Fire impacts on birds in forests of south-west western Australia - a review

Dr Ian Abbott

Department of Conservation

Kensington

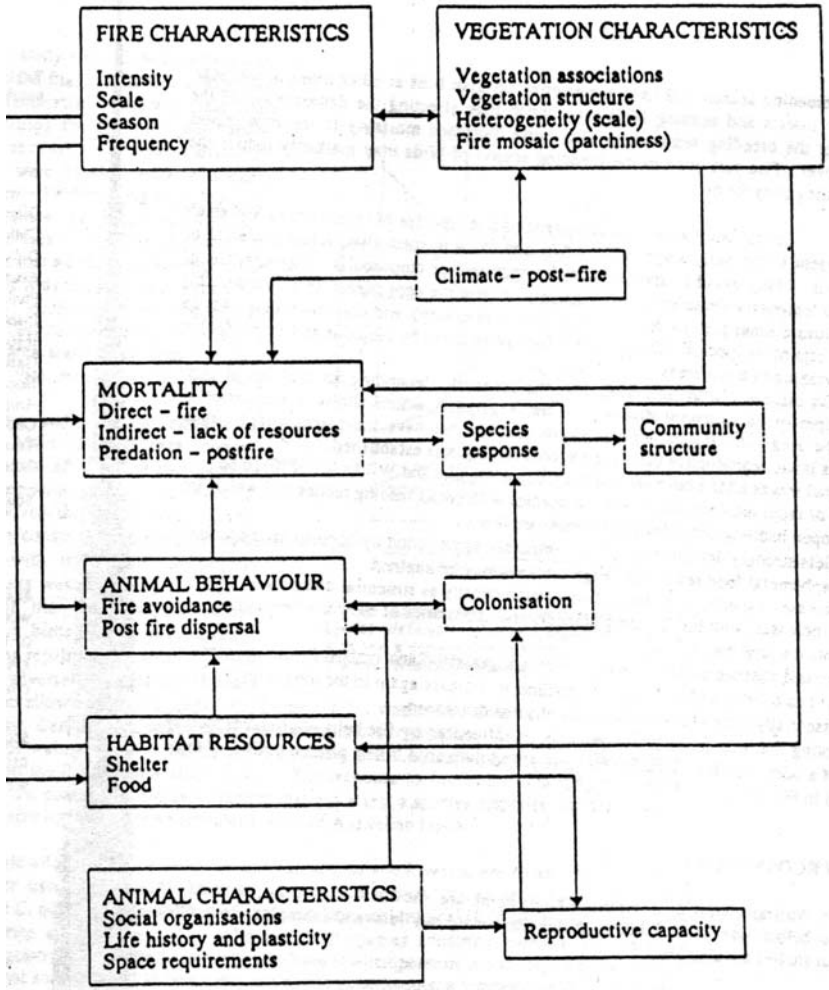

Fig. 1: Diagrammatic representation of the interactions between fire, vegetation, climate and faunal communities.

Structure of presentation

Empirical data

- Karri forest: species richness; total abundance
- Jarrah forest: species richness, total abundance
- Nesting period of all bird species

Largely theoretical

- Noisy scrub-bird

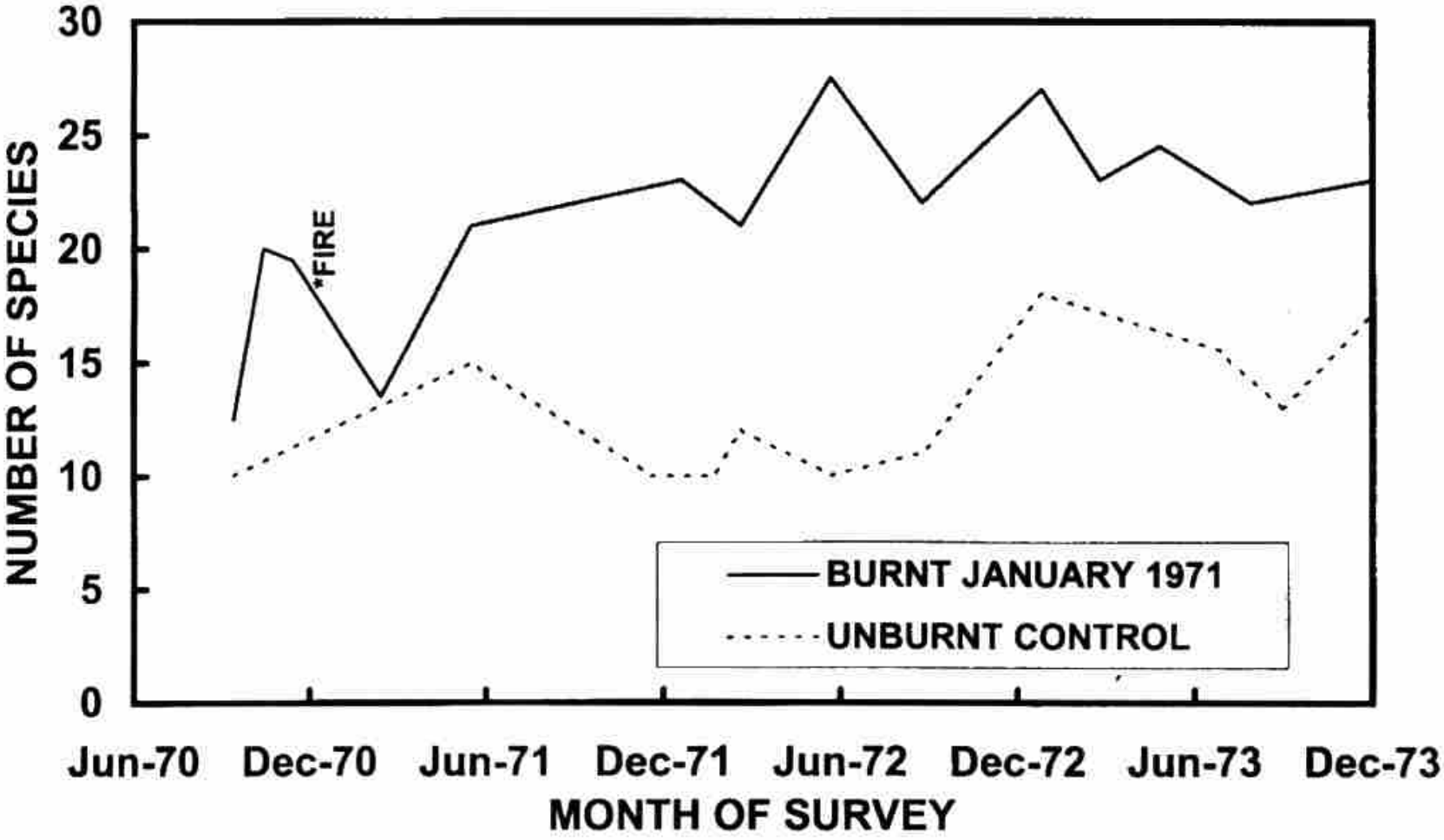

Figure 21. Number of bird species in karri forest decreased initially after fire and then progressively increased (Christensen and Kimber 1975).

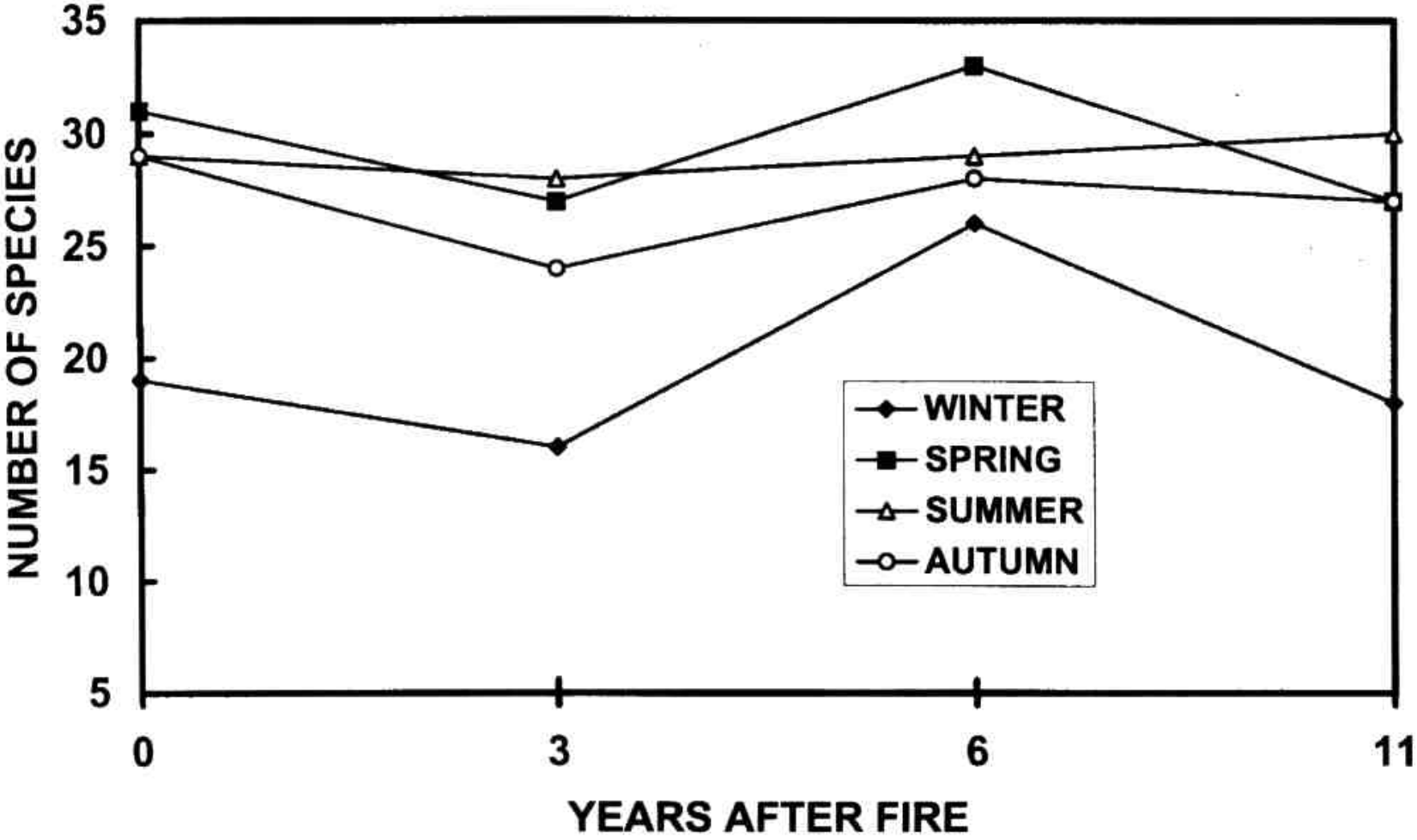

Figure 22. Number of bird species in mature karri forest was greatest 6 years after fire (Tingay and Tingay 1984).

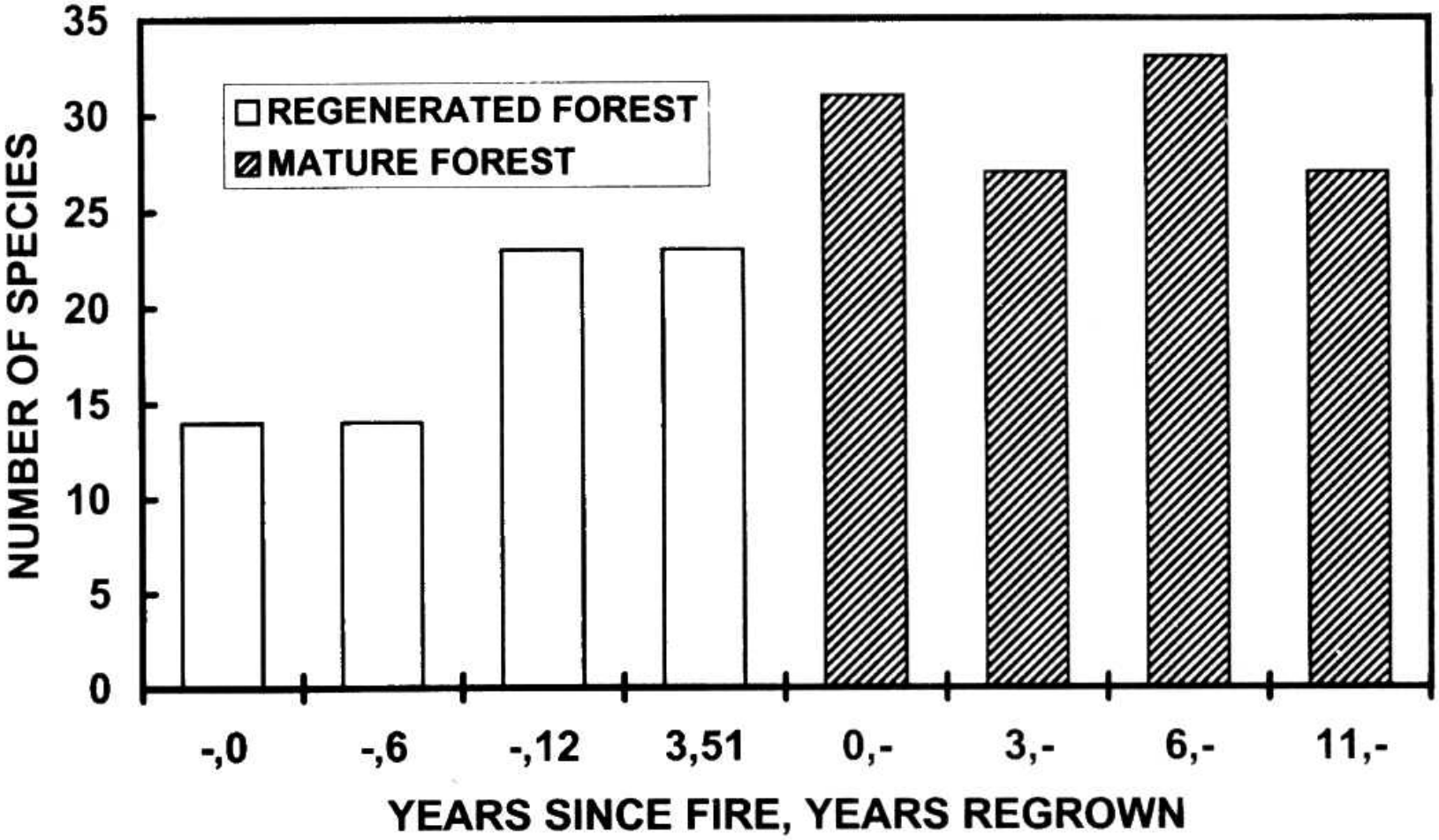

Figure 33. Number of bird species in karri forest increased steadily after clearfelling (data from Appendix 2 of Tingay and Tingay 1984).

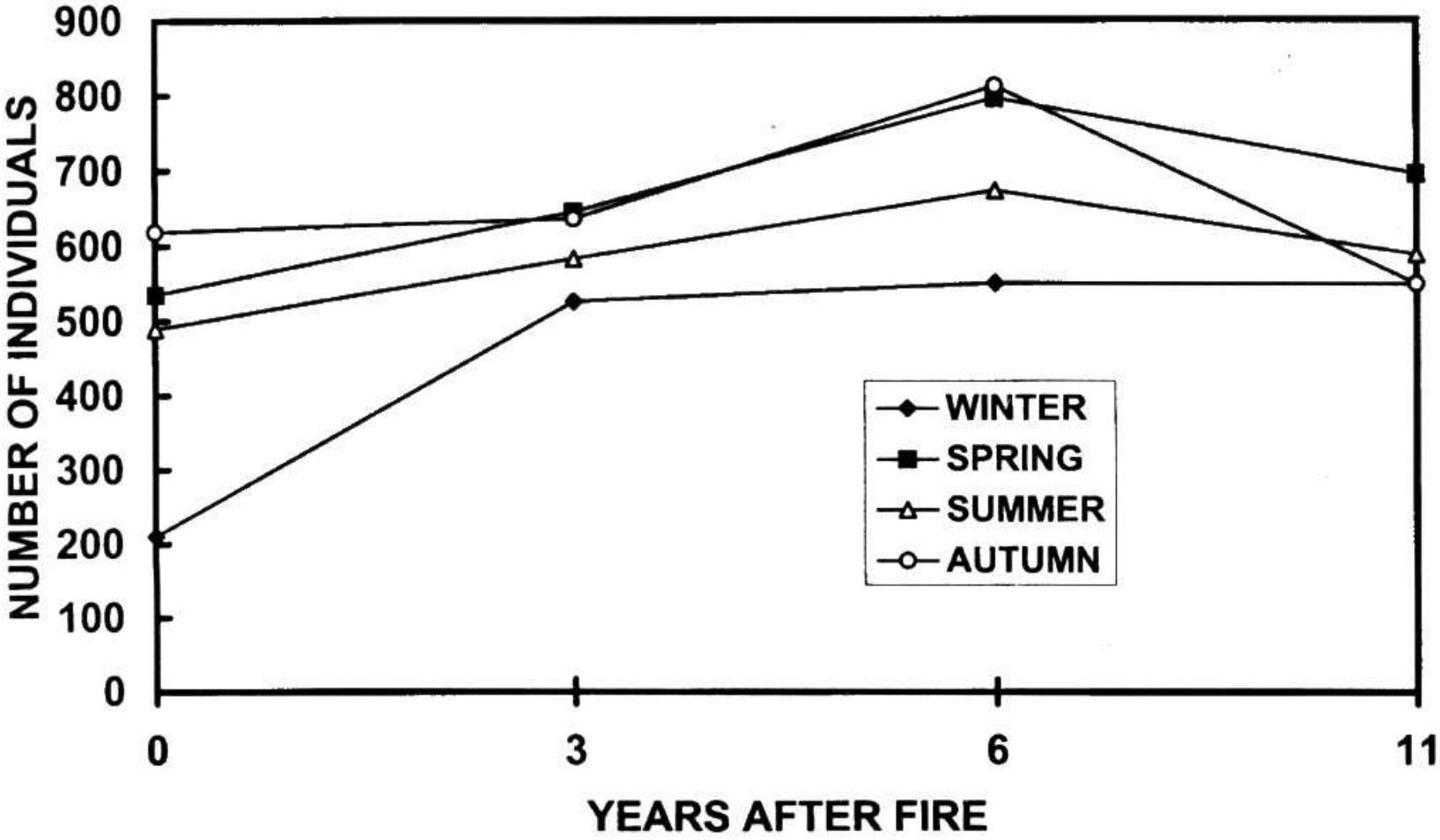

Figure 24. Abundance of birds in mature karri forest was greatest 6 years after fire (data from Appendix 2 of Tingay and Tingay 1984).

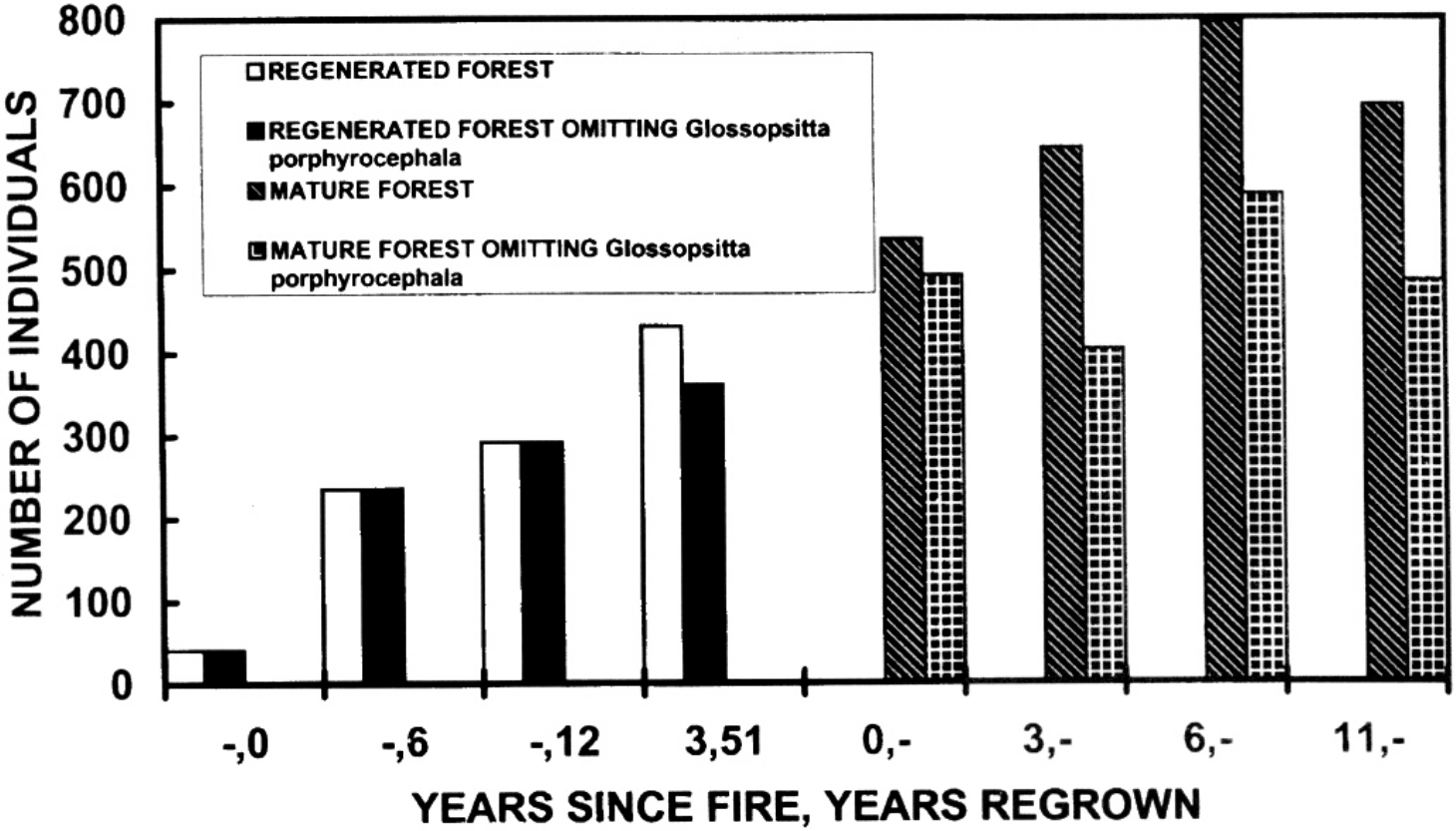

Figure 34. Abundance of birds in karri forest increased steadily after clearfelling (data from Appendix 2 of Tingay and Tingay 1984). The Purple-crowned lorikeet (Glossopsitta porphyrocephala) *is a blossom nomad and contributes in some years to much of the abundance of birds in mature karri forest.*

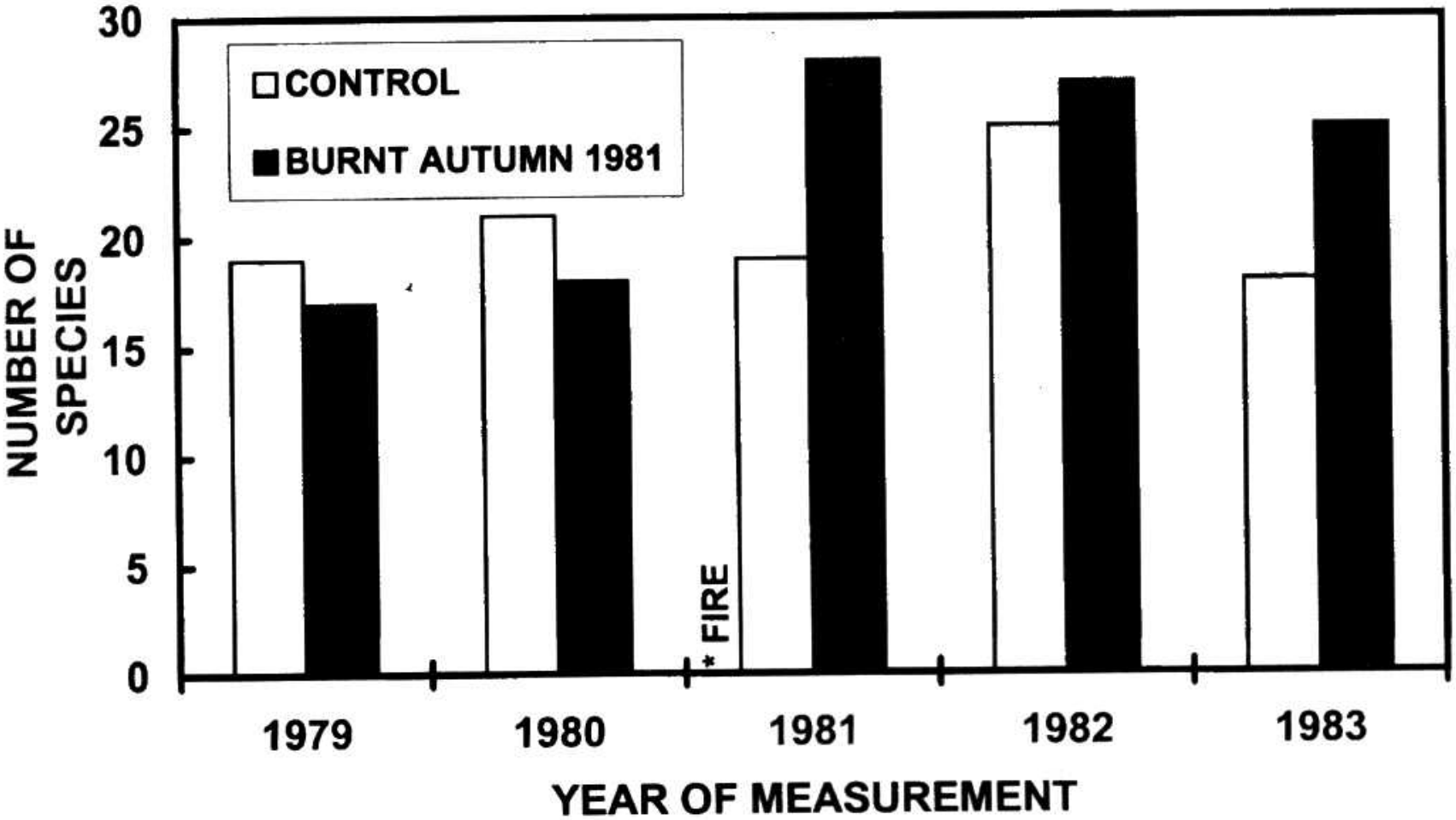

Figure 26. Number of bird species increased after autumn fire in jarrah forest (Christensen et al. *1985b).*

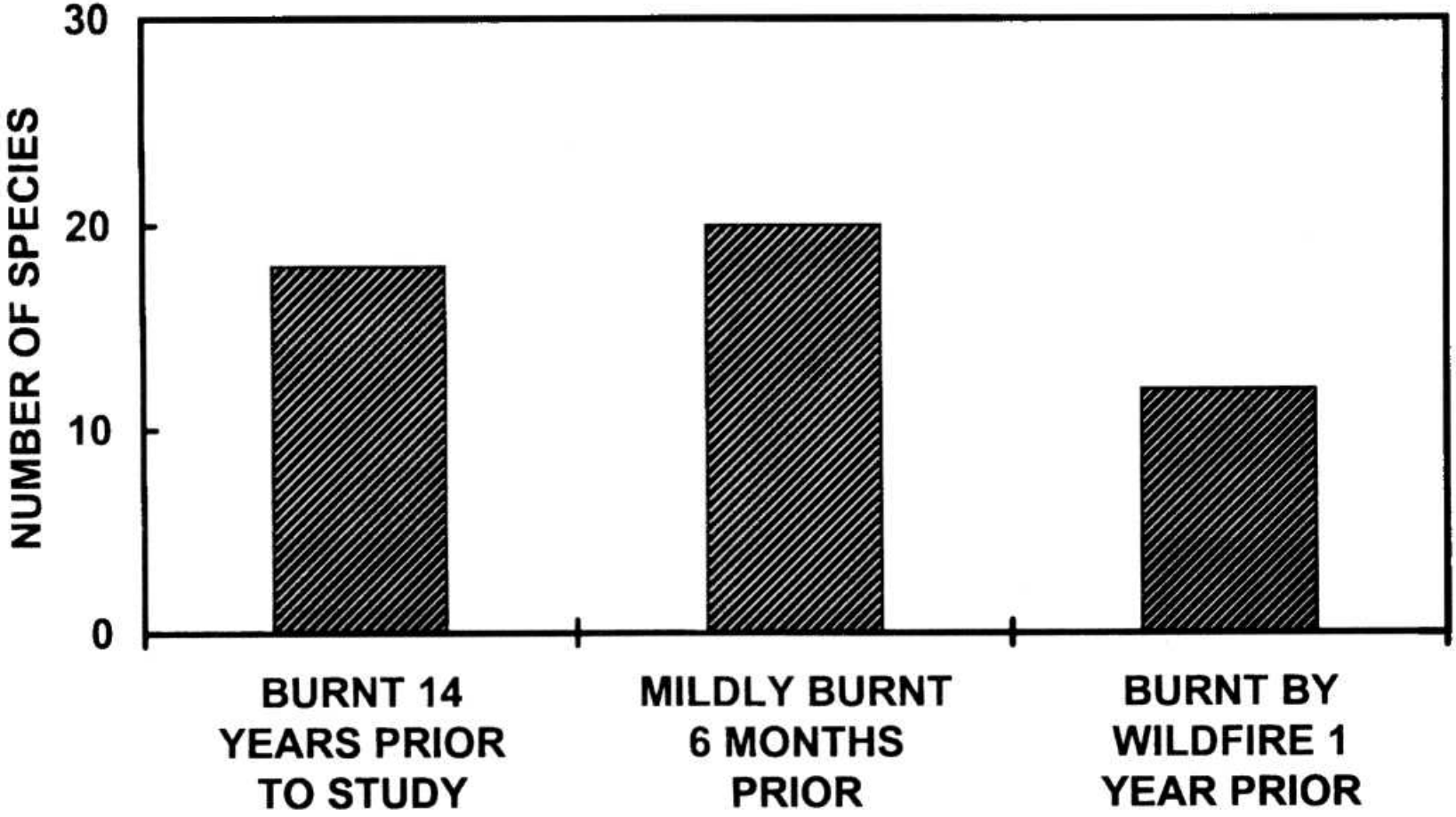

Figure 27. Number of bird species in jarrah forest increased after a low intensity fire but decreased after wildfire (Christensen et al. *1985b).*

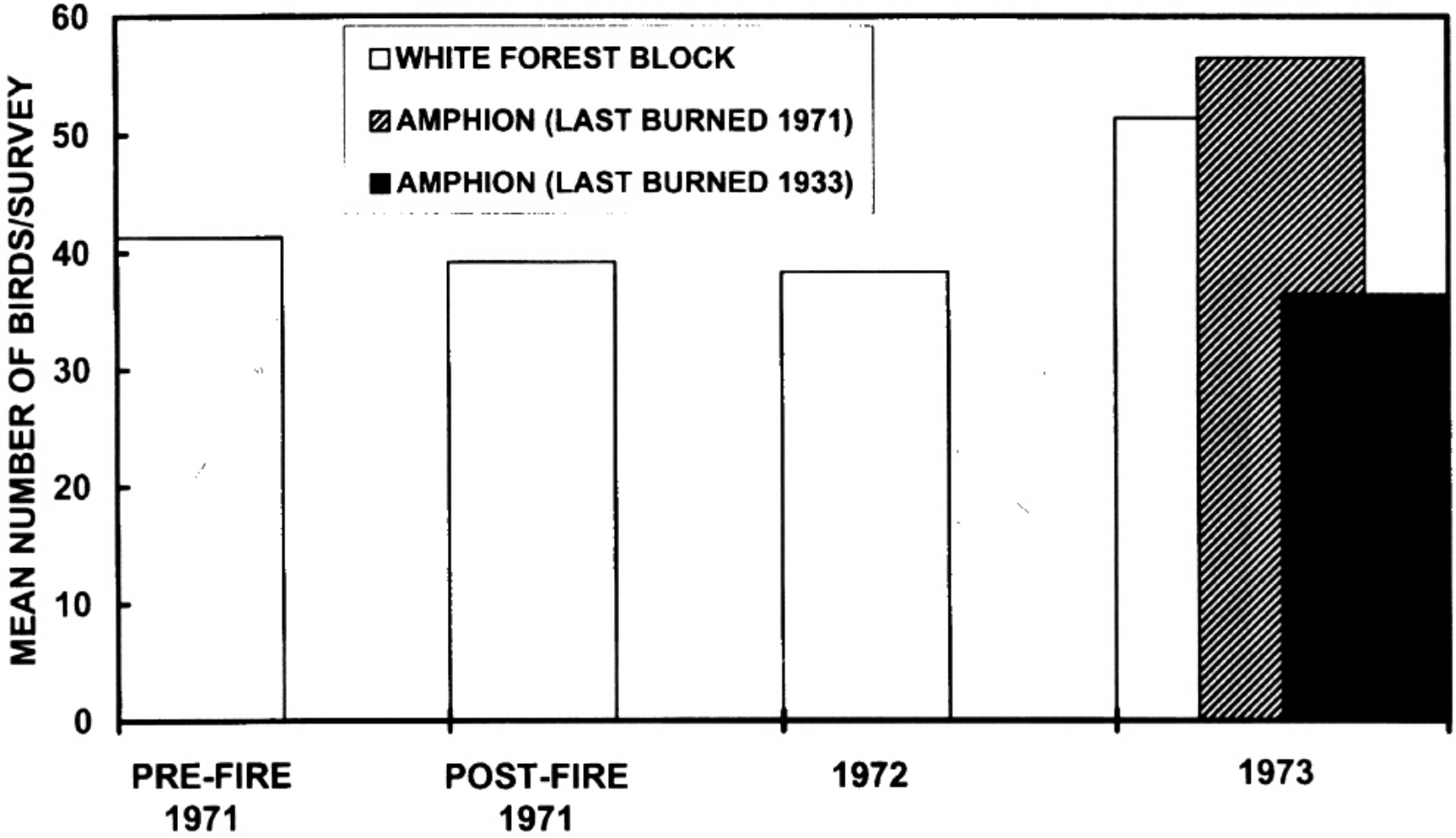

Figure 23. Abundance of birds (for 12 species) initially declined after spring fire in jarrah forest but increased after 2 years. Long-unburned forest did not have more birds than burned forest (Kimber 1974).

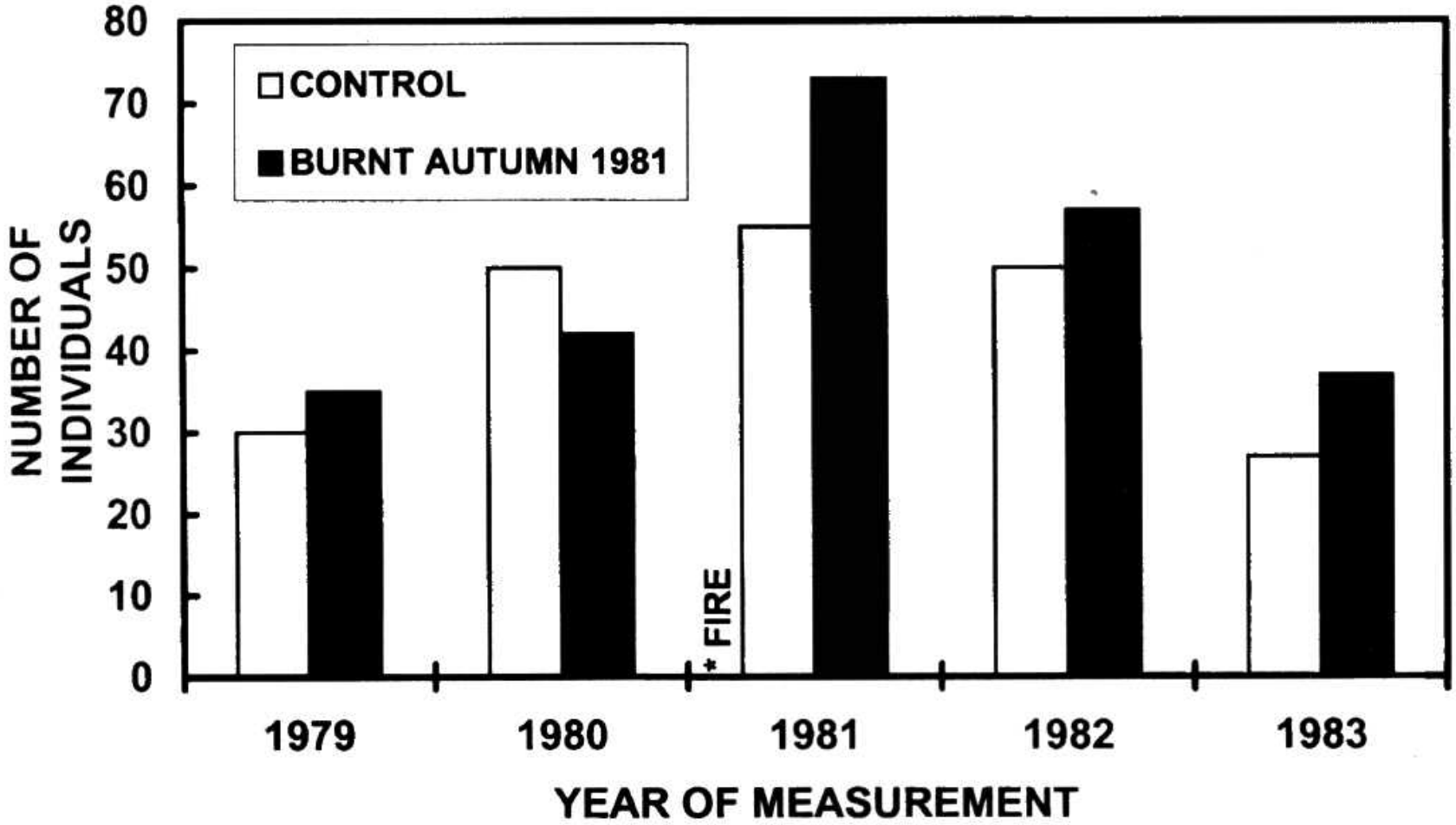

Figure 28. Abundance of birds increased after autumn fire in jarrah forest (Christensen et al. *1985b).*

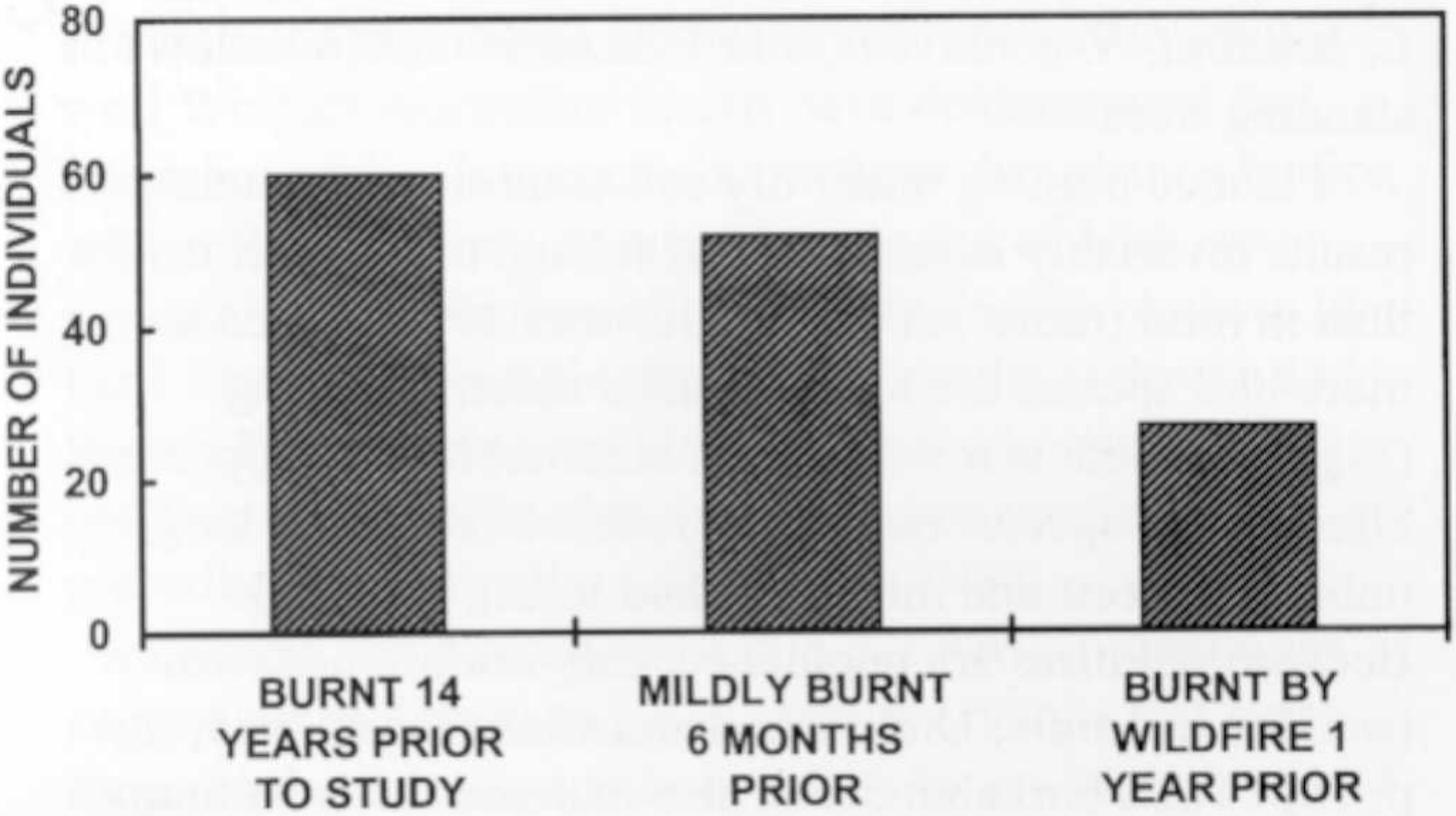

Figure 29. Abundance of birds in jarrah forest was lowest after wildfire and highest in forest not burned for14 years (Christensen et al. *1985b).*

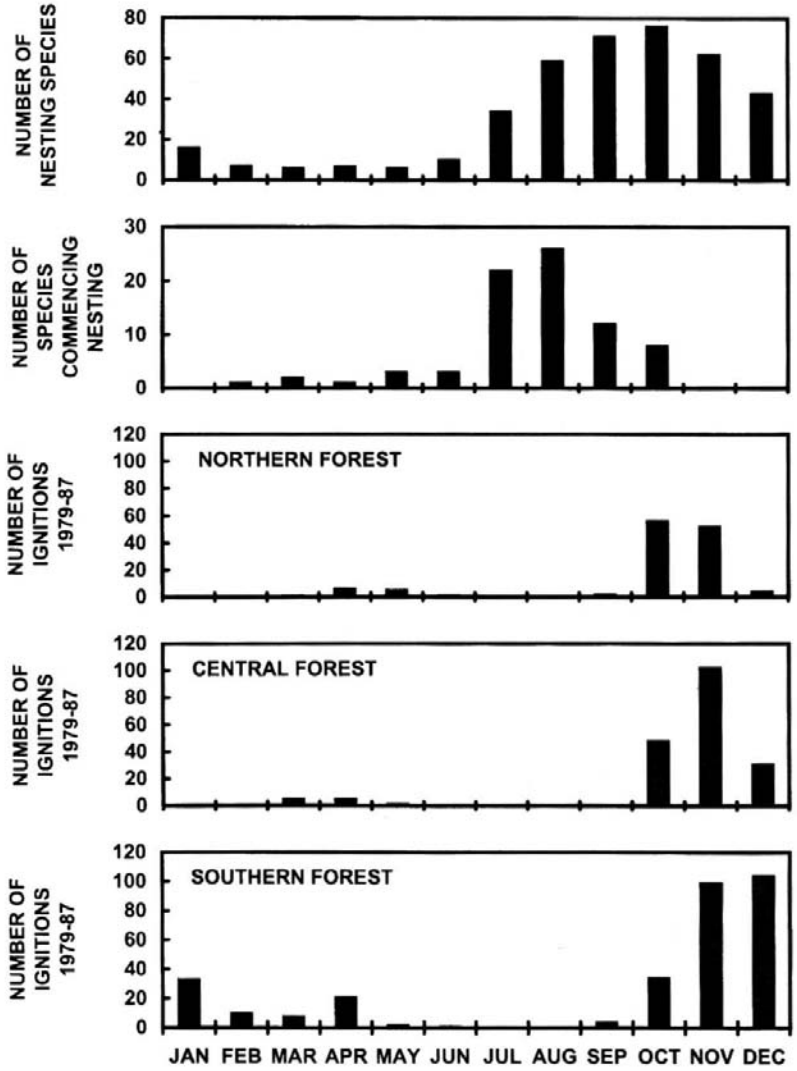

*Figure 25. Most bird species in the forests of south-west Western Australia nest in the period from July to December inclusive (based on data provided by Storr 1991). Most nesting commences in July and August, well before most prescribed burning begins (data on fire ignitions courtesy of CALM*fire*).*

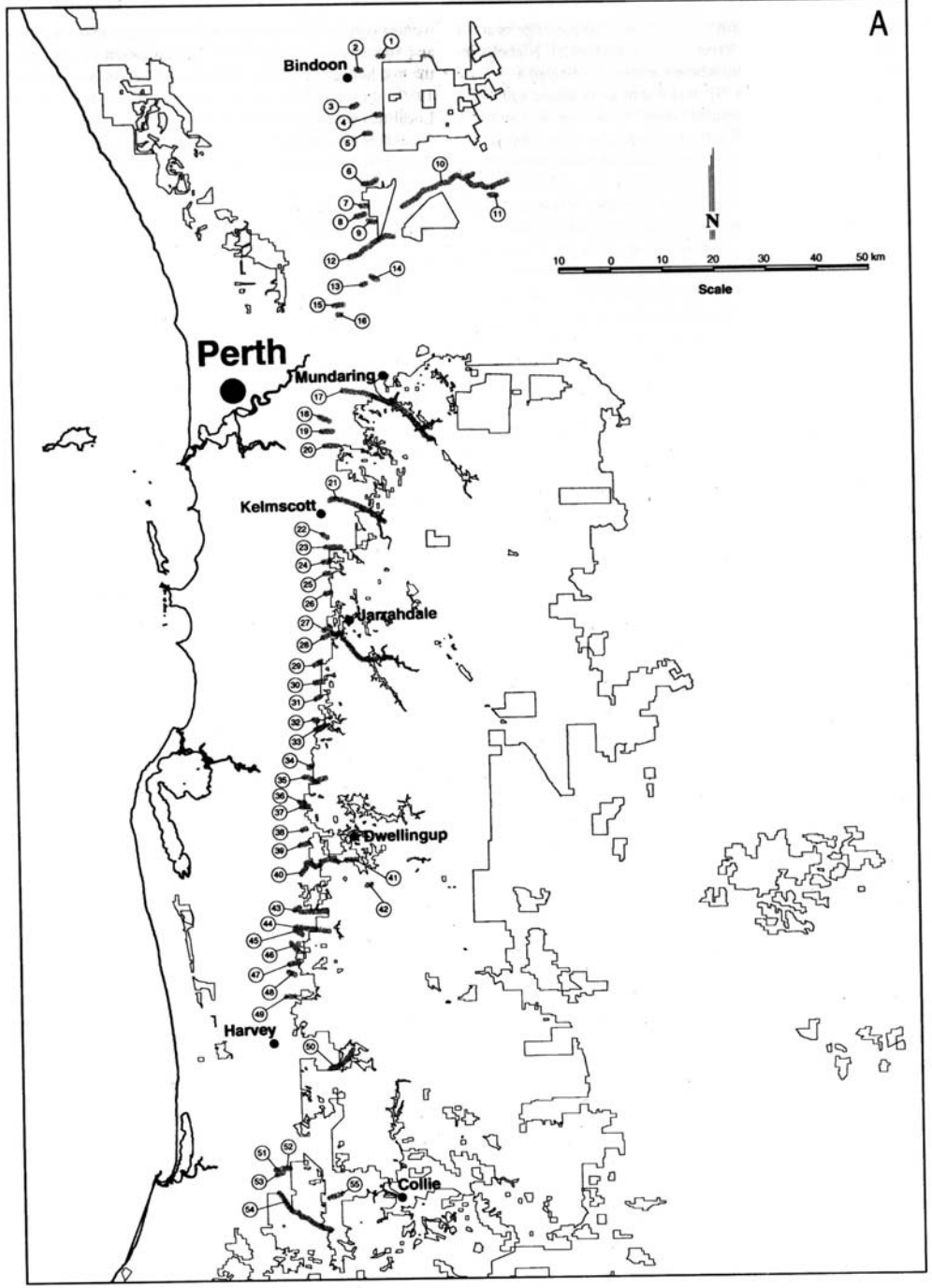

Figure 4A. Hypothetical core geographical distribution of Atrichornis clamosus *(Noisy scrub-bird) (see Table 3 for details).*

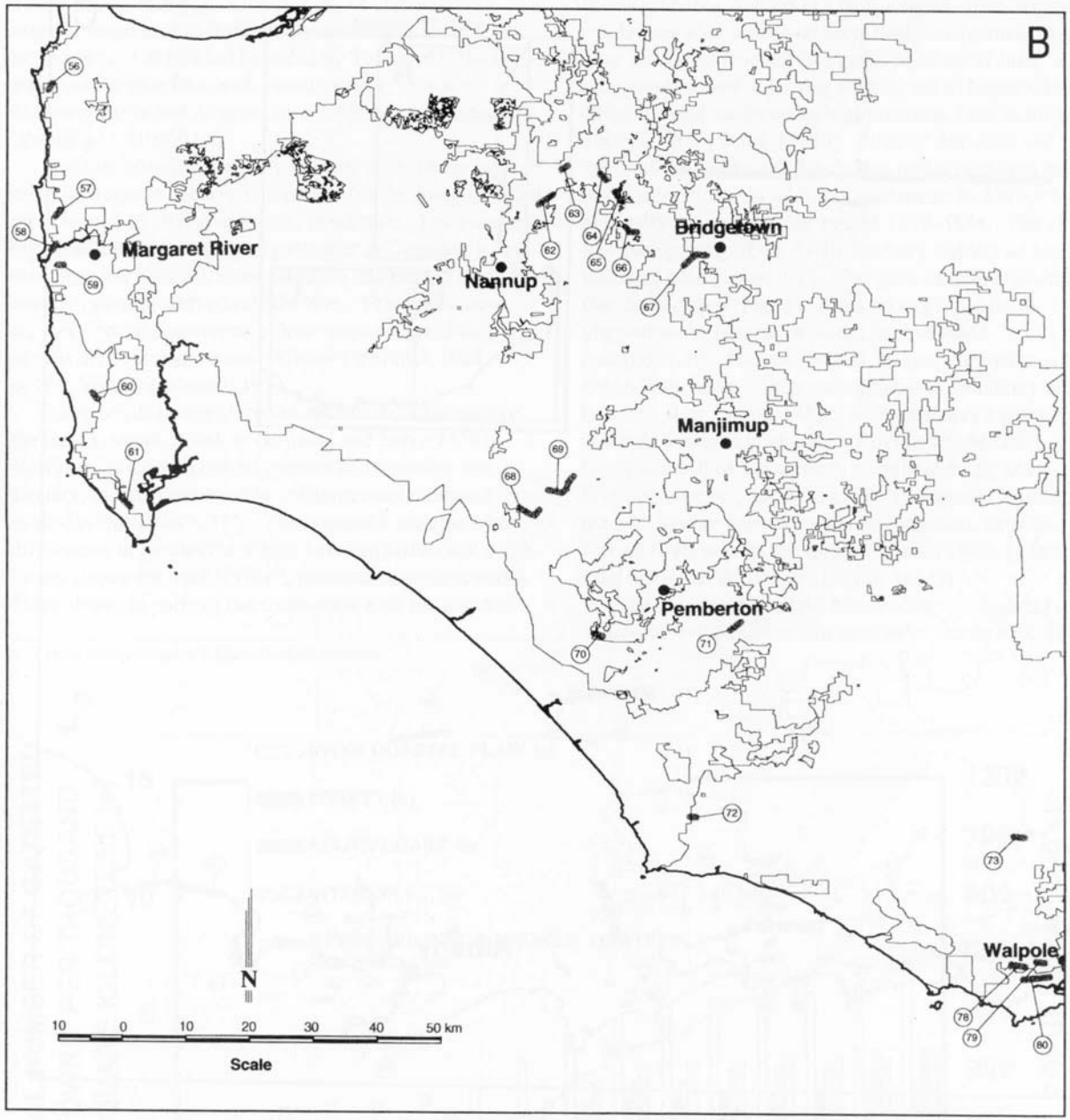

Figure 4B. Hypothetical core geographical distribution of Atrichornis clamosus *(Noisy scrub-bird) (see Table 3 for details).*

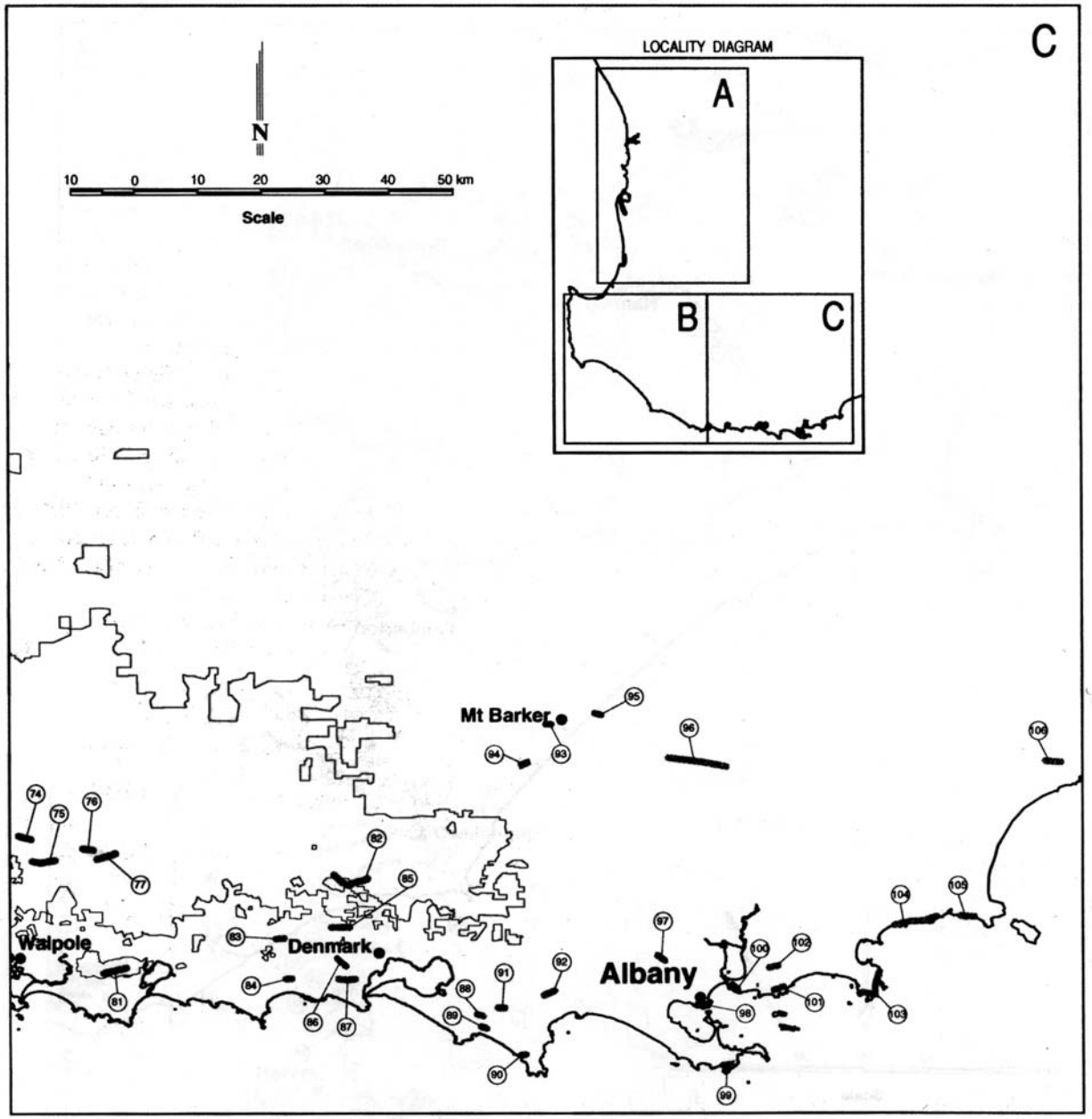

Figure 4C. Hypothetical core geographical distribution of Atrichornis clamosus *(Noisy scrub-bird) (see Table 3 for details).*

Fire impacts on invertebrates in forests of south-west western Australia - a review

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Knowledge base

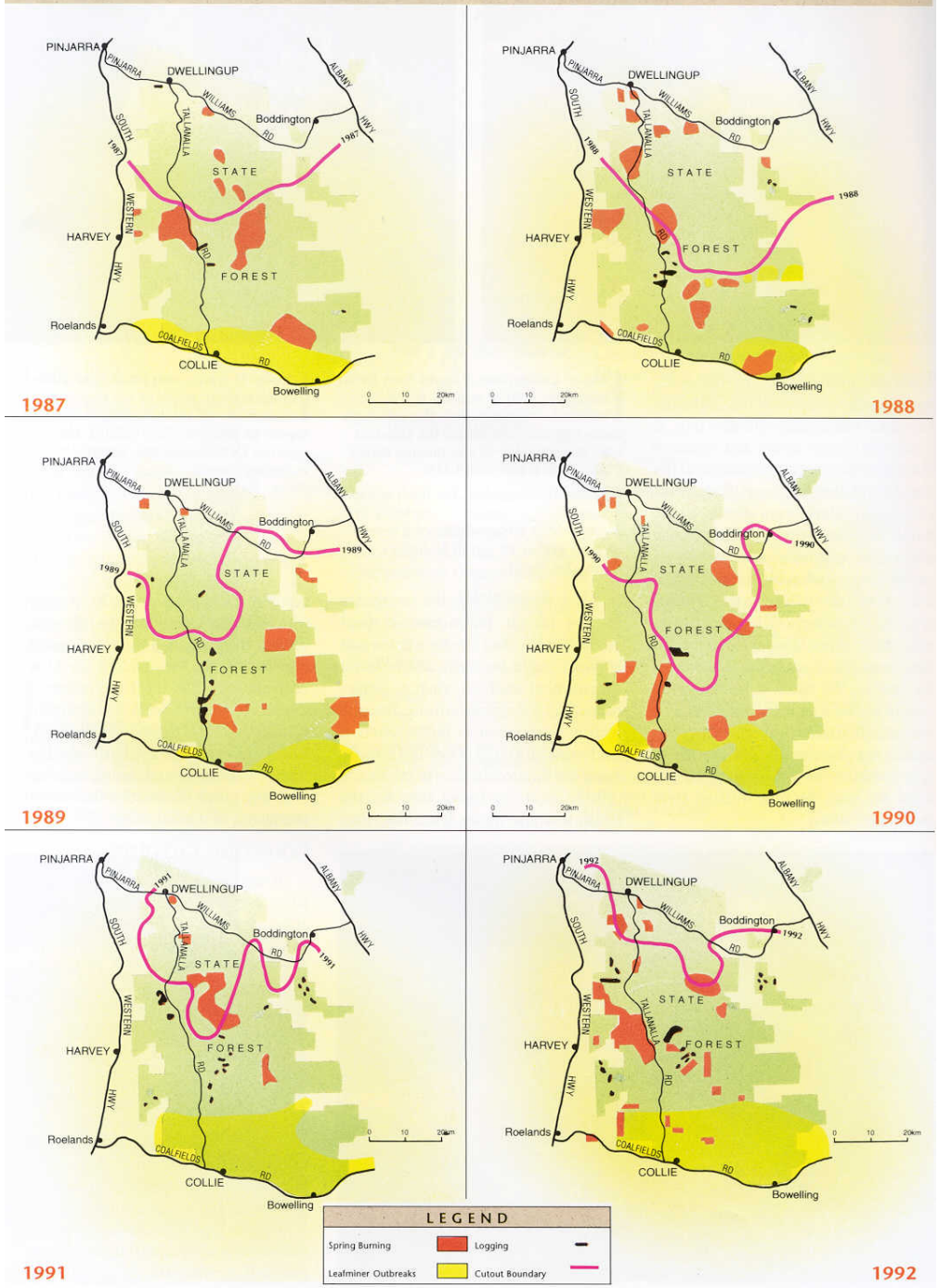
Pest defoliator & xylophagous insects

- Jarrah, rudis leafminer
- Gumleaf skeletonizer
- Bullseye borer

Soil/litter invertebrates

- Jarrah forest
- Karri forest
- Tingle forest

EXTENT OF JARRAH LEAFMINER OUTBREAKS 1987-92



Fire soil/litter invertebrate studies - 1

- Berlese, handsorting & pitfall-trapping sampling methods used
- Initially ordinal, later species-level, as discipline sophistication has increased
- Longitudinal studies all short-term
- Retrospective studies - assumptions
- Only one population study (cricket)

Fire soil/litter invertebrate studies - 2

- Early studies - some conflicting conclusions
  - often inadequate sampling/replication
- Monitoring - FORESTCHECK

Overall conclusions from early research (1955-85)

- Rapid recovery in density or frequency of occurrence of most taxa
- Environmental factors generally override fire impacts on species richness

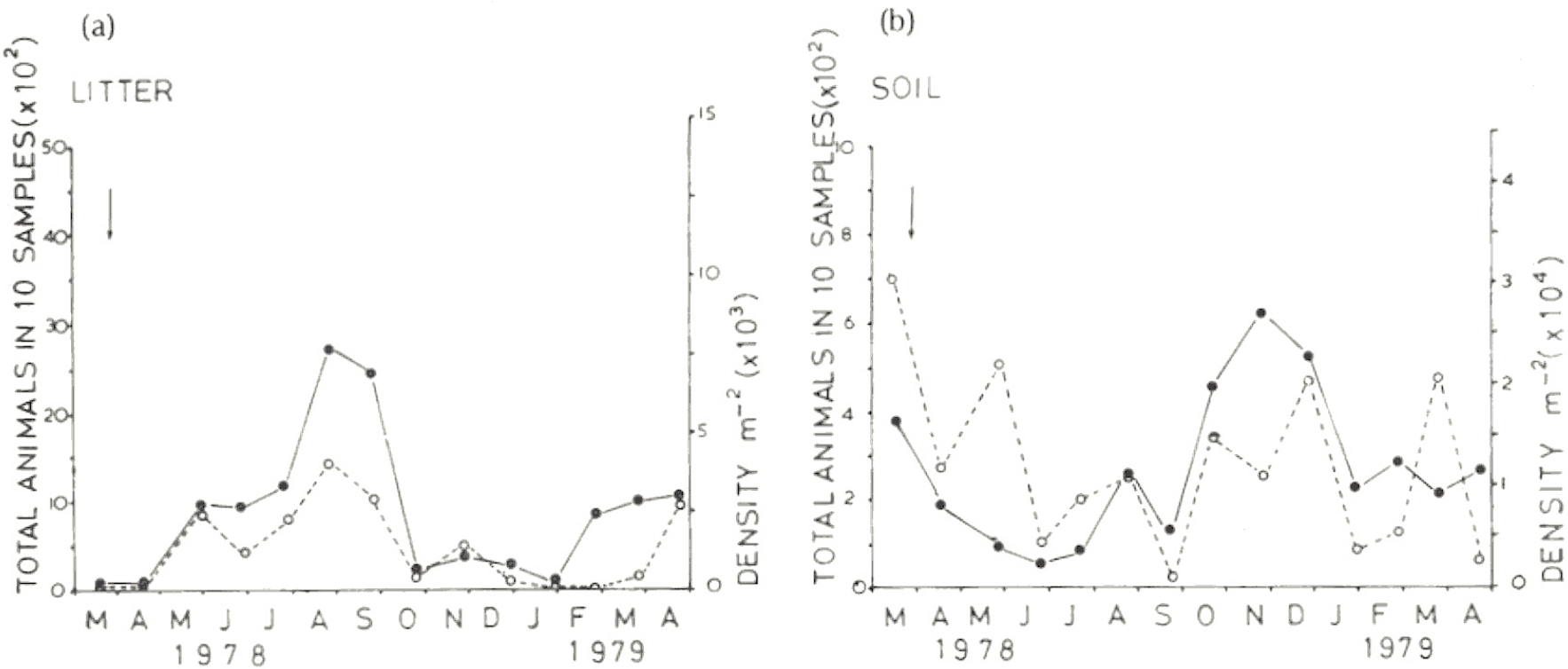


Fig. 5. Total soil and litter invertebrates sampled in the unburnt (●——●) and burnt (○·····○) plots at Karragullen. Arrow indicates date of burn.

Post-1987

- Concerns first raised about Gondwanan relicts (presumed to have evolved in absence of recurrent fire)
- New round of longitudinal & retrospective studies, with samples for some taxa sorted to morphospecies
- Avoidance of pseudoreplication

Batalling Jarrah forest study

- A four year longitudinal study of impact of single spring & autumn fires
- Of 149 beetle species trapped:
  - 39 only in spring burnt sites
  - 18 only in autumn burnt sites
  - 29 only in unburnt (for 8 yrs) sites
  - 63 in both unburnt & burnt sites

Tingle study - 1

- A retrospective study of samples collected in spring 1996 (16 000 specimens)
- 12 sites (4 Tr, 4Tv-3,9,60; 2J-0.2,30; 2K-11,30)
- 701 spp (surface-active beetles, flies, wasps & bees, spiders, mites, springtails)
- Ridge species richness: J 60-84, K 59-69, T 47-61

Tingle study - 2

- 66 spp common to all 12 sites
- 310 spp trapped only on sites burnt < 12 yrs
- 230 spp only on sites unburnt > 29 yrs
- (95 spp)

Tingle study - 3

Average no. unique spp per site

- Highest in Jarrah forest (56) [58/30 yrs]
- Lowest in Karri forest (34) [33/30 yrs]
- Tingle forest intermediate (46) [44/9 yrs valley]

Conclusions

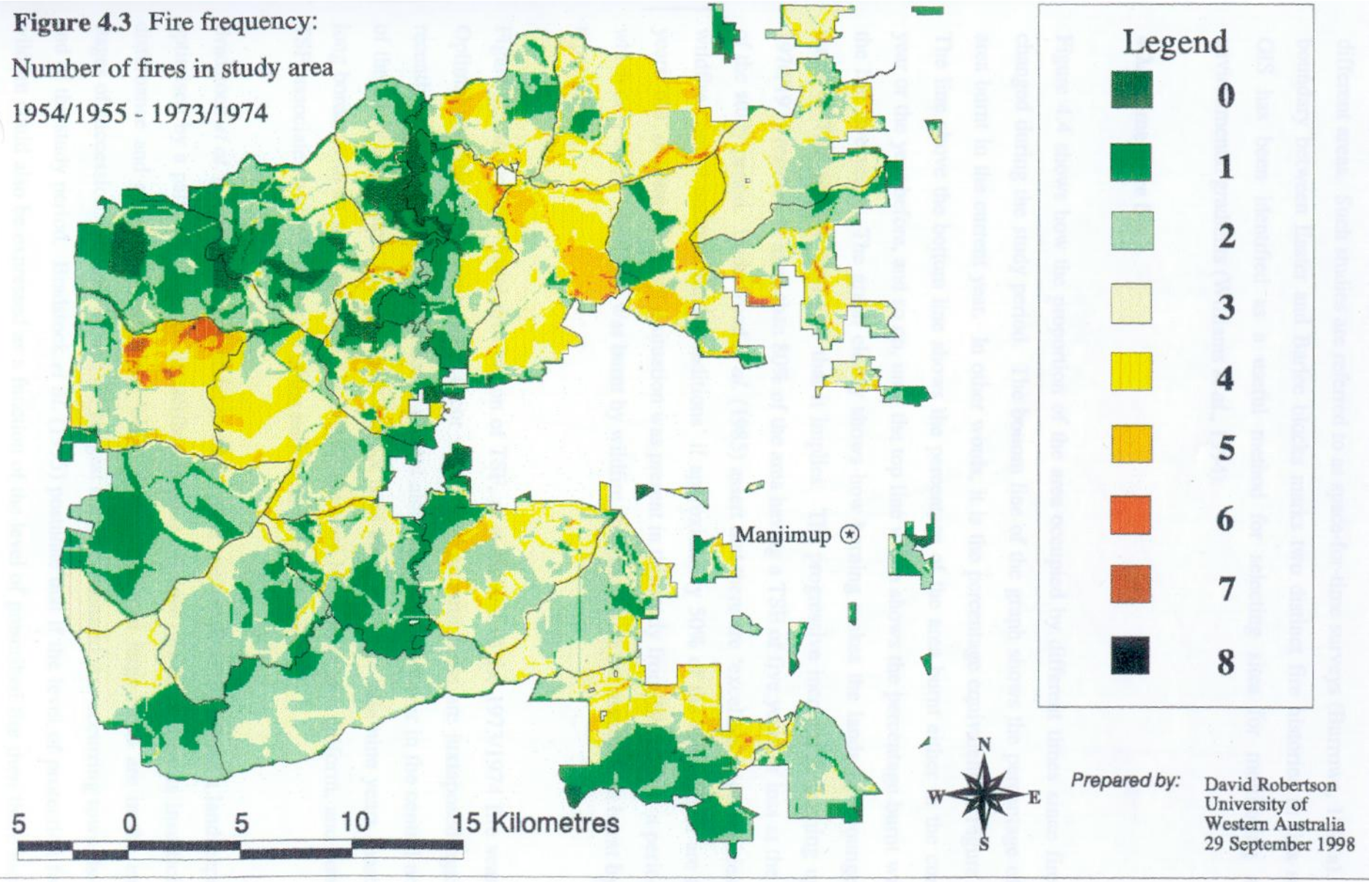
- Conserve regional invertebrate diversity by maximizing habitat heterogeneity

- Maintain a mosaic of fire regimes, ranging from frequently burnt in spring/autumn to long unburnt

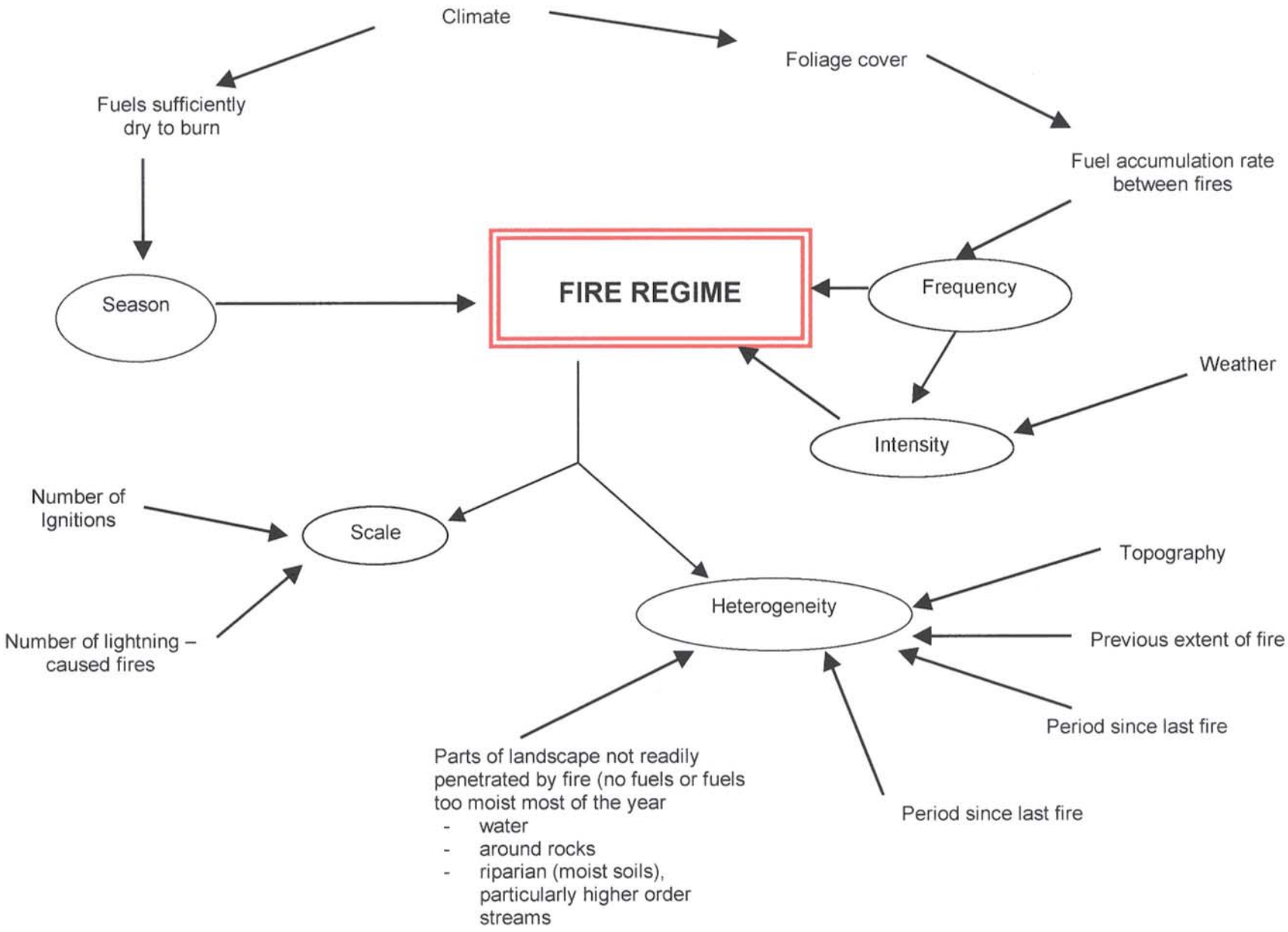
Figure 4.3 Fire frequency:

Number of fires in study area

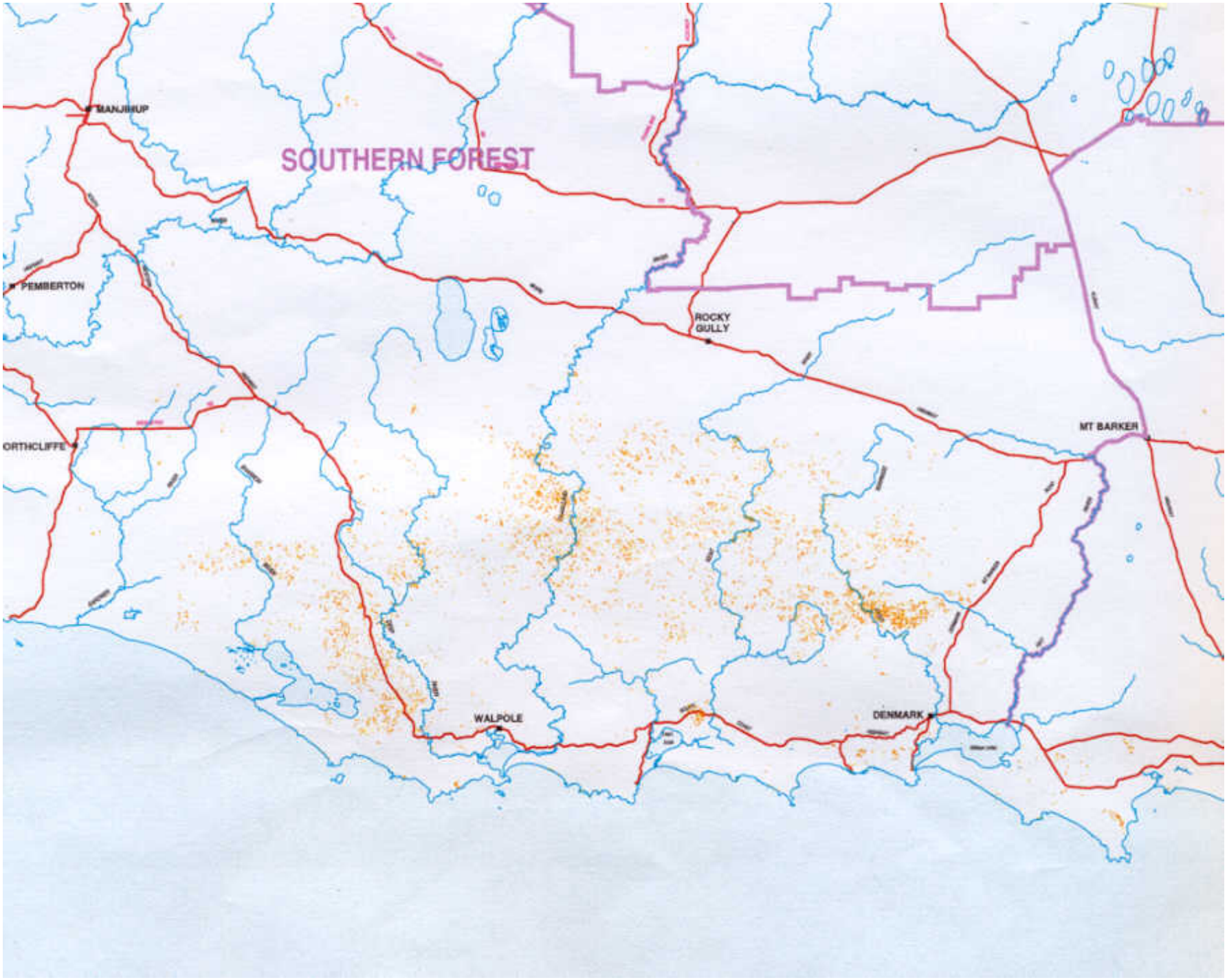
1954/1955 - 1973/1974



Prepared by: David Robertson
University of
Western Australia
29 September 1998


Climate
Foliage cover
Fuels sufficiently dry to burn
Fuel accumulation rate between fires
FIRE REGIME
Season
Frequency
Weather
Intensity
Number of Ignitions
Scale
Topography
Heterogeneity
Number of lightning – caused fires
Previous extent of fire
Period since last fire
Parts of landscape not readily penetrated by fire (no fuels or fuels too moist most of the year
- water
- around rocks
- riparian (moist soils), particularly higher order streams
Period since last fire


NORTHAM
YANNEROO
MIDLAND
MUNDARING
YORK
PERTH
SWAN
FREMANTLE
KELMSCOTT
Garden Island
JARRAHDALE
MANDURAH
PINJARRA
WANDERING
DWELLINGUP
WAROONA


SOUTHERN FOREST
MANJIMUP
PEMBERTON
ROCKY GULLY
MT BARKER
WALPOLE
DENMARK

Generalized fire regimes in south-west WA forests

Characteristic	Aboriginal (to 1855)	1855-1920	European 1920-1965	1965-2001
Season	Summer	Summer & autumn	Summer & autumn	Spring; some autumn
Median frequency (years)	2-4	? > 10	25-40	6-10
Median intensity	Low	High	High	Low
Scale				
Number of ignitions	Many	Few	Few	Many
Size of fires (ha)	? 10-500	Few to several thousands	Few to several thousands	5 000 maximum
Landscape heterogeneity (patchiness)	Moderate	Low	Low	High