WESTERN BRISTLEBIRD

RECOVERY TEAM

ANNUAL REPORT

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Compiled and edited by
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for

The Western Bristlebird Recovery Team

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SUMMARY

During 1994 a Recovery Team was formed and the Team has commenced implementation of the Research Plan. Existing and potential sites of occurrence were mapped east of Manypeaks to the eastern limit of distribution (Fitzgerald River National Park), resulting in increased knowledge of population boundaries and the discovery of several "new" locations. Two bristlebirds were caught and followed by radio-tracking at Two Peoples Bay Nature Reserve. Detailed vegetation mapping and sampling has been carried out in this area. Home-ranges were determined also by mapping singing birds in the same area; little change has occurred since G. Smith's mapping of home-ranges during 1975-76. Several potential translocation sites were identified.

INTRODUCTION

The following report is a summary of research carried out under the Western Bristlebird Research Plan in 1994 (first year of funding). Implementation of the Plan was made possible by funding from the Australian Nature Conservation Agency (ESP Project No.: 445) and CALM. During the year, a Recovery Team was set up to oversee the implementation of the Research Plan (Cale and Burbidge 1993). The Recovery Team consists of:

Dr Allan Burbidge (Chair) (CALM, Science and Information Division)
Dr Andrew Burbidge (CALM, WA Threatened Species and Communities Unit)
Dr Graeme Smith (CSIRO, Division of Wildlife & Ecology)
Mr Bruce Male (ANCA, Endangered Species Unit)
Mrs Brenda Newbey
Mr Alan Danks (CALM, South Coast Region)
Mr Kelly Gillen (CALM, South Coast Region).

Several of the above people and Mr Peter Cale met early in the year to begin implementation of the Research Plan and to initiate the formal setting up of a Recovery Team. Once formalised, the Team met once during the year, on 22 November 1994 at Two Peoples Bay. The Team was briefed on progress to date and a field inspection of research sites in Two Peoples Bay was carried out.

This report consists of a summary of progress in each of the tasks listed in the Research Schedule of the Research Plan (Cale and Burbidge 1993).

PROGRESS

Task 1: Population survey to map boundaries and determine index of relative density.

The location and extent of Bristlebird populations in the Manypeaks - Two Peoples Bay area is already relatively well known because records of Bristlebirds are noted during annual censuses for the Noisy Scrub-bird program (A. Danks pers. comm.). For the present survey, therefore, priority areas for investigation were to the east of the Scub-bird areas.

The objectives of the present survey were to search for Western Bristlebirds east of Waychinicup National Park to the eastern edge of the Fitzgerald River National Park, checking if previously known populations are still present and seeking additional populations. Where a population was found, an attempt was made to determine its geographic extent.

Part of the survey was carried out by B. Newbey, and part by S. McNee. Roads and tracks through all known and suspected Bristlebird habitat were traversed, and observations made in areas where Bristlebirds had previously been reported or were it was thought Bristlebirds were likely to occur. Some "random" sites were inspected where there was a lower chance of detection of Bristlebirds. This was done in order to avoid sampling only within any pre-conceived boundaries of "suitable" habitat. It is possible that Bristlebirds may have a broader habitat tolerance than currently perceived, and this suggestion is supported by observations at Sinker Reef, at Two Peoples Bay (see under Task 2.4, below). At all sites inspected, one or more observers spent 40 minutes or more walking slowly, pausing and, at most sites, playing a recorded tape of Bristlebird calls at intervals.

At some sites, Ground Parrots or Western Whipbirds were detected, and such occurrences were noted by the observer.

At sites where Bristlebirds were detected, vegetation was described using the coding system of Muir (1977) (see Appendix 1). One or two dominant species from each stratum were also listed. At many sites, the vegetation was quite variable within the site. In these cases, the vegetation was described at the point where the bird was first detected or, in the case of a "negative" site, in an area which appeared to be typical of the site.

Dates and general locations of field work are shown in Table 1.

All sites inspected are listed in Appendix 2 under the headings which correspond with the 1:50 000 map series (RF) which was used at 200% for mapping of sites. The sites are arranged alphabetically by site-type (see below), and then in numerical order. If the same site was checked more than once, all the records for that site are listed consecutively in chronological order. "Positive" sites (where Western Bristlebirds were recorded) and "negative" sites (where Western Bristlebirds were not recorded) are listed separately. If, however, a negative site was later found to be positive, it is listed with the positive sites.

Sites were classified as K, R, S or T, as shown in Table 2.

Table 1: Dates and locations of field work carried out during the Western Bristlebird population survey on the south coast of Western Australia in spring 1994.

Trip No.	Dates (1994)	Observer/ Assistant *	Location by 1:50 000 map name
1	29/6 to 4/7	BN / No	Jacup (NW part of FRNP)
2	8/7 to 15/7	BN / Yes	Bland, Darlingup, Twertup (W end of FRNP), Drummond (E end of FRNP)
3	26/7 to 1/8	BN / No	Bland, Darlingup,Twertup (W end of FRNP), Jacup (NW part of FRNP), Mainerup (northern FRNP), Whoogerup (SE part of FRNP)
4	16/8/94 to 25/8	BN / Yes	Bland (W end of FRNP), Jacup (NW part of FRNP), Drummond (E end of FRNP), Mount Manypeaks, Green Range(W of Cape Riche), Haul-off Rock (Cape Riche area), Whoogerup (SE part of FRNP), Cocanarup (northern FRNP)
5	20/9/94 to 22/9/94	BN / Yes	Mount Manypeaks, Two Peoples Bay
6	17/11/94 to 29/11	BN / No, but with S. McNee & W. Lewis for much of trip.	Bremer (near Gordon Inlet), Drummond (E end of FRNP), Jacup (NW part of FRNP), Hood (E of Bremer Bay), Whoogerup (SE part of FRNP)
7	10/10/94 to 17/10/94	SM / No	Waychinicup, Bluff Creek area, Mt Melville (Sandalwood Rd area)
8	27/10/94 to 4/11/94	SM / No	Mt Melville area, Mt Groper area, Warramurrup, N of Pallinup River (Millers Pt Rd area)
9	17/11/94 to 28/11/94	SM / Yes	Fitzgerald Track, Twertup Track, NW boundary of FRNP, Bell Track (mid-northern part of FRNP), Telegraph Tk (Woolbernup Hill - Twin Bay Tk area) (mid-southern part of Park)

Key: BN = B. Newbey; SM = S. McNee; FRNP = Fitzgerald River National Park

Figure 1 shows areas searched west of Cape Riche and locations of sites where Western Bristlebirds were found, and Figure 2 shows similar information for east of Cape Riche. All near-coastal roads between Manypeaks and Fitzgerald River National Park were surveyed but unless there was potential habitat present, such routes are not shown as search areas in Figures 1 and 2. Most native vegetation in this area has been cleared for agriculture. A small amount of potential habitat exists away from roads near the coast in this area, but was not searched due to lack of time. In Fitzgerald River National Park, large areas were not surveyed because they were burnt in the extensive fires of 1989 (Figure 3; see also McCaw *et al.* 1991).

Results obtained at each site are shown in Appendix 2. Locations of all sites are plotted on maps held at CALM's Wildlife Research Centre, Woodvale, WA. Further details, including location by distance and listening conditions, and exta Western Whipbird locations, are included in field note books. Ground Parrot records incidental to the bristlebird work are listed in Appendix 3.

Table 2: Classification of sites examined for presence of Western Bristlebirds.

Code	Description
K	Known at some time previously to have been "positive" for Western Bristlebirds. Vegetation data were recorded whether positive or negative.
R	"Randomly" selected sites at about 3km intervals IF there was any chance of a positive result i.e. in KSr (Very Open Shrub Mallee) or KSi (Open Shrub Mallee) with SCi-d or SDi-d (sparse to dense heaths or dwarf scrubs up to 1 m). Vegetation data were recorded only if positive. The intention with these sites was to sample areas slightly outside of vegetation types believed to be promising.
S	Speculative; looked promising. Vegetation data were recorded whether positive or negative.
T	Transect. Various times walking slowly along track (usually) playing tape intermittently. The minimum distance was 400m and the minimum time 40minutes. Vegetation data were recorded always if a positive record of Bristlebird presence was made, and frequently if negative, if the habitat appeared suitable.

Notes:- (1) Random was not a useful category and was little used.
(2) If two people were doing a site e.g. a T site, walking in opposite directions from a central point, then the site could be, and occasionally was completed in 20 minutes (20 + 20 =40).

Birds did not always respond vocally to the taped calls, but did so frequently enough to enable the survey to be made over the entire day in cooler months. Often, a bristlebird call was not heard until 10-15 minutes after the last taped call played, and in these cases, the call was presumably not in response to the tape. However, sometimes the calling bird would join in with the tape. In the work at Tick Flat (see under Task2.4 (a), below) it was also found that response to taped calls was very variable. Responses to playback may have been more predictable earlier in the year, but timing of field work in 1994 was to some extent determined by availability of suitable personnel.

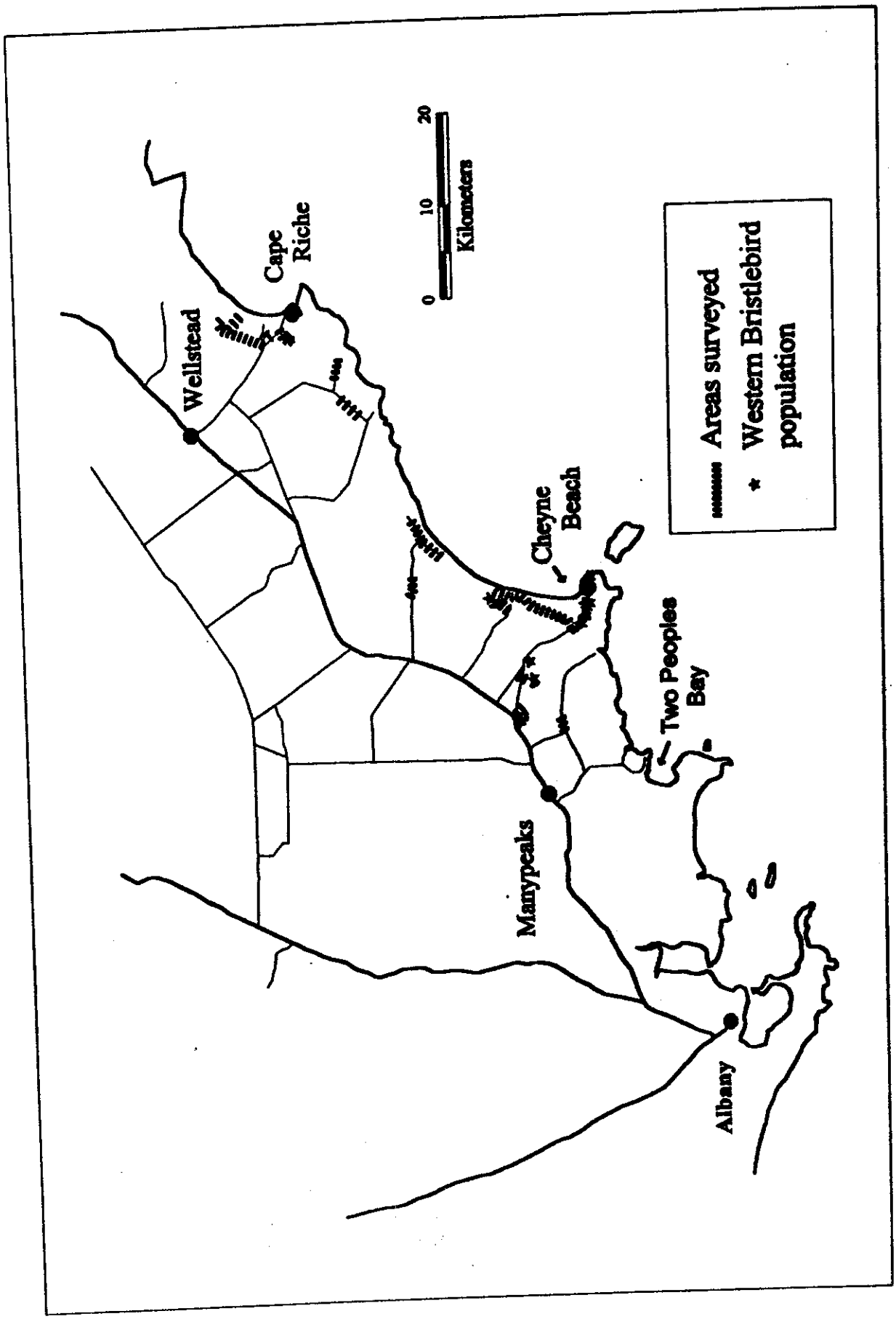

Figure 1: Areas searched for Western Bristlebirds from Cape Riche westward.

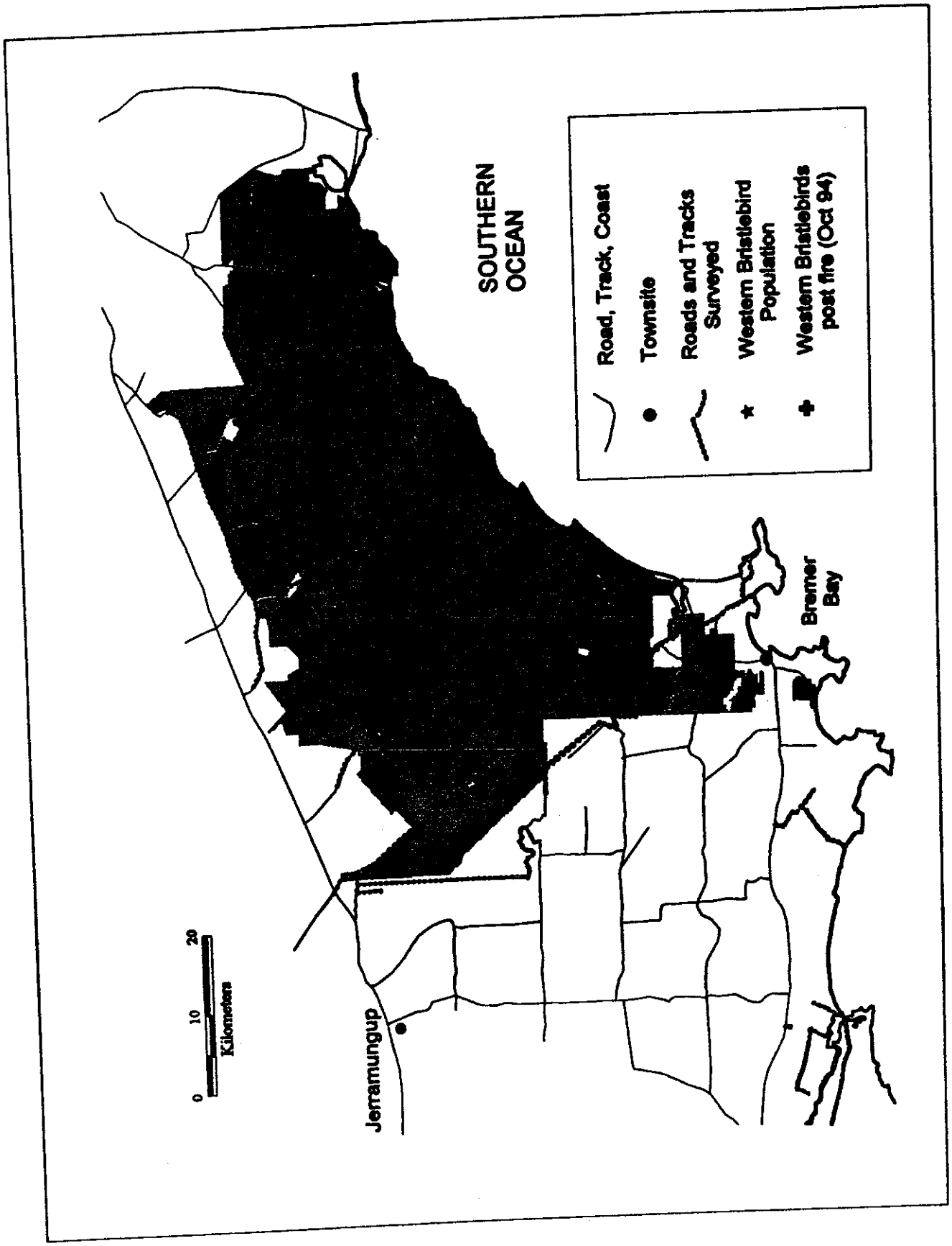

Figure 2: Areas searched for Western Bristlebirds east of Cape Riche. (Fitzgerald River National Park is shaded).

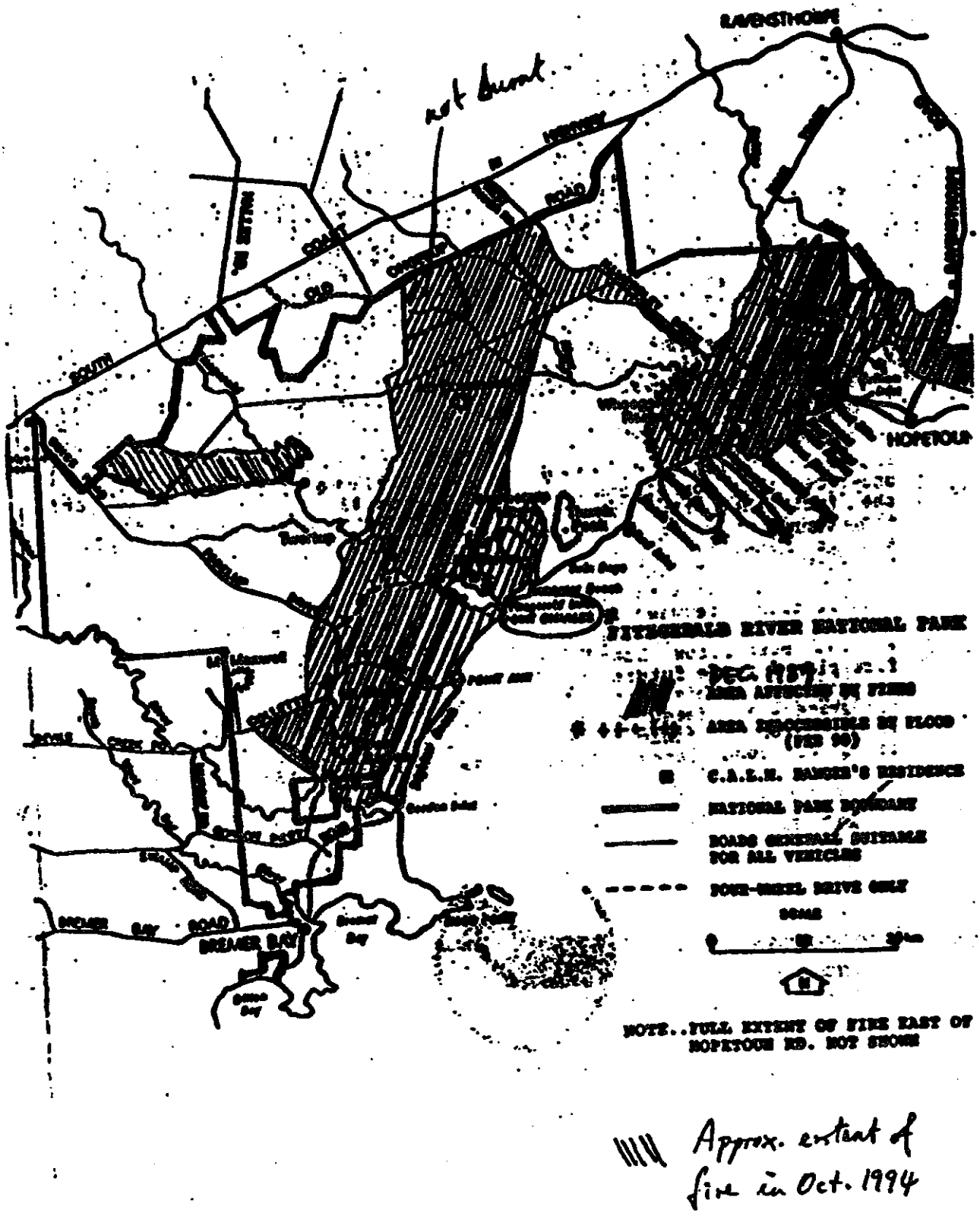

Figure 3: Extent of the 1989 and 1994 fires in Fitzgerald River National Park.

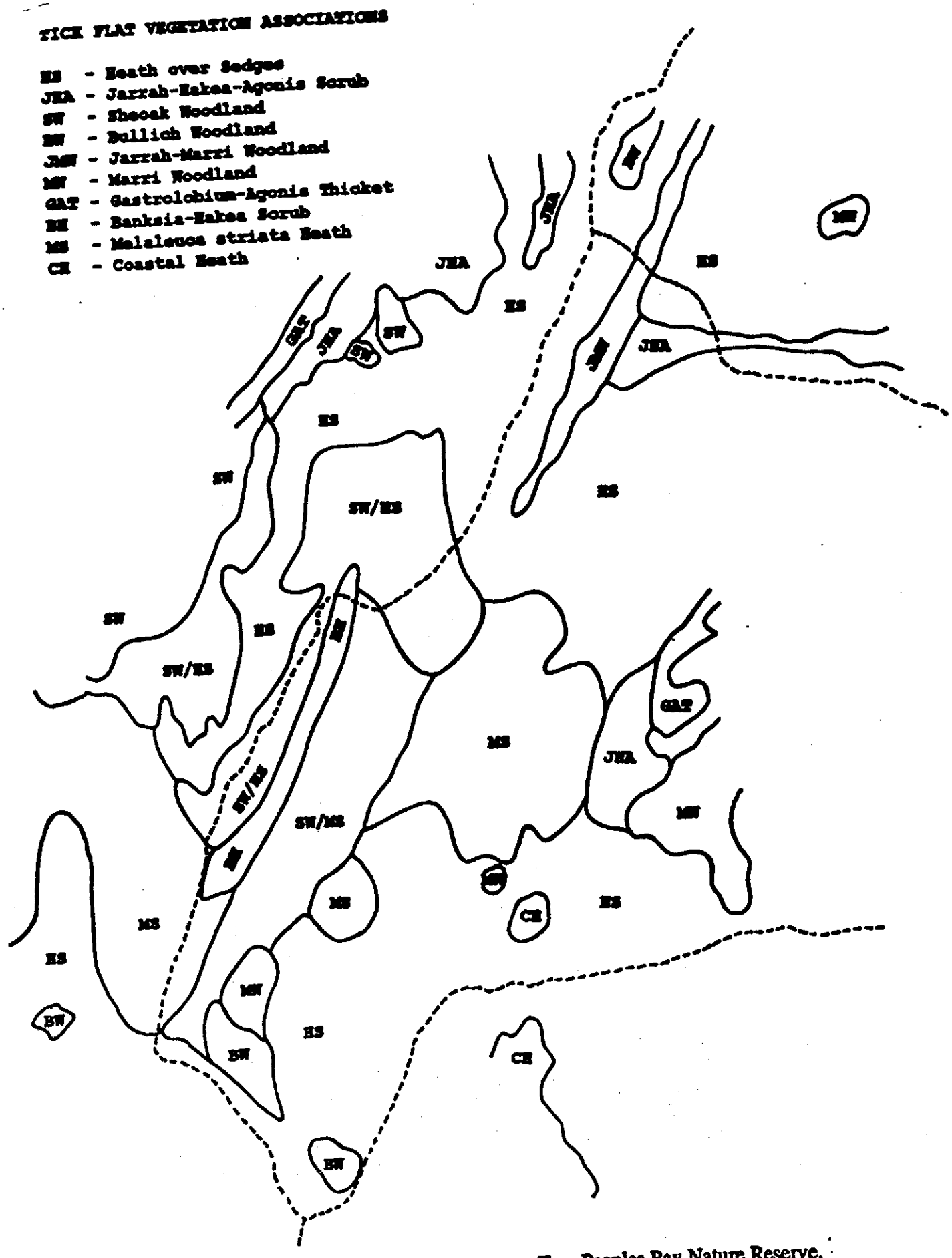

Figure 4: Vegetation map of the Tick Flat area, Two Peoples Bay Nature Reserve.

A total of only about 120 individual Western Bristlebirds were detected during the course of the survey. This probably represents about 75-95 pairs. This should not be considered the total population in this area for two reasons. First, the variable response to playback would have meant that unh unknown proportion of birds would have been missed, and it is likely that a different proportion would have been missed in different populations, particularly in small populations. Second, the amount of time available for this work was, in hindsight, insufficient. This meant that most effort was put into determining, as far as possible, species presence and the boundary of each population.

In any case, the available data suggest that the stronghold of the species is in Two Peoples Bay Nature Reserve. Here, where the information is much more detailed, the population was estimated to include about 245 pairs in 1991 (A. Danks, cited in Cale and Burbidge 1993). In the Manypeaks, Waychinicup, Boulder Hill, Angove area, there is estimated to be at least 50-100 pairs (A. Danks, pers. comm., January 1995). Thus the total known population of the Western bristlebird is estimated to be about 370-440 pairs.

The Fitzgerald Track area was surveyed in August and again in November, following the October fire (Figures 2, 3). When surveyed in November, three weeks post-fire, the bristlebirds had apparently moved to adjacent unburnt areas. Some of these birds were in an area used by bristlebirds in 1991 but where they were not detected in August 1994. These displaced birds were very vocal with long calling periods morning and evening and frequent calls throughout the day. There was little need for the tape. In almost all cases bristlebirds could be heard vocalizing in pairs, and often these pairs were in close proximity to other pairs. At no other time during the survey were birds so noisy or so close-packed.

It was surprising that no bristlebirds were located north of the northern firebreak in the vicinity of T70-0,2,7 and 9 as the habitat appeared to be a continuum with the other side of the firebreak, and quite extensive. However, it had not been subject to the same treatment as the south side which is itself a firebreak, and may have been subjected to various mangement actions including prescription burns.

All bristlebirds recorded in Fitzgerald River National Park occurred in broad vegetation structures mapped by Aplin (n.d.) and Aplin and Newbey (1990) as Pl (shrubs below 2m, open heath) or Et (shrubs above 2m, high open shrubland). These structural types are widespread in Fitzgerald River National Park, particularly in the northern and western areas. However, much of these structural types were also burnt in the fires of December 1989, which burnt about 150 000 ha of the Park (McCaw *et al.* 1991). The population of bristlebirds at Fitzgerald Track was, before the fire of October 1994, bounded, at least on the southern and eastern sides, by a change in vegetation structure and/or composition. In other areas, bristlebird populations were in a much larger area of structurally similar vegetation, but the degree to which plant species composition or fine scale vegetation structure changed across these areas is unknown.

Searches for bristlebirds in Fitzgerald River National Park were limited by access in that there are few tracks in some areas, and in others, such as along Telegraph Track, vehicle access is not permitted (Moore *et al.* 1991). However, because of the known limited nature of some populations, the known marked variability in plant species composition and fine-scale vegetation structure and the extent of recent fires, it is likely that no large populations of bristlebirds in the Park have been missed.

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Task 2: Assess changes in suitability of habitat with changing post-fire age.

Task 2.1: Census areas studied by G.T. Smith in 1976 to make comparisons with increased post-fire age.

The Tick Flat area was censused by Graeme Smith in winter - spring 1994, and his report included here as Appendix 4. He concluded that the relationship between habitat use and fire history for Western Whipbirds and Western Bristlebirds is similar, as follows. An area is recolonised between four and 14 years post-fire. The pattern of occupation is determined by the availability of colonists and the growth rate of the vegetation. Up to thirty years post-fire the habitat use and number of home ranges is almost constant. There is no evidence to suggest that loss of habitat suitability is responsible for the minor changes observed. By 50+ years post-fire, this constancy has generally been maintained, but there is a suggestion that a small number of locations may have been abandoned. These locations should be checked in 1995 to ascertain if the loss is genuine. (See Appendix 4 for the detailed report).

Task 2.2: Long-term monitoring of buffer strips at Two Peoples Bay

Following changes in the Two Peoples Bay Management Plan, in which it was determined that these buffers would no longer be burnt, this action became un-necessary. The relevant funding was therefore used for part of Task 2.1 (above) which was costed under the Western Whipbird Research Plan.

Task 2.3: Long-term monitoring of sub-populations in Fitzgerald River National Park where fire has been excluded.

No action was planned for this task in the first year.

Task 2.4: Determine microhabitat requirements.

Radio-tracking and vegetation survey work were carried out at Two Peoples Bay Nature Reserve in order to allow a quantitative comparison of activity patterns and vegetation structure and composition. There has been no time to do a detailed quantitative comparison within the deadline for this report, but the results of each study are presented below, together with a subjective account of habitat utilisation.

a) Radio-tracking

Western Bristlebirds were caught in mist nets and tracked by means of radio-transmitters in the Tick Flat area at Two Peoples Bay Nature Reserve in spring 1994. A detailed account of this work, which was carried out by Darren Murphy of Murcox Biological Services with assistance from Lawrence Cuthbert and Jessica Dyer, is included in Appendix 5.

The major obstacle to this work was the difficulty in catching bristlebirds. Once caught, radio-tracking posed few problems, but the major limitation on the data is the restricted sample size with respect to numbers of birds.

b) Vegetation

Chris Robinson carried out detailed sampling of vegetation structure and composition at Tick Flat, to enable the results of the censusing and radio-tracking projects to be related to habitat variables.

The vegetation sampling consisted of two components: regular sampling on a grid, and sampling at points known (from radio-tracking) to have been usd by Western Bristlebirds.

During the 1970s, Graeme Smith and Les Moore of CSIRO established a grid of vegetation sampling points in the Tick Flat area as part of work on Noisy Scrub-birds, Western Bristlebirds and Western Whipbirds. Based on an aerial photograph showing grid lines and plot locations (not permanently marked on the ground) of the Smith and Moore vegetation survey, the vegetation was re-surveyed at the old plot locations within the area being used for Task 2.1, above. Initially 111 plots were recorded, but this was later expanded to 160 (including 8 not permanently marked) following Darren Murphy's observations and radio tracking (see above).

Each of the Smith and Moore plots was located as accurately as possible using topographic and vegetation features in the 1976 aerial photograph. Each site was permanently marked with a galvanised steel dropper and an embossed aluminium label fixed with monil wire. Alpha-numeric labelling followed the Smith and Moore grid: plots north or south of the track were marked N or S respectively and one grid line east of the CSIRO hut was also marked E.

At each site a 2m x 2m square plot was laid out, with the dropper located in the SW corner of plots north of the track, and in the NW corner in plots south of the track (ie. the plots were laid out on the east side of the grid lines and away from the track).

A general description of the vegetation association(s) around the plot was recorded. Within each plot, estimated percentage of bare ground cover and projected foliage cover for each species was recorded. The number of individual shrubs was recorded with maximum and minimum heights. The number of *Melaleuca striata* shrubs within one plot was frequently estimated. Many stems support the continuous canopy of this species and it is not known whether each is a separate plant or whether they share a lignotuber beneath the ground. Sedge numbers were not recorded as they usually grow in clumps of indeterminate individual numbers. Minimum height was not recorded for many species whose canopy extends from ground level (eg. sedges).

Within the 2m x 2m plot structural data were recorded by estimating the total cover provided by all species at different height intervals. This data attempts to indicate suitability of the site for use by Bristlebirds, which are assumed to be favoured by dense cover close to the ground.

A measure of "covered tunnels" was also determined for each plot. Again assuming that Bristlebirds may be favoured by more dense vegetation close to the ground which provides cover for their movements, a score of 1 was given to a plot that was very open with little or no protective cover, to a maximum score of 5 for a plot with no bare ground and dense vegetation from ground to at least 0.5 m.

A 4m x 4m plot was laid over the 2m x 2m plot and percentage covers recorded for those additional species not located in the 2m x 2m. This provides an indication of the representativeness of the 2m x 2m.

Specimens of species unidentified in the field were determined at WA Herbarium. Specimens of some sedges will be labelled, mounted and incorporated in WA Herbarium as they are poorly collected and may be required by Karen Wilson's revision for the Flora of Australia.

A list of all plant species encountered is included in Appendix 6, and a description of vegetation associations in Appendix 7:

A vegetation map was prepared of Tick Flat valley (Figure 4) using 1986 1:4500 colour aerial photography and ground traverses. A classification of vegetation types was made according to Muir (1977). The map is accompanied by a clear plastic overlay, which can be used in conjunction with the maps of radio-tracking sites (Appendix 5). Colour slide photgraphy was taken of most vegetation associations to provide a general view and where possible, close up of the internal structure.

c) Vegetation Associations used by Western Bristlebirds

Radio tracking of two Bristlebirds captured and released by Darren Murphy showed contrasting movements and habitat use.

Bird 040 70913
Detailed notes at 32 tracked positions (see field note book) and 2 non-permanent 2m x 2m plot records were taken of floristics and structure. This bird's movements were erratic and extensive. It covered at least seven different vegetation associations, with a possible preference for the Jarrah-*Hakea-Agonis* association just downslope of the exposed granite on the southern flank of the valley.

Bird 040 70914
This bird's movements were restricted to what appeared to be a defined range. The bulk of the many tracking locations of were already covered by the 2m x 2m plots recorded in the initial grid program. Extra permanent plots (on the grid) were surveyed to cover bird movements into the Sheoak Woodland below the exposed granite on the north flank of Tick Flat valley. Data from 6 non-permanent plots was taken from the Jarrah-*Hakea-Agonis* scrub and *Gastrolobium-Agonis* thicket along the eastern margins of the exposed granite. The bird appeared to use these three associations and the more open Sheoak Woodland over Heath and Sedge. It did not appear to spend time in the Heath over Sedges separating the areas of Sheoak Woodland, but may have passed through quickly.

d) Sinker Reef

Prior to the project at Tick Flat, two bristlebirds were captured and released at the carpark above Sinker Reef. The vegetation at this location was Coastal Heath on shallow sand over limestone. Immediately around the carpark this association consisted of discreet clumps of shrubs (of one or more species; see Table 3) up to 1.5 m high and 3m or more across, separated by bare ground or low ground covers such as *Loxocarya* or prostrate *Hibbertia* spp. On the subdued ridges above and slopes below the carpark, *Banksia praemorsa*, *Agonis flexuosa* and *Adenanthos sericeus* form extensive windpruned canopies, 3m tall and up to 10 m long. Sedges did not form as significant a part of the vegetation here as they do in Tick Flat. Following their calls by ear, it appeared that the birds moved right around the carpark through all vegetation structures.

Table 3: Plant species which occurred in discreet clumps around the car parking area at Sinker Reef, Two Peoples Bay Nature Reserve.

Acacia littorea	*Spyridium majorifolium*
Agonis flexuosa	*S. globulosum*
Olearia axillaris	*Gyrostemon sheathii*
Leucopogon parviflorus	*Gompholobium confertum*
Lepidosperma gladiatum	*Clematis pubescens*
L. squamatum	*Rhagodia baccata*
Loxocarya cinerea	*Isolepis nodosus*
Hibbertia racemosa	*Helichrysum cordatum*
H. grossulariifolia	*Olax phyllanthi*
Dryandra nivea	*Melaleuca thymoides*
D. pteridifolia	*Leucopogon* sp.
D. sessilis	*Pimelea ferruginea*

This vegetation is significantly different in species composition to that in which Western Bristlebirds are normally found. It is similar to vegetation in a number of places further west along the coast at least to Augusta. However, it is not known whether this vegtation type can be used successfully for breeding, or whether it is only suitable for survival of individual birds.

Task 2.5: Translocation

Part of the purpose of the 1994 work was to provide a preliminary assessment of possible translocation sites. This is possible from the data gathered during Task 1 (survey). This revealed several possible sites.

In the Pabellup Drive area, Site R9 appeared quite suitable and is reasonably well separated from known occurrences at the Twertup Track sites. In the Devil Creek Road area, site T14, near Mt Maxwell, appeared very suitable, as did site S68, on "Hebs Track", south of Gordon Inlet, where the apparently suitable vegetation was quite extensive. T22 and T23 (N of Mt Drummond) also appeared suitable.

Further west, Mt Groper, and possibly Warramurrup Hill area, could provide suitable translocation sites.

Parts of Torndirrup National Park, south of Albany, may also be suitable as translocation sites. Noisy Scrub-birds have recently been translocated to this Park, and management for this species (particularly fire management) would be sympathetic to persistence of bristlebirds. Appropriate management of this site could probably be carried out much more easily than at any of the other sites mentioned above.

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APPENDIX 1: Muir's (1977) vegetation classification.

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Life form/ height class	Canopy cover			
	Dense d 70-100%	Mid-dense e 30-70%	Sparse i 10-30%	Very Sparse r 2-10%
T Trees > 30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB Trees < 5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S Shrubs > 2m	Dense Thicket	Thicket	Scrub	Open Scrub
SA Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SA Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SA Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SA Shrubs 0-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H Hummock Grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
GT Bunch Grass > 0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL Bunch Grass <0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT Sedges >0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL Sedges <0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

LOCATION OF 1994 TICK FLAT VEG. PLOTS. - PERMANENT PLOTS ONLY.

APPENDIX 2:

Results of searches for Western Bristlebirds on the south coast of Western Australia, spring 1994.

Sites are listed under the relevant map sheet name. Further location details are shown on maps held at the WA Wildlife Research Centre.

Abbreviations: WBB = Western Bristlebird; CB = calling Western Bristlebird (assumed to be a male); PR = pair of Western Bristlebirds (assumed male call responded to by an assumed female); fb = firebreak; Tk = track.

A) Sites searched by B. Newbey

POSITIVE SITES

BLAND

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
09/7	K11	0830	Twertup Tk	KSl.SCiSDc.VTl.VLi.	1PR + 1CB; calling concurrently. Site recommended by S.Nevill
21/11	K11	1745	Twertup Tk	*	2CBs
"	K11-1	"	Twertup Tk	*	1PR
"	K11-2	"	Twertup Tk	*	2CBs
"	K11-3	"	Twertup Tk	*	1CB
09/7	K12	1400	Twertup Tk	KSr.SBr.SCr.SDc.VTc	Negative. WBB present in 1993 (S. Nevill)
20/11	K12	1630	Twertup Tk	*	Big extension at prime calling time. 3 along Pabellup Drive using tape. Last 2 kms Twertup Tk & west along Pabellup Drive, without tape. All 3 observers listened without tape near sunset 1.7-2km from junction Twertup Tk/ Pabellup Drive
26/11	K12-a	1750	Twertup Tk	KSr.SCi.SDc.VLi. open area Si.SBd.SD ? thicket	1CB. Called in response to tape. 1.9km from junction above
27/11	"	0940	Twertup Tk	*	Extended 200m towards junction; negative
27/7	S20	0730	Twertup Tk	KSr.SCi.SDi.VTr.VLc	1CB. Bright loud Song A , 5 minutes after tape. Bird at edge of breakaway. Below, mallee too dense.

27/7	S21	0815	Twertup Tk	KSr.SBr.SCc.SDc.VLi	1CB. Responded to tape, calling frequently. Bird in small area as described; mostly SCd
27/7	S22	0930	Twertup Tk	KSr.SBr.SCl.VTl.VLi	1CB. Soft call poor trill after some time.
09/7	T3	0745	Twertup Tk	KSr.SBr.SCl.SDr.VTl.VLc	1CB
15/7	"	? am	Twertup Tk	"	Extended, no additional WBBs.

JACUP

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
29/6	K1	1605	Fitzgerald Tk	KSr.SAr.SCc.SDc.VLi	1CB **
17/8	"	1005	"	"	Bird calling again. 170m N of "BB07" Whipbird seen **
30/6	K2	0830	Fitzgerald Tk/N fb	KSr.SCc.SDc.VLc	1CB. Slash zone & beyond **
30/6	K3	0930	Fitzgerald Tk	KSrSCl.SDd.VTr	1CB. Just beyond slash zone **
30/6	K5	1400	Fitzgerald Tk/N fb	KSr.SCr.SDc.VLi	1CB.In slash zone **
02/7	K9	1030	N fb	KSr.SCc.SDc.VLi	1CB **
02/7	K10	1300	N fb	KSr.SCc.SD(?).VLi.	1CB. Did not appear to respond to tape. Called about 30 min. after tape last played**
17/8	K15	0730	Fitzgerald Tk (W)	"	1CB.In slash zone. Heard from near camp unprompted.
17/8	"	1645	Fitzgerald Tk	KSr.SCr.SDc.VLi	1CB. Responded to tape.
19/11	"	1530	"	KSr.SBr.SCl.SDi.VLi	Some not burnt. Negative Walked southwards down Fitzgerald Tk recording all WBBs as K-sites as WBBs present 1985,'86, '90, '91, '93
17/8	K16	0800	Fitzgerald Tk (E)	KSi.SCl.SDc.VLi	1CB. Called prior to tape-play**
17/8	K17	0840	Fitzgerald Tk (E)	"	1CB. Adjacent to K16. 50m N of "BB05" **
17/8	K19	1030	Fitzgerald Tk	KSr.SCi.SDc.VLi.	1CB. 40m S of "17B"Last burnt 26 years ago **
17/8	K19a	1040	Fitzgerald Tk	"	1CB- calling concurrently with K19 (not as pair) **
17/8	K20	1125	Fitzgerald Tk	KSi.SCi.SDc.VLi	1CB. 60m S "18A2" **
17/8	K21	1145	Fitzgerald Tk	KSr.Sr.SCi.SDc.VLr.	1CB **
17/8	K22	1200	Fitzgerald Tk	"	1CB.Vegetation continuous with K21 **
17/8	K23	1330	Fitzgerald Tk	"	1CB **

17/8	K24	1330	Fitzgerald Tk	"	1CB Calling concurrently with K23 **
17/8	K25	1405	Fitzgerald Tk	KSi.SCl.SDc.VLi.	1CB. *Eucalyptus preissiana* **
17/8	K26	1420	Fitzgerald Tk	KSi.SCl.SDc.VLi	1CB **
17/8	K27	1515	Fitzgerald Tk	KSi.SCr.SDc.VLi	1CB. *Eucalyptus preissiana* **
01/7	S4	1430	Fitzgerald Tk	KSi.SCc.SDc.VLi	1CB. In & beyond slash zone**
01/7	S5	1500	Fitzgerald Tk	KSi.SAr.SCc.SDd.VLr	1CB. In & beyond slash zone**
01/7	S6	1530	Fitzgerald Tk	KSr.SCl.SDd.VLr	1CB. Also positive post fire.
02/7	S8	1400	N fb	KSr.SBr.SCc.SDc.VLr.	Promising & West of K10.
19/11	S8-2	0518	"	KSr.SBr.SCc.SDi.	1CB
"	S8-1	0530	"	KSl.SDc	1CB. Near gully, adjacent to burnt edge.
18/11	S58-1	1645	Fitzgerald Tk	KSr.SBr.SCl.SDi.VTl.VLi	1CB. Along fire edge.
"	S58-2	"	"	"	1PR.
30/6	T1	1540	S fb	KSi.SCl.SDc.VLr	Negative. Originally recorded as S2. Became positive post fire Oct. (Rec. S McNee)
03/7	"	1105	"	"	Recheck and extension. Negative
18/11	T70-0	1110	N fb	KSl.SBr.SCc.SDi.VLr.	1PR. Rocky
19/11	"	1000	"	KSl.SBr.SCl.SDi.VLi.	Heard again nearby-vegetation recorded Also T70-5 at the same time.
30/6	T70-1	1500	S fb	KSi.SCl.SDc.VLi	Positive 1985, '91,Negative. First recorded as K6
03/7	"	?	"	"	" Negative.
17/11	"	1750	"	KSi.SCl.SDi.VLc	1CB. Also 1 WBB flushed.
18/11	T70-2	0540	S fb	KSl.SBr.SCl.SDi.VLi.	1PR + 1CB. Tape not used. These birds all called within 50m of each other. Later odd CB could be heard further W.
18/11	T70-3	0630	Between firebreaks	KSr.SCc.SDi.VLi.	1PR.Birds called several times
18/11	T70-4	0600	Between firebreaks	KSr.SAr.SBr.SCl.SDi.VLi	1CB. Site "looks right"
18/11	T70-5	0650	N fb	KSr.SBr.SCl.SDi.VLr.	1PR. Several song bouts. On hill. Whipbird heard.
18/11	T70-6	0830	N fb	KSi.SBr.SCl.SDi.VLi.	1PR. W side of a gully, moving downslope.
30/6	T70-7	1150	N fb	KSi.SBr.SCc.SDi.VLi	Positive 1985. Negative. Recorded as K4
18/11	"	0920	N fb	KSr.SBr.SCl.SDc.VLi.	1PR. Heard birds at T70-5 nearby at the same time.
18/11	T70-8	0830	N fb	KSr.SCl.SDc.VLr.	1PR. Heard at the same time as T70-6. Further up hill side.
19/11	T70-9	1030	N fb	KSi.SCc.SDc.VLr.	1CB. E side of hill

** Site burnt out in October 1994.

MOUNT MANYPEAKS

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
23/8	K30	0745	Cheyne Rd	KSr.SCr.SDc.VTl.VLd.	1CB -located by A.H. Burbidge & J.K. Rolfe earlier in month.
23/8	K30-1	0800	"	"	1CB. Heard from K30
23/8	K30-2	"	"	"	1CB. "
20/9	K30	1500	"	"	K30 bird heard again.
23/8	K31	0830	Cheyne Rd	KSr.SCl.SDc.VTc.VLc.	1CB. Hill top. Would be worth checking fire age - seems fairly recent. Whipbird heard
"	K31-1	0830	"	"	1CB. Another hill top to E.
23/8	S40	0915	Cheyne Rd	KSl.SBl.SCc.SDcVTl.VLi	1CB. On hill top
23/8	S41	1000	Cheyne Rd	KSr.SBl.SC?.SD?.VT?.VL?.	1PR. Hill top (cutting)
"	S41-1	"	"	"	1CB. In valley 300m to N
25/8	S48	0700	Behind Cheyne Caravan Pk	Si.SCl.SDc.VTc.VLc	1CB. In Waychinicup N P. An extensive area of suitable heathland -probably supports quite a number of WBBs.
"	S48-1	0700	"	"	1CB. Heard same time as S48.
20/9	S49	1600	E of Cheyne Rd	KSr.Sr.SBr>SCc.SDr.VLd	1CB: 2 WBBs seen. Site adjacent to negative S42.
21/9	S50	1530	Near "ruins"	KSr.SCl.SDc.VTl.VLc	1CB.Regrowth. Jarrah ca. 3m: *Hakea cucullata* ca. 0.7m.
"	S54	1730	Cheyne Rd	KSr.SCl.SDi.VTl.VLc	1CB. Mallee very low (<2m).
"	S54-1	"	"	"	1CB
23/8	T60	1615	Bluff Ck Rd	KSr.Sr.SAr.SBr.SCc.SDc.VTl.VLc.	1CB. Plants very diverse &dense

TWO PEOPLES BAY

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
22/9	S55	1015	Hassell Hwy	KSr.Sr.SBrSCc.SDi.VTc.VLc	1CB. Bordering paddock. Map joined to Manypeaks

WHOOGARUP

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
20-21/8	T50	1500	Quoin Hd Tk	KSr.Si.SCc.SDc.VTi.VLr.	1CB. Campsite-selected as it looked promising.
20/8	T50-1	1630	Telegraph Tk	"	1CB
21/8	T50-2	0700	Quoin Hd Tk	Sr.SBi.SCc.SDc.VTi.VLi.	1CB. Chittick clumps
25/11	"	1225	"	"	1CB. Short trill 15 minutes after intermittent tape-playing began.
21/8	T51	1000	Quoin Hd Tk	Si.SC?.SD?.VTi.VLi.	1CB.*Banksia baxteri*. Extensive heath to 1m.
24/11	T76-1	1740	Quoin Hd Tk	KSr.SCi.SDc.VTc.VLc	1CB Extensive
"	T76-2	"	"	"	1CB
25/11	T76	1600	"	"	Extended downslope towards river - no additional birds
25/11	T77-1	1700 +	Telegraph Tk	Si.SBr.SCc.SDi.VTc.VLi.	1PR.Long unburnt *Banksia baxteri* with open patches.
"	T77-2	"	"	Sr.SBr.SCc.SDi.VTc.VLc	1PR. Similar to above. T77 a long transect. Seemed promising near swamps, but negative.
"	T78-1	1730	Quoin Hd Tk	KSr.SCc.SDi.VTc.VLc	1PR
"	T78-2	"	"	"	1CB
"	T78-3	"	"	"	1CB

NEGATIVE SITES

BLAND

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
10/7	K13	1430	Dogger S.	"	Burnt 1991. Tried in tangle of vegetation near swamp.
22/8	K29	1130	Information Bay on Pabellup Drive	Si.SBr.SCc.SDc.VTr.VLi	Chittick. Dieback affected area. WBB recorded here ca.1992.
10/7	R4	1000	Rabbit Proof Fence	KSi.SBi.SCr.SDi.VTr	"
10/7	R5	1030	Rabbit Proof Fence	KSi.SBi.SCr.SDi.VTr	"
10/7	R6	1115	Rabbit Proof Fence	KSi.SAr.SBr.SCr.SDi.VTi	"

10/7	R7	1215	Rabbit Proof Fence	KSi.SAr.SBr.SCr.SDc.VTi	"
10/7	R8	1300	Rabbit Proof Fence	KSr.Si.SAr.SBi.SCr.SDr.VTi.VLc	"
11/7	R9	0900	Devil C Rd fb	"	Mixed eucalypts, KSc
27/7	R11	1445	Pabellup Drive	KSr.Sr.SAr.SBr.SCr.SDc.VTr.VLi	"
27/7	R12	1615	Pabellup Drive S	KSr.Sr.SBr.SCc.SDc.VTr.VLi	Near a past K-site (K29)
22/8	"	1400	"	"	Rechecked
09/7	S13	1100	Twertup Tk	SCr.SDi.VTc.	Looked OK
09/7	S14	1300	Twertup Tk	KSr.SCr.SDc.VTc.	Top of breakaway
20/11	"	1000	"	"	Redone and extended
11/7	S16	1415	Devil C Rd fb	KSr.SAr.SCi.SDc.VLi	Seemed promising
26/7	S19	1530	Twertup Tk	KSi.SBr.SCi.SDi.VTr.VLc	Fewer tall sedges than in K11
27/7	S23	1130	Twertup Tk	KSr.SBr.SCi.SDi.VTr.VLi	Looked very suitable
22/8	S41	1430	Swamp off rd to Quaalup	KSr.Si.SBr.SCc.SDc.VTi.VLi.	Similar to old Dogger Swamp site. Vegetation varied.
20/11	S61	0520	Twertup Tk	KSr.Sr.SBi.SCi.SDi.VLc.	Most comparable with some of positive sites nearby but firenge less than those sites
21/11	S62	0820	Pabellup Drive	Sr.SCc.SDc.VTc.VLi	Hill, near summit
21/11	S63	0950	Rd to Quaalup	Sr.SBr.SCi.SDc.VTr.VLi.	Ridge top. Similar to some sites at Waychinicup
26/11	S64	1830	Pabellup Drive	KSi.SBi.SCi.SDi.VTc.VLc	Mature heath. Stayed only 10 minutes.
26/11	S64a	1842	"	"	A separate site despite number
27/11	S66	1330	Park border off W. Pabellup Drive	Si.SBr.SCi.SDi.VTc.VLi	Appears suitable and quite extensive. Clumps of *Banksia baxteri* with open patches between.
27/11	S67	1415	"	KSr.SBr.SCi.SDi.VTc.VLi	Edge of swamp. Vegetation a suitable height with plenty of cover
09/7	T4	1200	Twertup Tk	"	"
09/7	T5	1230	Twertup Tk	KSi. (Unfinished)	"
09/7	T6	1330	Twertup Tk	"	"
11/7	T9	0945	Devil C Rd fb	"	Mostly dense tall heath

11/7	T10	1015	"	"	Some similar to Two Peoples Bay habitat
11/7	T11	1045	"	"	Some looked suitable. Very near farmland. Fox tracks
11/7	T12	1120	"	KSr.Sr.SBr.SCl.SDc.VLc.	Looked quite suitable
11/7	T13	1200	"	KSr.SCl.SDc.VLi	"
11/7	T14	1230	"	"	Spent extra time here - a promising site
11/7	T15	1530	fb (near R9)	"	Mallee and mallee heath
22/8	T58	1215	fb S Mt Maxwell	"	Chittick-*Banksia baxteri* with clearings. Should be OK.
28-29/11	"	1900 +	W. Border fb	KSr.Sr.SCl.SDc.VLc	May be too recently burnt. Good listening conditions.

BREMER AND CAPE KNOB

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
28/11	S68	0905	"Heb's" Tk	KSr.SCc.SDi.VTc.VLi.	Looks good; quite extensive. Peppermint clumps
"	S69	1030	"	SCl.SDc.VTr.VLc	Good quality heath - could be suitable though different to any I have recorded them in.
27/11	T80	1600	S of "Glen Idle"	KSr.Sr.SAr.SCc.SDi.VTr.VLi	Near top of rise
27/11	T81	1800	Gordon Inlet	SBr.SCc.SDi.VTc.VLc.	Some too recently burnt.
28/11	T82	0700	Gordon Inlet Rd	SCl.SDi.VTr.VLd	Whipbird heard
28/11	T83	0750	"	KSi.SAr.SCl.SDi.VTi.VLc	Upper layers ? too dense - plenty of cover but clearings not well defined.

COCANARUP

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
19/8	K29	1615	Old Ongerup Rd	SCc.SDc.VLr	WBB heard here 1989 (I.Roach) Site offers shelter but doesn't fit as long-term habitat. Whipbird calling

DARLINGUP

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
9-10/7	R3	"	Rabbit Proof Fence	"	Campsite. Similar to T7
27/7	R9	1230	Pabellup Drive	"	*Eucalyptus preissiana, Dryandra cirsioides* - looks possible Expansion. Similar landform to Fitzgerald Tk, structurally OK.
23/11	"	1300	"	KSi.SCi.SDc.VLi.	
27/7	R10	1350	Pabellup Drive	KSi.Sr.SBi.SCi.SDr.VTr. VLr	Gravelly hill. Perhaps eucalypts a bit too dense; sedges sparse.
27/11	S65	1100	"	KSi.SBr.SC?.SC?.VTi.VL ?	Whipbird heard
09/7	T7	1610	Rabbit Proof Fence	"	Similar structure to S15
10/7	T8	0800	Rabbit Proof Fence	"	Varied mallee heath

DRUMMOND

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
18/8	S30	1325	Short Rd	KSi.SCr.SDc.VLi	Plenty of Fieldwrens
18/8	S31	1600	Long Tk	"	Campsite. Some ? OK. Best accessible in the vicinity. Extensive but if SC seemed right, SD too sparse & vice versa.
19/8	S33	0855	Hamersley Drive	KSr.SCi.SDc.VLr	Too sparse?
19/8	S34	0930	Hamersley Drive	KSi.SCi.SDc.VLc	Ground parrot flushed
12/7	T20	1645	new Drummond Tk	"	Mallee heath -uneven
12/7	T21	1715	N fb/ "	"	Mallee heath to campsite
13/7	T22	0815	N fb	KSi.SCi.SDd.VLi	Looked suitable. Extra time spent.
13/7	T23	0900	N fb	"	Looks suitable
23/11	"	1825	"	"	"
24/11	T75	0500	Bell Tk	"	More suitable for Ground Parrots
14/7	T27a	0815	S fb	"	Chittick/ *Eucalyptus preissiana*

30/7	T39	1440	Old Hamersley Drive	*	Low heath with some dense shrubs to 2m. better suited to Ground Parrots.
18/8	T42	1215	Long Tk	KSi.SCr.SDc.VLi	Whipbird heard
18/8	T43	1500	Long Tk	*	Most not very suitable

GREENRANGE

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
23/8	S43	1400	Tinkelup N R	*	Very long since burnt. Most that could be accessed 'KSc' too dense for WBB. Near Warrisp Rd similar to S41 though more mature.
24/8	T61	1000	Near Swan L	Sr.SBi.SCc.SDc.VTc.VLi.	Probably suitable to S
24/8	S44	1100	Nr Hasell Beach	Si.SCc.SDc.VTi.VLi.	Dune. Good vantage point.
24/8	S46	1215	Warrisp Rd	*	Not much unclassed land, and most of that recently burnt.

HAUL-OFF ROCK

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
24/8	S46	1430	Res. 7041	*	*
24/8	T62	1500	*	*	Good listening conditions
24/8	T63		* Not mapped. E end of Reserve 400m.	KSr.Sr.SBr.SCc.SDi.VTc. VLi	The parts of the reserve seen has some vegetation currently suitable for WBB dense heaths < 1m with Jarrah or *Banksia* clumps.....
24/8	S47	1630	Res. 7041	*	.....However most would seem to have been often burnt and is also quite die-back affected.

HOOD

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
28/11	S70	1345	Near House Beach	SCc.SDi.VTr.VLc	*Myrtaceae* dominant
*	S71	1445	*	SBi.SCc.SDi.VTi.VLc.	Sructurally OK
*	S72	1545	Hebe Tk	LAi.Sr.SCc.SDi.VTr.VLd.	Peppermint trees- clumps

JACUP

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
01/7	K8	1700	Fitzgerald Tk	KSi.SCc.SDc.VLr.	Extensive apparently suitable. Probably positive 1990 (BB06)
13/7	K14	1100	Bell Tk site	"	Poor listening conditions at site. Also too far S.
03/7	R1	0900	S fb-E Fitzgerald Tk	"	Very mixed vegetation - some perhaps OK. Good vantage point
03/7	R2	0945	S fb	"	"
30/6	S1	1250	N fb	KSr.SCi.SDc.VLr	Ridge top
30/6	S3	1630	S fb	KSr.SBr.SCi.SDc.VLi	Perhaps too mature
02/7	S7	1130	N fb	KSi.SBr.SCc.SDc.VLr.	Looked promising. Near K9
12/7	"	1130	"	"	"
02/7	S9	1500	N fb	KSi.SCc.SDd.	Insufficient plants of bushy habit n.a. Extension. Adjacent to now-burnt S9.
19/11	"	0715	"	"	
02/7	S10	1530	N fb	KSr.SBr.SCc.SDc.VLr.	An extensive area continuous with S11.
19/11	"	0800	"	"	Partly burnt but extended area previously covered. Looks OK but light on sedges.
02/7	S11	1615	N fb	KSr.SBr.SCc.SDc.	Extensive: last apparently suitable before Twertup Ck. Few sedges
12/7	"	1045	"	"	"
03/7	S12	1030	S fb-E Fitzgerald Tk	KSr.SCi.SDc.VLr.	Possibly suitable; negative 1991.
13/7	S17	1300	N fb	SCc.SDc.VLi	Extensive, even, few clumps
14/7	S18	1530	Bell Tk	SB ? ?	Heath to 0.8m with taller clumps of chittick
31/7	S27	0845	Old Ongerup Rd	KSr.Sr.SCr.SDc.VLi	Shallow gully. Varied heaths. Searched for 3 hours. Whipbird, Red-carted Firetail + + +
31/7	S28	1135	Old Ongerup Rd	KSr.SCi.SDc.VTr.VLi	Varied heaths. Whipbird heard
31/7	S29	1330	Old Ongerup Rd	"	Whipbirds heard
18/11	S57	1550	Fitzgerald Tk	KSr.SBr.SCc.SDi.VTr.VLi	Unburnt patch ca. 80m by 80m. (May be too small)
03/7	T2	1630	Fitzgerald Tk NN fb	"	"

13/7	T23a	1000	Bell Tk	*	Some OK
13/7	T24	1400	N fb	*	Plenty of clumps. Mostly suitable-looking mallee heath
13/7	T25	1515	S fb	*	Mallee heath; looked OK
13/7	T26	1345	S fb	KSr. ? SD ? VLc	Low mallee heath. Appeared ideal for Ground Parrots
13/7	T27	1610	S fb	*	Mixed/patchy. Some ? suitable
14/7	T28	0930	S fb W Suzetta	*	Mallee heath; chittick clumps
14/7	T29	1005	NNW tk	*	Varied; some slashed, burnt
14/7	T30	1040	NNW tk	*	One side slashed. Mallee heath with *Dryandra circioides*
14/7	T31	1135	N fb	KSi.SAr.SCc.SDc.VLi.	Varied but looks OK for WBB
14/7	T32	1215	N fb	S ???	Chittick,*Banksia baxteri* heath with some more open patches
14/7	T33	1330	N fb	*	Mixed mallee heath looks OK
31/7	T40	1450	Bell Track	*	About 5km. Much looks OK
23/11	T74	1740	"	KSr.Sr.SBr.SCc.SDi.VTi. VLi.	Different fire age each side of tk. Both could be OK;

MAINNERUP

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
18/8	S32	0815	Hamersley Drive	KSr.SCi.SDc.VLi	Marginal but similar to old Bell Tk site
30/7	T37	1535	Old Ongerup Rd	*	Various heaths. Saw 2 whipbirds.

MOUNT MANYPEAKS

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
23/8	S42	1100	Cheyne Rd	*	A large site. Hill seems similar to S41, S40. Adjacent to S49, a positive site
21/9	S51	1605	"Ruins" tk	KSi.SCc.SDEi.VTc.VLi.	Eucalypts taller & denser: site higher in landscape than +ve S50
"	S52	1630	"	KSi.SCr.SDi.VTr.VLc.	Hilltop. Too sparse and low?

"	S53	1715	"	KSi.SCr.SDi.VTi.VLc	Clumps of low eucalypts but otherwise similar to S52.
24/8	T61	0830	Bluff Creek	"	Secondary dunes. Vegetation includes Peppermints over dense heath to 0.9m.
20/9	T64	1705	Near Bluff R.	SCi.SDi.VTc.VLc.	OK. Occasional 2m shrubs or Eucalypt clumps.
21/9	T65	0800	Near Bluff R.	Sc.SBi.SCc.SDc.VTi.VLi	OK.Dunes. *Banksia attenuata*
21/9	T66	0830	Near Bluff R.	"	OK. Listening conditions Fair - Good
21/9	T67	0900	Near "Bluff Creek"	KSr.Sr.SCc.SDi.VTi.VLc.	Similar to +ve S48 - behind Cheyne Caravan Park.
21/9	T68	0930	"	"	Opposite +ve T69
21/9	T69	1030	Dunes	"	Seems OK. Much *Anarthria*

TWERTUP

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
09/7	S15	1515	Rabbit Proof Fence	KSr.Sr.SBr.SCi.SDc.VTi.	Near Newbey site ca. 1982
12/7	T16	0900	N fb	KSi.SCc.SDc.VLi	"
12/7	T17	0935	N fb	SCc.SDc.VLi.	"
12/7	T18	1030	N fb	KSi.SBr.SCi.SDc.VLr	"
31/8	T41	0800	S fb W Twertup Ck	"	Many birds calling. Ideal conditions; some vegetation OK.
22/8	T54	0800	S Calyerup	"	Suitable vegetation Mixed mallee heath with some chittick.
22/8	T55	0835	S Calyerup	"	OK.Less mallee & chittick, more *Dryandra sirsioides & Hakea corymbosa*
22/8	T56	0850	Calyerup Tk	"	Mixed heath. Whipbird heard
22/8	T57	0940	Calyerup Tk	"	Mixed heath. Few sedges

WHOOGARUP

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
30/7	S24	0930	Hamersley Drive	KSi.SAi.SCi.SDi.VLi	Near a historical site (S.Nevill) but burnt since. This site a small unburnt area near a burnt but well regrown hillside.
30/7	S25	1140	Hamersley Drive	KSr.Sr.SBr.SCi.SDc.VTr.VLc	Seems suitable. Extensive.
30/7	S26	1245	Old Hamersley Drive	KSr.SCi.SDc.VLi	Quartzite ridge, exposed -plants wind-pruned, many birds calling including whipbird.
19/8	S35	1230	S fb (E of Hamersley Drive)	KSr.SAr.SCi.SDc.VLi	Seems possible.
20/8	S36	0930	Hamersley Drive	KSr.SCc.SDc.VTr.VLi	Seems suitable. Extensive.
20/8	S37	1010	Hamersley Drive	KSr.SBr.SCc.SDc.VLr.VTi	"
20/8	S38	1250	Quoin Hd Tk	KSi.SBr.SCi.SDi.VLi.	Hill top & surrounds, not v. extensive. Whipbird heard
20/8	S39	1330	Quoin Hd Tk	KSi.Sr.SAr.SBr.SCi.SDi.VLr	A gully
29/7	T34	1215	Hamersley Drive	"	W: regrowth,mostly to 0.5m but with scattered taller mounded mallee.
30/7	"	1030	"	"	Extended to W.
29/7	T35	1345	Hamersley Drive	"	Structure OK
29/7	T36	1430	Moir Tk	KSr.Sr.SBr.SCi.SDi.VTc.VLi	Different fire age each side of track
29/7	T37	1515	Moir Tk	"	Vegetation similar to T36
30/7	T38	1340	Old Hamersley Drive	"	W. mostly SC, SD heath
19/8	T44	1030	S fb (E.of Hamersley Drive)	"	Not ideal but good vantage track, excellent listening conditions.
19/8	T45	1100	S fb "	KSi.SCi.SDc.VLi	Promising site
19/8	T46	1150	S fb "	KSr.SCr.SDi.VLi	Includes biological survey site "58B" (Chapman and Newbey in press).
19/8	T47	1320	S fb "	KSr.SCr.SDi.VLr	Includes biological survey site "56A1 (Chapman and Newbey in press).
19/8	T48	1500	West River	"	Unlikely, but good listening conditions

20/8	T49	1415	Quoin Hd Tk	"	Very mixed mallee heath similar to old Dogger Swamp site
21/8	T52	1115	Quoin Hd Tk	KSi.SBr.SCr.SDc.VTr.VL i.	Less dense & lower species diversity than +ve T51. Appears to be an edge.
26/11	"	0530	"	"	Extended and rechecked
21/8	T53	1150	Quoin Hd Tk	KSi.Si.SBr.SCc.SDc.VTr. VLi	Similar to T52 but 'S' dominant shrub = *Banksia media*

B) Sites searched by S. McNee

POSITIVE SITES

WAYCHINICUP NATIONAL PARK AND ADJACENT RESERVES

MOUNT MANYPEAKS

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
11.10	S55	0558-0605	Near Hwy		No WEB heard
11.10	S55	0745-0810	Near Hwy		1CB, called twice
11.10	S55	0925-1010	Near Hwy		1CB, called twice
16.10	SS44	0524	Cheyne Rd	SCi.SDi.VLc	1PR,
16.10	SS44	0747-0814	Cheyne Rd	"	1PR, near swamp paperbarks plus 1CB further ESE (on E side of Road) and 1CB further ENE (on W side of Road)
16.10	SS45	0820-0905	Cheyne Rd	KSr.SBi.SCc.SDi.VLc	2PR, only about 20 m apart
12 10	T60	0900-1030	Bluff Ck	LBr.Sr.SBr.SCi-r.SDi-c. VTc-d.VLi-c	1CB, near paperbarks near creek
12.10	T60	1710-1850	Bluff Ck		1PR, further W than in morning
13.10	T60	0530-0647	Bluff Ck		1CB, same place as pm on 12.10, moved further N up hill into *B. baxteri* at 0558. Conclude only one pair (plus possibly 1 immature) at this site.

FITZGERALD RIVER NATIONAL PARK

JACUP (Fitzgerald Track)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
18.11	SS48	1530-1714	Fitzgerald Tk	KSr.SBr.SCc.SDi.VLi	3PR, within 300 m of each other
18.11	SS49	1640-1714	Fitzgerald Tk		(same 1CB as recorded at SS0)
19.11	SS50	0534-0623	W of Fitzgerald Tk	KSi-c.SAr.SBi.SCi. SDi. VLr	1CB
17.11	TT29 -A	1730-1908	E of Fitzgerald Tk	KSi.SBr.SCi.SDi.VLr	2CB
18.11	TT29 -A	0557-0609	E of Fitzgerald Tk	"	1PR and 2CB, two were within 20 m of each other
17.11	TT29 -B	1828-1838	E of Fitzgerald Tk	KSr.SAr.SBr.SCi.SDi	1PR
18.11	TT29 -B	0615-0645	E of Fitzgerald Tk	"	1CB, (plus one bird same as recorded at T70-8)
18.11	TT29 -D	0514-0520	E of Fitzgerald Tk		1CB S of firebreak in cleared area (plus 1CB, recorded in T9-9)
18.11	TT30	0753-0953	Fitzgerald Tk	KSr.SCi.SDi-c.VLr and KSr-i.SAr.SCo-i.SDi-e. VLr	2CB and 1PR

BLAND (Twertup Track)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
20.11	TT32	0536-0952	Twertup Tk	KSr.Sr.SAr.SBi.SCc. SDi.VLi	1CB south of track (plus 1CB N of track recorded at K11-9)

DRUMMOND (Telegraph Track)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
25.11	SS71	1846-1850	E of Drummond Tk		1CB, vegetation similar to S end of TT41

DEMPSTER (Twin Bay Track south of Telegraph Track)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
25.11	TT41 -A	1525-1750	Twin Bay Tk	KSr.SBr.SCi.SDc.VLr	2CB (possibly 3CB)
25.11	TT41 -B	1713-1736	Twin Bay Tk	KSr.Sbr.SCi.SDc.VLi	1PR

NEGATIVE SITES

WAYCHINICUP NATIONAL PARK

MANYPEAKS

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
11.10	SS43	1015-1114	N of Hwy	Mr.SAr.SBr.SCl.SDr.VTl.VLi	only a small area apparently long unburnt; apparent recent burn beyond
16.10	SS46	1528-1538 and 1600-1609	Waychinicup Rd	KSr.SCl-c.SDi.VLi KSr.SAc.SBc.SCl	swamp with paper barks in low lying areas, possibly too recently burnt, paperbarks shedding burnt bark
16.10	SS47	1616-1630	Waychinicup Rd	KSr.SBr.SCr.SDc.VLc	
11.10	TT23	0833-0925	Near Hwy		some areas look more recently burnt
11.10	TT24	1500-1640	Along Hwy		mixtops of tall and low heaths not that promising, tree cover high
11.10	TT24	1647-1720	S of Hwy		
15.10	TT26	1544-1745	S of Hwy	KSr.SCl.SDr.VLi KSr.Sr.SAr.SBi.SCl.VLi KSr.SBi.SCl.SDi.VLi	
16.10	TT27	0622-0720	E Cheyne		has dead stags of shrubs including *Hakea cucullata*
17.10	TT28	0615-1715 and 0815-0845	S of Hwy	KSl.SCl.SDc-i.VLi	reasonable from top of hill on, plenty of dead shrubs and dead branches of *Allocasuarina* and *E. marginata* trees
12.10	TT20	0555-0735	Bluff Ck	KSr.SCc.SDi.VLr KSr.SBr.SCc.SDi.VLi KSr.SAr.SCc.SDi.VLi	
12.10	TT21	0810-0855; 1500-1645	Bluff Ck	KSr.SCl.SDi.VLi	in valley up from T20
13.10	TT22	0704-0750	Bluff Ck	KTr.Sr.SCl.SDc.VLi	on top of ridge above swamp E of T20
13.10	SS42	0758-0817	Bluff Ck	SBr.SCc.SDi.VLc-i	patches of mallee on edges

MOUNT GROPER

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
28.10	SS1	0420-0520	Beaufort Inlet	KSr-i.SCr.SDi.VLi	near a small swamp
28.10	SS2	0652-0712	Beaufort Inlet	KSr.SBr.SCc.SDr.VLr	
28.10	SS3	0715-0740	Beaufort Inlet	KSr.SBr.SCc.SDr.VLr	
28.10	SS4	0900-1050	Beaufort Inlet	KSr.SAr.SBi.SCc.SDr.VLr	
28.10	SS5	1111-1131	Beaufort Inlet	SBr.SCc.SDi.VLr	

29.10	SS6	1010-1035	Beaufort Inlet	KSr.SBr.SCc.SDi.VLr	
29.10	SS7	1442-1515	Beaufort Inlet	KSr.Sr.SAr.SBr.SCc.SDr-i.VLr.VTr	
2.11	SS23	0520-0542	Millers Pt Rd	KSr.SAi.SBi.SCi.SDi.VLi	heathland low, possibly due to earlier burn; more like Western Whipbird country
2.11	SS24	0543-0605	Millers Pt Rd	KSr.SAr.SCc.SDi.VLi	just past corner opposite gravel pit
2.11	SS25	0656-0714	Millers Pt Rd-Paperbark Rd	KSi.SCi-c.SDi-c.VLr	
2.11	SS26	0729-0815	Millers Pt Rd-Paperbark Rd	KSr.SBr.SCc.SDi.VLi	
2.11	SS27	0830-0930	Millers Pt Rd-Paperbark Rd	KSr.SBr.SCc.SDi.VLr	
2.11	SS28	1023-1040	Paperbark Rd	KSr.SBr.SCc.SDi.VLi	
28.10	TT1	0540-0640	Beaufort Inlet	SBr.SCc.SDr.VLi KSr.SBr.SCc.SDi.VLi-r	
28.10	TT2	1200-1240	Beaufort Inlet	KSr.Sr.SBr.SCc.SDr.VLr SAr.SBr.SCc.SDr.VLr	
28.10	TT3	1545-1815	Beaufort Inlet	SBr.SCc.SDc.VLi SBr.SCc.SDi.VLi KSr.SBr.SCc.SDi-r.VLr	
28.10	TT4	0553-0653	Beaufort Inlet	KSr.SBr.SCc.SDi	
29.10	TT5	0703-0758	Beaufort Inlet	KSi.Sr.SCi.SDc KSi.SCi.SDi.VLi KSi.SAr.SBi.SCc.SDi.VLi	
2.11	TT10	0609-0647	Millers Pt Rd-Paperbark Rd	KSr-i.SBr.SCi.SDc.VLi	

HAUL OFF ROCK AND CAPE RICHE (Sandalwood Road)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
2.11	SS29	1717-1747	N Sandalwood Rd		small patch, with lots of *Banksia coccinea*
2.11	SS30	1747-1826	N Sandalwood Rd		
2.11	SS30	1350-1410	N Sandalwood Rd	KSr.SAi-r.SCi.SDi.VLi	looks not long since burnt
3.11	SS31	0833-0847	N Sandalwood Rd	KSr-i.SAr.SBi.SCc.SDi.VLi	
3.11	SS32	0855-0915	N Sandalwood Rd	KSr.SAr.SBi.SCc.SDi.VLi	

4.11	SS33	0503-0525	N Sandalwood Rd	KSi-r.SBr.SCl.SDc.VLr KSi.SBr.SCl-c.SDc.VLi	
4.11	SS34	0542-0602	N Sandalwood Rd	KSr.SBi-r.SCl-c.SDc.VLi	vegetation higher near track
4.11	SS35	0608-0628	N Sandalwood Rd		a mixture of veg types, same spp as in SS34 and SS33, plus *Dryandra* sp.
4.11	SS36	0709-0729	N Sandalwood Rd	KSr.SAr.SBi.SCc.SDi.VLi	vegetation very high towards creek
4.11	SS37	0843-0915	SE Sandalwood Rd	Sr.SAr.SBi-r.SCl-c.SDc.VLi	no mallees except a few *E. preissiana*, *E. tetraptera* and *E. lehmannii*
14.10	SS38	0602-0623	W Sandalwood Rd	KSr.Sr.SAi.SBi.SCc.SDr	
14.10	SS39	1333-1400	E Sandalwood Rd	KSr.SBr.SDc	
15.10	SS40	0840-0900	N Sandalwood Rd		low shrubs 0-1m, some 1-1.5m high, mallee less than 2m high
14.10	SS41	1806-1828	Mt Melville	KSr.SBi.SCc.SDi-c.VLr	
3.11	TT11	0530-0640	N Sandalwood Rd	KSr.SAi.SBc.SCl.SDr.VLr	valley floor has been chained; area is north of Reserve 31240 boundary
3.11	TT12	0659-0816	N Sandalwood Rd		looks like regrowth after a very hot fire
3.11	TT13	1637-1730	N Sandalwood Rd	KSr.SBr.SCl.SDi.VLi	
3.11	TT14	1737-1839	N Sandalwood Rd	KSr.SBr.SCl.SDc.VLi KSr.Sr.SAi.SCl.SDi.VLiKSr.SBr.SCc.SDi.VLr	
14.10	TT15	0645-0910 1033-1045	W Sandalwood Rd	KSi.SAr.SCc.SDi.VLr KSr.SBr.SCc.SDi.VTr.VLr	
14.10	TT16	0910-1033	W Sandalwood Rd	KSr.SAi-r.SBr.SCc.VLi KSr.SBr.SCc.SDc.VLi-e	where mallee more dominant heath 0.0.5 m high and not so dense
14.10	TT17	1200-1310	E Sandalwood Rd		on top of hills, very short thin shrubs
14.10 15.10	TT18	1445-1602 0721-0835	E Sandalwood Rd	KSi.SBi.SCc.SDc.VLi KSr.SAr.SBr.SCi.SDi.VLi	some areas thick with *Banksia coccinea* and *B. attenuata*, lots of dead *Banksia*
15.10	TT19	0617-0720	E Sandalwood Rd		*E. tetragona* on S and *B. coccinea* on N side; *Banksia* dominant in other areas

WARRAMURRUP AND PT SMOOTH ROCKS (Warrumurrup Road)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
30.10	SS8	0555-0605	on the flats	Sr.SBr.SCc.SDi.VLr	bare patches in heath

30.10 31.10	SS9	1515-1535 0530-0600 1000-1025	on range	Sr.SAr.SBi.SCc.SDi. VLi.VTiSr.SBr.SCr. SDr.VTc. VLc	
31.10	SS10	0600-0620 0823-0948	on range	KSr.SCi.SDc.VLc	
30.10	SS11	0622-0640 0812-0820	on range	KSr.SBr.SCc.SDi.VLc . VTi	
30.10 31.10	SS12	1732-1736 0645-0705 0750-0810	on range	KSr.SAr.SBc.SCi.SDr . VLi	lots of *Banksia menzii*
31.10	SS13	0710-0740	on range	KSr.Sr.SBr.SCc.SDi. VLi.VTi	
30.10	SS14	1622-1708	on range		vegetation dominated by *Melaleuca* 0.5-1m high mallee in low lying gullies
1.11	SS15	0600-0715	on range	SBr.SCc.SDi.VLi-c	
1.11	SS16	0825-0905	on range	KSr.SBr.SCc.SDi.VLi	
1.11	SS17	1238-1314	on the flat	Sr.SAi.SBr.SCi.SDi.V Li-	near swamp, unlikely area for WBB
1.11	SS18	1540-1605	on the flat	KSr.Sr.SAr.SCc.SDi. VLi	
1.11	SS19	1608-1628	on the flat	KSr.SCi-c.SDc.VLr	Sr and SAr in patches, bush looks trampled by kangaroos, site is adjacent to paddocks as is SS18-SS20
1.11	SS20	1632-1700	on the flat	SAr.SBr.SCi.SDi.VLi	very dense heath close to track, bush full of kangaroo pads
1.11	SS21	1704-1733	on the flat	SAi.SBr.SCc.SDi.VLi	paperbarks on low areas
1.11	SS22	1735-1805	on the flat	SAr.SBi.SCi.SDi.VLr	plenty of dead shrubs of *Hakea* and *Melaleuca*
30.10	TT6	0450-0537	on the flat	SBr- i.SCi.SDi.VLi.VTr	vegetation up from swamps
30.10	TT7	0624-0736	on range	Sr.SBr.SCc.SDi.VLc-i SCi.SDc.VLi	some good dense round shrubs
30.10	TT8	0813-0830	on range		walked until beginning of descent and tall trees
31.10 30.10	TT9	1635-1737 0830-0940	on range	LBr.SBr.SCc.SDi.VLc	vegetation is very thick, especially with bunch sedges

JACUP (Fitzgerald Track)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
19.11	SS51	0949-1038	W Fitzgerald Tk	KSr-i.SBi.SCc.SDi-r	near trig point and clay pan
19.11	SS52	1555-1628	Fitzgerald Tk		vegetation good height, different species from other sites on Fitzgerald Track
19.11	TT31	0853-0934	W Fitzgerald Tk	KSi-rSAr.SBi-r Sci.SDi.VLr	

BLAND (Twertup Track)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
20.11	SS53	1625-1650	Twertup Tk	KSr.Sr.SBr.SCc.SDi. VLr	
20.11	TT33	0950-1040	Twertup Tk	KSr.SAr.SBr.SCi.SDi. VLr	area appears to have been burnt more recently than where WBB located

(Inner firebreak on west boundary south of Old Ongerup Road)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
21.11	SS54	0929-1006	W firebreak	KSi.SAr.SBr.SCc.SDr -i. VLr	slopes away to the east, becomes denser mallee
21.11	SS55	1015-1030	W firebreak	KSi-r.SAr.SBi.SCi.SDi. VLr	is only a small area, possibly not so good for WBB
21.11	SS56	1712-1732	W firebreak	KSr.Sr-i.SBi.SCr.SDc. VLr KSr.Si.SBi.SCc.SDr. VLr	
21.11	SS57	1739-1749	W firebreak	KSi.SBr.SCi.SDc.VLr	
28.11	SS58	0940-1000	W firebreak	KSi.SAr.SBi.SCc-i.SDi	
21.11	TT34	0620-0653	W firebreak	KSr-i.Sr.SAr.SBr.SCc. SDi.VLr KSR.SR.SBr.SCi.SDc. VLr KSr-i.SAr.SBi.SCi. SDi.VLr	further west there is very little mallee or tall shrubs, mainly SCi and SDc
21.11	TT35	0743-0845	W firebreak		area is very variable, has apparently good WBB habitat but only in small patches
21.11	TT36	1554-1700	W firebreak	KSr.SAr.SBi.SCi-c.SDr-i .VLr	looks more recently burnt W of firebreak, *Banksia media* < 0.5 m high
21.11 28.11	TT37	1806-1839 0600-0706	W firebreak	KSr.SBr-i.SCc.SDi.VLr KSr.SBi-r.SCi.SDr-i.VLr	canopy of many shrubs goes to the ground
28.11	TT38	0728-0846	W firebreak	KSi.SBr-i.SCi.SDc-i.VLi	

(Bell Track)

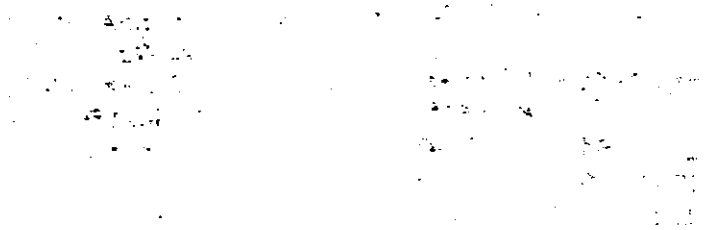
Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
24.11	SS59	0634-0704	Bell Track	KSr.SAr.SBr.SCi.SDc . VLr-i	
24.11	SS60	0739-0849	Bell Track	SAr.SBi.SCc.SDi-c.VLr	
24.11	SS61	0920-0940	Bell Track	KSr.Sr.SAr.SBr.SCi-c. SDc.VLi	more sedges than SS59 or SS60
24.11	SS62	0945-1000	Bell Track		not ideal for WBB
24.11	SS63	1042-1100	Bell Track		
27.11	SS64	0547-0630	Bell Track	KSr.SBr.SCi.SDc.VLi	
27.11	SS65	0717-0728	Bell Track	KSr.SAr.SBr.SCi.SDc . VLr	
27.11	SS66	0731-0743	Bell Track	KSr.Sr.SAr.SBr.SCi. SDc.VLr	
27.11	SS67	0828-0845	Bell Track	Sr.SAr.SBr.SCc.SDi SBi.SCc.SDr	
23.11	TT39	1755-1930	Bell Track	KSr.SCi.SDc.VLr	more like Ground Parrot vegetation

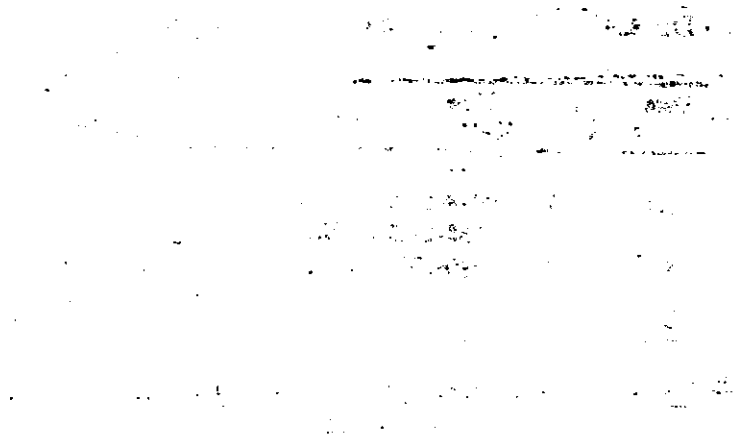
DEMPSTER (Woolbernup Hill, Telegraph Track)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
25.11	SS67	1048-1109 1138-1212	Woolbernup Hill		
25.11	SS68	1240-1300	Woolbernup Hill	KSr.SBr.SCi-r.SDc.VLi	plenty of bare patches on ground (1xGround Parrot recorded)
25.11	SS69	1312-1330	Woolbernup Hill	KSr.SAr.SBr.SCi.SDi. VLr	has denser and higher shrubs than SS68
25.11	SS70	1407-1520	Woolbernup Hill	KSr.SBr.SCi.SDi.VLi. VTr	
25.11	TT40	0837-1039	Woolbernup Hill	KSr.SAr.SCi.SDc.VLr	in some areas canopy cover only 50%

DRUMMOND (Telegraph Track)

Date	Site No	Time	Location	Vegetation (Muir 1977)	Comments
26.11	SS72	0620-0700	nr Quoin Tk	KSr.SAr.SBr.SCi.SDc -i. VLr	*Dryandra* sp at this site much higher (1.2-2m high) than at Woolbernup





APPENDIX 3

Ground Parrot records incidental to the Western Bristlebird population survey

a) Records by B.J. Newbey

1/7/94 Fitzgerald Track at BB01 0.5km N from N firebreak, 2 Ground Parrots heard, commencing about 17.40hours, 35-40 minutes after sunset::
(A) at 320degrees about 200 m distant - 3 calls
(B) at 200 " about 100m away (in slash zone) - 1 call.

2/7/94 Fitzgerald Track at BB01 as above, 1 Ground Parrot heard, 1730hrs, 308degrees, ca.150m, 1 long call

2/7/94 Fitzgerald Track 0.09km N of N firebreak, 1 Ground Parrot heard, 09.25am From slash zone only 30m from Fitzgerald Track, 1 call

2/7/94 5.4km W of Fitzgerald Track on N firebreak. 1 Ground Parrot heard, 16.29hours, 154 degrees (SSE) in valley, 3 calls clear but probably quite distant

3/7/94 2km E Fitzgerald Track along S firebreak at Western Bristlebird site K6(T70) 1 Ground Parrot heard 300 degrees at 12.31hours just after a light shower, ca. 80m. away Called again 12.39hrs as rain began again.

16/8/94 Campsite Fitzgerald Track/S firebreak. 1 Ground Parrot heard. About 10 minutes before sunset.

17/8/94 Campsite Fitzgerald Track/S firebreak. 1 Ground Parrot about 1700 hours - well before sunset -near 1 Ground Parrot about 20 minutes after sunset - distant.

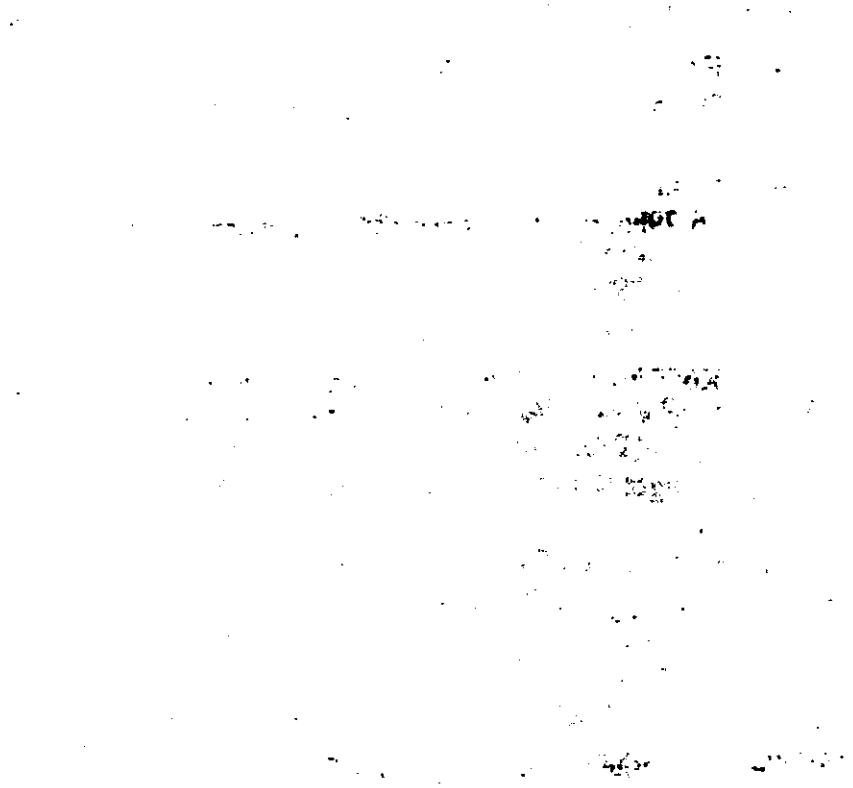
18/8/94 Campsite 6.9km along "Long Tk" (S31) 2 Ground Parrots heard. (minimum)
(A)1708hrs, 60m W; 1735hrs(sunset), 60m S
(B)1720hrs,100mSSE

18/8/94 Hamersley Drive - 6.4km S from entry of Old Ongerup Rd (S34) 1 Ground Parrot seen, 0930hrs, where eucalypts graded from KSr to KSi. (Muir code: KSi.SCi.SDc.VLc).

23/11/94 Campsite -Bell Tk/N firebreak, 1 Ground Parrot heard at 1914hrs. 120 degrees, about 200m away - 5-note call.

b) Record by S. McNee

25/11/94 Site SS68, Woolbernup Hill, 1 Ground Parrot recorded



APPENDIX 4:

Report by G.T. Smith:

Populations of Western Bristlebirds (*Dasyornis longirostris*) and Western Whipbirds (*Psophodes nigrogularis*): comparisons between 1976 and 1994

Populations of Western Bristlebirds (*Dasyornis longirostris*) and Western Whipbirds (*Psophodes nigrogularis*): comparisons between 1976 and 1994

Introduction

Fire is a frequent phenomenon in coastal areas of the south coast of Western Australia. The frequency and intensity of fires has important conservation implications, especially in areas of high conservation value such as Two Peoples Bay Nature Reserve. The change in fire regimes following European settlement is thought to be the main factor that caused the rapid decline of a number of now rare species (Smith 1977). The survival of three of these species,. Noisy Scrub-bird (*Atrichornis clamosus*), Western Bristlebird (*Dasyornis longirostris*) and the Western Whipbird (*Psophodes nigrogularis*) at Two Peoples Bay, was a result of a fortuitous combination of habitat and a topography that provided natural fire breaks, which prevented the whole area from being burnt at the one time. Management of the reserve since the late 1960s has concentrated on preventing wildfires. This successful strategy has resulted in the expansion of the distributions and populations of all three species within the reserve.

There are sufficient data to indicate that in the reserve, a fire frequency of less than 10 years will lead to a reduction and possible elimination of the rare species. At the other end of the scale, data on how long after fire the vegetation remains suitable for these species is uncertain, but may be in excess of 50 years (Smith 1987a).

The research plan for the Western Whipbird and Western Bristlebird (Cale & Burbidge 1993) identified the last point as one needing more research. This report details the results of a census of these species in an area of the Two Peoples Bay Nature Reserve and compares the results with those obtained by the author in 1976. The results are discussed in relation to the fire history of the area.

Study Area and Methods

The census was carried out in three adjacent areas of the reserve: Tick Flat, Robinson Valley and the Wave Sign Track (Fig. I). The areas were chosen because the most complete population data from the 1970s are from these areas, especially Tick Flat, where detailed studies of the two species were carried out (Smith 1987b, 1991).

The census was carried out during three trips to Two Peoples Bay: 22-27 August 1994, 5-16 September 1994 and 10-15 October 1994. Singing birds were located during repeated walks along tracks and ridges in the study area, every morning and

afternoon. The time spent at any one location was variable because all walks started and finished at the CSIRO hut at Tick Flat. All locations were visitied a minimum of 10 times which on past experience shoud be sufficient to detect the presence of an individual or pair of either species. The location of all singing birds (either single or a pair) was recorded on 1: 4500 colour aerial photographs (No. WA2429 (c)). Accuracy of the locations varied from exact, for the few sightings or birds singing close to the track to plus or minus 50-100 metres. The latter degree of accuracy is acceptable given that for both species the core area of the home ranges are about two hectares and the minimum home range is six hectares. The same methods were used in the 1970s studies.

Results

The locations of all Western Whipbirds (N=356) and Western Bristlebirds (N=242) are given on photocopies of the 1: 4500 aerial photographs. These data, together with data on birds calling at the same time were used to deliniate the home range boundaries. These boundaries, together with those from 1976 are shown on Figures 2 and 3. The locations of the home ranges in relation to fire history are given in Figures 4 and 5. and their histories are presented in Tables 1 and 2.

The smaller number of observations in 1994 has resulted in generally smaller home ranges for both species. There has been little change in the number or location of the home ranges of both species between 1976 and 1994.

The study areas can be divided into areas that were burnt in 1962 and 1964 and a larger area that has not been burnt since at least 1945. There were 26 Whipbird home ranges in the unburnt area in 1976. Two home ranges (Nos. 36 and 41) were not recorded in 1994. However, both home ranges were at the end of census walks and thus visited least often. Presence or absence of birds in thse locations remains uncertain. The only other change between 1976 and 1994 concerns home ranges 23, 24 and 26. The 1994 home ranges are basically the same as that in 1974 and 1975. Divorce and the death of one male led to amalgamation and enlargement of home ranges 23 and 26. The details are given in Smith 1991. In the areas burnt in 1962 and 1964, 19 home ranges were identified. Data in Table 1 show that there was a steady increase in the number of home ranges in the area up to 1976, with another home range recorded in 1982 and one in 1994. Only one home range (No. 10) has become disused since 1976.

In the unburnt area, 24 Bristlebird home ranges were recorded. No birds were located in four home ranges in 1994. Of these, No. 25 was certainly unoccupied, the status of Nos. 29 and 34 are uncertain because they were at the edge of the census area. Location 31 is probably on the edge of a home range and failure to record a a bird in this location was not unexpected, especially as it was only recorded three times in 1976. There was one new location (No. 39) situated in the atypical habitat of old *Melaleuca marginata* with a sparse understorey of shrubs and grass clumps. In the burnt areas, 14 home ranges were recorded and there has been a steady increase in the number of home ranges from 1971 to 1973 (Table 2). The only change between 1976 and 1994 was the apparent absence of birds in Location 4. In 1994 birds were recorded in lLocation 3 with a few records from Location 4.There was no evidence to suggest two pairs of birds in this area and the data were combined to show only one home range.

Discussion

Whipbirds and Bristlebirds live in dense vegetation and are seen rarely. Their songs are their most conspicious characteristic. Because both species use home ranges that overlap with those of their neighbours a large number of observations of the locations of singing birds are required to determine the number of pairs in an area. The optimal period to carry out a census is just prior to and during the breeding season. Unfortunately this study could not start until after the breeding season had started. In addition, the winter of 1994 was dry and warm which had an adverse effect on the frequency of calling. These factors probably have had the effect of reducing the size of the observed home ranges and may have reduced the probability of recording birds in apparently abandoned locations.

Given these limitations, there is no evidence to suggest that there has been any significant change in both burnt and unburnt areas. The reasons for the apparent abandonment of some locations used by both species in 1976 but not in 1994 are unknown. It would be worthwhile to check these areas again in 1995 to determine if they have been abandoned.

At the start of the previous study in 1971, both species were found to be occupying locations that had been burnt seven years before. Whipbirds continued to occupy new locations up to 14 years after the fire. In the following 18 years only two new locations were recorded. Bristlebirds showed a similar pattern but no new locations have been recorded for the last 20 years. Both species appear to have abandoned one location since 1976. This apparent loss may be due to insufficient data, mate loss or

death of the pair or deterioration of habitat. These areas should be checked in more detail next year.

Conclusion

The relationship between habitat use and fire history for both species is similar and the general conclusion is applicable to both species.

After fire, an area is recolonised between four and 14 years post-fire. The pattern of occupation is determined by the availability of colonists and the growth rate of the vegetation. Up to thirty years post-fire the habitat use and number of home ranges is almost constant. There is no evidence to suggest that loss of habitat suitability is responsible for the minor changes. By 50+ years post-fire, this constancy has generally been maintained, but there is a suggestion that a small number of locations may have been abandoned. These locations should be checked in 1995 to ascertain if the loss is genuine.

Table 1

***Psophodes nigrogularis*: Home range histories**

***Home range may have been occupied prior to the year in which it was recorded.**

Number	Year first recorded	1976	1982	1994	Year Burnt
1	1971*	x	x	x	1962
2	1973	x	x	x	1962
3	1972*	x	x	x	1962
4	1994			x	1962
5	1975	x	x	x	1962
6	1975*	x	x	x	1962
7	1982		x	x	1962
8	1976	x		x	1962
9	1972*	x	x	x	1964
10	1974	x			Unburnt
11	1972	x	x	x	1962
12	1974	x	x	x	1962
13	1971*	x	x	x	1962
14	1975	x		x	1962
15	1994			x	1962
16	1972*	x	x	x	Unburnt
17	1976	x		x	Unburnt
18	1970	x	x	x	1964
19	1971*	x	x	x	1964
20	1971*	x	x	x	1964
21	1972	x		x	1964
22	1973	x		x	Unburnt
23	1971	x	x	x	Unburnt
24	1970	x	x	x	Unburnt
25	1970	x	x	x	Unburnt
26	1971	x		x	Unburnt
27	1971	x	x	x	Unburnt
28	1972	x	x	x	Unburnt
29	1971	x	x	x	Unburnt
30	1971	x		x	Unburnt
31	1971	x		x	Unburnt
32	1971	x		x	Unburnt
33	1971	x		x	Unburnt
34	1972	x	x	x	Unburnt
35	1971	x	x		Unburnt
36	1971	x	x	x	Unburnt
37	1971	x		x	Unburnt
38	1972	x		x	Unburnt
39	1971	x	x	x	Unburnt
40	1971	x	x		Unburnt
41	1973	x	x	x	Unburnt
42	1971	x	x	x	Unburnt
43	1974	x		x	Unburnt
44	1975	x	x	x	Unburnt
45	1972	x	x		

Table 2

***Dasyornis longirostris:* Home range histories**

***Home range may have been occupied prior to the year in which it was first recorded**

Number	Year First Recorded	1976	1982	1994	Year Burnt
1	1971*	x	xx	x	1962
2	1971*	x	x	x	1962
3	1973	x	x	x	1962
4	1973	x	x		1962
5	1971*	x	x	x	1962
6	1972	x	x	x	1962
7	1974	x		x	1962
8	1973	x		x	1964
9	1972	x	x	x	1962
10	1973	x	x	x	1964
11	1974	x	x	x	1964
12	1972	x		x	1964
13	1971	x	x	x	1964
14	1971	x	x	x	1964
15	1970	x	x	x	Unburnt
16	1971	x	x	x	Unburnt
17	1972	x	x	x	Unburnt
18	1974	x		x	Unburnt
19	1976	x		x	Unburnt
20	1973	x	x	x	Unburnt
21	1971	x	x	x	Unburnt
22	1972	x	x	x	Unburnt
23	1971	x	x	x	Unburnt
24	1971	x	x	x	Unburnt
25	1973	x			Unburnt
26	1972	x	x	x	Unburnt
27	1971	x	x	x	Unburnt
28	1971	x	x	x	Unburnt
29	1971	x	x		Unburnt
30	1971	x	x	x	Unburnt
31	1976	x	x		Unburnt
32	1972	x	x	x	Unburnt
32	1972	x	x	x	Unburnt
33	1974	x	x	x	Unburnt
34	1971	x	x		Unburnt
35	1971	x		x	Unburnt
36	1971	x		x	Unburnt
37	1972	x		x	Unburnt
38	1973	x		x	Unburnt
39	1994			x	Unburnt

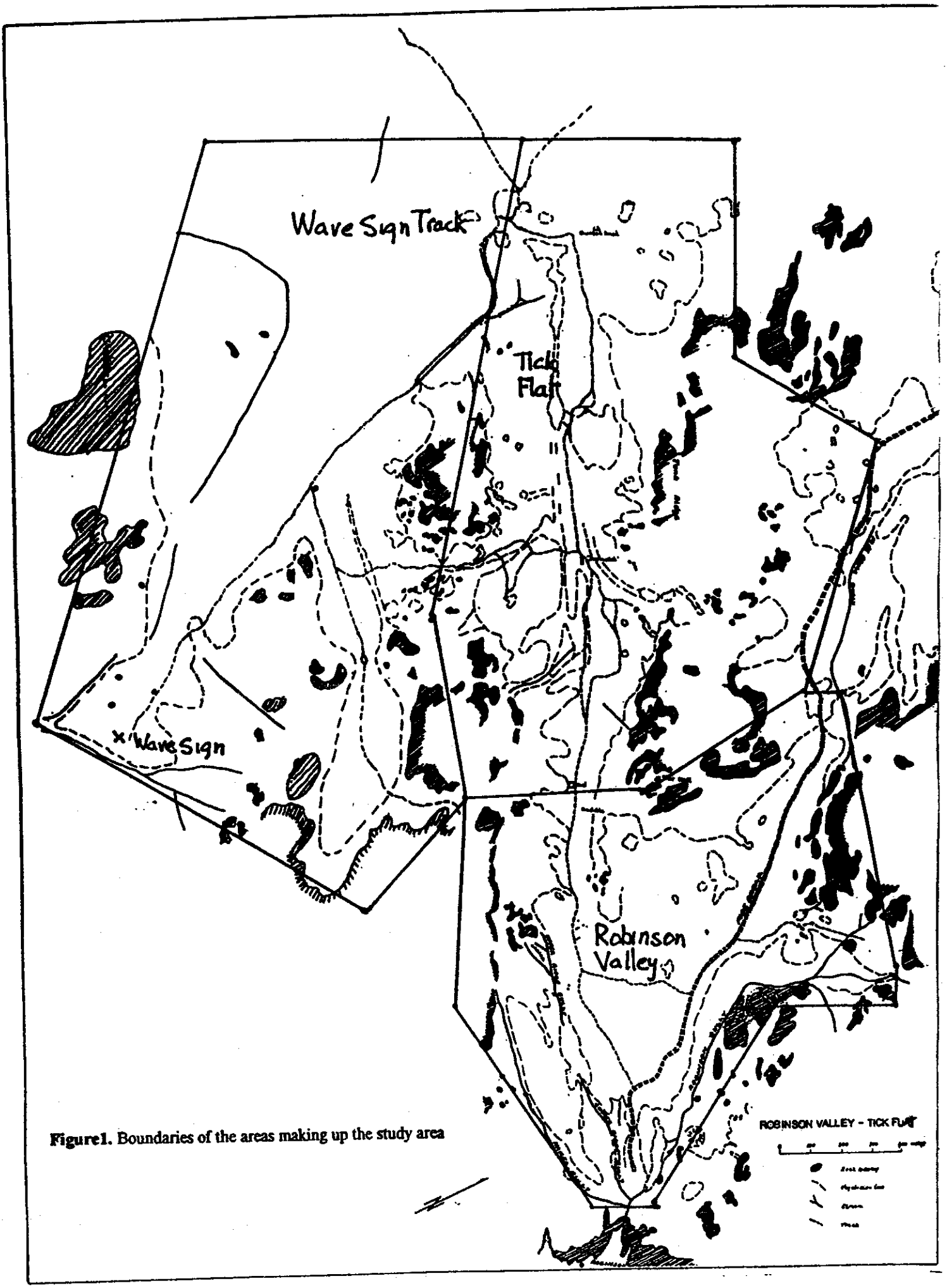


Figure1. Boundaries of the areas making up the study area

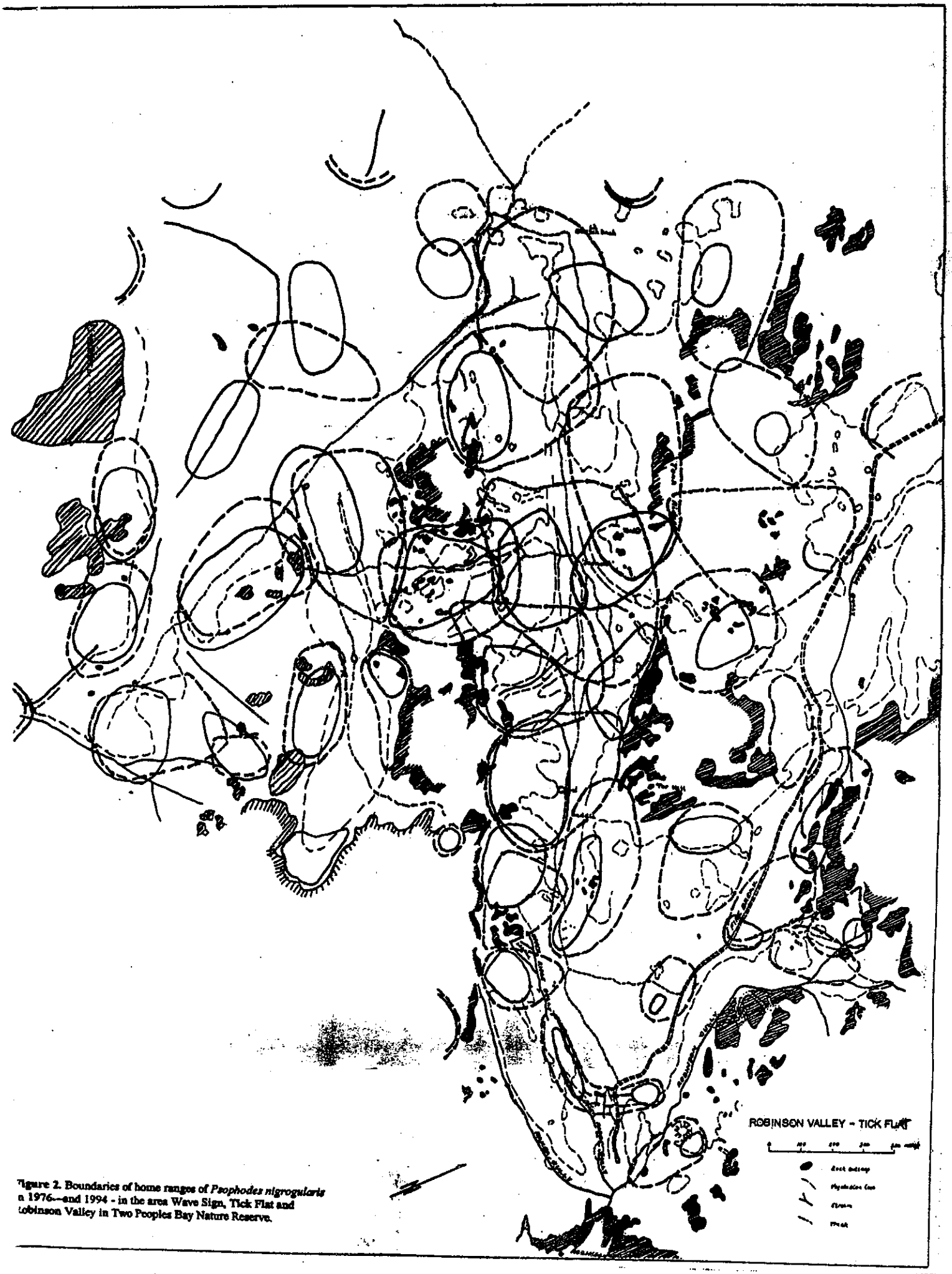


Figure 2. Boundaries of home ranges of *Psophodes nigrogularis* in 1976--and 1994 - in the area Wave Sign, Tick Flat and Robinson Valley in Two Peoples Bay Nature Reserve.

Figure 3 Boundaries of home ranges of *Dapornis longirostris* in 1976 - and 1994 - in the area Wave Sign, Tick Flat and Robinson Valley in Two Peoples Bay Nature Reserve

Figure 4. Locations of home ranges of *Psophodes nigrogularis* in an area of Two Peoples Bay Nature Reserve shown in more detail in Figure 1. Heavy dashed line shows fire boundary for 1962 and 1964 fires.

Figure 5. Locations of home ranges of *Dasyornis longirostris* in an area of Two Peoples Bay Nature Reserve shown in more detail in Figure 3. Heavy dahsed line shows fire boundary for 1962 and 1964 fires.

APPENDIX 5:

CAPTURE, RADIOTRACKING AND HABITAT UTILISATION OF THE WESTERN BRISTLEBIRD: REPORT ON A FEASIBILITY STUDY

December 1994

by
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Murcox Biological Services
PO Box 194
Leinster WA 7437

Note: Appendices A-D referred to in this report, are held at CALM's WA Wildlife Research Centre

Report to Department of Conservation and Land Management

BACKGROUND TO STUDY

Following the success of the management and recovery program for the Noisy Scrub-bird, *Atrichornis clamosus*, at the Two Peoples Bay Nature Reserve, a similar program has now commenced to develop management and recovery strategies for the endangered Western Bristlebird, *Dasyornis longirostris* (Cale and Burbidge, 1993). Apart from some early work conducted by CSIRO (Smith, 1977, 1985, 1987) extremely little information is available concerning this predominantly ground dwelling and secretive passerine. This is largely due to the presence of individuals only being indicated by short infrequent bouts of song.

As part of the research plan for Western Bristlebird a study was undertaken to determine the feasibility of using radio telemetry [illegible] bristlebirds. As this study and later components of the research plan were to require the capture of individuals, this study also investigated potential capture methods for Western Bristlebirds. As with any species, the determination of reliable and efficient capture methods involves the determination of [illegible] which are consistent and predictable and which can be exploited.

METHODS

Timing

The study was originally programmed to commence in August but was delayed due to logistical and organisational setbacks. The study was conducted by Darren Murphy of Murcox Biological Services with field assistance from Lawrence Cuthbert and Jessica Dyer. Following discussion and agreement on procedures, use of facilities and preparation of equipment the study commenced in the final week of September.

Study Area

The Research Plan (Cale and Burbidge, 1993) suggested that the study be carried out in the Fitzgerald River National Park. However following discussion with the concerned parties the decision was made to conduct the study in the area known as Tick Flat in the Two Peoples Bay Nature Reserve. This decision was based on the fact that a greater body of information concerning distribution and behaviour was known for the birds inhabiting the Tick Flat area and that concurrent censusing of this population was being conducted.

Prior to the commencement of the study three areas around Tick Flat were identified by Graeme Smith as primary areas to target for the capture of Western Bristlebirds. These were areas in which he had considerable amounts of data from his current censusing of calls and was confident of the home range boundaries and core activity areas of the resident birds. It was decided that these area would be the primary target areas for capture and were numbered one, two and three accordingly. These areas as defined by Graeme Smith are shown on Map 1 (Appendix B).

Capture Methods

Mist-netting

From previous experience in the capture of predominantly ground dwelling birds it was decided that mist-nets were the most likely to be successful in the capture of Western Bristlebirds. Initially a mixture of standard terylene four shelf 12m x 2.5cm mesh and 9m x 2.5cm mesh mist-nets were utilised, however this mesh size was thought to be too small after several birds escaped from the nets (see Appendix A for details). As a result 9m x 12m x 5.75cm mesh mist-nets were acquired and utilised for the remainder of the study.

Nets were erected and opened so that the bottom shelf string ran along the ground. Where the ground was uneven small wire pegs were used to peg down the bottom shelf string to ensure that there were no gaps for birds to get through. The nets were tensioned so that the bottom shelf pocket sagged on the ground and that the higher shelf pockets also sagged slightly. This was done to prevent birds bouncing out of the nets and to allow birds to mesh adequately in the nets.

Mist-nets were erected in continuous lines of up to ten nets along existing tracks running through the three target areas or other areas of known Western Bristlebird activity. Nets were also erected off the main tracks in areas of bird activity. Where possible the latter were established along overgrown disused tracks thus negating the need for additional clearing of vegetation. Western Bristlebirds were often observed or heard regularly in areas away from established or disused tracks and in these locations the vegetation was cleared in 50cm wide strips to facilitate the erection of mist-nets. These lines were cleared to ground level, however where possible roots and plant bases were left to promote revegetation of the area. The strips were raked to remove loose debris, and overhanging vegetation was removed to prevent mist-nets getting caught. Following the completion of the study the majority of the removed vegetation and debris was spread over the cleared area in an attempt to reduce the visibility of the cleared strips and to promote revegetation.

All mist-nets opened were checked at least every 30 minutes and on days when persistent rain occurred mist-net lines were not opened or opened for only short periods of times while they could be watched continuously. This was done to reduce the risk of any birds being caught becoming over stressed or hypothermic due to getting wet.

Locations of the mist-net lines utilised are presented by Map 2 (Appendix E). The Mist-net lines have been numbered (M1-M8) for later reference in this report.

Drift Fences

The combination of a drift fence and Elliott traps is a method of capture that has been utilised for Noisy Scrub-birds and has previously resulted in the capture of Western Bristlebirds. The drift fence consisted of a 90m x 150cm plastic moulded-mesh fence held in place by star pickets every 3-5m. The fence is held flush with the ground by small wire pegs. An approximately 10cm x 10cm section of fence is cut away at ground level every 3-5m along the fence. At each cut away section a single Elliott trap modified with a wire mesh end is place flush with the drift fence. Elliott traps were placed on alternate sides of the drift fence. Both type A and C Elliott traps were used.

Although several drift fences have been established in the vicinity of [illegible] Noisy Scrub-bird recovery program, not all these are located in areas of [illegible] activity. Although on attempt was used to utilise an existing drift fence [illegible] was later taken down and erected in an area of known bristlebird [illegible] locations of the two drift fences utilised are presented on Maps 3 and 4. These [illegible] numbered for later reference in this report.

Playback of Recorded Song

Unlike many other vertebrate fauna groups birds are not easily attracted to traps or nets by the use of bait. A widely used technique however to attract territorial bird species is the use of species specific call playback. As the Western Bristlebird is thought to be a territorial species the use of playback was considered appropriate to draw individual birds toward opened mist-nets.

To facilitate the playback of calls two or three speakers (depending on the formation of the erected mist-nets), each with between 10-20m of speaker cable, were positioned approximately 5-20m away from mist-nets on opposing sides. The taped calls were then played using a small portable battery operated cassette player through a 12V amplifier from a concealed position away from the nets or drift fence.

The playback calls were recorded on continuous loop cassette tapes (outgoing message tapes for answering machines), so that continual stopping and rewinding of tapes was not necessary. Several existing recordings of Western Bristlebirds were utilised during the course of the study, including recordings made by Shapelle McNee (SM) during a study conducted for the RAOU and recordings taken from the commercially available Bird Observers Club Bird Call Series (BOC). Both recordings were made from the Two Peoples Bay Nature Reserve, but the BOC recording contained only the A-call of the species whereas the recording by Shapelle McNee contained a duet of the A and B-calls. The BOC recording was used in preference largely due to the better quality of the recording.

During the course of the study, when wind and weather permitted, recordings were also made of individuals and pairs of birds in and around those areas where mist-nets were erected. This was done as it was thought that playback of a particular bird's own call or that of a close neighbour may elicit a a better response. Two good quality recordings were made and are referred to as P1 and P2 in Appendix A.

The position of speakers in relation to mist-nets and length of playback calls was varied considerably during the course of the study.

Flushing and Driving of Birds

If and when a Western Bristlebird was known to be close (within 20m) of a mist-net, flushing and driving were used to force the bird into the net. This involved moving around the bird so that it was between the net and us. We than moved noisily through the vegetation in the hope of pushing the bird along the ground the toward the net (driving) but forcing the bird to fly into the air and toward the net (flushing). Movement through the vegetation was made in a zigzag pattern so as to prevent the bird from slipping past. We we carried poles to beat the vegetation on either side of us for the same effect. Due to the fact that the birds were seldom seen, driving and flushing were only used when we were confident about the exact location of the bird.

Timing of Capture Attempts

Capture attempts using the techniques described above were made predominantly between the hours of 0600 - 1030 and 1030 - 1300. These times varied according to arrival times at the study site and weather conditions. Captures were not attempted after 1400 so that birds could be released following the lengthy processing procedure with enough daylight hours to allow them to reorientate and feed if necessary.

Handling and Processing of Captured Birds

Following capture, birds were placed in a calico holding bag and transported immediately back to Jeemaluk (the field station). The weight (to nearest 0.5g) of the bird and bag was then taken using a 100g Pesola balance, before the bird was placed in a $25cm^3$ (15.5 litre) holding box. A sheet of paper towel was placed on the bottom of the holding box to collect faeces deposited by the bird. The calico holding bag was then weighed and the weight of the bird calculated (to nearest 0.5g). All equipment required for the processing of the bird was prepared to minimise the actual handling time.

The bird was removed from the holding box and a size 4 alloy numbered band[1] was fitted to the left tarsus of the bird and the band number recorded. A single size 3/4 colour band was then fitted above the metal band on the left tarsus and a further two colour bands fitted to the right tarsus. All colour bands were sealed with clear nail polish ("Hard as Nails"). As fewer than ten birds were anticipated to be captured and to facilitate easier identification, all three colour bands fitted to each bird were of the same colour, with different colours utilised for each bird.

The following morphometric measurements as described by Lowe (1989) were then taken using a set of butted vernier callipers from each bird:

Head-bill length (HB)
Bill length (BK)
Bill depth (BD)
Bill width (BW)
Tarsus length (TL)
Tarsus width (TW)

The following morphometric measurements as described by Lowe (1989) were [illegible] using a butted ruler or non-butted ruler from each bird:

Wing length (WL)
Tail length (TA)
Total length (LE)
Wing Point (WP)

Notes were then taken on the presence/absence of tail barring, brood patches, cloacal protuberances and general feathering. Notes on soft part and plumage colouration, and moult activity were also taken. All ectoparasites located during the taking of morphometric measurements were collected and placed in a labelled vial containing 60% alcohol. Untouched feathers were also collected and placed in a labelled vial for DNA analysis.

Following the death of 040-70912 (see later for details) it was decided that only brief notes on soft parts and plumage would be taken to reduce the processing time of captured birds. This effectively reduce the handling time of the birds from over 90 minutes to approximately 60 minutes.

All data were recorded on ABBBS field data sheets.

Following completion of measurements a radio transmitter was attached to the bird.

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1 Numbered bands supplied by the Australian Bird and Bat Banding Scheme.

Attachment of Radio transmitters

Attachment of the radio transmitters was made using a modified technique following Raim (1978), Sykes *et al.* (1990), and Johnson *et al.* (1991). This technique had previously been used successfully on the Noisy Scrub Bird (Danks *et al.*, 1990), Ground Parrot *Pezoporus wallicus* (A.H. Burbidge, pers. comm[2].) and on the Spinifexbird *Eremiornis carteri* (Murphy, unpublished data).

Prior to attachment, the radio transmitter was weighed (to nearest 0.25g) using a 30g Pesola balance, the signal emission checked and the signal frequency noted. The bird was then held firmly while an area of feathers approximately the same size as the transmitter was clipped from the interscapular region leaving approximately 2mm of the feather bases. A piece of surgical gauze the same size again was then placed over this area and several drops of a non-toxic cyanoacrylate (Vetbond) placed on the gauze. This was allowed to dry for approximately five minutes after which a second film of cyanoacrylate was placed on the gauze, a second film was also placed on the outer surface of the transmitter and the transmitter was then held firmly against the gauze for approximately five minutes to allow the glue to dry enough to hold the transmitter in place. Great care was taken to ensure that no excess cyanoacrylate was allowed to spoil the surrounding feathers or run between the body of the bird and the wings. The bird was then returned to the holding box and held for a further ten minutes to ensure that the transmitter attachment had been successful.

Following satisfactory inspection of the transmitter attachment, leg bands and checking of signal emission the bird was released from the point of capture.

Radio-tracking

To allow captured birds to resettle and resume normal behaviour, radio-tracking of birds was not commenced until the day following capture and release. Birds were then located using the technique described below.

The general direction of the bird was first inferred from several bearings taken approximately 50m apart. An attempt was then made to approach the bird quietly with as little disturbance as possible to a distance of approximately 30m. The bird was then circled at a distance of 30m to gain a general location. An attempt was then made to approach the bird and pinpoint its exact position by circling the bird in increasingly smaller circles. Location of the birds position to within 5m was considered satisfactory, before moving away to minimise disturbance. If the bird was moving randomly or moved rapidly away

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2 Alan Burbidge, Department of CALM, Woodvale and Western Bristlebird Recovery Program coordinator.

when approached, its location was noted along with a measure of the accuracy (eg. to within 15m). At each location taken a length of biodegradable surveyors tape was placed on which was written the band number of the bird, the date and the time. Between the taking of exact locations the general movement of the bird was monitored from a distance of approximately 50m. Notes on the movement, general behaviour and vocalising of the birds being radiotracked were made. Generally locations were taken at 40-80 minute intervals.

The above described method was utilised over the technique of triangulation as the accuracy of triangulation is only maximised when three bearings are simultaneously taken from fixed receivers, and even then this accuracy is likely to be no better than to within 15m (Pyke and O'Connor, 1990). As the purpose of this study was to determine microhabitat utilisation it was decided that triangulation would not be accurate enough.

RESULTS

Capture of Birds

A total of nearly 100 hours of playback time was conducted during this study. Responses to playback were inconsistent and infrequent, consisting predominantly of vocal responses of either bouts of A-calls from a single bird or an A/B-duet from a pair of birds. In the majority of cases these vocal responses were not followed by any visible active response. Duration of vocal responses ranged from single calls and short song bout to long song bouts by both single individuals and pairs. On several occasions individual birds giving the A-call in response to the playback were heard to change the structure of their call, however this was not a common occurrence. A vocal response was considered to have been made if a bird or birds sang from within 150m either during playback or within one minute of playback being discontinued.

An active response was considered to have taken place when a bird or pair were visibly or audibly observed to approach the playback. On the few occasions when birds responded actively they tended to circle or approach the playback speakers slowly and with extreme caution, often remaining quiet for long periods of time. As the birds were difficult to observe it was only known if they approached the playback by listening for calls. It is possible that if the birds remained silent they could have approached the playback without being recorded.

On those occasions when birds approached close enough to a line of mist-nets to warrant an attempt to flush or drive the birds toward the net the common response of the birds was to go to ground. This generally resulted in the birds ceasing to call and any further response being indeterminable. On several occasions following an attempt to drive a bird

was heard calling from behind suggesting that the bird had either remained silent until we had passed or had moved away from us.

On ten occasions, following vocal response, individual birds responded actively and entered erected mist-nets, however only on two occasions were birds successfully caught and both birds were driven toward the net. On other occasion one bird entered a net following playback without a prior vocal response and three birds entered nets without playback being commenced. On one of these latter occasions the bird was successfully caught.

Of the thirteen occasions when birds entered opened mist-nets we were able to reach the birds in time to prevent their escape only three times. Generally it appeared that the 2.5cm mesh nets had mesh too small to allow the birds to adequately entangle while the 5.75cm mesh-nets had mesh too large allowing the birds to pass through the net. Also the majority of birds entered the net along the bottom shelf and may not have been travelling fast enough to have hit the net hard enough to get entangled.

Accounts of individual responses during the period of this study are detailed in Appendix A, however, two occasions when active responses occurred are worth special mention. On both these occasions we managed to open mist-nets and commence playback between a pair of birds. On both these occasions both birds (particularly the bird giving the A-call) became very vocal and agitated. It appeared in both occasions that the A-bird was trying to locate and reach its mate, suggesting that it saw the presence of another bird (the playback) as a threat.

Of the four playback recordings utilised during this study, the most frequent response, either vocal or active, was achieved from those recorded during the study and played in the area from which the recordings were made. These recordings were also the only ones that elicited B-calls responses directly to the playback.

Both vocal and active responses occurred throughout the day, however birds appeared to call slightly more frequently and respond more positively in the first four or five hours after dawn. Birds also appeared to again call more vigorously toward the last few hours before dusk, however playback was not attempted at this time as birds would have to be held overnight due to time needed to process and attach transmitters.

Prior to the study conducted at Tick Flat some attempts to capture birds and gain responses to playback were made at several other locations in the Two Peoples Bay Nature Reserve. At Sinker Reef on Thursday, September 15 two birds were caught. The circumstances of these captures are detailed below.

Following a positive and active response from a bird giving the A-call to playback on the previous day five 2.25cm mesh mist-nets (5x40') were erected and opened in the carpark at

Sinker Reef. Soon after commencing playback (SM) a bird began responding with a bout of A-calls. The bird was calling frequently in response and moved around the edge of the carpark. On several occasions we attempted to drive the bird toward the net, however it would go silent and begin calling again several minutes later from some distance away. After approximately 60 minutes of playback a bird was noticed caught in the bottom shelf of one of the nets. The bird was removed and banded (040-70910). This bird however was caught some 20m from where the bird giving the A-call was estimated to be and whilst this bird was being banded the A-bird began calling again from close to where the bird was being held. The first bird was being quite vocal while being banded and the second bird responded vigorously with a bout of A-call. An successful attempt was made to flush this second bird toward the nets. The bird was removed and banded (040-70911).

Radio-tracking

Following one day of radio-tracking, 040-70912 was found dead in a shallow burrow. This burrow was less than 40m from where the bird had been observed alive late the previous afternoon. There was no sign of predation and it is believed that the bird died of a combination of hypothermia and stress. The bird had been released at approximately 1700, and the combined with relatively low overnight temperatures and hail storms the following day may have prevented the bird from feeding adequately. Following this unfortunate death, measures were taken to prevent a re-occurrence. These included cutting down handling times, ceasing all capture attempts after 1300, and refraining from intensive radio-tracking for one day following release.

Transmitter attachments to the three birds caught during the course of this study were all considered successful. Some difficulty was experienced in the attachment of the transmitter to 040-70913. The transmitter was checked and appeared to be working prior to attachment, however prior to release the transmitter signal was rechecked and found to have ceased working. As a result the transmitter had to be removed and a new transmitter attached. The transmitter attached to 040-70913 remained attached to the bird for six days before the transmitter was located, still working, lying on the ground beneath a small bush. There was no sign of the bird or remains. The transmitter attached to 040-70914 remained attached to the bird for at least 14 days after which it is assumed the battery ran down and no signal was received. The transmitter attached to 040-70912 was still attached to the bird when it was found dead approximately 40 hours after release.

Radio-tracking of birds was also considered a success with little effort to locate the birds being encountered. Occasionally the strength of the signal from the transmitter fluctuated, however this was most likely attributable to the movement or positioning of the bird. On many occasions the birds being radio-tracked moved away rapidly when approached, suggesting that they were disturbed by our movement toward them. This unfortunately was unavoidable, however the general position of the bird prior to it moving away was usually readily determinable.

Daily chronological notes on the radio-tracking conducted during this study for the three birds 040-70912, 040-70913, 040-70914 are presented in Appendices A, B and C respectively.

Morphology and Behaviour of Captured Birds

All five birds captured, including the two birds from Sinker Reef, showed little difference in general plumage coloration. Both 040-70911 and 040-70913 differed from the three other birds in having a pale brick red iris rather than a deep brick red iris. Both these birds also possessed a faintly fleshy pale gape and relatively bare thighs and upper under-arms suggesting that both birds were probably young. 040-70914 also was found to have synchronous growth bars in the tail. The movements of this bird (see Appendix C) may also suggest that this bird was a young bird in either its first or second year. 040-70914 was also extremely vocal, giving a continuous rasping call whilst being handled.

Both 040-70911 and 040-70914 were heard to give the A-call prior to capture and the latter bird gave the A-call several times during radio-tracking. No calls were heard from 040-70912 and 040-70913 prior to or after capture. Although A-calls were heard from a bird prior to the capture of 040-70912, we could not be sure that it was this bird which had given these calls.

The morphological measurements of 040-70910 were consistently slightly less, however the measurements of the other four birds were relatively similar. Completed ABBBS field data sheets giving morphological and plumage characteristics taken are presented in Appendix D.

General Behaviour and Observations

Few visual observations of Western Bristlebirds were made during the period of this study and when they did occur they were of such short duration that no substantial observational notes could be made.

Birds calling from elevated positions were observed on several occasions. Generally birds were observed giving A-call, however on one occasion a bird was seen giving a B-call from an elevated perch.

During the study many birds were heard calling. In the majority of cases either a bout of solitary A-calls or an A/B-call duet commenced by an A-call was heard. On several occasions the Waychinicup trill call (extended A-call) was heard from an area south-west of Jeemaluk, and on one occasion a disjointed A-call was heard. The latter sounded like the first few notes of the common A-call repeated several times before the end notes were

completed. Bouts of duetting commenced by a B-call and solitary B-calls were also heard during the period of this study but were not common.

In the majority of cases where birds responded to playback, were encountered or were able to be approached closely there was usually an indication, either visually or audibly, of the presence of two birds. Commonly when duetting was absent, the presence of two birds was indicated by short soft communication calls best described as chit-calls (Smith, 1987).

During capture attempts and radio-tracking the presence of several pairs within a particular area was indicated by audible calls and the knowledge of the position of the responding or radio-tracked bird. On one occasion seven birds were suspected of being within 150m of each other though not all were heard to call at the same time (see Appendix A).

DISCUSSION AND RECOMMENDATIONS

Generally during the period of this study vocal responses to playback were easily elicited from individuals and pairs of Western Bristlebird, however more active responses were far less consistent and unpredictable. The birds did not appear to be vigorously defending territory boundaries and appeared to be reasonably tolerant of the presence of other birds within their home range. Birds did however appear to become more responsive to the presence of another bird when the intruding bird came between or was closer to their mate than they were. This would suggest that during the period of this study the preservation of pair bonding was considered by the birds as a vital resource over and above food resources or nesting sites that may be defended by the establishment of territories. This is supported by the fact that more positive responses were also received when the calls of the pairs being targeted for capture were played back. As there was no indication of breeding during this study it would appear possible that Western Bristlebirds maintain long term pair bonds, with pairs remaining together and outside of the breeding season. This may however be a temporally dynamic behaviour and it is recommended that a study be conducted over a longer period, probably one year, to investigate the response of individual Western Bristlebirds to playback. It may be possible that at certain times of the year, particularly during breeding that Western Bristlebirds will respond more positively to playback techniques.

Secondarily to not being able to elicit a consistent and predictable response to playback, problems were experienced during this study in that birds once enticed into a mist-net were not getting adequately entangled to enable successful capture. Of the two net sizes utilised during this study the 2.5cm mesh nets appeared to be too small and the 5.75cm nets appeared to be too large. As net sizes between these two are currently difficult to obtain a method similar to that developed for the capture of Noisy Scrub-birds may need to be adopted. This however will only be effective if a consistent and predictable response to playback can be found.

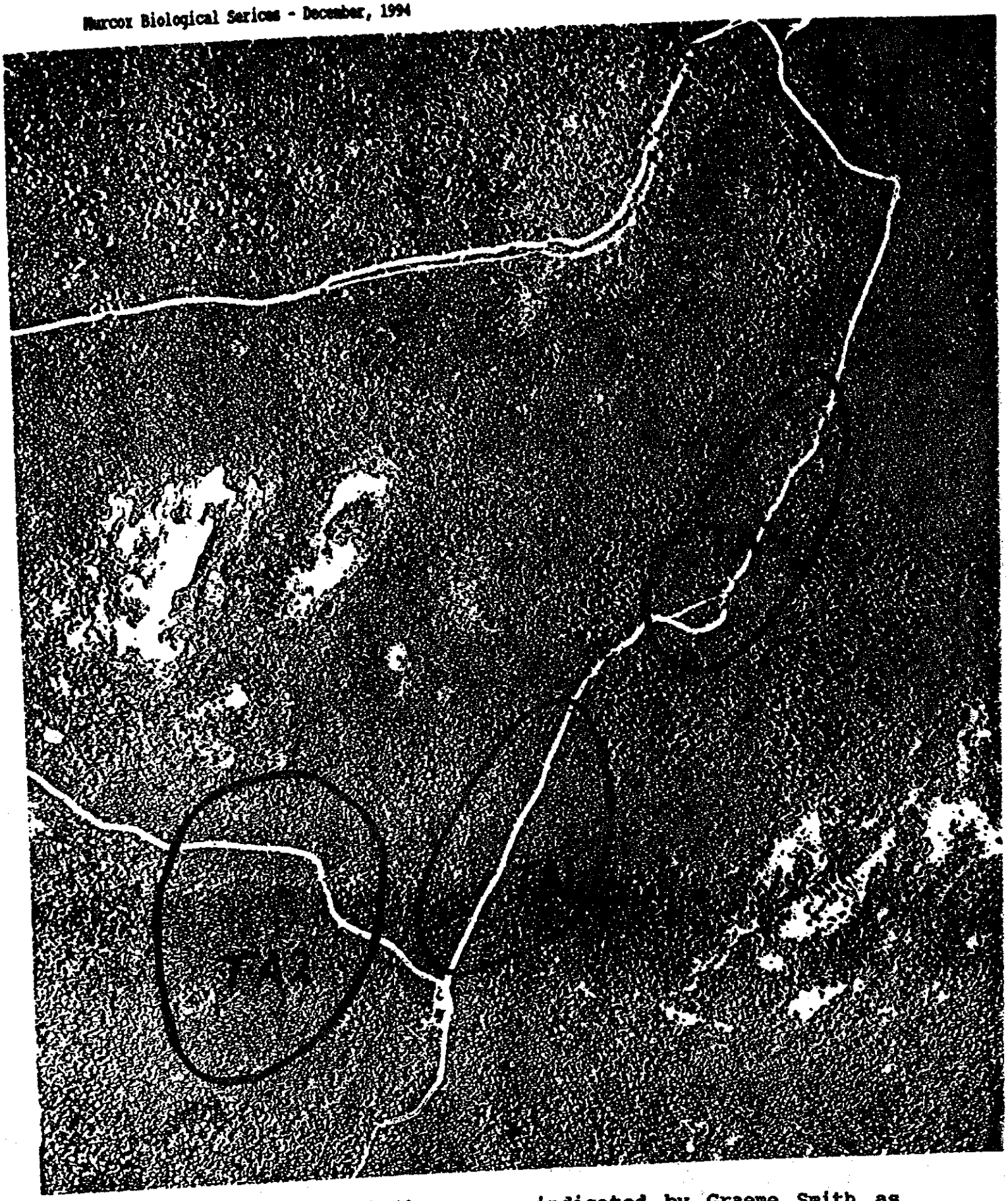
As Western Bristlebirds appear to inhabit predominantly low heathlands it is possible that they are able to see and become wary of mist-nets standing up to 2m high. In addition to the above recommendations it is suggested that future attempts to capture Western Bristlebirds utilise modified two or three shelf mist-nets that may not be so easily visible.

The technique of using drift fences was unsuccessful during the period of this study. Admittedly D2 was only erected several days before been utilised and previous experience with this technique has suggested that the fence need to be left for up to several months to allow the birds to get used to their presence (A. Danks pers. comm.[3]). Drift fences however are not easily erected or moved and this technique is unlikely to present a practical and efficient method of capture for use during future research or translocation of Western Bristlebirds requiring the capture of numerous individuals.

The use of radio-tracking to determine habitat utilisation during this study can be considered a success. No difficulties in either transmitter attachment or tracking was encountered. There was some concern however as to the disturbance to birds during radio-tracking, particularly as birds often appeared to move away from the radio-tracker when approached. Should this work be continued some consideration to modification of the technique may be necessary or if some reduction in accuracy can be tolerated then triangulation from fixed receiving points could be considered.

As the results of microhabitat utilisation gained from this study are to be interpreted in conjunction with the results of botanical study conducted concurrently by Chris Robinson, no interpretation of the data will be made in this report.

3 Alan Danks, Reserve Manager, Two Peoples Bay Nature Reserve



Map 1: Locations of the areas indicated by Graeme Smith as Primary target area for the capture of Western Bristlebirds. TA1 - Target Area 1; TA2 - Target Area 2; TA3 - Target Area 3.

Map 2: Locations of mist-nets lines(M1-M8) utilised during the study and referred to in the main text.

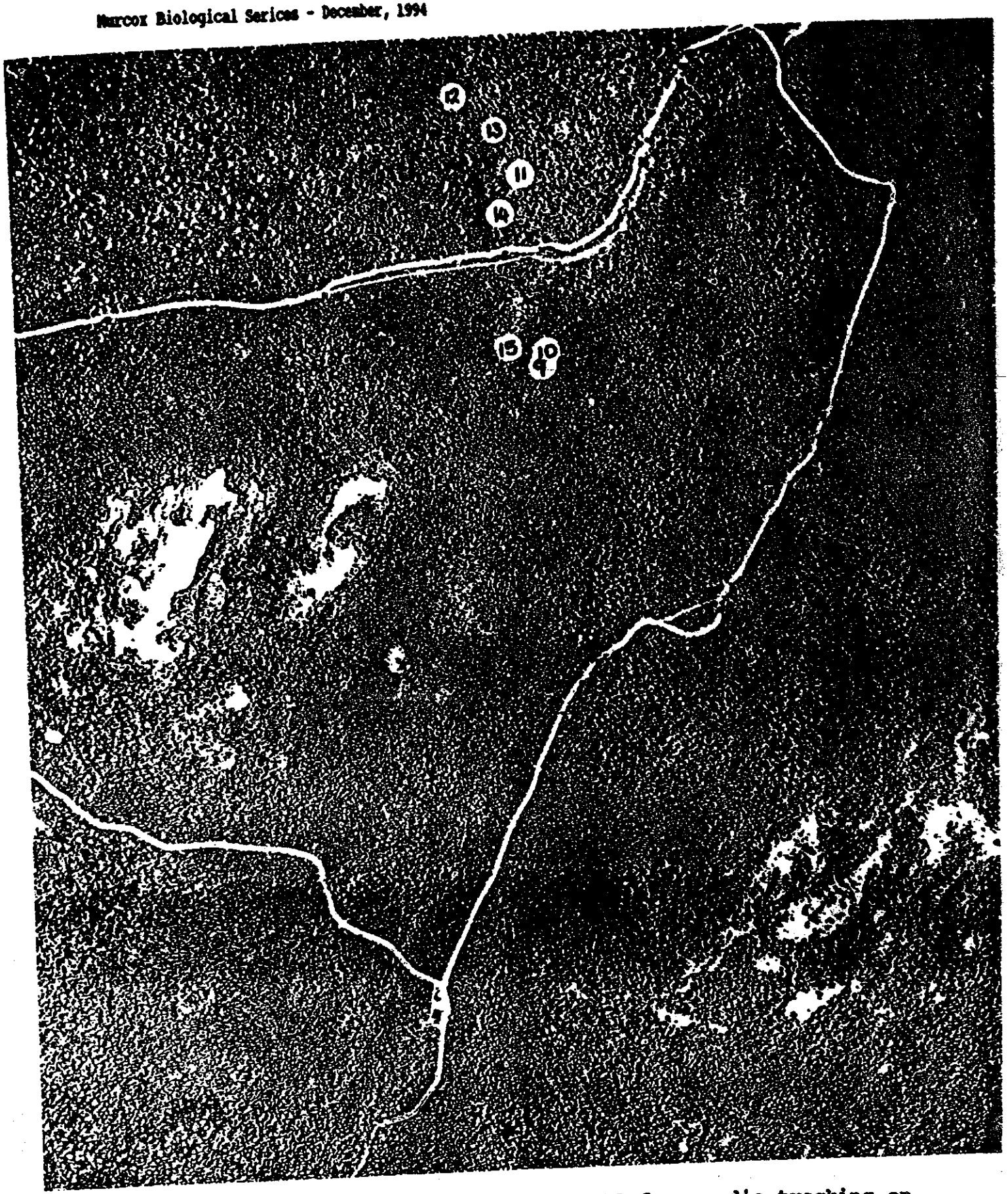
Map 3: Location of Drift Fence 1 (D1) utilised during the study and referred to in the main text.

Map 4: Location of Drift Fence 2 (D2) utilised during the study and referred to in the main text.

Map 5: Estimated locations of 040-70912 from radio-tracking on Wednesday, October 5, 1994. 1 (0730); 2 (0845); 3 (1005); 4 (1120); 5 (1240).

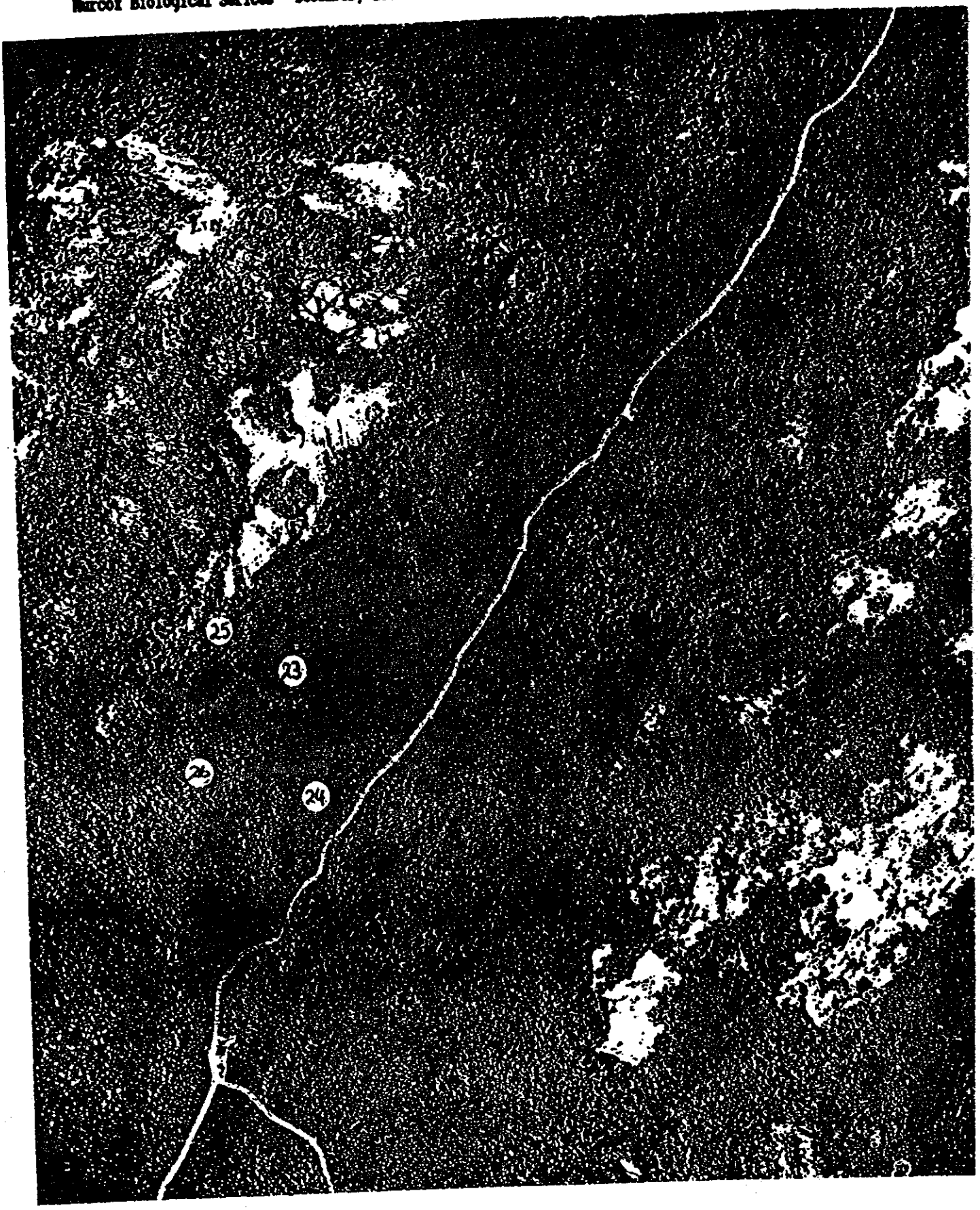
Map 6: Location where 040-70912 found dead in shallow burrow on Thursday, October 6, 1994. 6 (0700).

Map 7: Estimated locations of 040-70913 from radio-tracking on Thursday, November 3, 1994. 1 (0710); 2 (0805); 3 (1000); 4 (1100); 5 (1120); 6 (1300); 7 (1420); 8 (1445).



Map 8: Estimated locations of 040-70913 from radio-tracking on Friday, November 4, 1994. 9 (0730); 10 (0815); 11 (0905): 12 (1050); 13 (1140); 14 (1350); 15 (1435).

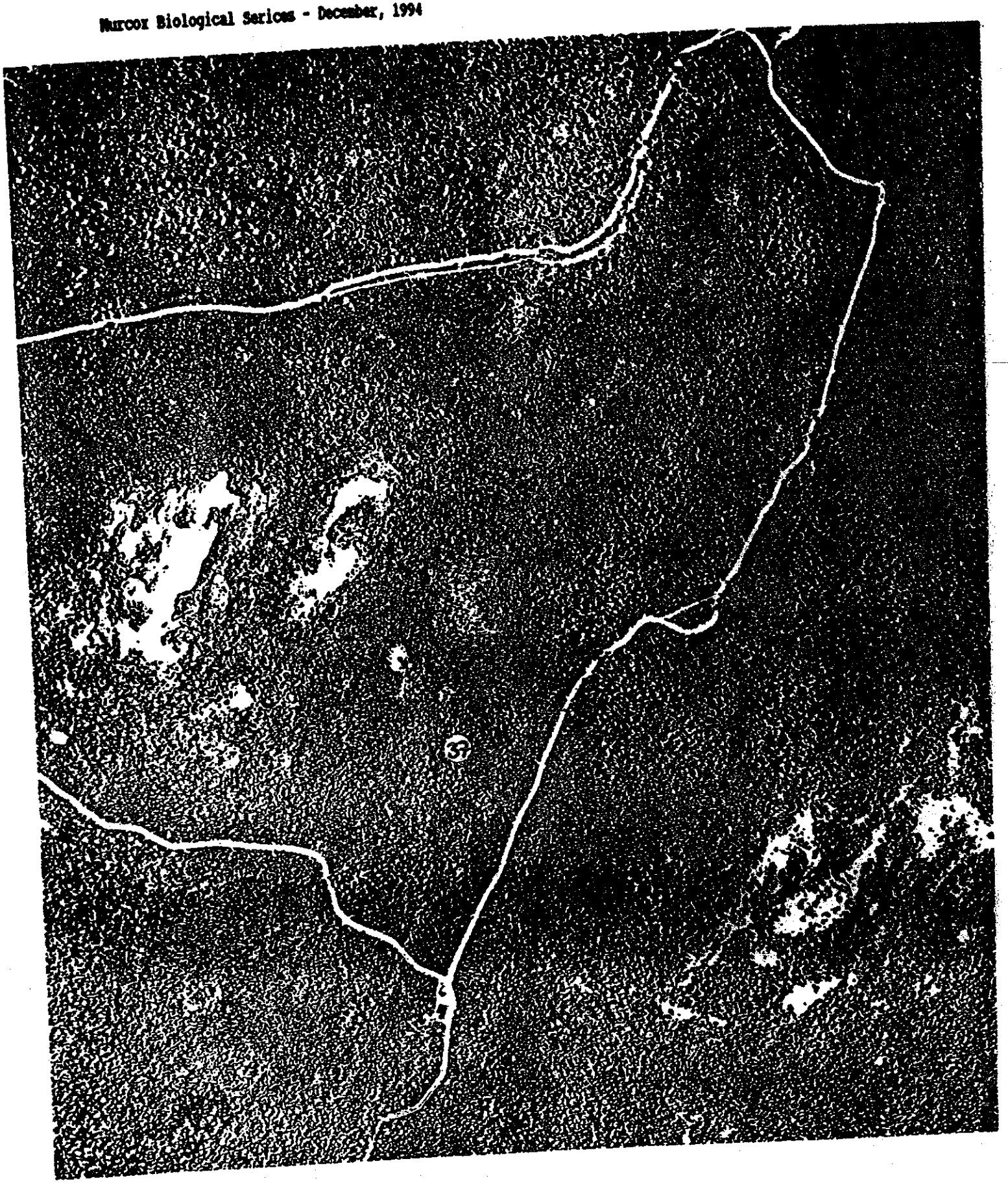
Map 9: Estimated locations of 040-70913 from radio-tracking on Sunday, November 6, 1994. 16 (0730); 17 (0830); 18 (0930); 19 (1045); 20 (1255); 21 (1435).



Map 10: Estimated locations of 040-70913 from radio-tracking on Monday, November 7, 1994. 22 (1400); 23 (0730); 24 (0915); 25 (1030); 26 (1330); 27 (1830).

Map 11: Estimated locations of 040-70913 from radio-tracking on Monday, November 7, 1994. 27 (1830).

Map 12: Estimated locations of 040-70913 from radio-tracking on Tuesday, November 8, 1994. 28 (0600); 29 (0640); 30 (0730); 31 (0800); 32 (1000); 33 (1040); 34 (1110); 35 (1300).; 36 (1815).



Map 13: Location where transmitter found removed from 040-70913 on Wednesday, November 9, 1994. 37 (0650).

Map 14: Estimated locations of 040-70914 from radio-tracking on Monday, November 7, 1994. 1 (0600); 2 (0800); 3 (1045); 4 (1125); 5 (1155); 6 (1450); 7 (1540); 8 (1645); 9 (1710); 10 (1740); 11 (1800).

Map 15: Estimated locations of 040-70914 from radio-tracking on Tuesday, November 8, 1994. 12 (0615); 13 (0700); 14 (0745); 15 (0830); 16 (0945); 17 (1020); 18 (1100); 19 (1140); 20 (1340); 21 (1425); 22 (1530); 23 (1615); 24 (1650); 25 (1800).

Map 16: Estimated locations of 040-70914 from radio-tracking on Wednesday, November 9, 1994. 26 (0630); 27 (0752); 28 (0810); 29 (0950); 30 (1040); 31 (1125); 32 (1410); 33 (1510); 34 (1630); 35 (1750); 36 (1822).

Map 17: Estimated locations of 040-70914 from radio-tracking on Thursday, November 10, 1994. 37 (1345); 38 (1445); 39 (1535); 40 (1700); 41 (1740); 42 (1825); 43 (1845).

Map 18: Estimated locations of 040-70914 from radio-tracking on Friday, November 11, 1994. 44 (1205); 45 (1245); 46 (1315).

APPENDIX 6:

Plant species list for Tick Flat Bristlebird habitat.

Acacia cochlearis
A. leioderma
A. littorea
A. myrtifolia
Acrotriche cordata
Actinotus glomeratus
Adenanthos cuneatus
A. obovatus
Agonis flexuosa
A. flexuosa var. latifolia
A. hypericifolia
A. parviceps
A. marginata
A. aff. linearifolia
Allocasuarina fraseriana
A. humilis
Ampera ericoides
Anarthria gracilis
A. prolifera
A. scabra
Andersonia caerulea
Andersonia parvifolia
Astroloma baxteri
A. pallidum
Billardiera sp.
Banksia attenuata
B. coccinea
B. grandis
Boronia crenulata
B. spathulata
Bossiaea linophylla
B. rufa
B. dentata
Burchardia umbellata
Cassytha sp.
Chorizema glycinifolium
Conospermum capitatum
Conostylis serrulata
Cyathochaeta clandestina
Dampiera leptoclada
Darwinia citriodora
D. vestita
Dasypogon bromelifolius
Daviesia gracilis
D. incrassata
Dodonaea ceratocarpa
Dryandra formosa
D. nivea
D. pteridifolia
D. sessilis
Hydranthera brunonis
Eucalyptus calophylla
E. gardneri
E. megacarpa
E. marginata
E. staeri
Eutaxia obovatus
Franklandia fucifolia
Gahnia trifida
Gastrolobium bilobum
Gompholobium polymorphum
G. scabrum
Haemodorum sp.
Hakea ceratophylla
H. corymbosa
H. ruscifolia
H. prostrata
H. trifurcata
H. varia
H. ellipsoidea
Hibbertia furfuracea
H. pulchra
H. racemosa
Hypocalymma strictum
Hypolaena exsulca
Isopogon formosus
Jacksonia horrida
Johnsonia teretifolia
Lechenaultia tubiflora
Lepidosperma gracile
L. squamatum
L. sp. Tick Flat
Leucopogon parviflorus
L. propinquus
L. revolutus
L. verticillatus
Lindsaea linearis
Logania serpyllifolia
Lomandra sonderi
Loxocarya flexuosa
L. fasciculata
Lyginia barbata
Lysinema ciliatum
Melaleuca pentagona

M. striata
M. thymoides
Mesomelaena graciliceps
M. stygia
Needhamiella pumilio
Nemcia coriacea
Nuytsia floribunda
Olearia axillaris
Opercularia hispidula
Patersonia occidentalis
P. umbrosa
Petrophile longifolia
P. rigida
P. squamata
Pimelea longiflora
P. rosea
Platysace compressa
Pteridium esculentum
Pterostylis aff. barbata
Pultenaea reticulata
Rinzia oxycoccoides
Schoenus caespititius
S. sublaxus
S. aff. breviculmis
Sollya heterophylla
Sphaerolobium alatum
S. medium
Sphenotoma dracophylloides
Spyridium globulosum
S. majoriifolium
Stylidium calcaratum
S. junceum
S. schoenoides
Synaphea polymorha
Tetrarrhena laevis
Tetraria capillaris
T. octandra
Tetratheca setigera
Velleia trinervis
Waitzia citrina
Xanthorrhoea preissii
Xanthosia huegelii
X. rotundifolia

APPENDIX 7:

Tick Flat vegetation associations

HS : Heath over Sedges

Muir: Heath B to Low Scrub B over Dense Low Sedges to Low Sedges.
This is the most common association, usually located on mid and lower slopes, on grey-white siliceous sands. Generally the sedge component (especially *Anarthria scabra*) provides the greatest cover with the heath frequently being composed of scattered emergent shrubs, *Melaleuca thymoides* being the most common. Several species included here as "sedges", such as *Dasypogon* and *Conostylis* are more closely allied to Liliaceae, but have a life form more similar to the sedges than shrubs of the heath. The mid to lower southern slope of the valley has the tallest and densest sedges, often providing 100% cover up to 1m deep. Tall (+1.5 m) mid-dense *Hibbertia furfuracea* and *Agonis* aff. *linearifolia* also occur on this slope. This association is the lowest (ca. 0.5 m) and most open on the upper slopes. Where these may be a loam or clay component in the soil, as may occur immediately downslope from Jarrah-Hakea-Agonis association, the sedge component (especially *Anarthria scabra*) is diminished and provides less cover; shrubs (particularly *Allocasuarina humilis*) contribute more to the structure and cover. This combination of vegetation association and soil type has a higher dieback hazard rating and often shows evidence of *Phytophthora* activity, including dead Proteaceae and *Daviesia* resulting in a higher bare ground component. In the lower south western end of the valley, *Agonis flexuosa* forms very sparse low open woodland over the heath and sedges.

HEATH - Characteristic Species
Melaleuca thymoides
Allocasuarina humilis
Agonis hypericifolia
A. aff. linearifolia
Adenanthos cuneatus
Eucalyptus marginata (mallee)
Petrophile rigida
Daviesia incrassata
Hypocalymma strictum
Jacksonia horrida
Hibbertia furfuracea
Xanthorrhoea preissii
Xanthosia rotundifolia
Banksia attenuata
Gompholobium scabrum
Darwinia vestita

SEDGES - Characteristic species
Anarthria scabra
A. prolifera
Patersonia umbrosa
Cyathochaeta clandestina
Dasypogon bromeliifolius
Hypolaena exsulca
Lyginia barbata
Schoenus caespitius

Lepidosperma squamatum
Conostylis serrulata

JHA : Jarrah - Hakea - Agonis Scrub

Muir:Thicket to Scrub over Open to Very Open Low Sedges

This association occurs on shallow sandy loam or clay immediately downslope from the granite outcrops and in some of the upper drainage lines. The stunted mallee Jarrah and proteaceous elements of this community have in many areas suffered dieback impact. The taller species on the upper slopes may reach 2-3 m and slightly higher in the drainage lines. Some elemments of the Heath over sedges community are present, however *Anarthria scabra* is either absent or a minor component of cover.

Characteristic Species

Eucalyptus marginata
Dryandra formosa
Hakea trifurcata
H. ceratophylla
H. varia
Hibbertia furfuracea
Agonis aff. linearifolia
A. hypericifolia
Acacia leioderma
Xanthorrhoea preissii
Patersonia umbrosa
Tetraria capillaris
T. octandra
Loxocarya fasciculata
L. flexuosa
Mesomelaena gracilliceps
M. stygia
Anarthria prolifera

SW : Sheoak Woodland

Muir: Low Forest to Low Woodland B over Low Scrub B to Low Heath C over Low Seges

The most dense *Allocasuarina fraseriana* is upslope, toward the granite outcrops north of the middle of Tick Flat. The understorey is largely composed of dense *Anarthria scabra* (often covered to 0.5m in Sheoak needles) with occassional, widely scattered shrubs of *Melaleuca* and *Agonis*. On the margins of this woodland and in the woodland lower in the valley, either side of the track, the *Allocasuarina* canopy is less dense and the heath over sedges or *Melaluca striata* heath component is significant.

BW : Bullich Woodland

Muir:Low Forest B over Heath B over Tall Sedges

Bullich Woodland is located in several positions in the Tick Flat valley, where a north-south sand drift has crossed the westerly drainage line to create small areas of increased soil moisture, resulting in taller shrubs and sedges under the Eucalypt canopy.

Characteristic Species

Eucalyptus megacarpa
Agonis flexuosa
A. aff. linearifolia
Bossiaea linophylla
Hibbertia furfuracea
Anarthria scabra
Patersonia umbrosa
Platysace compressa
Lepidosperma squamatum

JMW : Jarah-Marri Woodland

Muir: Low Forest B to Low Woodland B over Heath A-B over Tall Sedges to Open Low Sedges

Located in the main drainage line of Tick Flat valley and consists of a variable overstorey of 3-4 m Jarrah and/or Marri over dense tall shrubs and sedges.

Characteristic Species

Eucalyptus marginata
E. calophylla
Agonis aff. linearifolia
A. flexuosa
A. hypericifolia
Acacia leioderma
Bossiaea linophylla
B. dentata
Boronia crenulata
Banksia grandis
Gastrolobium bilobum
Hakea elliptica
H. varia
Leucopogon revolutus
Nemcia coriacea
Xanthorrhoea preissii
Anarthria scabra
Patersonia umbrosa
Loxocarya flexuosa
Cyathochaeta clandestina

MW : Marri Woodland

Muir: Low Forest B over Heath B over Tall Sedges

This association of dense trees (under 5m), over tall shrubs and clumped sedges is primarily located in shallow loamier soils over granite at the margins of exposed granite sheets.

Characteristic Species

Eucalyptus calophylla
Acacia leioderma
Leucopogon parviflorus
L. verticillatus
L. revolutus
Hibbertia furfuracea
Agonis hypericifolia
Gastrolobium bilobum
Bossiaea linophylla
Lepidosperma gracile
Anarthria scabra
A. prolifera
Patersonia umbrosa
Loxocarya flexuosa
Tetraria capillaris

GAT : Gastrolobium - Agonis Thicket

Muir: Thicket over Tall Sedges

This dense association is confined to the margins of the granite outcrops.

Characteristic Species

Gastrolobium bilobum
Agonis marginata
A. hypericifolia
A. aff. linearifolia
Acacia myrtifolia
Hibbertia furfuracea
Patersonia umbrosa
Lepidosperma gracile
L. squamatum
Anarthria prolifera
Mesomelaena gracilíceps
M. stygia

BH : Banksia - Hakea Scrub

Muir: Thicket to Scrub over Low to Open Low Sedges

This association is confined to a lense of partially lateritised substrate, surfacing below the track, on the northern slope of the lower end of Tick Flat valley. It is typified by emergent *Banksia coccinea* and *Hakea trifurcata*, both of which have been affected by *Phytophthora* dieback, to the extent that what was once a more dense thicket is now open scrub, with frequent patches of bare soil.

Characteristic Species

Banksia coccinea
Hakea trifurcata
Allocasuarina humilis
Melaleuca striata
Mesomelaena stygia
Cyathochaeta clandestina
Hypolaena exsulca

MS : Melaleuca striata Heath

Muir: Dense Heath B to Heath B over Open Tall Sedges

Melaleuca striata, with occassional other shrubs, forms an almost continuous canopy at about 1 m, over sedges which are much less dense in this association than in the more open heath characterised by emergent *M. thymoides*.

Characteristic Species

Melaleuca striata
M. thymoides
Agonis hypericifolia
Hypocalymma strictum
Anarthria scabra
A. prolifera
Cyathochaeta clandestina
Dasypogon bromelifolius
Hypolaena exsulca

CH : Coastal Heath

Muir: Heath B

At the western end of Tick Flat valley, a number of limestone caprock outcrops support fragments of the association which is more common further west and toward Sinker Reef.

Characteristic Species

Dryandra sessilis
Agonis flexuosa
Melaleuca pentagona
M. thymoides
Spyridium majorifolium
S. globulosum
Pimelea rosea
Hakea prostrata
Sollya heterophylla

Acacia littorea
Acrotriche cordata
Hibbertia racemosa
Platysace compressa
Olearia axillaris
Lysinema ciliatum
Gahnia lanigera
Loxocarya flexuosa
Cyathochaeta clandestina
Lepidosperma squamatum
Anarthria prolifera