THE STATUS OF THE TRAPDOOR SPIDER GENUS *MOGGRIDGEA* IN THE STIRLING AND PORONGURUP RANGES

A REPORT TO THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

by

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EXECUTIVE SUMMARY

1. **Objectives**

- To assess the distribution of *Moggridgea* in the Stirling and Porongurup Ranges and document and map site occurrences.
- To assess the specific status of populations.
- To recommend management and conservation measures, including fire control.

2. **Results and Conclusions**

- In the Stirling Ranges, *Moggridgea* sp. S occurs at the following sites (*, newly located): Toolbrunup; Mt Magog; Talyuberlup creek*; The Cascades walking trail, first and second creeks; The Cascades; Bluff Knoll walking trail; South Mirlpunda creek; Moongoongoonderup creek (3 sites); Bluff Knoll, south face*; Wedge Hill*. Although currently deemed to represent only a single species, future research may point towards more than one species occurring in the Stirling Ranges.
- In the Porongurup Range, *Moggridgea* sp. P occurs at three sites along the south face (*, newly located): south end of Millinup Pass; Cockatoo Creek*; "Waddy's Hut" at Mira Flores*.
- In the Stirling Ranges, spiders occur in deeply shaded, moist gullies, particularly on south facing banks. Populations occur as patchily distributed aggregations determined by fine-scale favourability of habitat.
- In the Porongurups, spiders occur predominately on the bark of karri and very old red gum trees.
- The "best" populations occur at the Toolbrunup, Cascades and Talyuberlup sites. The latter site had remained unburnt for a long period, and during the study maintained the densest population of spiders with the most favourable demographic status. However, the site sufferred a major fire in January 1997, and the survival of the *Moggridgea* population must be reassessed.
- Fire is considered to be the greatest contemporary hazard to gradual decline of *Moggridgea* populations.

3. **Recommendations**

- Exclude fire (where possible) from known sites recognised as possessing viable populations.
- Adopt a fine-scale habitat approach to conserving populations.
- Monitor several sites in the Stirling and Porongurup Ranges.
- Explore nominated potential sites.
- Investigate further the specific status of all known populations.
- Consider supporting a researcher to study further the biology and persistence of *Moggridgea* in the Stirling and Porongurup Ranges, compare the status of such populations with *M. tingle*, and to search other possible sites in the south-west forests.

OBJECTIVES

This report addresses the following objectives, as listed in "Scope of Work" outlined in correspondence from Dr A.A. Burbidge, 26 February 1996:

1. Conduct searches of known and possible sites of occurrence in the Stirling Range (including Bluff Knoll, Mt Toolbrunup, Mt Magog, Talyuberlup Peak, Isongerup Peak, Red Gum Hill) and the Porongurup Range. Assess abundance of and map distribution of all populations. Lodge voucher specimens in the Western Australian Museum. Field work to be conducted in April - May 1996 and August 1996.

2. Determine specific status of each population.

3. Report on:

(i) The current distribution and abundance of the species and any close relatives in the area

(ii) How the burrows can be distinguished from other mygalomorphs

(iii) How the populations can be monitored, preferably by a Park ranger or local ecologist; and

(iv) What management actions are necessary, including fire management.

INTRODUCTION

The trapdoor spider genus *Moggridgea* occurs in southern Africa from where it was first described in 1875, the isle of Socotra (in the Arabian Gulf), southwestern Western Australia (tingle forest, Stirling and Porongurup Ranges) and in South Australia at American River, Kangaroo Island. While the genus is widespread in southern Africa, where together with the Socotran species, 31 species are recognised, the genus in Australia is restricted to a few localities [see Main (1991) for biogeographic review and Griswold (1987) for taxonomy and distribution of African species].

Moggridgea's relictual status in Australia, where it has been isolated from the African stock since at least the late Jurassic-early Cretaceous (120 ma), gives the genus biogeographic significance. It can be considered a "model" genus for interpreting other arthropod distributions and its occurrence in particular areas can give clues to earlier bioclimatic scenarios.

However, associated with its age and relictual nature, the biology and behaviour of *Moggridgea* are dependent on an environment and climate reminiscent of a much wetter era. Nevertheless, like many other invertebrates, it is able to persist in favourable microhabitats in a way which larger, vertebrate animals cannot.

From earlier observations [BYM personal observations, and Main and Gaull (1992)] it is apparent that in the Stirling Ranges the genus is confined to permanently moist, shaded microhabitats, predominantly in clay soil along the banks of creeks with a southerly aspect and along the south faces of peaks. Some specimens have also been observed away from creeks in irregular, minor declivities of mossy soil such as along the Bluff Knoll walking trail and up slope from the Cascades creek. The only known occurrence prior to this study of the genus in the Porongurup Ranges was the southern section of Millinup Pass where a single specimen was found in wet karri litter (MSH and Julianne Waldock).

A previous report (Main and Gaull, 1992) indicated that fire was severely depleting populations of *Moggridgea* in the Stirling Ranges, whose long-term survival was under threat from these fires.

The present study was commissioned by the Department of Conservation and Land Management after the Stirling Ranges *Moggridgea*, as yet undescribed, was added

to the Western Australian list of critically endangered species by a scientific panel reporting to the Department of Conservation and Land Management. We here review previous knowledge of *Moggridgea* distribution, taxonomy and biology in the Stirling and Porongurup Ranges, and provide further information on new sites located during the survey, the taxonomic status of the populations, and demographic status of several populations.

METHODS

Permits

Specimens were collected under the following permits:

SF001791	Licence to Take Fauna for Scientific Purposes (issued to M.S. Harvey)
NE001424	Permit for Research/Educational Excursion in CALM Estate (issued to M.S. Harvey)
SF002040	Licence to Take Fauna for Scientific Purposes (issued to B.Y. Main)
NE001591	Permit for Research/Educational Excursion in CALM Estate (issued to B.Y. Main)

Search for new sites

Criteria for selection of search sites

Search for additional locations of *Moggridgea* populations was based on certain predictive qualities but constrained by time and accessibility of locations due to precautions against the spread of die back. Earlier observations indicated that suitable sites would be restricted to the following sorts of physiography or topography:

a) gullies or creek banks on south-facing aspects of peaks
b) locations above the "cloud line" (above about 550 m)
c) sites at "base" level of peaks on southeastern peaks (which capture moisture from onshore winds of summer high pressure systems)
d) drainage lines or slopes of peaks with craggy tops (as Mt Magog)
e) drainage lines on southerly face of peaks with east/west aligned ridge-like crest

f) drainage lines descending from depressions and/or plateau-like boggy, peat or swampy tops (as the Cascades and Cascades Trail First and Second creeks)

Conversely it was predicted that sites subjected to direct afternoon summer sun, or generally northern aspects of peaks, slopes or gullies would not provide suitable habitats. Additional habitat requirements were predicted to be:

a) clay, or compacting loamy soil;
b) shade provided by tree and shrub canopy; and
c) orientation of minor topography (e.g. jutting rocks, curvature of creek banks) to provide microhabitat shade and moisture holding capacity.

In addition it was taken as an axiom that the longer the elapsed period since a site had been burnt the more likely it would be for *Moggridgea* to be present.

On the basis of these predictive qualities various peaks and lower locations were assessed as "potential" or "unlikely". Thereafter as many "potential" sites as expedient were explored and to check the validity of our predictions some "unlikely" sites were also searched.

Table 1 lists all sites explored, including those from which *Moggridgea* was already known and indicates new sites where the spiders were located and negative sites. Table 2 lists unsampled potential sites. Maps 1-4 show the location of all sites where *Moggridgea* spp. has been located in the ranges.

On site search for burrows

Visual search

Visual search of microhabitats (e.g. creek banks and slopes also some old litter and duff) of potential (and "possible" and unlikely) sites was undertaken. In most instances search time was calculated (number of searchers x time) for a specified area. Litter and duff was searched by gently teasing and scraping litter to expose the soil/litter interface where indeed doors of another trapdoor spider, *Eucyrtops*, but no *Moggridgea* were located. At the first sites searched, when burrows were located, door diameters were measured with drafting dividers and a millimetre scale steel rule, and recorded. Once it was established that the "new" observers had developed a "critical eye", an

arbitrary measure of door diameter was accepted and recorded. Door diameters were categorised as small to medium (S/M 2.0-4.0 mm) and medium to large (M/L > 4.0 mm, i.e. > 4.0-8.5 mm).

In the Porongurups, redgum (marri) and karri bark and litter at the butts of trees was also searched. Search time was calculated as for ground searches. Bark of red gums and bullich was also scanned in the Stirling Ranges but generally appeared too dry and exposed to be a possible habitat for *Moggridgea*.

Pitfall traps

In addition to visual search of selected areas, pitfall traps were also set at seven sites in the Stirling Ranges and one site in the Porongurup Range in the hope of collecting male specimens. Sites were selected in April and visited again in September (with the exception of Wedge Hill) and December. The pitfall traps consisted of two litre ice-cream containers with holes 10 cm in diameter in the lids. These were inserted in the ground with the lids flush with the soil or litter surface. Commercially available anti-freeze (ethylene glycol) was used as a killing/preservative fluid in the traps. The traps were protected from rain with plastic roofs supported on wire pegs. Eight traps were set at each site.

No male specimens were captured.

Specimens collected

Some female and juvenile specimens were collected as noted below and listed in Table 3.

Assessment of population status

Because the diameter of a door has a direct correlation with the size and relative age of a spider the proportions of different sized doors can indicate the demographic state of a population. From counts and arbitrary measurements of doors (see above) made at each site together with observations regarding disturbance due to fire, an estimate of population viability and a demographic status assessment of each population was made.

An estimate of population viability was made as follows: Viability = 3 to 5 large nests (adults) (i.e. doors > 7 cm diameter) in 10-20 specimens in a square metre. This estimate is based on experience of other mygalomorph species where, if a quarter of the population is "adult" or comprised of reproductively mature females (matriarchs), then the population is viable (BYM records).

Criteria used to assess the demographic status of a population and a prognosis for its recovery (if a burnt site) or prediction for persistence (if an unburnt site) are listed in Table 4.

Finally, using these arbitrary scales and criteria, the demographic status and prognosis for recovery or persistence of each population, is summarised in Table 5.

SPECIES STATUS

Spiders have distinctive sexual dimorphism which means in determining species, ideally both sexes should be examined. In practise this is not always possible and compromises sometimes have to be made. At the time this study commenced only two males had been collected from the Stirling Ranges (at two different localities) and none from the Porongurups. While the basis of species distinctions within other relict mygalomorph genera (e.g. *Neohomogona* in the ranges) it is assumed that there will be different species of *Moggridgea* in the two mountain systems. However, there is also the possibility of two or several species in the Stirling Ranges, arguing again from recent data indicating at least two species of *Neohomogona* (BYM, unpublished data). It is likely that the species in the eastern and western blocks (i.e. either side of the Chester Pass demarcation) will be distinctive. In addition the two males (from Mt Magog and Toolbrunup) show some differences but without further specimens it is not clear whether these differences reflect intra- or interpopulation distinctions.

Should it be shown ultimately that more than one species is present in the Stirling Ranges then this would raise further difficulties in management and conservation.

For the present, we conclude that two species occur in the study area: *Moggridgea* sp. S (Stirling Ranges) and *Moggridgea* sp. P (Porongurup Ranges). Voucher specimens of both are lodged in the Western Australian Museum and the B.Y. Main collection, University of Western Australia (Table 3).

BIOLOGY AND IDENTIFICATION

Spiders

To the untrained eye, *Moggridgea* species are easily confused with other sympatric spiders, particularly those belonging to the infraorder Mygalomorphae, which includes numerous other trapdoor spider families.

The spiders (Plate 1) are small, up to a total body length of about 8.0 mm, dark brown (almost black), shiny with a slightly "humped" abdomen, short spinnerets, short geniculate ("kneed") chelicerae ("jaws"); first two pairs of legs with lateral rows of stout, slightly "hooked" spines; eyes in two rows of four spread widely across the front of the carapace. Male specimens have no apophyses on the first leg, and possess a simple, needle-like embolus (copulatory organ) on the pedipalp. The diagnostic character for the genus is a group of long, straight finely pointed sensory hairs on the underside of the patella (knee joint of leg) on the first, second and fourth legs (visible only with sufficient magnification).

Burrows or tubes

Stirling Ranges

The burrow is shallow, adult tubes up to 6.0 cm long; burrows are oriented obliquely into creek banks or may be cocoon-like, short, up to 3.0 cm in moss or appliquéd on soil or against stones. Tubes are blind at the basal end i.e. the silk lining is complete like a stocking "toe". Prey remains are not stored in the burrow but ejected immediately after a repast.

When sited in creek banks the doors (Figure 1; Plate 4) open at any angle, that is the hinge may be uppermost with the lip of tube facing "down-hill" or the hinge may be aligned with the slope. Most frequently the door is attached to the lower part of the rim and thus when open hangs outwards with the "lip" of the tube facing upwards (Figure 1; Plate 3).

The door, which is made of silk bound soil, is almost circular, thin and stiff with a relatively broad hinge and is very slightly inset into the rim of the burrow when closed. The upper surface of the door, which may have moss, algae or liverwort growth incorporated with the soil particles, blends with the soil and when closed is recognisable

as a thin circular line - it is easier to detect when damp than during the dry summer months. The under (inside) surface of the door is lined with silk. In active nests this is white or light grey whereas in old (defunct) nests the silk becomes darker and slightly frayed in appearance. Spider burrows tend to occur in aggregations of one to two or three contiguous square metres depending on the favourability of the area.

Porongurup Ranges

From observations made during this study it was found that spiders make small, cocoon-like tubes up to 2.5-3.0 cm, closed by a flat, circular door on or under karri or marri bark, the nest being made of bark fragments bound together with silk. However, the original specimen was found in disturbed karri litter (MSH and JMW) and BYM later (January 1997) found one defunct nest in a low soil bank. These two finds suggest that the spiders also live in the soil and further soil and litter searches should be made. The bark occurrences are indicative of the very wet nature of the habitat and that it has not been burnt for a long time.

Field identification of burrows and nests

Burrows in soil

Plates 3 and 4 and Figure 1 show doors of *Moggridgea* sp. S. Doors of two species of *Eucyrtops* (Plates 5-8, Figure 1) and an *Aganippe* species (Figure 1) are also illustrated for comparison and to assist identification of *Moggridgea*.

Tubes in bark

Plate 9 illustrates a tube situated on bark from the Porongurup Ranges (*Moggridgea* sp. P).

Phenology

Only two male specimens have been found (both from the Stirling Ranges), both collected in pitfall traps during early or late winter. Two adult females with young (30 and 7 respectively) in the burrows were found in April. These data indicate that *Moggridgea* sp. S is reproductively active in the autumn/winter with mating and dispersal occurring during this season. Thus, one would expect that eggs would be

produced in the spring, hatch early to mid summer and after late summer/autumn incubation in the female burrow, the spiderlings would disperse following late autumn/early to mid winter rain depending on the season.

Vulnerability to fire

Earlier observations and records indicate that *Moggridgea* sp. S is extremely vulnerable to fire (Main and Gaull, 1992). While a few mature spiders may survive in an aggregation subjected to fire, younger cohorts in a population suffer high mortality. Thus following fire, the recovery of a population depends on (a) a few old female animals being able to reproduce which is partly dependent on maturation of males from younger cohorts with which to mate and/or (b) survival and persistence of some juveniles.

While it is not known how long spiders take to mature it is unlikely that they would mature in less than six or seven years. Thus it could take many years for a population to return to its "normal" demographic structure after a fire. Recent observations at the sites studied by Main and Gaull in 1991/1992 indicate that where populations have been directly subjected to fire, a population in no way approaches a pre-fire demographic status five years later. However unburnt patches within a burnt area, containing at least some only partially affected "sub-populations" (such as the Toolbrunup site), may recover more quickly.

Nevertheless, the prognosis is that successive fires will cause a decline by gradual attrition of any population.

The Porongurups species, because of the specialised habitat (karri bark and possibly karri litter and humus), is likely to be even more vulnerable to fire.

KNOWN DISTRIBUTION

Prior to the present study *Moggridgea* was known to occur at the following eight sites [BYM observations and/or recorded by Main and Gaull (1992)] and an additional ninth site located by Sarah Barrett (Barrett 1996) in the Stirling Ranges:

1. Bluff Knoll Walking Trail (above waterfall at sharp bend in path);

2. First Creek, Cascades Walking Trail (downstream from cement steps);
3. Second Creek, Cascades Walking Trail;
4. Cascades, north bank (south facing) below water falls at end of trail;
5. Toolbrunup. Creek site between car park and large scree slope;
6. Mirlpunda creek gorge, site adjacent to end of (disused) South Mirlpunda Track. Vertical bank, west side of wide flat valley with meandering creek bed and "billabongs" (south of the Three Arrows);
7, 8. Moongoongoonderup Creek system; three subpopulations on drainage system between southeast face Bluff Knoll, Isongerup and Moongoongoonderup Peaks (lowest site on south side of culvert crossing on Ellen Track); and
9. Mt Magog, south face below summit (Sarah Barrett site).

Prior to this study the only known location in the Porongurup Range was at the southern end of Millinup Pass in a dense stand of long unburnt karri.

Moggridgea spp. have now been recorded from 15 discrete localities in the Stirling Ranges and Porongurups National Parks, 12 from the Stirling Ranges, including three newly discovered sites, and three from the Porongurups, of which two are newly found. Those in the latter region are restricted to sites on the southern fringe of the park where soil moisture levels are high and where fire has been excluded for a long time, at least 30 years at Millinup Pass.

Those in the Stirling Ranges can be arranged into three population groups:
(i) scattered sub-populations east of Chester Pass;
(ii) Toolbrunup massif; and
(iii) Mt Magog/Talyuberlup complex.

Long-distance visual inspection was also made of several potential sites, summarised in Table 2. The following regions may retain *Moggridgea* populations and should be assessed in future surveys: Mondurup Peak, Henton Peak, Coyanarup Peak (southwest facing gullies), Kyanorup Eminence (south east gully), Mt Success (south gully) and various sites on the Isongerup/Ellen Peak massif.

Numerous sites were investigated in regions initially deemed to be unsuitable for the survival of *Moggridgea*. In all cases, *Moggridgea* was not found, further supporting

the guidelines developed to predict the occurrence of *Moggridgea* in the Ranges. See Table 1 and Map 2 for the sites examined.

POPULATION STATUS AND PROGNOSIS FOR PERSISTENCE

The following features are listed for each site: Name of site and co-ordinates; date censused; years since burnt; area of transect or plot "sampled"; search time (see above regarding calculation); number of nests categorised as small/medium and medium/large (see above). On the basis of these records and other general observations (see comments following) an assessment was made with regard to the demographic status of the population and a prognosis indicated or recovery potential predicted (if burnt in the last five years).

PORONGURUPS NATIONAL PARK

MILLINUP PASS, SOUTH END

Coordinates: 34°41'43"S 117°53'51"E

Dates censused: 28.iv.1996, 2.ix.1996, 16.xii.1996

Time since burnt: over 30 years

28.iv.1996

Area of search: Two patches, each of approximately a hectare

Search time: 8 hours (4 people x two hours, some other intermittent activity while setting pit traps)

Number of nests observed: 1 small/medium nest on karri bark (also many old nests S/M and M/L)

16.xii.1996

One patch about 1/2 hectare (within area of one of above patches)

3 hours (3 people x 1 hour)

1 small/medium nest on karri bark (old nests various sizes also located)

Demographic status of population

Difficult to assess because of unfamiliarity with behaviour and extreme difficulty of discerning viable nests which are well camouflaged. Defunct nests are readily discerned whether with or without a door. It may be possible to make some kind of judgement with more experience on the basis of relative number of viable to "old" nests observed in a given area and time spent searching.

At present it is assumed the population is in a viable condition.

Prognosis for persistence

Vulnerability to fire (because of exposure on bark) is high thus areas such as this long unburnt patch need to be protected if possible from fire.

If fuel reduction burns are essential then every safeguard should be taken to protect the trunks of trees while burning the litter.

Comments

Spiders were located in a stand of large, buttressed, old karri trees with some saplings and regrowth and old and mixed age redgum trees with an understory of predominantly hazel (*Trimalium*). There were many old moss-covered rotting logs and thick litter of leaves, bark and debris. The area was selectively logged many years ago (60 or more).

This site is where the original specimen was found in litter some years ago.

Post script

BYM and A.R. Main revisited the site on 14.i.1997 and observed old nests on redgum bark on two trees. Search time 2 hours (2 people x 1 hr). Tree one: 9 nests (old, one with door still attached), (2 S/M, 7 M/L). Tree two: 3 nests (1 S/M, viable ?, 2 M/L, old).

Also observed one (L) old nest with door attached but hanging open, in mossy bank of soil (edge of graded track).

COCKATOO CREEK

Coordinates: not determined.

28.iv.1996

Time since burnt: unknown

Area of search: half a hectare

Search time: 1.5 hours

Nests observed: 1 viable nest S/M; numerous old nests on attached bark and bark on ground

Status of population and prognosis for persistence

As for Millinup Pass population

Comments

Very wet site adjacent to permanent creek, some minor disturbance and close to labyrinth of forest tracks and farm paddock.

"WADDY'S HUT" AT MIRA FLORES

Coordinates: not determined

14.i.1997

Time since burnt: unknown, but possibly within last 10 years

Area of search: 100 m x 1 m bank and 7 trees in 1/2 hour

Search time: 30 minutes (1 person x 30 mins)

Number of nests observed: 1 S/M defunct nest on bark

Demographic Status of population and prognosis for persistence

On present data unable to say other than that the species occurs at site.

With minimal future disturbance and absence of fire the population may possibly persist.

Comments

Area very disturbed in the past, near a dam, old hut and tracks. Forest reestablished but ground and litter over grown with *Dolichos* creeper. However, it is a very wet site and with minimal future disturbance could be regarded as a favourable habitat.

STIRLING RANGES NATIONAL PARK

Mt Magog (at 650-700 m)

Coordinates: 34°23'59"S 117°56'35"E, 50 586676E 6193312N

24.iv.1996, 3.ix.1996, 19.xii.1996

Time since burnt: 14 years

Area of search: Four people searched along walking trail, particularly from approximately 500 m and at pitfall site [Sarah Barrett (1996) sampling site]. Search was made of clay soil pockets amongst rocks on the steep slope, southern face of the peak in the vicinity of the walking path; edges of the scree slope to east of path also explored.

Search time: Intensive search by one person (BYM) for approximately 45 minutes at pitfall site, amongst duff under litter and bare patches of clay soil against projecting stones.

No burrows found.

A male specimen collected earlier by Sarah Barrett in pitfall trap.

Demographic status of population and prognosis for persistence

On the basis of the single male specimen known it is not possible to assess the status of the population but it must be considered as a positive site and that the spiders are likely to persist provided the habitat is not burnt.

Comments

General habitat consists of mallee scrub and shrubs, i.e. a low woodland/thicket on stony, loamy clay soil on an extremely steep, south facing slope which is in shade virtually the whole day. Because it is positioned below the craggy summit it receives considerable run off and the soil below the duff and litter is thus permanently moist. As the site is situated above the "cloud line" this further adds to the moisture content of the soil and humus.

This is the area where S.B. obtained a male specimen in a pitfall trap thus it can be regarded as a positive site but that the behaviour of the spiders is extremely cryptic and spiders are probably sparsely distributed.

The crevice on the western aspect of the summit and the gully it opens into possibly provide some favourable extended habitat.

This site was burnt in Januray 1997. BYM visited the area in February and viewed the site from a distance, and noted that the habitat was severeley burnt, some canopy although scorched, still present.

TALYUBERLUP PICNIC SITE

Coordinates: 34°24'54"S 117°57'21"E, 50 587856E 6191407N

23.iv.1996, 3.ix.1996, 19.xii.1996

Time since burnt: 14 years

Area of search: 185 m x 2 m bank of creek

Search time: 3 people searched

[6 aggregations of burrows spaced along transect between 15 m north of culvert to 200 m along creek: at 15 m (4 nests), 150 m (11), 155 m (7), 160 m (12), 175 m (1) and 200 m (3)]

Total =38 burrows (S/M 13; M/L, 25)

Population demographic status

Good.

Prognosis for persistence

Good.

Comments

North side of road unburnt (south side burnt April 1996). Habitat, creek with deeply incised banks, variously shaded by tree canopy (white gums) and some scattered understory of shrubs, *Poa* grass and tussocks. Steeply sloping banks up to five metres high with some shelves. Channel very narrow in places, with creek course about a metre wide and steep one metre high banks. Nests located on lower 2-3 m slopes of east bank where shaded throughout the day due to configuration of creek course - the west bank (no nests) much more exposed.

One specimen collected, an adult female with brood of spiderlings.

The site has subsequently been burnt in Jan 1997. The site was visited within 2 weeks follwoing he fire by BYM and it appeared that the population has been destroyed. However, a search a search in mid-late wionter should be made to reassess the status of the population.

TALYUBERLUP PEAK WALKING TRAIL

Explored trail to ridge below bluff. Although good clay soil and shaded areas, no *Moggridgea* burrows located but several *Aganippe* burrows observed.

TOOLBRUNUP PEAK WALKING TRAIL, CREEK SITE

Coordinates: 34°23'32"S 118°03'32"E, 50 597338E 6193829N

23.iv.1996, 3.ix.1996, 19.xii.1996

Time since burnt: 3 months (prior to April visit); previously 15 years

23.iv.1996

Area searched: 1 m^2 (base square of BYM/KG study site)

Total = 18 burrows (S/M, 9; M/L, 9)

Population demographic status

Good

Recovery potential

Yes

Comments

Habitat and viability of spider population A deep gorge-like creek opening into a V shaped channel. Open forest of jarrah/redgum (marri) with shrub understory. Study site (BYM/KG) mostly unburnt except downslope edge and 2 m^2 (of original 10 m transect). Much of the gully, both upstream and downstream from original study site, burnt at ground level although canopy not burnt.

Spiders surviving in unburnt patches but no viable nests in burnt areas. Some nests possibly defunct post fire due to sun exposure as a result of understory being burnt. No apparent recruitment of juveniles in burnt patches (as at April and September).

Area of known population aggregations previously extended about 100 m along both banks of gully.

North bank (south facing) with 5 "sites" unburnt and still with viable nests. South bank with 3 unburnt "sites" (1 m^2 and 2 "sites" of 3 contiguous m^2) containing active nests considered to represent viable subpopulations (estimate of viability = 3 to 5 adults in 10 to 20 specimens in a square metre).

Another count was made of nests in the study square in December 1996 and although 5 fewer M/L nests were located the demographic status and recovery potential prognosis were unaltered. However the habitat generally and the square where the counts were made had deteriorated; part of the bank had eroded and ash and litter was deposited on the previously mossy slope thus damaging potential and actual nest sites.

A count was also made in December of a 3 m^2 site on the south bank (north facing): search time 15 minutes (1 person - BYM): 21 defunct nests observed and 10 viable nests (3, S/M; 7, M/L). This imbalance of large nests relative to juveniles was presumably due to the fire and indicates a "Fair" category for demographic status with a "Likely" recovery potential.

THE CASCADES WALKING TRAIL (FIRST CREEK, DOWNSTREAM FROM CEMENT STEPS)

Coordinates: ca. 50 614250 6196100N

29.iv.1996

Time since burnt: 5 years (April 1991)

Area: Censused two patches (each 2.0 x 1.5 m) = 6.0 m^2 (one patch on each of north and south banks)

Search time: 2 hours (4 people x 30 minutes)

Number of viable nests:

South bank patch S/M, 4; M/L 1

North bank patch S/M, 3; M/L 2

Total = S/M, 7; M/L, 2. = 9

Demographic status

Fair

Recovery Potential

Likely

Comments

An irregular creek course with alternating steep vertical and sloping banks. Favourable patches of approximately 1.5 to 2.0 m high of varying lengths.

Total length of favourable or potential habitat in transect of 85 m;

South bank, 2 patches (6 continuous metres and 2 contiguous metres)

North bank 3 patches (4 continuous metres, 8 continuous metres, 10 continuous metres). Rocky creek bed. Regrowth of Acacias along banks and edge of creek bed. Canopy of jarrah trees regrown (some stag heads). Gully, cool, shady, some patches of sunshine on south (north facing) bank. Habitat for *Moggridgea* partially restored. The most deleterious post fire effect persisting in erosion of banks with some areas where soil and rocks have washed down in 0.5 m^2 lumps as well as surface erosion.

Census made of nests down stream from where nests observed in 1990/91 (BYM).

THE CASCADES WALKING TRAIL (SECOND CREEK)

(Site sampled in BYM/KG study)

Coordinates: ca. 50 614200 6195900N

29/4/96

Years since burnt: 5 years (April 1991)

Area censused: 5 contiguous m^2 (north bank)

Search time: 1 & 1/2 hours (3 people for 30 minutes)

Number viable nests: Patches 1 & 2, S/M, 0; M/L, 3. Patch 3 (KG sample square), S/M, 2; M/L, 7. Patches 4 & 5, 0.

Total nests = 12 (S/M, 2; M/L, 10).

Demographic status

Moderate.

Recovery Potential

Yes (but likely to take many years - 20 from now to recover to preburn status?).

Comments

Dense regrowth of sword grass, acacias and other shrubs up to 2 m high. Banks with alternate patches of bare ground and heaps of gum leaves (obscuring spider habitat).

THE CASCADES

Coordinates: 34°22'29"S 118°14'17"E, 50 613838E 6195597N

29.iv.1996, 17.xii.1996

Years since burnt: 5 years (April 1991)

Area of search: 2 areas. Area 1 (transect 2 m high x 8 m = 16 m^2); Area 2 (2 m high x 10 m = 20 m^2, BYM/KG study area)

Search time; Area 1: 2 hours (4 people x 30 minutes); Area 2: 2 hours (4 people x 30 minutes)

Number of viable nests

Area 1. Total nests = 18 (S/M, 11; M/L, 7) in 16 m^2.

Area 2. (10 patches 2 x 1 m). Patch 1, S/M, 5; M/L, 4. Patch 2, S/M 1; M/L, 1. Patches 3, 4, 5, 7, 8, 9, 10 no spiders. Patch 6, S/M, 1; M/L 2.

Total nests = 14 (S/M, 7; M/L, 7) in 20 m^2.

Demographic status of population

Good (but numbers of specimens lower than before fire of five years ago).

Recovery potential

Yes (but may take many years - 20 years from now ?).

Comments

Sword grass along edges and in creek bed dense; shrubs of *Acacia*, *Agonis*, *Xanthosia* and *Leucopogon* forming dense thickets along banks about 1.5 to 2.0 m high obscuring much of spider habitat along banks. Also heaps of litter covering previous mossy and liverwort areas of spider habitat. Banks generally heavily eroded.

WEDGE HILL

Coordinates: 34°23'17"S 118°10'18"E, 50 607710E 6194181N

2.v.1995, 17.xii.1996

Years since burnt: 24 years ? (general area burnt 1972); general area burnt 5 years ago (1991) but gullies escaped

2.v.1996

Area of search: 12 m^2 (transect along bank 6 m x 2 m high)

Total no. nests = 5 (2 S/M; 3 M/L)

17.xii.1996

Area of search: Approximately 1 m^2

Total no. of nests: 2 viable nests M/L; 5 defunct nests various sizes

Demographic status of population

On limited data available due to constraints on search time, unable to make an assessment other than to state that it is probably good (bearing in mind that only a small section of the creek was explored, that favourable banks were observed and that the habitat has been unburnt for many years). Also, one of the defunct nests had a parasitic wasp cocoon in it - this suggests a viable population, i.e. that the population is large enough to support parasitism.

Comments

The habitat is one of two creeks which escaped the fire of 1991 on the southern face of Wedge Hill. The vegetation indicated an association of understory plants which

have matured in the absence of fire (e.g. a *Dryandra* species); similarly the soil/litter interface with a high component of duff indicated a mature ground habitat suitable for many terrestrial invertebrates. The gully is generally moist and in permanent shade. The gullies on the south face run from an east/west oriented mountain with a crest like summit. This configuration provides shade and attracts southern precipitation.

Spiders are possibly more abundant upstream from the study site (where pitfalls were placed). Other mygalomorph genera observed were *Eucyrtops*, *Stanwellia* (abundant) and a "wet" habitat species of *Chenistonia*.

BLUFF KNOLL, SOUTH FACE

Coordinates: ca. 50 616100 6193600N

1.v.1996

Years since burnt: 5 years (previously 19 years, i.e. in 1972; and about 15 years before that in 1957?)

Area of search: 4 creek courses in three of which *Moggridgea* nests were located in low numbers.

Site 1: one hour search time (4 people 15 minutes)

No. of nests: 1 defunct nest

Site 2: along bank of 150 m x 2 m an area of 16 m^2 (8 m x 2 m high)

Search time: 1 hour (4 people 15 minutes)

No. of nests: 1 S/M; also 4 defunct S/M

Site 3: No. nests 1 S/M

Demographic status

Terminal.

Recovery Potential

Unlikely.

Comments

Although most of the gully where the search was made was badly affected by the fire there were some small pockets which might harbour some spiders. A few patches of unburnt *Dryandra* and *Allocasuarina* suggested possible residual pockets of habitat.

ELLEN TRACK, WEST END (MOONGOONGOONDERUP CREEK)

Coordinates: 34°22'53"S 118°17'18"E, 50 618433E 6194776N

30.iv.1996, 4.ix.1996, 18.xii.1996

Years since burnt: 5 years

Area of search: 2 m^2

Search time: 40 minutes (2 people x 20 minutes)

No. of nests: Total = 10 (7 S/M; 3 M/L)

Demographic status

Good.

Recovery potential

Yes.

Comments

The habitat comprises a very high steep bank, 3 m high, along a deeply incised, shady gully. The area is wooded with high jarrah and redgum trees and a dense understory of acacias and other shrubs. The creek is a permanent water course with sedges and some sword rushes in the bed.

The site is down stream from two other sites previously recorded as badly affected by fire (Main and Gaull, 1992). The area was noted as heavily overgrown by regrowth after the 1991 fire but these sites were not relocated during 1996.

POPULATION MONITORING

An essential component of the study of the ongoing status of *Moggridgea* spp. in the Stirling and Porongurup Ranges is the monitoring of selected populations. We here propose several potential sites for monitoring:

1. Toolbrunup;
2. The Cascades;
3. Talyuberlup Picnic Site;
4. Wedge Hill; and
5. W. end of Ellen Track.

Toolbrunup and The Cascades could be monitored once a year (preferably in late or autumn or winter), whilst Talyuberlup could be examined in winter 1997 (to assess the full effect of the January 1997 fire) and again in five years. Wedge Hill could be monitored as a 'control', given that the site has not been burnt for some time. The west end of Ellen Track could be censused again in two years time.

We have given above detailed criteria for population status assessment, and selected populations could be regularly monitored by staff initially trained in *Moggridgea* burrow identification.

Firstly, visual searches must be undertaken, and counts of burrows made, with doors categorised as small/medium or medium/large as described above. [The present study did not attempt the fine measurements of observed doors in the way adopted by Main and Gaull (1992) due to contraints of time. But an attempt was made to devise a simple method of calculating burrow size which less experienced observers could readily use.]

Counts of burrows should be made within prescribed areas, i.e. in square metre plots. The extent of burrow occurrences contiguous with the sample square in a defined transect should also be noted. A demographic status assessment could then be made (see Table 4) and compared with the site data listed below.

Markers are presently in situ at Toolbrunup, The Cascades, and second creek along The Cascades walking trail. The Talyuberlup transect begins 15 m north of the culvert at the Talyuberlup Picnic Site and runs along the creek for approximately 200 m.

CONCLUSIONS

From earlier observations, reported studies, and investigations carried out during the present project it is concluded that *Moggridgea* is patchily distributed throughout the Stirling and Porongurups Ranges. The distribution is determined by the topography, soil type, degree of shade and moisture. As predicted, favourable sites occur predominantly in gullies or creeks at the base of south or southeast facing aspects of mountains (Toolbrunup, Moongoongoonderup, Talyuberlup) and in drainage lines either below craggy tops (Mt Magog, south face Bluff Knoll) or below crests with west/east orientation (Wedge Hill), or in creeks debouching from small, plateau-like, high, swampy areas (The Cascades and also Toolbrunup).

An important feature related to topography is the elevation of peaks which project above the "cloud line" (e.g. Mt Magog, Toolbrunup and Bluff Knoll). Such sites catch the onshore southeast summer winds and encourage fog and mist precipitation at a time when heavy rain is not prevalent, thereby maintaining a reservoir of moisture in high level "bogs" which feed into permanent streams.

The spiders occur in clay, on heavy loam soils along creek courses which are permanently shaded and moist but following fire, regrowth of shrubs on banks and sword rush and *Gahnia* tussocks in creek beds and along edges, obscures the habitat.

The spiders are firstly vulnerable to fire itself, in that because the burrows or tubes are shallow (and sometimes appliquéd to the surface) they are destroyed by fire. Secondly those that do survive are frequently buried by deposition of ash and debris due to erosion of the banks and shifting of the unstable soil and litter after rain. Finally, because the mossy and liverwort banks of creeks suffer disturbance and erosion, the formerly firm, open surface spaces which they provided for burrows, become overgrown with shrubby vegetation. Until this post-fire vegetation dies and rots down in 8 to 10 or more years the habitat is generally unavailable for spiders.

Spiders in the Stirling Ranges are all burrowers, while the Porongurups species predominantly makes tubes on the bark of karri and redgum trees. As a consequence it appears that the Stirlings populations are better able to withstand low intensity fires (but not high intensity) but the Porongurups populations are probably extremely sensitive to

fire. The spiders have been found there only in long unburnt habitats (at least 30 years post fire?).

While there is only inferential data on long term recovery after fire, the "best" *Moggridgea* populations (i.e. with the highest density in the aggregations) have been located only in long unburnt sites (approximately 20 years post fire). Fire frequency of less than the life cycle periodicity of the spiders is likely to be deleterious. Because of the long maturation period and longevity of spiders, reestablishment of high density populations is estimated to take at least 20 years.

Although some post-fire populations of spiders (The Cascades, Toolbrunup) appear to be retaining a demographic status indicative of persistence of the populations the numbers of spiders within populations have been reduced as well as some aggregations having been lost.

Furthermore, there is a loss of some cohorts (small spiders killed in fire and lack of recruitment immediately post fire). This is reflected in the absence of some "middle" aged cohorts in populations observed about five years after fire. Thus the likelihood of males (which mature earlier than females) being available every year is reduced thereby prohibiting continuous annual reproduction and recruitment. The net lag effect of a fire is thus a gradual population decline (in total numbers) and further fragmentation of aggregations.

Historically, spiders have survived in the face of fire, *although they are not adapted to fire in an ecological sense.* Nevertheless, in that fire is continually reducing appropriate habitats, causing a decline in population numbers, depleting some cohorts and fragmenting aggregations of spiders, the long term effect is that, by attrition, the species is becoming increasingly endangered.

While undoubtedly these relict species having been suffering a decline over geological time, due to increased sclerophylly of the vegetation, the increased frequency of partly human-induced fires is exacerbating the ecological and population "sag".

RECOMMENDATIONS FOR CONSERVATION AND MANAGEMENT

The long-term persistence of *Moggridgea* species in the Stirling Ranges and Porongurups National Park is clearly related to constraining the deleterious effects of fires which will kill individuals, and which modify and destroy the available habitat through soil erosion, loss of shading vegetation, and emergence of post-fire plants. Consequently, the following recommendations for conservation and management are made:

1. In that fire is the greatest hazard for persistence of *Moggridgea* there is the need to give priority for fire exclusion from the "best" sites identified which includes sites recovering from fire.
2. Because of the vulnerability of *Moggridgea* to fire it is recommended that fire protection regimes be directed to:

- sites recognised as having "Good" demographic status and/or potential persistence (see Tables 4 and 5); and
- sites which were formerly recognised as "Good" but which have been recently burnt.

3. The present policy of large fire-control blocks is not seen as conducive to protection of *Moggridgea* sites. Smaller scale control areas with the objective of establishing a mosaic of smaller areas of different aged burn patches would seem to be more favourable for the persistence of *Moggridgea*.
4. The frequency of fuel reduction burns needs to be less than 20 or 25 years in areas containing *Moggridgea* populations, unless it is possible to have "discretionary" burns by deliberately avoiding *Moggridgea* aggregations and their microhabitats in areas such as creek courses.
5. If prescribed burning is considered as a management "tool" to prevent large-scale, high intensity fires, then special emphasis should be given to inducing low intensity fires while at the same time, excluding some gullies where *Moggridgea* is present, or is likely, to be present.
6. In order to review the ongoing status of *Moggridgea*, monitoring of selected populations is required. Possible sites for continual monitoring could include

Toolbrunup, The Cascades, Talyuberlup picnic site, Wedge Hill, and sites along the west end of Ellen Track.

7. Potential sites (where *Moggridgea* has not been searched for) need to be explored, particularly those which have not been burnt recently, especially Mondurup Peak. If such unburnt sites retain significant populations, these should be designated as fire-exclusion zones.
8. If Department of Conservation and Land Management staff or other personnel are to monitor (or census at intervals) some of the populations then they will need initial tuition in searching for and identification of nests, and in method of measuring door diameters and generally assessing demographic status.
9. Support a full time study (as a three year contract) on the biology of *Moggridgea* to further elucidate the life history and biology of *Moggridgea* species in the Ranges.

ADDENDUM: JANUARY 1997 FIRE

An extensive fire burnt a large section of the western section of the Stirling Ranges National Park (north of Stirling Range Drive) in January 1997, affecting two *Moggridgea* sites: Mt Magog and Talyuberlup Picnic Site. The *Moggridgea* site on Mt Magog was inspected from a distance by BYM and Bert Main in early February 1997, and appeared to be severely burnt. The Talyuberlup Picnic Site was visited and inspected closely. The vegetation along the creek line, where the *Moggridgea* population was situated, has been completely burnt, and nearly all *Moggridgea* burrows appear to have been either burnt or the occupants killed through intense heat. The intensity of the fire was highlighted by the complete destruction of the Western Australian Museum pitfall traps, of which no trace could be found. Two small unburnt burrows were noted on the underside of stone overhangs, but the status of the occupants remains uncertain.

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REFERENCES

Barrett, S. (1996). *A biological survey of mountains in southern Western Australia.* Report to Department of Conservation and Land Management.

Griswold, C.E. (1987). The African members of the trap-door spider family Migidae (Araneae: Mygalomorphae) 1: the genus *Moggridgea* O. P. Cambridge, 1875. *Annals of the Natal Museum* **28**: 1-118.

Main, B.Y. (1991). Occurrence of the trapdoor spider genus *Moggridgea* in Australia with description of two new species (Araneae: Mygalomorphae: Migidae). *Journal of Natural History* **25**: 383-397.

Main, B.Y. and Gaull, K. (1992). *Response of trapdoor spiders to fire in the Stirling Range*. Report to Department of Conservation and Land Management.

Table 1. Sites explored for *Moggridgea* spp. in Stirling Range and Porongurup National Parks. Sites which are underlined represent sites from which *Moggridgea* spp. were found. Those coordinates denoted with 'ca.' were calculated from Stirling Range National Park 1:50 000 map; all others were GPS readings taken in situ.

Locality	Previous data	New data	Coordinates
Stirling Range National Park			
Toolbrunup Peak, walking trail	Site first discovered by BYM in 1991.	Original study site badly affected by bushfires in 1996. Many *Moggridgea* burrows destroyed, and creek banks eroding due to scorching and loss of vegetation.	34°23'32"S 118°03'32"E 50 597338E 6193829N
Mt Magog	1 male pitfall trapped by Sarah Barrett (CALM, Albany) in 1995.	Site inspected closely April 1996. Eucalypt and shrubs thicket with deep litter. Also examined scree slope slightly to the east of the trap site. No *Moggridgea* found.	34°23'59"S 117°56'35"E 50 586676E 6193312N
Mt Magog Picnic Site	-	Deeply incised creek banks inspected. No *Moggridgea* found.	34°24'32"S 117°55'12"E 50 584554E 6192117N
White Gum Flat	-	No *Moggridgea* found.	ca. 50 583350 6192750N
Talyuberlup Picnic Site	-	Site discovered April 1996. Single burrow on south side of road. Good population in creek gully on north side of Stirling Range Drive.	34°24'54"S 117°57'21"E 50 587856E 6191407N
Talyuberlup Peak walking trail	-	Some shaded areas, clay soil. No *Moggridgea* found.	?
Stirling Range Drive	-	Several creek sites examined, including Mabinup Creek. No *Moggridgea* found.	ca. 50 597850 6198350N
Red Gum Spring and Red Gum Hill	-	No *Moggridgea* found.	ca. 50 572200 6195950N
Moingup Spring	-	Inspected by BYM in 1992 and 1996. No *Moggridgea* found.	ca. 50 601000 6192600N
The Cascades walking trail, creek #1	Site first discovered by BYM in 1991.	Badly affected by 1991 bushfire, mostly due to erosion of banks, and vigorous regrowth of sedges and shrubs.	ca. 50 614250 6196100N

Locality	Previous data	New data	Coordinates
The Cascades walking trail, creek #2	Site first discovered by BYM in 1991.	Badly affected by 1991 bushfire, mostly due to erosion of banks, and vigorous regrowth of sedges and shrubs.	ca. 50 614200 6195900N
The Cascades	Site first discovered by BYM in 1990.	Population severely depleted through erosion and growth of sedges and woody shrubs after 1991 bushfire.	34°22'29"S 118°14'17"E 50 613838E 6195597N
Bluff Knoll Walking Trail	Site first discovered by BYM in 1990.	Not reinspected during this survey.	ca. 50 614750 6195850N
North-East Track	-	Several north flowing creeks were inspected. No *Moggridgea* found.	ca. 50 621000 6201500N
Moir Hill Track	-	Swampy area with Yate inspected. No *Moggridgea* found.	ca. 50 622500 6200600N
Ellen Track, E. of Arthurs Knob	-	East flowing creek examined. No *Moggridgea* found.	ca. 50 626400 6198950N
S. of Pyungorup Peak	-	Junction of two creeks examined. No *Moggridgea* found.	34°22'17"S 118°19'20"E 50 621584E 6195868N
South Mirlpunda Track, N. end	Site first discovered by BYM in 1991.	Not reinspected during this survey.	ca. 50 614250 6196100N
Ellen Track, W. end	Site first discovered by BYM in 1991.	Small population of *Moggridgea* in deeply incised creek wall.	34°22'53"S 118°17'18"E 50 618433E 6194776N
South Isongerup Track, N. end	Two sites first discovered by BYM in 1991.	Heavily overgrown with post-fire *Acacia* thickets. Actual bank with *Moggridgea* population not reinspected closely during this survey.	ca. 50 617700 6195500N
Ellen Track, near washed-out creek	-	*Moggridgea* not found.	34°23'25"S 118°18'03"E 50 619585E 6193797N
Bluff Knoll, S. face	-	Very small population of *Moggridgea* found in rocky banks.	ca. 50 616100 6193600N
East Pillenorup Track	-	Shallow creek gully inspected. No *Moggridgea* found.	ca. 50 610950 6189900N

Locality	Previous data	New data	Coordinates
Wedge Hill	-	Small population of *Moggridgea* found in gully on S. face.	34°23'17"S 118°10'18"E 50 607710E 6194181N
Porongurup National Park			
S. end of Millinup Pass	Two juveniles collected by MSH & J.M. Waldock in 1993.	Several old tubes found on tree bark. Some juveniles detected.	34°41'43"S 117°53'51"E
Cockatoo Creek	-	Several old tubes and several juveniles observed.	
"Waddy's Hut" at Mira Flores	-	Few old tubes found on tree trunks.	

Table 2. Sites at which it is possible that *Moggridgea* sp. S occurs, but have not been sampled. Sites were assessed visually from the distance in April-May, September and December 1996.

Site	Description	Coordinates
Mondurup Peak	South face with several deep, heavily wooded gullies.	ca. 50 574850 6192500N
Henton Peak	South face with two deep, heavily wooded gullies.	ca. 50 582000 6195900N
Coyanarup Peak	Two major NW facing gullies, heavily wooded.	ca. 50 613800 6193250N ca. 50 614900 6193000N
Kyanorup Eminence	Small south-east facing gully.	ca. 50 613100 6191850N
Mt Success	Deep south facing gully.	ca. 50 610700 6193300N
Bluff Knoll / Isongurup through to Ellen Peak	South face of the massif has numerous drainage lines which probably contain *Moggridgea*, especially above 700 m.	

Table 3. Voucher specimens of *Moggridgea* spp. in Stirling Range and Porongurup National Parks. WAM, Western Australian Museum; BYM, B.Y. Main collection, University of Western Australia.

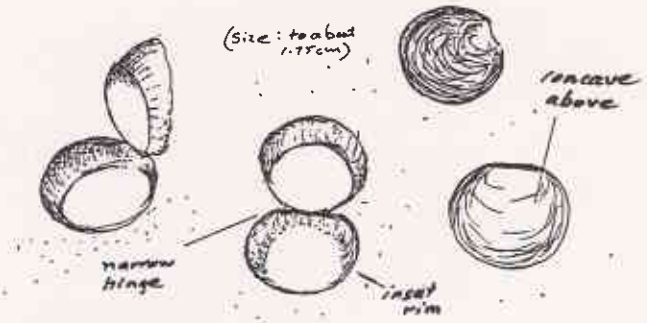
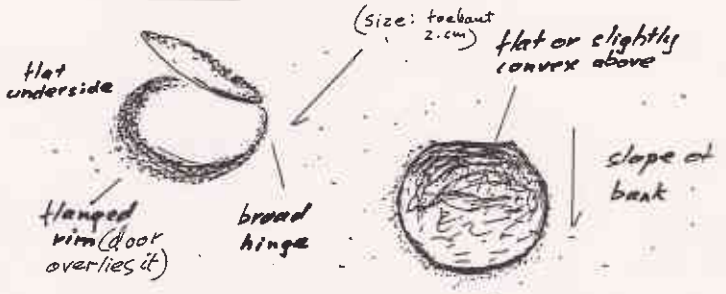
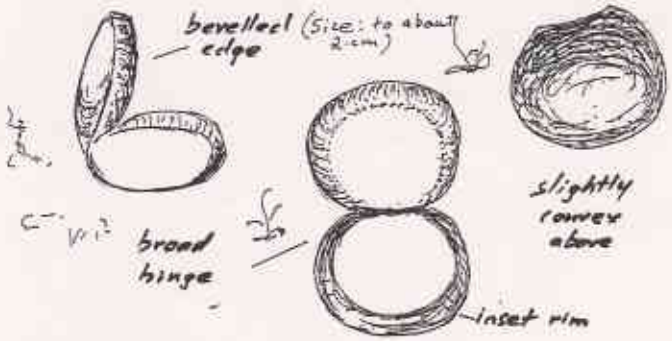
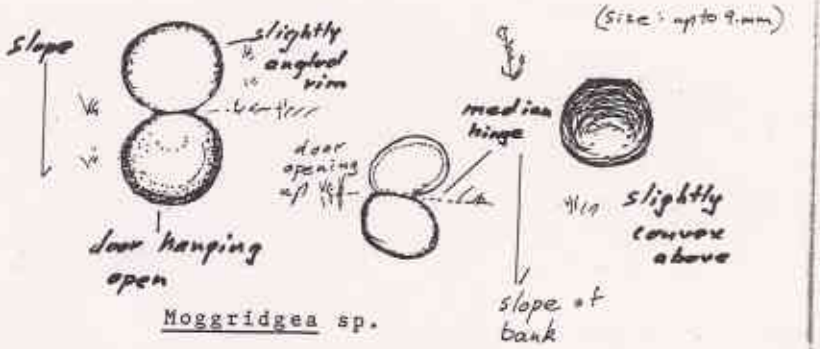
Identification	Registration no.	Locality	Date	Sex/stage
Moggridgea sp. S	WAM 93/853	Stirling Range Natl Park: Toolbrunup	1 April - 24 May 1993	1 ♂
Moggridgea sp. S	WAM 96/1668-1669	Stirling Range Natl Park: Toolbrunup	23 April 1996	2 juveniles
Moggridgea sp. S	BYM 1991/14-18	Stirling Range Natl Park: Toolbrunup	24 October 1991	7 ♀ and immatures
Moggridgea sp. S	WAM 96/1671	Stirling Range Natl Park: Talyuberlup Picnic Site	25 April 1996	1 adult ♀ and young
Moggridgea sp. S	WAM 95/1206	Stirling Range Natl Park: Mt Magog	19 September 1995	1 ♂
Moggridgea sp. S	BYM 1990/24-25	Stirling Range Natl Park: Bluff Knoll walking trail	4 July 1990	2 ♀
Moggridgea sp. S	BYM 1990/40-41, 43	Stirling Range Natl Park: The Cascades	10 September 1990	3 ♀
Moggridgea sp. S	BYM 1991/6	Stirling Range Natl Park: Moongoongoonderup creek (valley between Bluff Knoll, Moongoongoonderup and Isongurup)	22 October 1991	1 ♀
Moggridgea sp. S	WAM 96/1670	Stirling Range Natl Park: Wedge Hill	17 December 1996	1 ♀?
Moggridgea sp. P	WAM 94/353-354	Porongurup Natl Park: S. end of Millinup Pass	30 March 1993	2 juvenile ♀
Moggridgea sp. P	WAM 96/1667	Porongurup Natl Park: Cockatoo Creek	28 April 1996	1 juvenile ♀

Table 4. Criteria used for assessing the demographic status of populations and prognosis for recovery potential (if a burnt site) or persistence (if an unburnt site).
S/M = small to medium doors (i.e. door diameters up to 4. 0 mm)
M/L = medium to large doors (i.e. door diameter greater than 4.0 mm).

Demographic status	No. present per 5 x 1 m transect or per m^2	Recovery potential or persistence likelihood
Good	>10 and >25% S/M	Yes
Moderate	>10 and <25% S/M	Yes
Fair	5 to 10 and S/M and M/L present	Likely
Poor	<5 and S/M and M/L present	Unlikely
Terminal	<5 and S/M only present	Unlikely

Table 5. Summary of the demographic status and prognosis for recovery potential or persistence of populations from sites where counts were made of burrows, i.e. doors. (See Table 4 for criteria for assessment). Present: nests and/or spiders noted but unable to make an assessment.

Site	Demographic status	Prognosis for recovery potential/persistence
Stirling Range National Park		
Toolbrunup Peak (north bank)	Good	Yes
Toolbrunup Peak (south bank)	Fair	Likely
Mt Magog	Present	?
The Cascades walking trail, creek #1	Fair	Likely
The Cascades walking trail, creek #2	Moderate	Yes (but long term, possibly 20 years)
The Cascades	Good	Yes (but long term, possibly 20 years)
Talyuberlup Picnic Site	Good	Yes
Moongoongoonderup, Ellen Track, W. end	Good	Yes
Bluff Knoll, south face	Terminal	Unlikely
Wedge Hill	Probably good	Yes?
Porongurup National Park		
S. end of Millinup Pass	Present	Yes, if unburnt
Cockatoo Creek	Present	Yes, if unburnt
"Waddy's Hut" at Mira Flores	Present	Yes, if unburnt

SOIL	TOPOGRAPHY	DOORS SPECIES
SAND	Outwash, southern foot of eastern peaks	 Aganippe sp
	Creek banks	 Eucyrtops sp. 1
LOAMY CLAY & CLAY	Slopes & creek banks	 Eucyrtops sp. 2
	Creek banks	 Moggridgea sp.

BYM

Figure 1 Illustrations depicting different trap door types found in the Stirling Range National Park.

Plate 1 Female *Moggridgea* sp. S from Toolbrunup. Note heavy spination on anterior legs and two rows of widespread eyes. Photograph by Jiri and Marie Lochman.

Plate 2 Female *Eucyrtops* sp. from Bluff Knoll. Note dense scopula (brushes of hairs) on anterior legs. Photograph by Jiri and Marie Lochman.

Plate 3 An open door and entrance of burrow of *Moggridgea* sp. S at Toolbrunup. Note downward "hang" of door. Photograph by Jiri and Marie Lochman.

Plate 4 Aggregation of *Moggridgea* sp. S burrows at Toolbrunup, some doors opened. Note various orientations of openings. Photograph by Jiri and Marie Lochman.

Plate 5 Closed plug-like door of *Eucyrtops* sp. from Bluff Knoll. Photograph by Jiri and Marie Lochman.

Plate 6 Open plug-like door of *Eucyrtops* sp. from Bluff Knoll. Photograph by Jiri and Marie Lochman.

Plate 7 Closed wafer-like door of *Eucyrtops* sp. from Moingup Creek. Photograph by Jiri and Marie Lochman.

Plate 8 Open wafer-like door of *Eucyrtops* sp. from Moingup Creek. Photograph by Jiri and Marie Lochman.

Plate 9 An open nest, without door, of *Moggridgea* sp. P at south end of Millinup Pass, showing slightly angled rim of opening and the bulbous outline of the nest. Photograph by Western Australian Museum.

Map 1 Known distribution of *Moggridgea* sp. S in Stirling Ranges National Park.

Map 2 Localities in the Stirling Ranges National Park from which *Moggridgea* sp. S was not located (•) or is suspected (*).

Map 3 Known distribution of *Moggridgea* sp. P in Porongurups National Park.

Map 4 Known distribution of *Moggridgea* sp. S in Stirling Ranges National Park (1:50 000 map; situated in separate Postpak).

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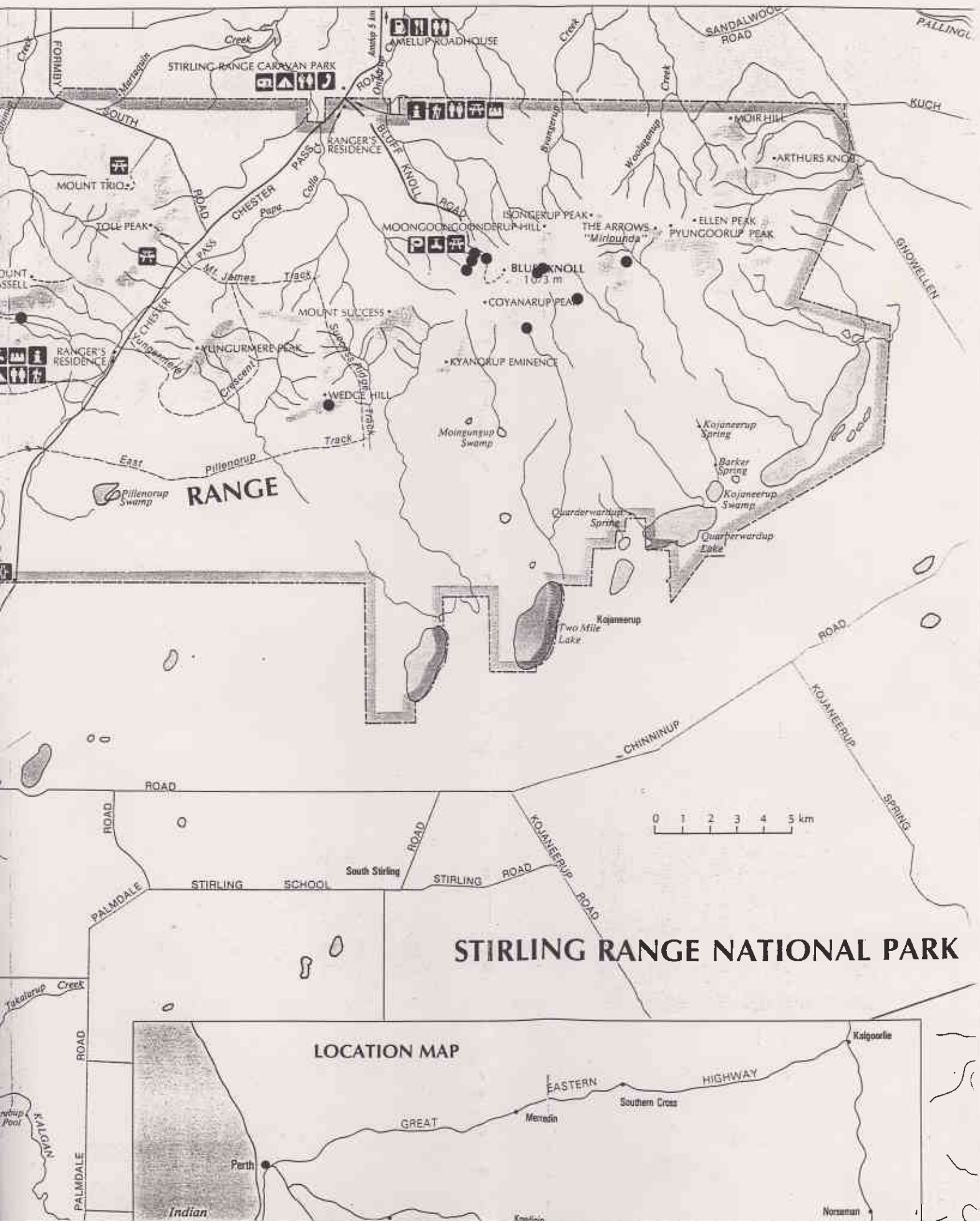
• *Mog*

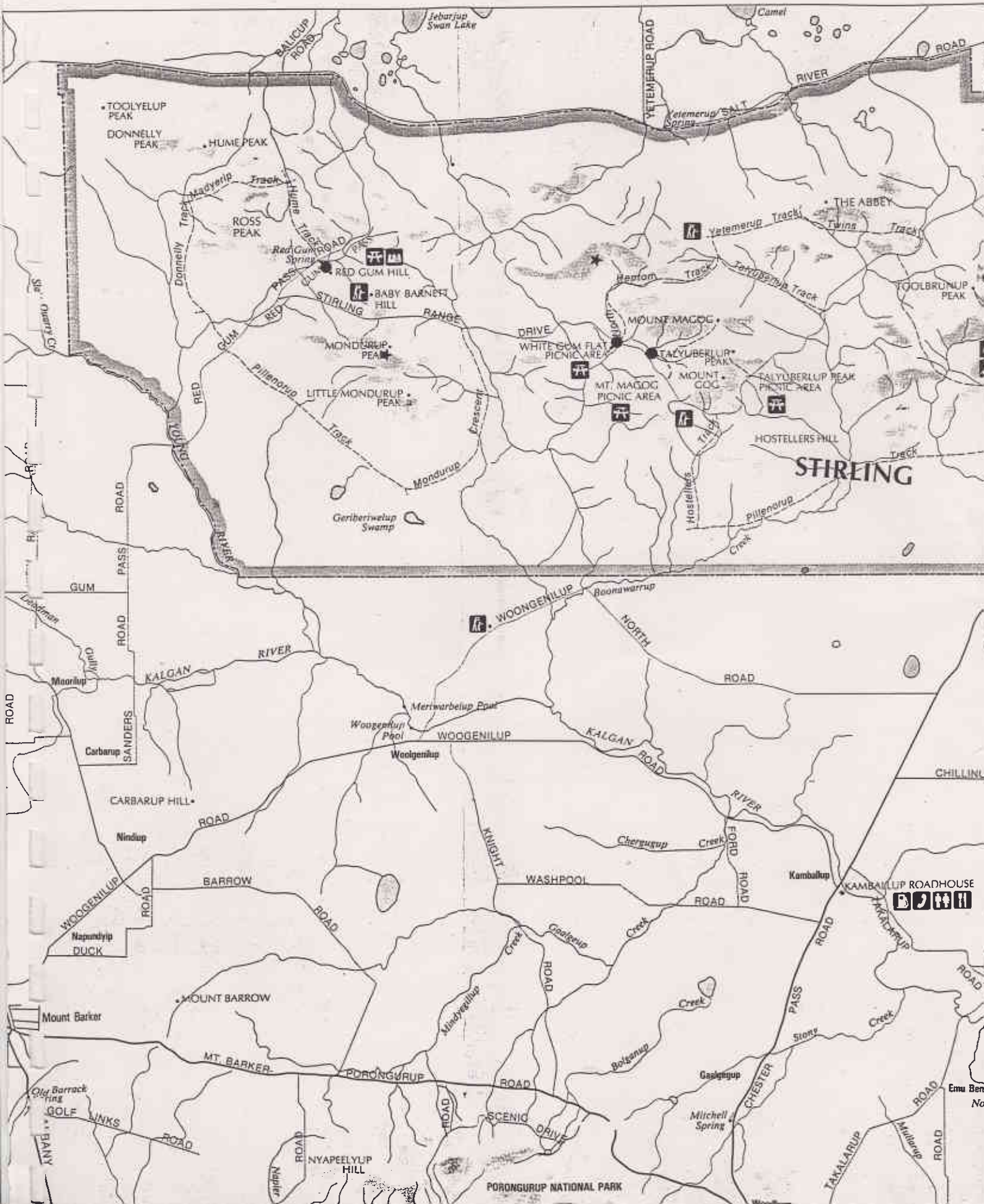

Jebarjup Swan Lake
Camel
BALICUP ROAD
YETEMERUP ROAD
ROAD
RIVER
Yetemerup Spring
SALT
TOOLYELUP PEAK
DONNELLY PEAK
HUME PEAK
Madyerip Track
Hume Track
ROSS PEAK
Donnelly Track
Red Gum Spring
RED GUM HILL
BABY BARNETT HILL
RED GUM PASS ROAD
STIRLING RANGE DRIVE
MONDURUP PEAK
LITTLE MONDURUP PEAK
Pillenorup Track
Mondurup Track
Crescent
Geriberiwelup Swamp
THE ABBEY
Yetemerup Track
Twins Track
Talyuberlup Track
Henton Track
TOOLBRUNUP PEAK
MOUNT MAGOG
WHITE GUM FLAT PICNIC AREA
TALYUBERLUP PEAK
MOUNT COG
TALYUBERLUP PEAK PICNIC AREA
MT. MAGOG PICNIC AREA
HOSTELLERS HILL
Hostellers Track
Pillenorup Creek
STIRLING
Quarry Rd
RED GUM PASS ROAD
GUM
Leadman
Gully
KALGAN RIVER
Moorilup
Carbarup
SANDERS
CARBARUP HILL
WOONGENILUP
Boonawarrup
NORTH ROAD
Meriwarbelup Pool
Woogenilup Pool
Woogenilup
WOOGENILUP
KALGAN ROAD
RIVER
CHILLINU
ROAD
Nindup
WOOGENILUP
BARROW ROAD
KNIGHT
WASHPOOL ROAD
Cherguguo Creek
FORD ROAD
Kamballup
KAMBALLUP ROADHOUSE
TAKALARUP
Napundyip
DUCK
Gaalgegup Creek
Creek
ROAD
PASS
MOUNT BARROW
Mount Barker
Mindyegillup
Creek
Stony
Creek
MT. BARKER POROGURUP ROAD
Bolganup
Gaalgegup
CHESTER
Old Barrack Spring
GOLF LINKS ROAD
ALBANY
ROAD
ROAD
SCENIC DRIVE
Mitchell Spring
ROAD
Emu Ben
TAKALARUP
Mullarup
ROAD
NYAPEELYUP HILL
Napier
POROGURUP NATIONAL PARK

gridgea sp. S recorded



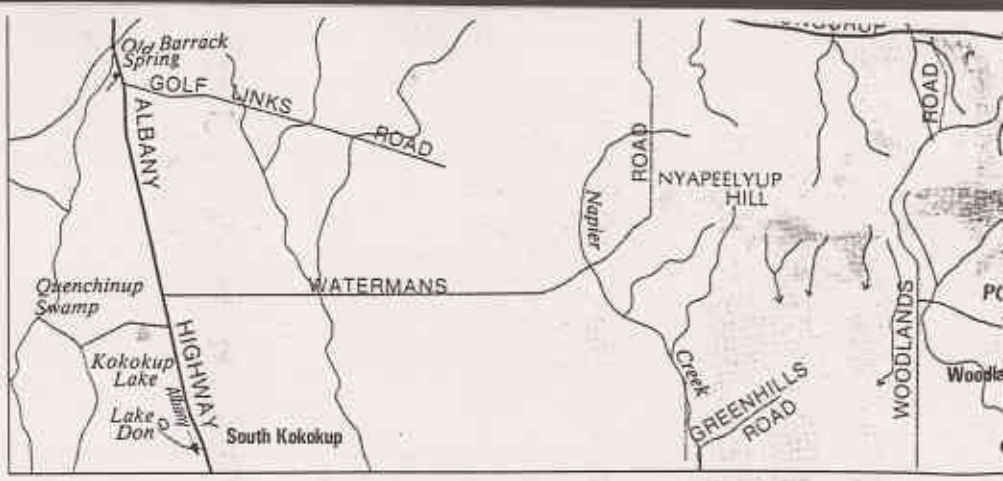
● *Moggri*

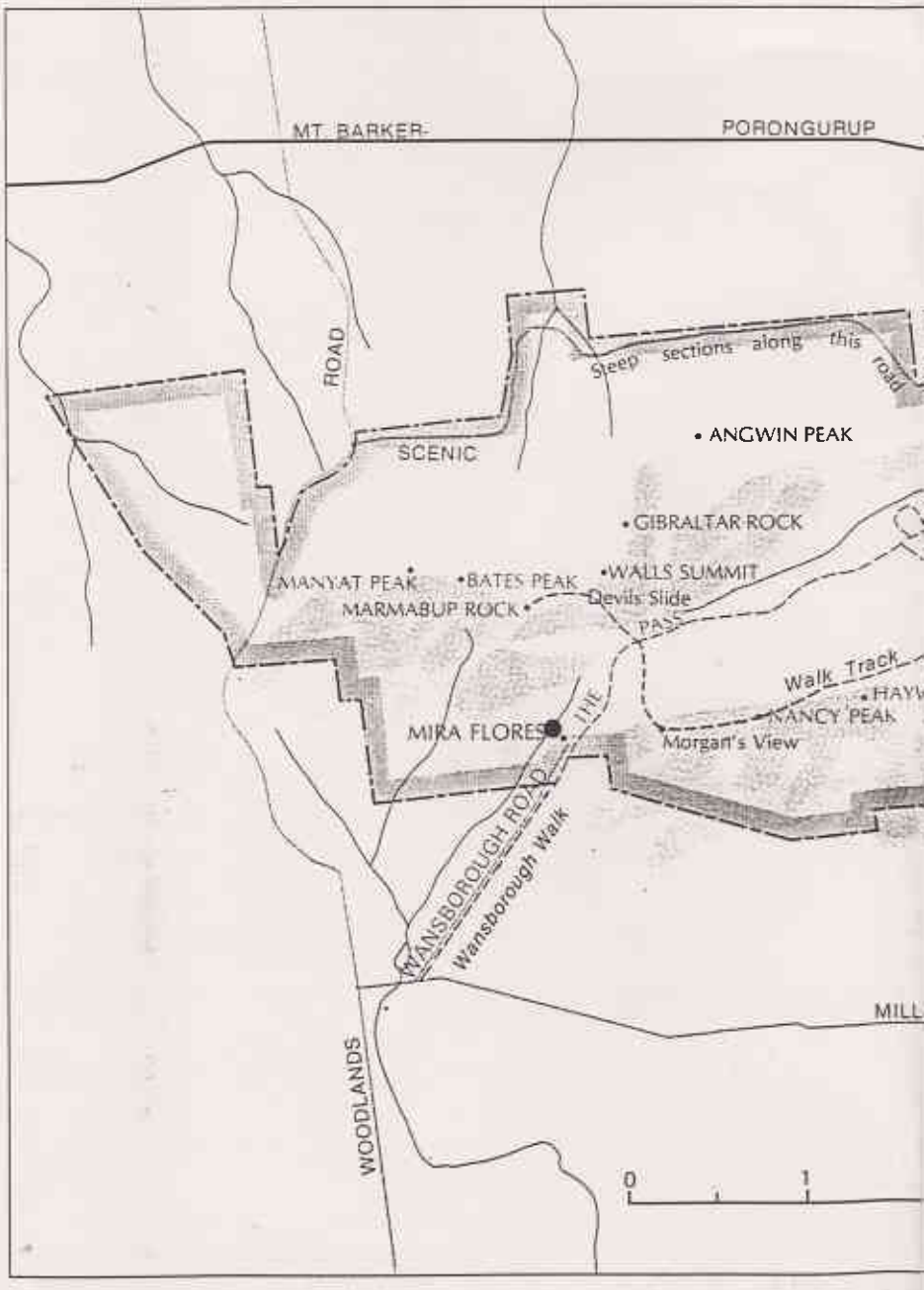
* Potentia



dgea sp. S not found

d *Moggridgea* sp. S sites


Old Barrack Spring
GOLF LINKS ROAD
ALBANY
ROAD
NYAPEELYUP HILL
Napier
Quenchinup Swamp
WATERMANS
HIGHWAY
Kokokup Lake
Lake Don
Albany
South Kokokup
Creek
GREENHILLS ROAD
WOODLANDS
ROAD


MT BARKER-
PORONGURUP
ROAD
Steep sections along this road
SCENIC
• ANGWIN PEAK
• GIBRALTAR ROCK
MANYAT PEAK
• BATES PEAK
• WALLS SUMMIT
MARMABUP ROCK •
Devils Slide
PASS
Walk Track
MIRA FLORES
LINE
NANCY PEAK
Morgan's View
WANSBOROUGH ROAD
Wansborough Walk
WOODLANDS
0
1

oggridgea sp. P recorded