

FAUNA SURVEYS IN THE BERRY CORRIDORS - SEVEN MILE BEACH TO BROUGHTON VALE FOCUS AREA



Gaia Research Pty Ltd

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Fauna surveys in the Berry Corridors

Seven Mile Beach to Brought Vale focus area

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The findings of this report are based on the author's analysis and interpretation of survey results. Views and interpretations presented in the report are those of the authors and not necessarily those of SLA.

Front Cover: False Pipistrelle *Pipistrellus tasmaniensis* trapped at Moeyan Hill. Photograph by G. Daly.

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EXECUTIVE SUMMARY

Clearing of mature native forest for agriculture and urban development continues to be a major threat to forest dependant fauna along the eastern seaboard of New South Wales. The Greater Glider *Petauroides volans* is a forest dependant arboreal marsupial that dens in mature gum trees. The species has a patchy distribution along the east coast of Australia but is common in many mature forest types, especially those that grow on higher nutrient soils. It is considered a surrogate for forest connectivity and 'health'. Surveys were undertaken for the Greater Glider and other arboreal mammals in portions of the Berry area, herein termed the Berry Corridor to compliment surveys undertaken in Seven Mile Beach National Park (NP). In addition harp trapping was undertaken for microbats within the corridor. Many species of microbat den in mature trees and this group of vertebrates provides an indication of forest complexity (variation in types of hollows and forest types), even in fragmented landscapes.

Seven Mile Beach NP has a robust population of Greater Glider, however the species was not detected at Moeyan Hill, Berry hospital reserve, Harley Hill and freehold land on the lower slopes of Berry. The species was detected along the Illawarra escarpment to the west of Berry. The absence of Greater Gliders within the fragmented portions of the Berry corridor is attributed to previous clearing for agriculture. Although these patches of forest support many large Blackbutt *Eucalyptus pilularis*, there is a general lack of large hollow-bearing trees.

There is a high species diversity of microbat in the Berry area, with eleven species trapped during the survey. In particular Moeyan Hill supports a population of False Pipistrelle *Falsistrellus tasmaniensis* and Broughton Creek and its tributaries support a large population of Large-footed Myotis *M. macropus*.

The Berry corridor currently consists of fragmented or weakly connected patches of bush that occur on freehold land and council reserves (Moeyan Hill and Harley Hill). Although there is a relatively high species diversity within these patches historic clearing has resulted in forest dependant species such as the Greater Glider to become locally extinct between Seven Mile Beach NP and the Illawarra escarpment. This study provides data to support the existing revegetation programs undertaken by Berry Landcare. In particular species that provide food resources for native animals such as Blackbutt, Forest Red Gum *E. tereticornis* and Swamp Mahogany *E. robusta* should be planted in areas between the existing council reserves. There should also be a program to conserve and enhance the riparian corridor along Broughton Creek to conserve and enhance the habitat for the Large-footed Myotis.

1 INTRODUCTION

1.1 Background

Modern approaches to manage for biodiversity are based several assumptions, one is that if the full suite of vegetation communities/habitat (environmental heterogeneity) are represented within conservation reserves then the majority of species will be protected (Burnett, *et al.*, 1998, Margles and Nicholls 1987: Huntley 1988, Regional Forestry Agreement 2001). Conservation biologists have argued that reserves should have certain characteristics for maintaining biodiversity, some of these include size (the bigger the parcel of reserved land the better- MacArthur and Wilson 1967) and shape (least edge per area). Habitat loss and fragmentation, caused by large-scale human modification of ecosystems, is a major driver of biodiversity loss (Fahrig, 2003; Radford *et al.* 1995, Kingsford *et al.*, 2009; Lindenmayer and Fischer, 2006, 2007, Irish and Kavanagh 2011, http://www.daff.gov.au/forestry/policies/rfa/regions/nsw_statewide/reserve_design). Clearing bushland was listed under the *Threatened Species Conservation Act 1995* as a key threatening process in 2007.

The use of relatively common “indicator” species (including invertebrates) as a surrogate for ecosystem health is an effective way for monitoring ecosystems (Soule and Simberloff 1986, Ray, 1988, Soule and Kohm 1989, Anderson 1990, Kavanagh 1991, Lindenmayer *et al.* 2011). For forest dependant species such as the Greater Glider *Petauroides volans* surveys allow managers to map habitat corridors within an area that can be used for broader conservation management across various land tenures.

The Greater Glider has been known to suffer population declines as a result of logging (Kavanagh *et al.* 2004, Fleay 1947), clearing for agriculture and or urban developments, road infrastructure, wildfire (Andrew *et al.* in press, Mahoney 2007), and predation by the Powerful Owl *Ninox strenua* (Kavanagh 1988). In some instances this has lead to catastrophic declines in populations and possibly local extinctions (Mahoney 2007, Daly 2010, Lindenmayer *et al.* 2011, Andrew *et al.* in press). Currently one population in NSW is listed as endangered (Scientific Committee determination dated 02/11/07) due to habitat fragmentation.

Given the fact that there are examples of documented local population declines of Greater Glider we conducted systematic surveys for the species in Seven Mile Beach National Park (NP) and select areas to the west of this reserve (herein called the Berry Corridor) to determine the status of this species.

Species such as bats and birds that can fly are not so limited by habitat fragmentation as they can disperse over thinly vegetated or cleared land. Microbats are a group of vertebrates that is understudied as few people have the requisite traps and knowledge to identify species in the hand. The other focus of this survey was to conduct harp trapping within a number of sites to ascertain the species diversity at various sites. This report examines the connectivity of habitat within the study area and comments on the risk of decline or extinction in the future.

2 METHODS

Fauna surveys attempt to detect animals by a range of methods including trapping, direct observations, call playback, identification of calls and indirect evidence (scats, incisions or scratches on trees or cracked casuarina cones). The methods used in the current assessment were developed for the comprehensive assessment of forests as part of the Regional Forestry Agreement conducted in the late 1990's. The author used these methods during that survey and maintained this approach since that time. Consequently data generated during the current survey is part of the largest dataset of for southern New South Wales and adhere to those defined under the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working draft)*, prepared by the Department of Environment and Conservation (2004) and the *Draft Guidelines for Threatened Species Assessment* prepared by the (then) Department of Environment and Conservation and Department of Primary Industries (2005).

Surveys were primarily conducted along narrow dirt roads. The location of each site was recorded using a global positioning system (GPS) (projection in Geocentric datum of Australia 94 in Zone 56) and details are given on the locations of the surveys in **Table 1**.

2.1 Background information on the Greater Glider

The Greater Glider is a nocturnal arboreal marsupial with a distribution largely associated with eucalypt forests along the ranges and coastal plain of eastern mainland Australia, from northern Queensland to southern Victoria (Kavanagh 2004). The Greater Glider is common and widespread and apart from the Sugar Glider *Petaurus breviceps* is the most secure species of glider in Australia (Clayton *et al.* 2006; Lindenmayer, 2002). Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows (Tyndale-Biscoe and Smith 1969, Kavanagh and Lambert 1990, Lindenmayer *et al.* 1990).

Lindenmayer and Taylor (2003) found that using microsatellite DNA sequences that Greater Gliders in some of the oldest and most isolated patches of forest in a study area had lower genetic diversity and were more closely related to each other than to gliders 10km away indicating genetic erosion from inbreeding. This finding is consistent with an experiment conducted by Kavanagh and Whelan (2004) that showed animals had a high fidelity to their small home range even when impacted by logging.

Food

The Greater Glider is folivorous and feeds almost exclusively on the leaves of eucalypt and corymbia trees (Kavanagh and Lambert 1990). The species is absent from areas that support Radiata Pine *Pinus radiata* plantations (Lindenmayer 2009b) or non-hollow-bearing eucalypt forest. The Greater Glider is most abundant in forest types that contain higher quantities of nitrogen and phosphorous (Braithwaite *et al.* 1984).

Shelter requirements

The Greater Glider is an obligate hollow-dependent species. Trees occupied for denning typically have large diameter stems as hollows take between 80-180 years to develop

(Mackowski 1984) adequate sized hollows for this relatively large species (Van Dyke and Strahan 2011). Trees used as nest and den sites by the Greater Glider are typically tall which allows animals to volplane (up to 100m) (Goldingay and Schiebe, 2000). The highest abundances of the species occur in old growth forest where there are many large trees with hollows (Lindenmayer *et al.* 1995). In the south coast bioregion the highest density of the species may occur in mature Brown Barrel *E. fastigata* forest such as that which occurs in Monga NP (D. Goodridge pers. comm.). The Greater Glider is not known to use artificial nest sites such as nest boxes (Beyer and Goldingay 2006; Lindenmayer *et al.* 2009b) and hence is tied to old growth forests.

Home range

The Greater Glider appears to have a limited capacity for movement and dispersal, occupying small home ranges of 1-3 hectares (Henry 1984; Kelh and Borsboom 1984, Comport *et al.* 1996, Kavanagh and Whelan 2004). Radio tracking studies (Kavanagh and Whelan 2004) found that logging reduced home ranges to unlogged sections of forest and animals did not disperse into other sections of unlogged forest outside their home range. Greater Gliders used 1-7 (median 3) den trees, ranging in size from 71 to 193 DBH (diameter at breast height) being among the largest in the study area (Kavanagh and Whelan 2004).

These studies indicate that the species can subsist in relatively small patches of remnant eucalypt forest if a suitable number of den trees are retained. However, Greater Glider do show a high degree of fidelity to forest patch and den trees and a poor ability to disperse into adjacent unlogged areas makes this species vulnerable to habitat alteration such as wildfire, forestry and tree removal for urban development (Tyndale-Bisco and Smith 1969; Lunney 1987; Macfarlene 1988; Smith and Lindenmayer 1988; Lindenmayer *et al.* 1990, Millage *et al.* 1991, Kavanagh and Bamkin 1995; Kavanagh *et al.* 1995; Goldingay and Daly 1997, Kavanagh and Webb 1998; Kavanagh 2000, Kavanagh and Whelan 2004 and Eyre 2004). The species is not known to disperse over open ground and hence is tied to near contiguous forest. Norton and Possingham (1991) predicted that the minimum size of habitat patch required for a sustainable population of Greater Glider was 1000 hectares. However, this is subject to forest productivity (levels of foliar nutrients vis soil nutrient levels) as Eyre (2004) suggested that in southern Queensland Greater Gliders required forest patches up to 16,000 hectares for viable populations.

Threats

The Greater Glider population is threatened due to loss of habitat from urban development, road widening, wind storm events (particularly hollow-bearing trees used for denning), wildfire and predation from Powerful Owl.

Previous studies in the region

There have been a number of studies of Greater Gliders in the Illawarra and Shoalhaven regions. These include studies in Booderee NP (Lindenmayer *et al.* 2011), Jervis Bay NP (Gaia Research 2013, 2008, 2003, Capararo and Murphy, 1996), Conjola NP (Daly *et al.* 1998, Daly unpub. data), Mount Gibraltar Reserve, Mittagong (G. Daly unpub data 2011, BES 2008), Murramarang NP (Mills and Craven unpub. data, Davey 1984), Royal NP (Maloney 2007) and Seven Mile Beach NP (Murphy 1998, Daly unpub. data), Moeyan Hill (Murphy 1995).

These studies indicate the species is relatively abundant within several coastal reserves in the Shoalhaven Local Government Area that support Blackbutt and Spotted Gum *Corymbia maculata* forests, namely Seven Mile Beach NP, Murramarang NP, Meroo NP (Daly unpub. data) and historically. The species had had a dramatic decline along the Illawarra escarpment, Royal NP, Jervis Bay NP, Booderee NP and Conjola NP.

Study areas

The Berry corridors area is composed of a number of portions of land (Fig. 1) some ten to 20 kilometres north-east of the town of Nowra (Lat 34° 57' 30", Long 150° 44'). There are two reserves managed by the NSW National Parks and Wildlife Service within the corridor, namely Seven Mile Beach NP (953ha) and Cullunghutti Aboriginal area (Coolangatta) (67ha). Shoalhaven City Council has a number of reserves in the area including Moeyan Hill (37ha) and Harley Hill cemetery (circa 8ha). There is also a small area of reserved land adjacent to the Berry Hospital (4.5ha). The majority of the corridor is freehold land, the majority of which had been cleared for agricultural purposes. Since this clearing portions of forest have regrown. On the basis of diameter at breast height the regrowth forest in the order of eighty years old. The sites selected for assessment were outside the reservation system and chosen with respect to access, size and quality of the forest.

Geology

The geology of the study area consists of volcanic rocks in the Berry formation including moderately deep soils tuffaceous Budgong sandstone (Hazelton 1993). The area has steep to rolling hills and deeply incised gullies. On some hills there are small areas of exposed rock at the surface, whereas in most of the area there are deep (>150 mm) brown or yellow podsollic soils of high fertility derived from Berry formation (Hazelton 1993).

Climate

The climate of the area is mild (average range of 17 - 24°C in summer and 5 - 17°C in winter) being moderated by the close proximity to the sea (Bureau of Meteorology website 2009). The average temperature is also influenced by the region's elevation being 10 - 304 m (Australian Height Datum). The Berry 1: 25000 topographic map indicates that the average annual rainfall for the region is 1278 mm with peaks in February and November. The site owned by Virtue had the highest elevation and subsequently the average temperatures were lower than the other survey sites.

Habitat

The descriptions of the vegetation communities surveyed are taken from the Office of Environment (OEH) *Biometric* assessment of native vegetation in NSW based on catchments (OEH 2012). The canopy at sites ranged from approximately 20-30 metres in height and tree hollows were present. There were three vegetation communities surveyed they were Blackbutt - Turpentine - Bangalay moist open forest (the vast majority of survey sites), Brown Barrel - Mountain Grey Gum tall forests (Virtue) and River oak forest

The majority of sites can be classified as Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin (SR516). The main dominant species in this community are Blackbutt *Eucalyptus pilularis*, Bangalay *Eucalyptus botryoides*, *Eucalyptus saligna* X *botryoides*, and Turpentine *Syncarpia glomulifera*. The main associated species are Grey Ironbark *E. paniculata* subsp. *paniculata* and Cabbage-tree Palm *Livistona australis*.

Brown Barrel - Mountain Grey Gum tall forests on volcanic soils has a very limited distribution in the Shoalhaven being largely restricted to areas of high rainfall on fertile soils at higher elevations (above 400m AHD) such as in the Sassafras area. There are small occurrences in the Berry area on Woodhill and Broughton Vale. This endangered ecological community is named Robertson Basalt Tall Open-forest. The main canopy species is Brown Barrel *E. fastigata* but other another canopy tree seen outside the study area was Mountain Grey Gum *E. cypellocarpa*. Blackwood is often abundant in areas previously cleared. About 400ha or less than 15% of its original occurrence has been estimated to remain though this is mostly as small and isolated pockets (Scientific Committee determination 15 June 2001).

River Oak Open Forest occurs on river banks of major rivers or banks of swift flowing streams and rivers. It is found along most of Broughton Creek and Broughton Vale Creek upstream from the influence of saline water. The main species present is River Oak *Casuarina cunninghamiana*. Other species common present in the shrublayer and midcanopy are *Hymenanthera dentata*, *Urtica incisa*, Black Wattle *Acacia mearnsii*, *Acacia floribunda*, *Stephania japonica*, *Pandorea pandorana*. The ground cover includes *Lomandra longifolia*, *Oplismenus aemulus*, Kidney Weed *Dichondra repens*. OEH (2012) states that there is 645ha of the forest type in the Shoalhaven.

2.2 Elliott and cage trapping

Ten size A Elliott traps (0.1 x 0.1 x 0.3m) were set at Virtue's along one two hundred metre line (herein termed transect) at regular intervals for three consecutive days from 18-20 December 2013 (**Figure 3**). Traps were set, on the ground and baited with a mixture of peanut butter and rolled oats. The traps were placed under bushes or other vegetation to protect captured animals from the elements. Leaves were placed in the traps to provide insulation for captured animals. Traps were checked in the early morning and captured animals were released after identification.

Two medium sized (0.2 x 0.2 x 0.55m) cage traps were set along each transect at point one and five for the same period as the Elliott traps. The cage traps were baited with sardines. Cage traps were rebaited on day two or when animals had been caught. The location of transects are given in **Table 1** and shown in **Figure 3**.

2.3 Harp Trapping

Harp traps were erected over narrow tracks of roads and creeks. Harp traps were erected at number of locations within the corridor to capture information over a range of altitudes and vegetation communities. Harp traps were set for a period of one to three consecutive nights. Bats were identified, measured and weighted and released at the site either immediately after capture or at dusk if predatory birds were heard/observed in the immediate area.

2.4 Foot-based Spotlighting

Spotlighting was conducted for arboreal mammals for 20 minutes at each site The survey area for each spotlight search covered an area of approximate 2ha mostly along trails and dirt roads Traversing formed trails reduces the noise generated by trampling over leaves and branches and hence elevates detection of animals. Spotlighting was conducted with the aid of a lens lezer light emitting diode (LED) spotlights and involved the identification of animals by direct observation and the recognition of species-specific calls.

2.5 Diurnal Bird Census

Diurnal birds were surveyed for a period of 20 minutes within a 2ha area within the Virtue’s place and Berry Hospital. The locations of the survey sites are given in **Table 1**. Animals were identified by their species-specific calls and by direct observation with the aid of binoculars. Birds detected outside the surveyed transects were also recorded.

2.6 Incidental Observations

Incidental observations of animals were made based on visual identification of animals, their scats or call recognition. These are included in the excel spreadsheet (**Appendix 1**).

Table 1
Summary of survey site locations

Note: Grid References in GDA 94.

Location	Survey/Name	Location	
		Easting	Northing
Virtue	Elliott & cage trapping	291584 ¹ 291515 ²	6155213 ¹ 6155118 ²
Virtue	Call Playback	291	6155
Virtue - boundary fence_a	Harp trap site 1	291536	6155182
Virtue - boundary fence_b	Harp trap site 2	291569	6155214
Virtue – garden track_a	Harp trap site 3	291425	6155206
Virtue – garden track_b	Harp trap site 4	291359	6155126
Virtue – gully	Harp trap site 5	292115	6147290
Broughton Mill Creek	Harp trap site 6	291472	6154833
Pigott	Harp trap site 7	292115	6147290
Moeyan Hill_a	Harp trap site 8	291971	6147185
Moeyan Hill_b	Harp trap site 9	291610	6147397
Moeyan Hill_c	Harp trap site 10	291456	6147624
Berry Hospital _a	Harp trap site 11	290900	6149391
Berry Hospital _b	Harp trap site 12	290944	6149378
Bragg_ridge	Harp trap site 13	291808	6151351
Bragg_creek	Harp trap site 14	292697	6151276
Hand_near front gate	Harp trap site 15	291340	6151461
Hand_track to creek	Harp trap site 16	291182	6151562
Hand_in creek	Harp trap site 17	291186	6151499
Smart_Broughton Ck	Harp trap site 18	293161	6150561
Virtue – boundary fence	Diurnal bird site 1	291536	6155182

Targeted microbat trapping and spotlight surveys – Berry Corridors and environs

Location	Survey/Name	Location	
		Easting	Northing
Berry Hospital	Diurnal bird site 2	290900	6149391
Virtue - boundary fence plus garden track	Spotlight site 1	291584 ¹ 291515 291413 ²	6155213 ¹ 6155118 6155188 ²
Moeyan Hill	Spotlight site 2	291971 ¹ 291456	6147185 ¹ 6147624
Bragg	Spotlight site 3	291971 ¹ 291456 ²	6147185 ¹ 6147624 ²
Virtue	Call Playback	291480	6155180

Note 1: Start point of transect.

Note 2: Finish point of transect.

Note 3: Indicative commencement point.

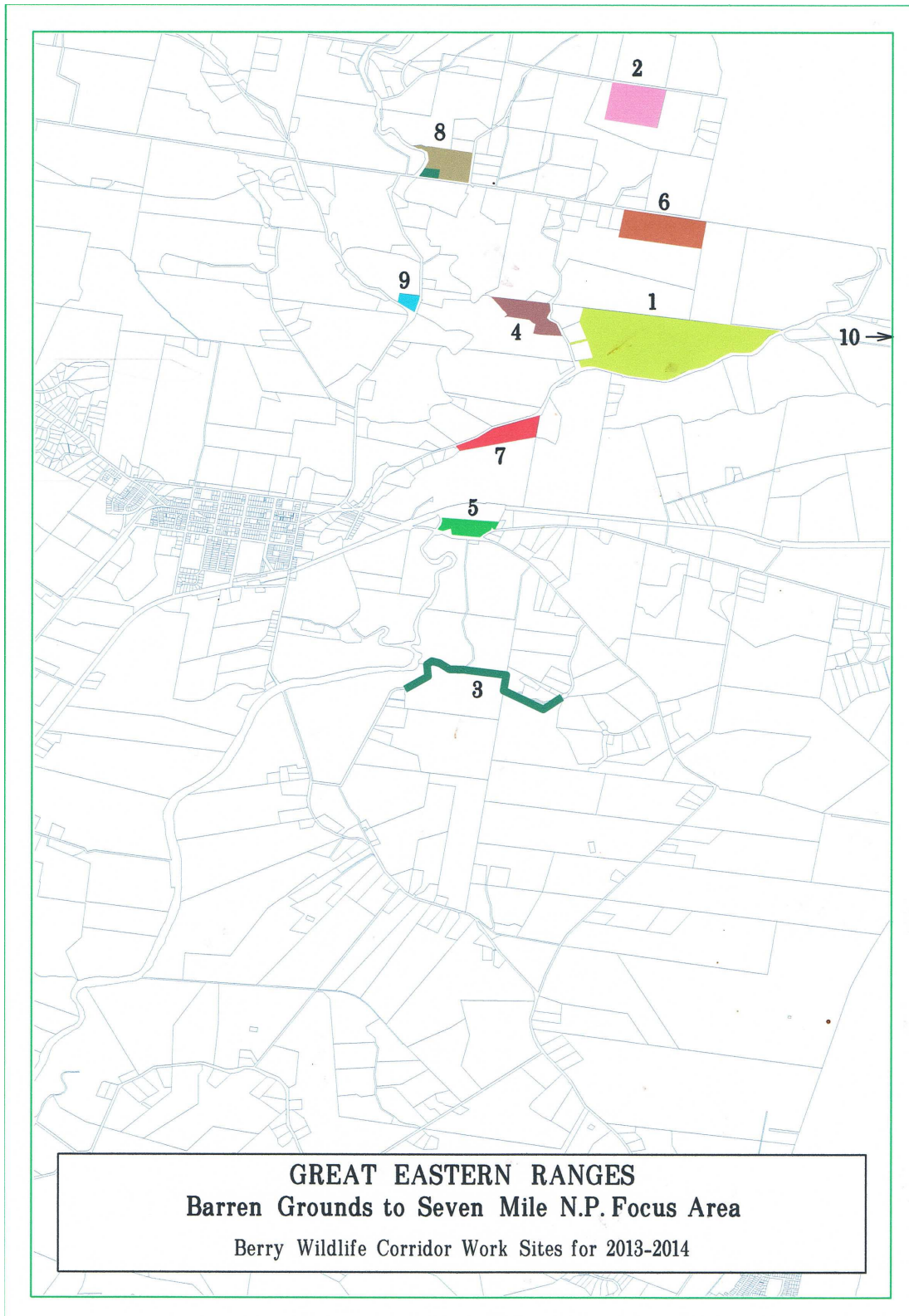


Figure 1
Location of some (numbers 1, 3, 4 and 5) of the survey sites

3 RESULTS

3.1 Elliott and cage trapping

Elliott and cage trapping caught the Bush Rat *Rattus fuscipes*, Brown Antechinus *A. stewartii*. The site supports a medium species density and diversity of small ground dwelling mammal.

3.2 Microbats

Ten species were caught during the survey. There were:

- Chocolate Wattled Bat *Chalinolobus morio*,
- Gould's Wattled Bat *Chalinolobus gouldii*,
- Southern Fishing Bat *Myotis macropus*,
- Gould's Long-eared Bat *Nyctophilus gouldii*
- Lesser Long-eared Bat *Nyctophilus geoffroyi*,
- False Pipistrelle *Falsistrellus tasmaniensis*,
- Eastern Horseshoe Bat *Rhinolophus megaphyllus*,
- Southern Broad-nosed Bat *Scotorepens oronio*,
- Large Forest Bat *Vespadelus darlingtoni* and
- Little Forest Bat *Vespadelus vulturnus*

Table 2 presents an overview of species caught at various locations. Apart from the False Pipistrelle, Southern Broad-nosed Bat and Southern Fishing Bat the species caught are common in the southern region of NSW. All of the Southern Fishing Bats captured were female and six were pregnant. A total of 40 Southern Fishing Bat were trapped in two days representing the largest number caught by the author at any site and possibly the largest capture rate anywhere for this species.

Table 2
Summary of bats trapped

Site	Cg	Cm	Fa	Ng	Ne	Mm	Rm	So	Vd	Vv
Harp Trap Site 1 - Virtue				6			1		2	6
Harp Trap Site 2 - Virtue		1		7	2				15	5
Harp Trap Site 3 - Virtue										
Harp Trap Site 4 - Virtue							2			
Harp Trap Site 5 - Virtue		1		1						
Harp trap site 6 - Broughton Mill Creek						3			2	
Harp trap site 7 - Pigott										2
Harp trap site 8 - Moeyan Hill_a		1			1				4	2
Harp trap site 9 - Moeyan Hill_b	2	4	2	7	3			5	3	15
Harp trap site 10 - Moeyan Hill_c	1		2		2			3	1	15
Harp trap site 11 - Berry Hospital_a				2						19
Harp trap site 12 - Berry Hospital_b			1	1	2				1	13

Harp trap site 13 - Bragg_ridge					1					6
Harp trap site 14 - Bragg_creek										
Harp trap site 15 - Hand_near front gate										
Harp trap site 16 - Hand_track to creek										
Harp trap site 17 - Hand_in creek										4
Harp trap site 18 - Smart_Broughton Ck	1					40		2	4	10
	Cg	Cm	Fa	Ng	Ne	Mm	Rm	So	Vd	Vv

Note 1: Cg = *Chalinolobus gouldii*, Cm = *Chalinolobus morio*, Fa = *Falsistrellus tasmaniensis*, Mm = *Myotis macropus*, Ng = *Nyctophilus gouldii*, Ne = *Nyctophilus geoffroyi*, Rm = *Rhinolophus megaphyllus*, So = *Scotorepens orion*, Vd = *Vespadelus darlingtoni*, Vv = *Vespadelus vulturnus*. Clear cells indicates no captures.

3.3 Spotlight surveys

Species regularly detected during the five spotlight searches (total 100min.) were Sugar Gliders, Common Ringtail Possum and Common Brushtail Possum. One Greater Glider were observed at Broughton Vale. This contrast with surveys in Seven Mile Beach NP where 25 Greater Gliders were observed during eleven searches (220 min.) (Daly unpub. data). **Table 3** presents an overview of species detected at various locations.

Table 3
Summary of Arboreal mammals detected during spotlight surveys

Site	Sg	Gg	Cr	Cb
Site 1 - Virtue		1		
Site 2 - Moeyan Hill	5		2	
Site 3 - Berry Hospital	1		2	1
Site 4 - Bragg	2		2	

Note 1: sg = Sugar Glider, Gg = Greater Glider, Cr = Common Ringtail Possum, Cb = Common Brushtail Possum

3.4 Diurnal Bird Census

Twenty two species of bird were detected during the systematic diurnal surveys (**Table 4**). Incidental observations and indirect evidence made by Messer's, Daly and Virtue revealed the presence of many additional species. This information is included in **Appendix 1**.

A number of seasonal breeding migratory birds were detected during the systematic surveys. These included the Rufous Whistler, Sacred Kingfisher, Black-faced Monarch and Dollarbird. The area has a relatively high species diversity of bird.

Table 4
Number of individual Birds Detected During the Systematic Surveys

Species	Virtue	Berry Hospital
Red-browed Firetail	3o	
White-throated Treecreeper	1w	
Crimson Rosella	2w	
Pied Currawong	1w	
Brown Thornbill	2o	2w
Eastern Spinebill	2o	
Lewins Honeyeater	1w	1w
Brown Cuckoo Dove	2o	
Spotted Pardalote	2w	1w
Australian King Parrot	1w	
Wonga Pigeon	1w	
Superb Lyrebird	2w	
Black-faced Monarch	1w	
Brown Gerygone		4w
Sacred Kingfisher		1w
Eastern Yellow Robin		2w
Grey Fantail		1o
Black-faced Cuckoo Shrike		1W
Grey Butcherbird		1W
Australian Magpie		1W
Rainbow Lorikeet		3W
Peafowl		1W
Total species	13	12

Note 1: o = observed within Subject Site, w = heard call within Subject Site, O = observed adjacent to Subject Site, W = heard call adjacent to Subject Site.

4 DISCUSSION

Habitat corridors can be defined as a remnant or restored area of vegetation, which allows the movement of animals between two larger blocks of vegetation that were historically connected (Bennett, 1990). The Berry corridor is fragmented as a result of previous clearing for agriculture and the majority of forest is regrowth. Mature forest occurs along the escarpment and at Seven Mile Beach NP. Outside of these areas there are relatively few trees that support hollows. Given this limitation the various parcels of bushland support a high species diversity of bird and microbat. In particular the presence of False Pipistrelle at Moeyan Hill indicated that it has a high conservation value. The capture of 40 Southern Fishing Bat at one site on Broughton Creek indicates that the habitat is of high conservation value within NSW.

The Greater Glider is a forest dependant species that is not known to disperse over the ground. For a Greater Glider population to be connected there needs to be corridors of large trees with a minimum distance of approximately 30m or less. The absence of Greater Gliders within most of the fragments was not unexpected as the patches supported few large hollow-bearing trees.

There is a need to revegetate land between Seven Mile Beach NP - Cullunghutti Aboriginal area - Moeyan Hill - Hartley Hill to Berry hospital reserve to allow for animals to disperse from the parks into other areas so that a larger population exists over a broader area. Norton and Possingham (1991) predicted that the minimum size of habitat patch required for a sustainable population of Greater Glider was 1000 hectares. Currently the area occupied by Greater Glider within Seven Mile Beach NP and environs is only just capable of supporting a viable population. There is also a need to revegetate land between the escarpment and various freehold lots on the lower slopes to facilitate the dispersal of Greater Gliders and other species of animal.

The populations of Sugar Glider, Common Ringtail Possum and Common Brushtail Possum appear to be secure in the area. The facts that these species can den in locations other than large tree hollows and can disperse over open ground are factors that allow them to persist in a mosaic of urban, rural and reserve.

These surveys and those conducted for the Office of Environment and Heritage have provided adequate data on the distribution of forest dependant arboreal mammals to recognise that the Seven Mile Beach NP is barely adequate to cater for the long-term survival of the Greater Glider in this region. The situation for Greater Gliders in the Barry area mirrors that of the In a Congo-Bingi area in Eurobodalla Shire. Surveys by the author in that region allowed adequate quantitative data to be collected to allow this population to be nominated as endangered (Gaia Research 2006, Daly 2006). This action will also be undertaken for this population.

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