

Records of the Inland Carpet Python, *Morelia spilota metcalfei* (Serpentes: Pythonidae), from the South-western Slopes of New South Wales

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Location records of the Inland Carpet Python *Morelia spilota metcalfei* were collated from the south-western slopes of New South Wales from scientific literature, published reports, landholder questionnaires, public information sessions, informal conversations and field observations. Fifty-three records, encompassing a minimum of 95 observations were obtained. Twenty-nine records (58%) and 57 observations (69%) originated from granite outcrops. High priority conservation areas for this species in the SWS include; inselbergs such as Goombargana Hill, Gerogery Range and Nest Hill, the granite belt between Kyeamba and Wagga Wagga, large vegetated ranges such as Yambula Range and the Rock Nature Reserve and the riverine environment along the Murray and Murrumbidgee Rivers. Future conservation of *M. s. metcalfei* habitat in the SWS will require appropriate management of granite land forms with particular focus on strategic grazing, pest animal programs and fire control.

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INTRODUCTION

The Inland Carpet Python *Morelia spilota metcalfei* is one of three sub-species of *Morelia spilota* that occur in New South Wales. The Diamond Python *M. s. spilota* is confined to the east coast of Australia, ranging from south of the Victorian border to the northern rivers region of NSW and extending inland to the Great Dividing Range (Swan et al. 2004). In the northern part of its range it intergrades with the Coastal Carpet Python *M. s. mcdowelli* (formerly part of *M. s. variegata*) near Coffs Harbour (Shine 1994, Swan et al. 2004), extending north to Cape York and west to the Great Dividing Range (Wilson 2005). The Inland Carpet Python *M. s. metcalfei* (formerly part of *M. s. variegata*) occurs inland of the Great Dividing Range, extending from central Queensland in the north to the Warby Ranges region in Victoria (Coventry and Swan 1991, Heard et al. 2005) and west into South Australia to the Eyre Peninsula (Schwaner et al. 1988). It is geographically isolated from the other two sub-species, although a potential contact zone with *M. s. spilota* may have once existed in the Hunter Valley region (Shine 1994).

General habitat accounts of *M. s. metcalfei* indicate that it occurs in most vegetation types throughout its range including swamps but excluding treeless plains. It commonly frequents large trees in River Red Gum *Eucalyptus camuldulensis* forest, eucalypt woodland and mallee vegetation types (Robertson and Hurley 2001), often in association with watercourses (Shine 1994) or granite outcrops (Heard et al. 2005). It utilises a range of micro-environments including hollows in trees and logs, rock crevices, disused rabbit burrows (Heard et al. 2005) and occasionally roof cavities in rural buildings (Shine 1994).

Morelia spilota metcalfei is the largest snake species in New South Wales, growing to over 2.5 m in length and occasionally attaining 3.5 m (Kortlang and Green 2001). However, basic information regarding geographical distribution, population density and habitat preferences remain poorly documented in NSW (see Heard et al. 2005 for Victorian populations). Evidence suggests that populations of *M. s. metcalfei* have declined considerably over the last 100 years (Shine 1994, DSE 2003), even though sightings from new regions are still being reported (Morris 1993). In Victoria, it is listed as Endangered

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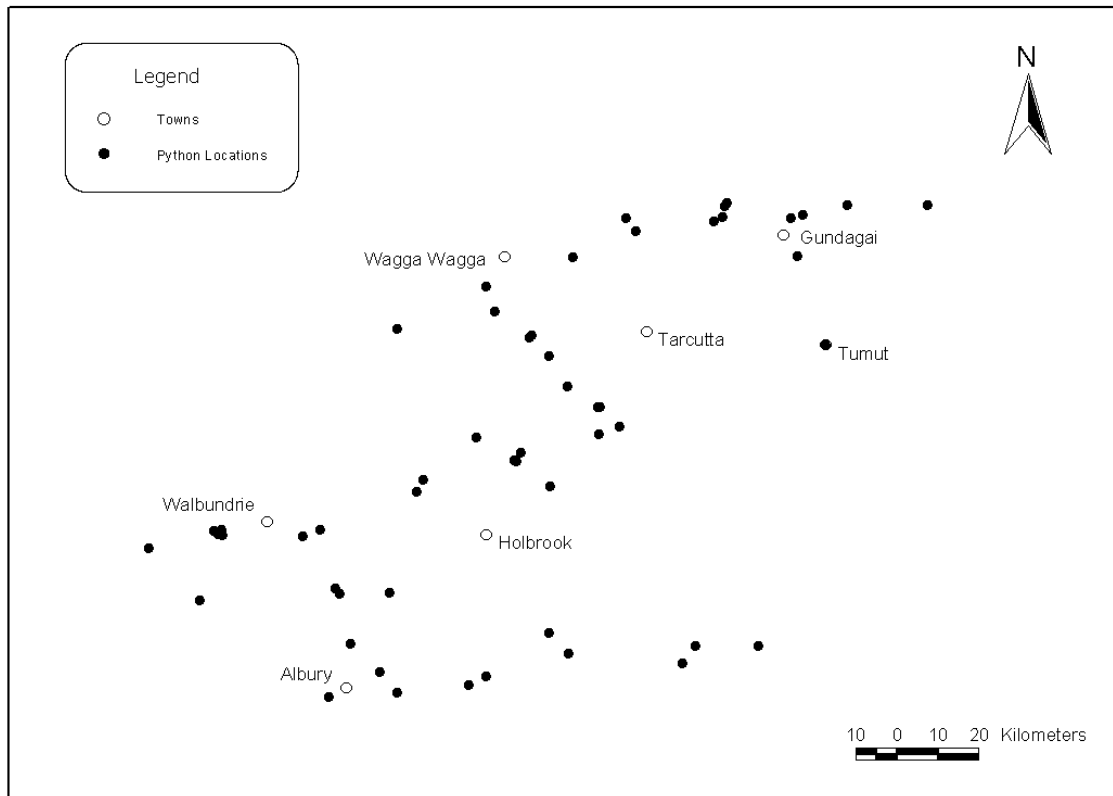


Figure 1. Location records (n = 53) of the Inland Carpet Python *Morelia spilota metcalfei* in the south-western slopes biogeographical region of New South Wales (including three records from near the Victorian border) based on field observations, published reports, landholder and public questionnaires and personal communications.

(DSE 2003) and in the western division of NSW it is considered regionally endangered (Sadler and Pressey 1994, Sadler 1994). In the Victorian wildlife atlas database, 160 formal location records of the species exist (DSE 2003) and although anecdotal reports suggest pythons may be relatively common along vegetated river systems, there are far fewer records for the NSW Murray catchment area in the NSW wildlife atlas database (DECC 2007). However, during a survey of 105 landholders in the Coleambally region, 29% of farmers claimed to have seen *M. s. metcalfei* on their property (Doody et al. 2004). In this paper we document historic and current records of *M. s. metcalfei* in the upper Murray catchment area, specifically the south-western slopes (SWS) biogeographical region of New South Wales (*sensu* Benson 1999).

METHODS

We collated records of *M. s. metcalfei* within the SWS of New South Wales, an area encompassing major towns such as Albury and Wagga Wagga and smaller townships such as Walbundrie, Walwa, Gerogery, Howlong, Tarcutta and Gundagai (Fig. 1). Five distinct methods were used to obtain *M. s. metcalfei* records. These were:

(1) Literature review: Records were obtained from the scientific literature, published reports, the New South Wales National Parks and Wildlife Service wildlife atlas database, Victorian Department of Sustainability and Environment wildlife atlas and Bionet databases.

(2) Landholder questionnaire. A total of eighty-four landholders involved in two long-term wildlife monitoring programs (Lindenmayer et al. 2001, Cunningham et al. 2007) and an intensive study of granite outcrops in the SWS (Michael in prep) were shown photographs of *M. s. metcalfei* from field guides and local specimens and asked if they had ever encountered this or other sub-species on their property. In addition, an article on python habitat requirements and a request for information on sightings in the region was printed in the Murray Catchment Management Authority (CMA) newsletter and distributed to members of the West Hume, Culcairn, Holbrook, Upper Murray and Kyeamba Creek landcare groups.

(3) Public presentations. As part of an extensive education program aimed at informing landholders and the wider community on the habitat requirements of local wildlife, participants were shown photographs of *M. s. metcalfei* and asked if they had encountered this or other sub-species in the region. Between 2004 and 2007, we held 14 information sessions, mostly involving local landcare groups, field naturalists and interested members of the public. Over 500 people took part in the presentations.

(4) Informal conversations. Between 2000 and 2007, python sightings were mentioned in conversation to friends, colleagues and additional landholders encountered in the region during field work, as a way of generally collating historical information on snakes.

(5) Personal field observations. Intensive searches of 50 granite outcrops within the SWS were conducted to investigate their role in conserving reptile diversity in modified landscapes. Active searches for pythons were conducted between 0800 and 1100 hours on clear sunny days during spring/summer months of 2006 and 2007. Habitats such as hollow logs, trees and rock crevices were inspected using a hand held torch and seats and slough skins were recorded. Approximately 1,950 ha of suitable habitat, encompassing 660 ha of outcropping was surveyed. Spotlighting was conducted on sites that contained significant amounts of remnant vegetation (n = 22).

RESULTS

A total of 53 location records, representing a minimum of 95 observations, were obtained from the bioregion (Fig. 1), including three records from

the Victorian border (all from near the Murray River near Bellbridge, Mount Granya and Pine Mountain). In some areas of the SWS, *M. s. metcalfei* has not been sighted since the 1960's or 1970's, however pythons from 28 locations have been sighted since 1990 (Table 1).

Approximately half of all location records were obtained from informal conversations. Twenty-three locality records (43%) and 35 observations (37%) were collated in this way, although landholder questionnaires proved successful with 17 location records (32%) and 35 observations (37%). Nine location records (17%) and 19 observations (20%) were obtained from the scientific literature, three location records (6%) and five observations (5%) were a result of personal field observations.

Literature review

Most published accounts of *M. s. metcalfei* came from the Wagga Wagga district. Annable (1995) recorded 11 pythons between 1976 and 1989, although specific locations were not documented. The largest specimen recorded measured almost 4 meters in total length (Annable 1995). Sass (2003) recorded three pythons between 2001 and 2002 from three locations near Wagga Wagga and a 2.5 m individual was observed basking on the lower slopes of the Rock Nature Reserve during January 1999 (Murphy and Murphy 2006). Records of two specimens lodged with the Australian Museum were obtained from Shine (1994): one from Wagga Wagga in 1983 and an undated record from near Tumut. A number of additional surveys for herpetofauna have been conducted within the SWS, but all lack records of pythons (Caughley and Gall 1985, Lemckert 1998, Lindenmayer et al. 2001, Daly 2004). The New South Wales National Parks and Wildlife Service and Bionet wildlife atlas databases produced two results; one from Wagga Wagga (reported in Shine 1994) and one from the Murray River near Talmalmo (DECC 2007). The Victorian wildlife atlas database contained a record from Pine Mountain near the state border in the Upper Murray region (DSE 2003).

Landholder questionnaires

Of the sixty-four landholders involved in the long-term monitoring studies in the SWS, 14 (21.8%) were aware of pythons being on their properties, although only two landholders had seen them in recent years (post 2000). A further 20 landholders involved in the granite outcrop study revealed two more location records. In addition, the article published in the Murray Catchment Management Authority (CMA) newsletter revealed an additional record near Walla Walla.

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Table 1. Inland Carpet Python *Morelia spilota metcalfei* location and sighting information in the south-western slopes biogeographical region of New South Wales based on field observations, published reports, landholder and public questionnaires and personal communications.

Location	Latitude / Longitude	Date	Abundance & sighting information
Albury 'Padman Park'	36° 04' S 146° 53' E	1970's	1 climbing pergola near Murray River (M. Miles)
Albury 'Black Range'	35° 57' S 146° 56' E	1960's	2 sighted on granite hill (B. Plunkett)
Thurgoona	36° 04' S 147° 06' E	1960's	1 sighted in hay shed (B. Plunkett)
Bellbridge 'Victorian border'	36° 04' S 147° 04' E	1990's	1 climbing tree in school grounds (R. Fenton)
Walbundrie 'Goombargana'	35° 43' S 146° 35' E	- 2003	3 seen near homestead, north side of hill (J. Packer)
Walbundrie 'Goombargana'	35° 43' S 146° 35' E	- 2000	4 seen near homestead, west side of hill (M. Everritt)
Walbundrie 'Goombargana'	35° 43' S 146° 35' E	- 2005	2 seen near homestead, east side of hill (C. Packer)
Walbundrie 'Goombargana'	35° 43' S 146° 35' E	2002	slough found during biodiversity survey (NPWS)
Walbundrie 'Maloney's Road'	35° 43' S 146° 49' E	1997	road kill handed to NRE in Victoria (G. Schilg)
Balldale 'Stock Reserve'	35° 52' S 146° 32' E	1990's	2 sightings near farm dam (M. Everritt)
Kentucky State Forest	35° 45' S 146° 24' E	2002	1 sighted entering rabbit burrow (P. Spooner)
Gerogery 'Brea Springs'	35° 50' S 146° 54' E	- 2007	6+ sightings on hill and grain shed (I. Sanders)
Gerogery 'Beelawong'	35° 51' S 146° 55' E	- 2007	1 sighted in Red Gum tree (D. Michael)
Yambla Range 'Tabletop Mt'	35° 51' S 147° 03' E	- 2005	3 sightings on range since 1960's (R. Patterson)
Walla 'Morgan's lookout'	35° 42' S 146° 52' E	1970's	1 collected near Billabong Creek (R. Paech)
Wymah	36° 02' S 147° 19' E	2001	accidentally road kill
Mt Granya 'Victorian border'	36° 03' S 147° 16' E	1990's	road kill specimen handed to NPWS (G. Mawson)
Talmalmo 'old pub'	35° 56' S 147° 29' E	1970's	1 sighted in tree behind old pub (N. Jones)
Talmalmo	35° 59' S 147° 32' E	1998	1 atlas record near quarry (NSW NPWS)
Ournie	35° 56' S 147° 50' E	1960's	1 sighted entering a rabbit burrow
Pine Mountain 'Victoria'	36° 00' S 147° 49' E	- 2007	1 atlas record (DSE)
Morven 'Boongarra'	35° 37' S 147° 07' E	- 2007	1 entering burrow in 1970's, recent scats (I. Webb)
Morven 'Coonawarra'	35° 36' S 147° 08' E	1960's	1 local specimen translocated to hay shed (P. Webb)
Cookadina	35° 30' S 147° 17' E	2005	slough skin found during Honours survey (S. Sass)

Pulletop 'Nest Hill'	35° 33' S 147° 23' E	- 2007	5+ sighted in farm shed & homestead (P. O'Brian)
Pulletop 'Nest Hill'	35° 33' S 147° 23' E	- 2007	2 sighted together in rocky gully line (D. Pugh)
Pulletop 'Jayfields Nursery'	35° 32' S 147° 24' E	2005	1 sighted in shed then stolen (N. Passalacqua)
The Rock Nature Reserve	35° 16' S 147° 04' E	1999	1 sighted on hollow log (Murphy & Murphy 2006)
Forest Hill 'Mt Kiaora'	35° 06' S 147° 32' E	- 2005	regular sightings (S. Sass)
Wagga 'Plum Pudding'	35° 14' S 147° 20' E	- 2007	regular sightings (S. Sass)
Wagga 'district'	35° 13' S 147° 26' E	1976-89	11 seen in the district (Annable 1995)
Wagga	35° 13' S 147° 26' E	1983	Voucher specimen Australian Museum (Shine 1994)
Wagga 'Mt Flakney'	35° 17' S 147° 26' E	2000	2+ regular sightings (S. Sass)
Wagga 'Big Springs'	35° 17' S 147° 25' E	- 2007	3+ regular sightings (D. Green)
Little Billabong Creek	35° 36' S 147° 28' E	2006	2m female road kill on Hume Highway (B. Corey)
Murraguldrie State Forest	35° 30' S 147° 37' E	2005	accidentally killed during control burn (K. Durrant)
Tooma 'Possum Point'	35° 58' S 148° 03' E	1999	1 sighting in tree near Tooma creek (K. Durrant)
Kyeamba 'Stock reserve'	35° 26' S 147° 36' E	2007	slough skin found during survey (S. Sass)
Kyeamba 'Ballandry'	35° 26' S 147° 37' E	2001/02	slough skin found during survey (S. Sass)
Tumut	35° 18' S 148° 13' E	1980	voucher specimen Australian Museum (Shine 1994)
Ladysmith 'Crows Nest'	35° 23' S 147° 31' E	2005	2 sighted on granite hill & recent scats (D. Michael)
Ladysmith 'Wisconsin'	35° 19' S 147° 28' E	2007	recent scats found on granite outcrop (D. Michael)
Jackalass 'Slate quarry'	35° 06' S 148° 08' E	2006	1 sighted in creek bed near slate quarry (M. Crane)
Nangus	35° 01' S 147° 55' E	2006	1.4 m male sighted in farm building (D. Michael)
Nangus 'Pidgeon camp'	34° 59' S 147° 56' E	1990's	1 sighted on hill, 2 in rocky gully (J. Smart)
Nangus	34° 59' S 147° 57' E	- 2000	3 sighted in roof cavity & near homestead (J. Smart)
Nangus	35° 01' S 147° 56' E	2000	1 sighted in grazing paddock (M. Crane)
Wantabadgery 'Tufnel Park'	35° 01' S 147° 41' E	1990's	2 local specimens translocated on farm (W. Howard)
Wantabadgery 'Moonlite Hill'	35° 03' S 147° 42' E	2000	1 sighted crossing road (F. Chalker)
Nanangroe 'Donna Valley'	34° 59' S 148° 29' E	2006	1 sighted regurgitating brushtail possum (M. Crane)
Nanangroe 'Stockdale'	34° 59' S 148° 16' E	1980's	1 sighted climbing 'hills hoist' clothesline
Gundagai	35° 01' S 148° 07' E	2002	road kill near river north of township (M. Crane)
Tarrabandra	35° 00' S 148° 09' E	2006	road kill near river adjacent granite hill (M. Crane)

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Public presentations

Many landholders involved in the 'questionnaire' also attended presentations; therefore their records were already incorporated in the list of sightings. The information sessions revealed an additional python location near Wymah. Unfortunately, the landholder identified it as being a python after accidentally driving over it. He had lived on the property all his life and had never encountered a python before. Interestingly, another participant claimed to have seen a large python descending a tree near Mudgegonga during the late 1980's, which, if authentic would prove to be a significant record and range extension for this species in Victoria.

Personal field observations

On the western side of Gerogery Range (Stringybark Hill), a 2 m python was observed in a grain shed during 2001, whilst in May 2006, on the opposite side of the range, a 1.8 m female was found coiled in the canopy branches of a Blakely's Red Gum *Eucalyptus blakelyi*. Landholders from both sides of the range were aware of pythons inhabiting the hill, although only the farmer on the western side of the range had regularly sighted pythons. Two were accidentally killed during routine farming activities during the summer of 2005.

During the summer of 2006 we were informed of a python residing within a farm shed near Nangus. This specimen measured 1.4 m in length and was identified as a sub-adult male. In addition, during the granite outcrop study python scats were identified near Morvan (an area known to harbour the species based on the landholder questionnaire) and on a property in the Kyeamba Valley with no previous known records of the species.

Informal conversations

Feedback from colleagues and other sources produced 22 extra location records for the region as well as securing additional sightings from some of the more familiar python locations such as Wagga Wagga, Yambla Range, Gerogery Range and Goombargana Hill near Walbundrie. Six of these records were of road killed specimens, of which two were handed in to local wildlife authorities for formal identification.

Location of pythons based on landform type

Landform type had a significant effect on the location and abundance of *M. s. metcalfei* records within the SWS (Fig. 2). Forty two percent of location records and 50% of observations were from well vegetated 'inselbergs' and other granite land formations. Lowland remnant vegetation accounted

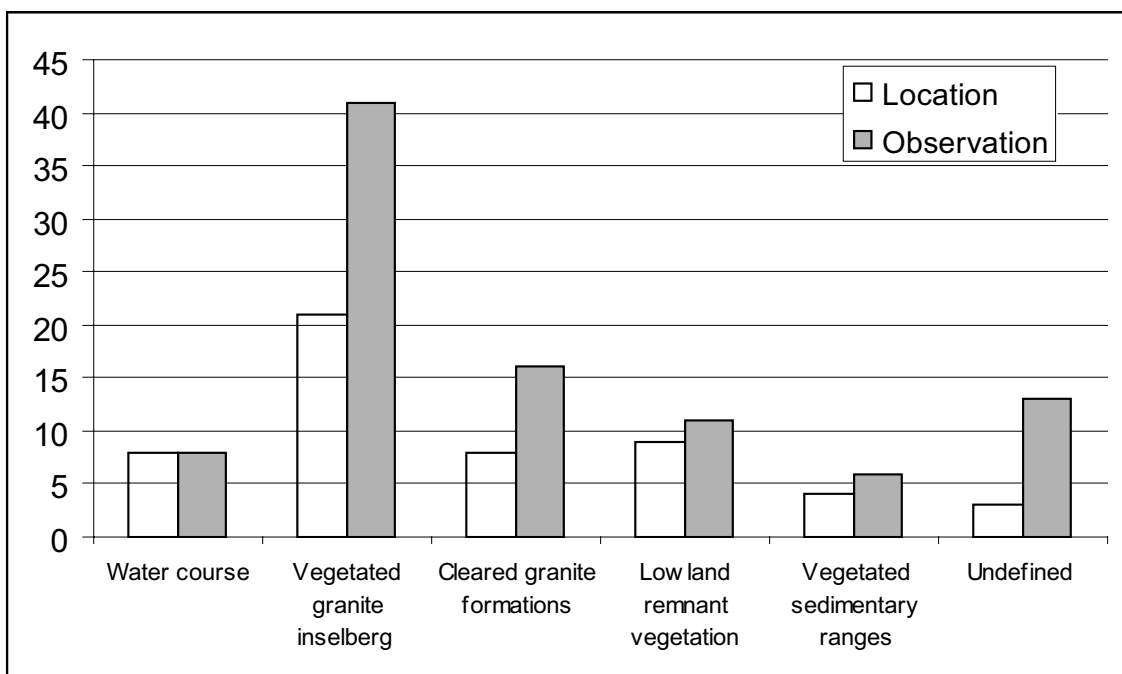


Figure 2. Distribution of Inland Carpet Python *Morelia spilota metcalfei* location records (n = 53) and observations (n = 95) from the south-western slopes of New South Wales, classified by topographic position or vegetation condition.

for 18% of records and 13.4% of observations, while granite hills, devoid of native overstorey vegetation, accounted for 16% of records and 19.5% of observations. Watercourses and sedimentary ranges accounted for 18% and 8% of records, 9.7% and 7.3% of observations, respectively (Fig. 2).

DISCUSSION

Understanding what factors affect a species' distribution and abundance provides an important foundation in mitigating human impacts on biodiversity (Lindenmayer and Burgman 2005). However, with limited information on past population densities for many reptile species, reference to present day patterns of diversity must be made with caution (Sadler and Pressey 1994). Nevertheless, *M. s. metcalfei* was once considered widespread in woodlands along major watercourses and rock outcrops in Victoria (LCC 1987, DSE 2003) and presumably was similarly abundant in southern New South Wales. Anecdotal reports however, suggest population densities of *M. s. metcalfei* have been significantly reduced in many parts of south-eastern Australia (Robertson et al. 1989, Sadler and Pressey 1994, Sadler 1994, Shine 1994).

Habitat loss has undoubtedly had a significant effect on the distribution and abundance of *M. s. metcalfei*. However, a number of other causal factors have contributed to population declines, including illegal collection for the pet trade (Hoser 1993, Shine 1994), changes in prey availability and composition (Heard et al. 2004, Shine 1994), predation by feral animals, particularly the European Fox *Vulpes vulpes* (Heard et al. 2006) and deliberate or accidental killing by humans (Shine 1994). All of these factors are likely to have influenced the present day distribution and abundance *M. s. metcalfei* in the SWS.

Box-Gum Woodland (*Eucalyptus albens*, *E. melliodora* and *E. blakelyi*) once occurred extensively throughout the fertile lowland parts of the SWS but has been reduced to 4% of its original extent (NSW NPWS 2002). In contrast, the less fertile hills and granitic woodlands are much less cleared and appear to have played an extremely important role in buffering pythons from the effects of broad scale vegetation loss. Over 40% of all records collated in this study came from vegetated granite inselbergs (Fig. 2). The remaining records originate from lowland remnant vegetation, vegetated watercourses such as the Murray and Murrumbidgee Rivers, Billabong and Little Billabong Creek or ranges such as the Rock Nature Reserve and Yambla Range (including

Tabletop Mountain). Although few observations stem from these sedimentary ranges, given the large area of remnant vegetation and rugged terrain, their role in conserving viable populations of *M. s. metcalfei* may be important.

A study in the Coleambally region of the Murray and Murrumbidgee irrigation area found *M. s. metcalfei* to be significantly associated with large patches of remnant vegetation, independent of the presence of creeks or river systems (Doody et al. 2004). In this study, 16 observations came from areas devoid of native overstorey vegetation (Fig. 2). In summer, pythons are often attracted to rural buildings in search of commensal prey items (Shine 1994, Fearn et al. 2001) but also native birds which nest in garden vegetation (e.g. one landholder watched a python raiding a Superb Fairy Wren *Malurus cyaneus* nest from a garden shrub). Pythons exhibit seasonal shifts in habitat use depending on thermoregulatory needs and prey availability (Shine and Fitzgerald 1996, Slip and Shine 1988, Heard et al. 2004). Therefore, it is likely that pythons in the SWS are persisting in modified landscapes by supplementing their diet with commensal prey species and using the cover of rocks, native grass and road side vegetation when returning to elevated outcrops during the cooler months.

The practice of lodging specimens with the Australian Museum or observations with the National Parks and Wildlife Service is not strong in the region, as evidenced by the number of sightings provided by landholders and subsequent lack of records in the wildlife atlas databases (Fig. 2). Similarly, the transportation of pythons from the local environment into grain and hay sheds appears to have ceased in the region, probably as an artefact of extirpation and population declines, but also as a response to improved rodent control, better shed designs and tighter laws governing the handling and movement of reptiles. Similarly, one landholder near Gerogery reported Queensland pythons being historically stocked on his property, however recent observations from pythons on this property and adjacent granite outcrops resemble *M. s. metcalfei*. How commonly *M. s. mcdowelli* was translocated to the SWS is now difficult to determine as properties are increasingly changing ownership meaning this information may no longer exist in the region.

This study highlights significant populations of *M. s. metcalfei* may still occur in the SWS. Priority conservation areas for this species in the region include inselbergs and other granite land forms, such as Goombargana Hill, Gerogery Range, Nest Hill, the granite belt between Kyeamba and Wagga Wagga, vegetated ranges such as Yambla Range and the Rock

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Nature Reserve and the riverine environment along the Murray and Murrumbidgee Rivers. Sadly, due to extensive habitat loss, degradation and fragmentation, it appears many potentially suitable granite outcrops in the production parts of the landscape no longer support populations of *M. s. metcalfei* in the SWS.

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