Great Victoria Desert fire and biodiversity research:

Seasonality and habitat patchiness

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Queen Victoria Spring Jan. 1989


Queen Victoria Spring Sept. 1988

Fire issues in spinifex

- A regime of summer fires would appear to be detrimental to many vertebrate species (and flora).
- Little data on the impact of summer versus prescribed spring fires
- No long-term studies with pre-fire data and sampling more than one fire event.
- Are traditional Aboriginal regimes appropriate for nature conservation?

Fire studies QVSNR/GDNR

- Seasonality of fire
  - Do summer wildfires reduce vertebrate diversity & abundance ?
  - Are spring prescribed burns “beneficial” for small vertebrate assemblages ?
- Size of unburnt (refuge) patches
  - What sizes of unburnt patches maintain vertebrate assemblages?

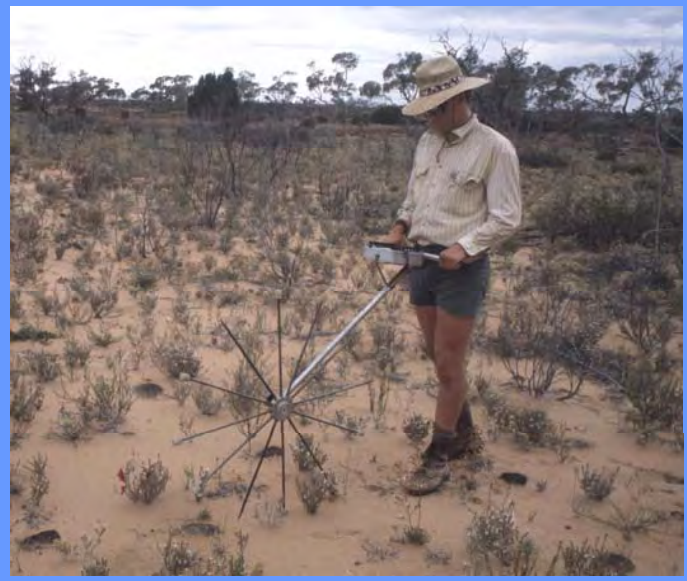
Seasonality of fire: Queen Victoria Spring Nature Res.
25 ha plots; each with a grid of 16 x 10 m fences/ 2 pits
Experimental fires in SPRING (Sept. 1988, Oct. 1990);
SUMMER (Jan. 1989, Nov. 91); UNBURNT controls.

September 1988 fire

21^0 C, wind 10 km/h

Rate of spread 430 m/h

Spinifex 21% to 7%



January 1989 fire

36^0 C, wind 10-25 km/h

Rate of spread 750 m/h

Spinifex 20% to <1%

Aspects of study

- Pitfall trapping of vertebrates
- Vegetation survey and documentation of regeneration strategies
- Invertebrate sampling using small cups and Galt solution. Invertebrates sorted to Order. Spider study by Peter Langlands.

Spider study

Langlands *et al.*

A short term decrease in abundance, but no clear pattern in species richness after fire. Over the longer term, rainfall in the year before sampling becomes the major determinant of spider assemblages.

Reptile responses

to fire at QVSNR

- Summer fires led to the loss of a range of spinifex “dependent” species- *Ctenotus* skinks, legless lizards, some geckos; but provided suitable conditions for two dragons.
- Spring fires decreased abundance of some species, but generated enough open habitat for these dragons


Dasycercus cristicauda


Sminthopsis psammophila


Sminthopsis hirtipes


Ningaui ridei

Notomys alexis

Pseudomys hermannsburgensis

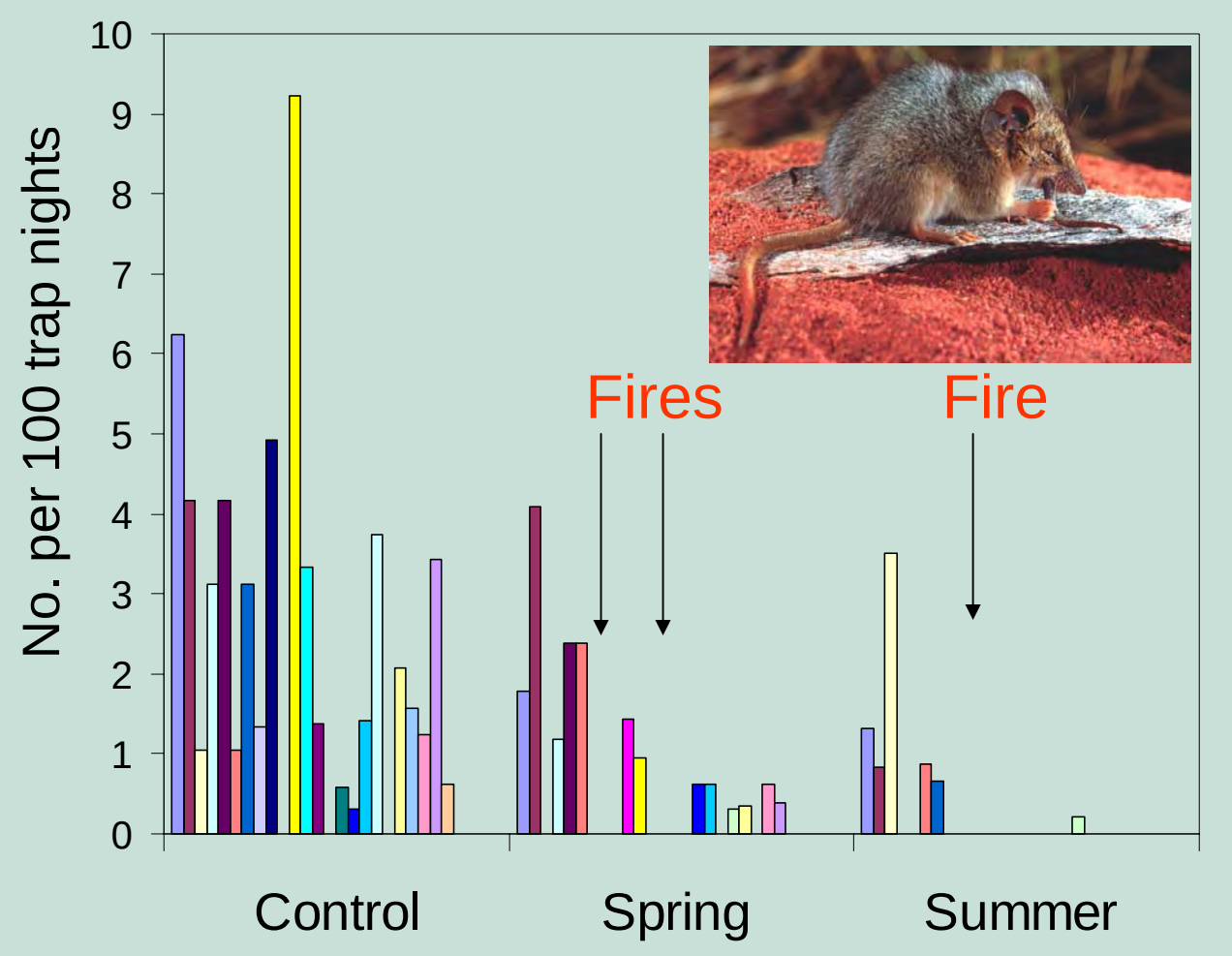
- 6 dasyurids (marsupial insectivores), from 5-100 g
- 2 native rodents, 1 possum and introduced *Mus*

PREDICTION: Most species will survive a summer fire, but then emigrate or die post-fire and reinvade as regeneration proceeds. Spring fires will maintain species diversity.

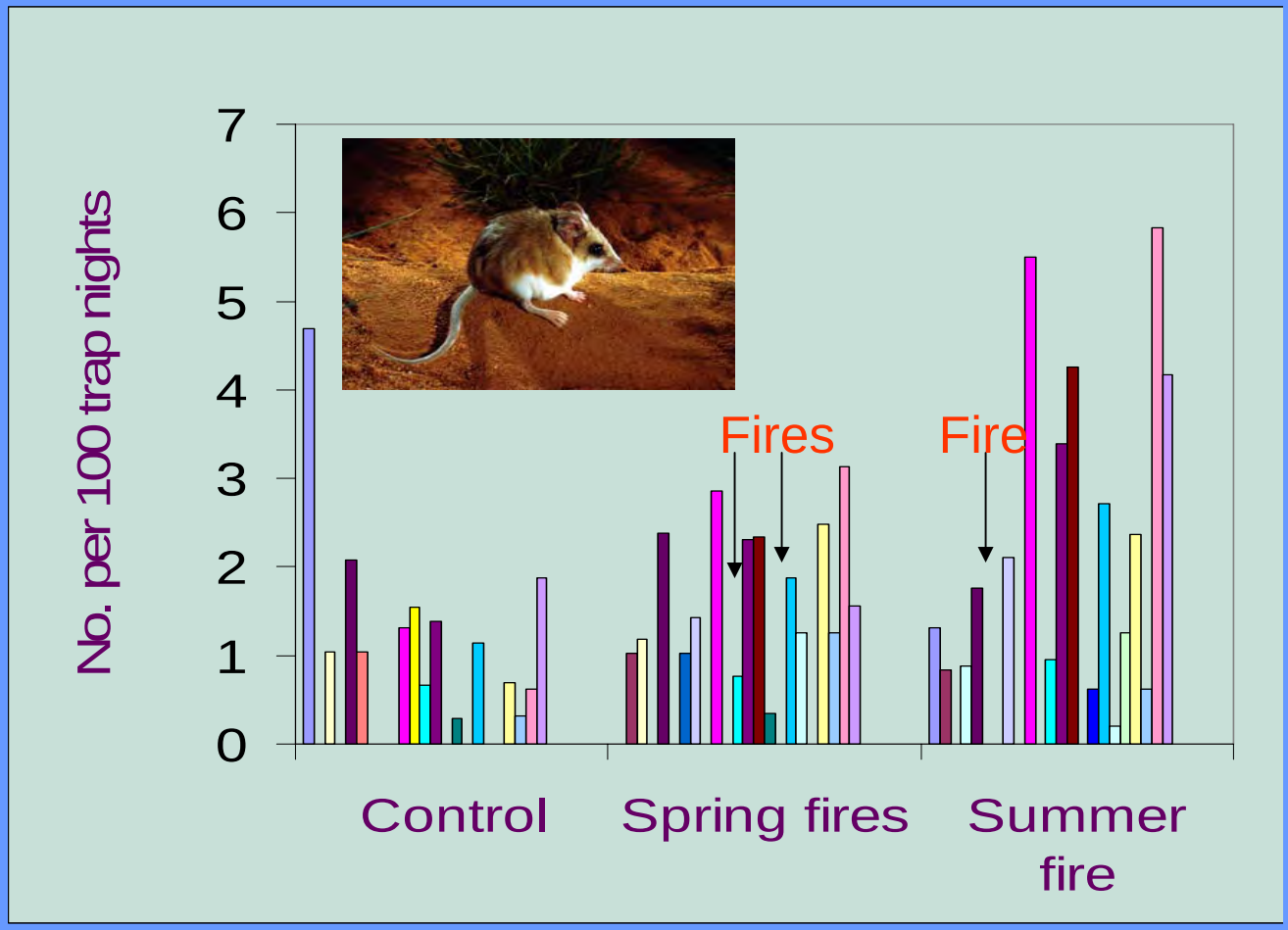
Results: Changes in species diversity

	Control (2 plots)	Spring fires (2 plots)	Summer fires (5 plots)
Pre-fire (Mean # spp)	3.0	2.8	2.0
Short-term post fire Sept. 1989 to Oct. 1990	2.4	2.0	1.1 (*Pseudomys*)
Jan 1991 to Mar 1991	3.0	3.5	2.0 (+*S. hirtipes*)
Continuing effects Dec 1991 to Mar 1998	4.0	3.5	3.1 (+ *Mus*)

Response of *Ningaui ridei* to fire



Response of *Sminthopsis hirtipes* to fire



Conclusions of QVSNR fire study: Seasonality

- Varied responses; those that forage/ shelter in spinifex are removed by a summer fire (e.g. *Ningaui*).
- Spring fires maintain diversity but reduce abundance of some species.
- Dasyurids have good dispersal capabilities across fire scars.
- Rodent population dynamics primarily driven by rainfall; fire only a factor in short term.

Patch size study: Gibson Desert Nature Reserve

Unburnt control and burn treatment with pairs of 4 sizes of unburnt patches 5x 5 m (0.0025 ha), 10 x 10 m (0.01 ha), 20 x 20 m (0.04 ha) and 40 x 40 m (0.16 ha); spaced 50 m apart

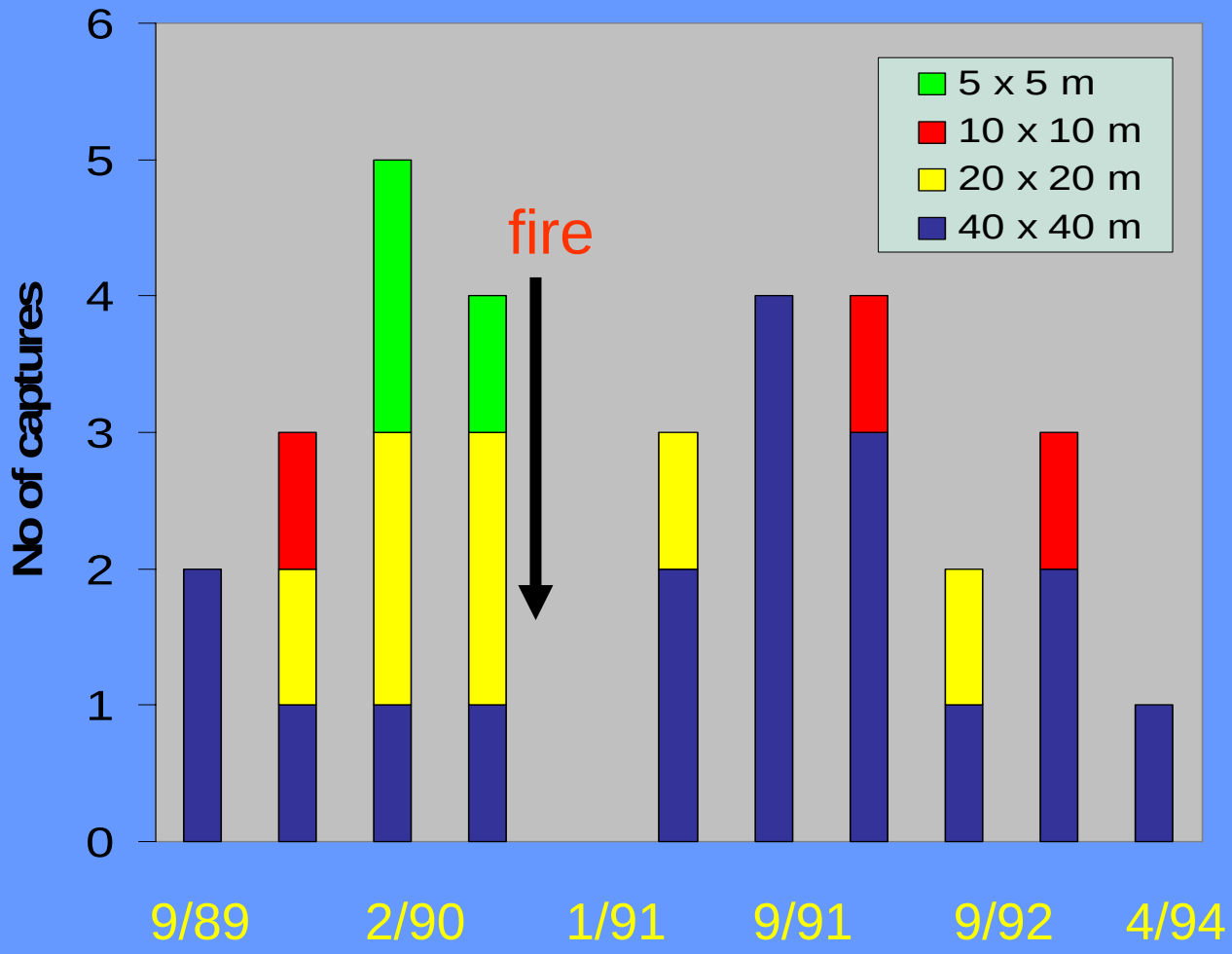

Burning study site


Immediately post-fire


12 months post-fire


2 years post-fire

Patch size and *Ningaui* captures



Results of patch size study

- *Ningaui ridei* was able to persist on larger unburnt patches.
- Within 6 months of the fire, recapture data indicated individuals were crossing from the unburnt control to patches.
- Regeneration proceeded rapidly due to favourable summer rains and pre-fire biomass was reached 4 years after fire.

Management implications 1

- Spring patchy fires maintain or even enhance reptile and small mammal diversity, but reduce the abundance of some species.
- Summer fires lead to disappearance of spinifex specialists and success of reinvasion depends on proximity and fire history of unburnt refugia.
- Concerns about larger dasyurids (e.g. Sandhill Dunnart and Mulgara)- appear to be strongly associated with unburnt spinifex.

Management implications 2

- Vast areas to manage- need to make decisions on biodiversity criteria and research findings, not notions of traditional aboriginal burning regimes.
- Vertebrate groups of particular concern for fire management in Great Victoria Desert- large dasyurids, Bilbies and herbivorous colonial skinks (*Egernia* spp).

Integrated approach:

- Better resource data- veg. map as minimum
- Encourage Aboriginal management, where possible
- Ground and aerial burning by conservation agencies
- Imagery to monitor