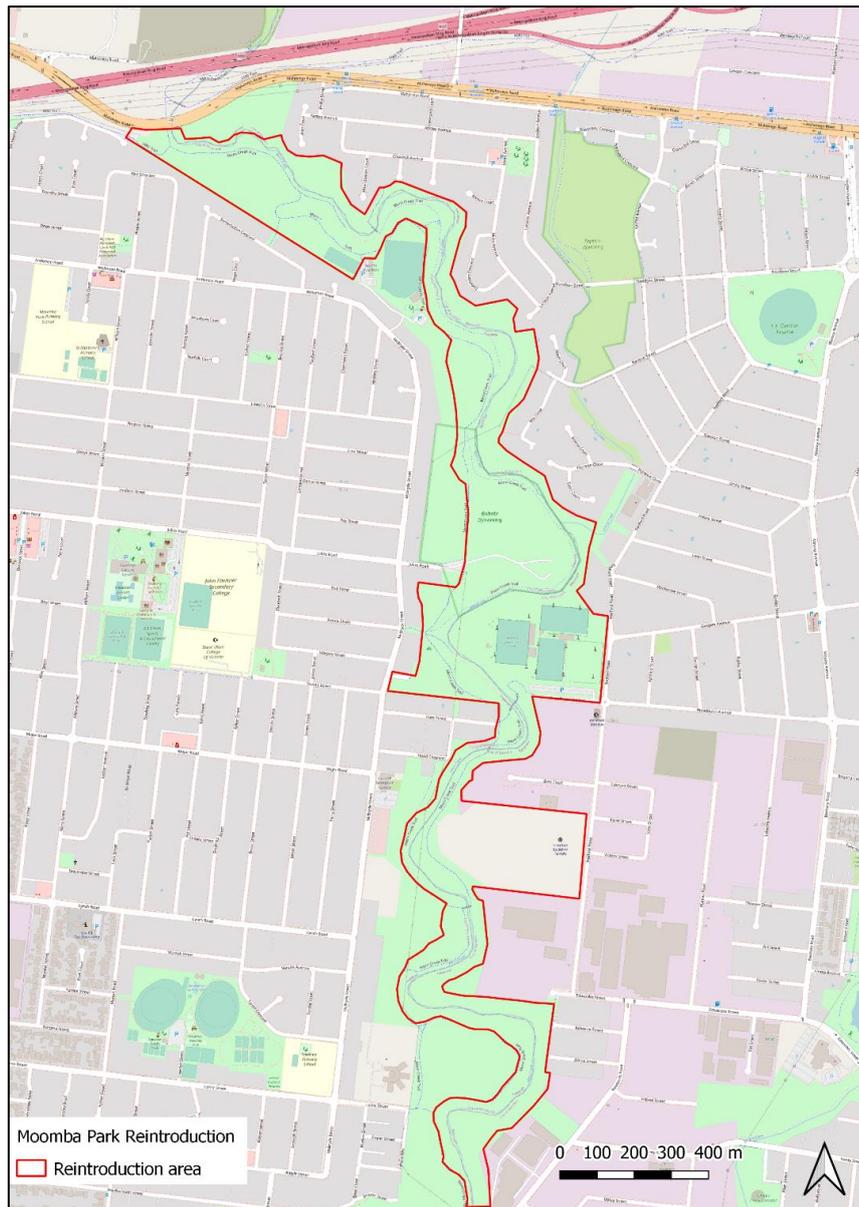


Figure 3 Map of Moomba Park, potential reintroduction area

8. Conclusion

After conducting a review of the biology and ecology of Krefft's Gliders in southeast Australia, including habitat requirements, Merri Park was determined as the most suitable site for Krefft's Glider reintroduction. Whilst Moomba Park was also considered as a potential reintroduction site, a sparse tree canopy and comparative lack of food plants meant that Merri Park was ultimately found to be more suitable, despite the reduced area. Further revegetation at Merri Park is now being planned, with additional Silver Wattles and Black Wattles to be planted in 2023. Further improvements to the habitat at Merri Park will involve the installation of Krefft's Glider specific nest boxes, as well as the installation of road crossing structures at Arthurton Road and St George Road, bringing the total area of potential habitat to 83ha.

Moving forward, consideration should be given to the requirements for obtaining relevant permits and licensing required under Wildlife Act 1975 or Flora and Fauna Guarantee Act 1988. A further

consideration is the method by which Krefft's Gliders will be sourced, either through trapping and translocating from an extant population, or rehoming rescued Krefft's Gliders.

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