Predicting fire impact on small vertebrates

by GORDON FRIEND

The effects of fire on animal and plant life and the role of fire in the management of wildlife habitat on nature reserves are important issues in conservation and land management.

CALM is addressing these through a long-term program of research focussing on particular habitat types (especially in arid and semi-arid regions) based on an experiental approach.

To obtain experimental data on which to base management decisions does, however, require much time, money and personnel.

Guidelines are needed urgently, and there is a clear role for predictive modelling.

Such modelling systems are now quite well-developed and sophisticated with respect to fire behaviour and plant ecological effects (eg fire management systems PREPLAN, EXPERT SYSTEMS), but no attempt has yet been made to develop a model which enables quantitative prediction of the impact of various types of fire on fauna.

As part of the department's Fire Ecology Research Program investigating faunal responses to fire, such a model is being developed by Dr Gordon Friend, based on research at Tutanning Nature Reserve, to assist land managers and to aid the formulation of hypotheses regarding fire effects.

These predictions can be tested and further refined through the experimental approach adopted in the research.

The model is based on the concept of species "life form types", which are derived from an individual's shelter and food requirements - the two essential (resource) criteria for existence.

If these criteria are adequate, activity and breeding take place and these latter two (time-based) phenomena give rise to population and species persistence.

Species are thus able to be grouped on the basis of similar shelter and food requirements into a number of life form types (= guilds).

Based on the probable changes fire has on an animal's environment, shelter and food requirements are able to be listed in order of increasing impact/sensitively to fire.

Thus more "weight" is given to fire sensitive requirements, and this takes account of the fact that a species needing, for example, hollow trees for shelter and nectar for food, is likely to suffer a far greater impact than one that burrows and is omnivorous.

To be of general use, however, the model needs to consider fire regimes and incorporate factors that take account of intensity, season and frequency of burning.

This can be done by further weighting of shelter and food scores depending on the intensity of a particular fire, and adding in seasonal activity/breeding factors depending on the season of burning.

Factors taking account of frequency are difficult to derive as little information exists on how different species respond to different fire frequencies.

The relationship between impact and fire interval is likely to be of an exponential nature, however, so the logarithm of fire interval, or its reciprocal, may be appropriate.

Clearly, much remains to be done to refine the model so that it can be used by land managers.

In particular, it needs input of data on the relationship between fire intensity and the environmental attributes defining various species' shelter and food requirements, and input from a professional modeller to refine the system mathematically.

One of the reptiles being studied at Tutanning, the legless lizard Pygopin lepidopodus

Experimental burning in a