Abundance of the frog *Geocrinia lutea* after fire in a Western Australian forest – a critique of a paper by Driscoll & Roberts

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SUMMARY

A paper (Driscoll and Roberts 1997) purporting to demonstrate that low intensity prescribed fires in spring are detrimental to the frog *Geocrinia lutea* has several shortcomings. The study used inappropriate controls, was based on short-term recovery data, employed atypically intensive fires, and did not quantify differences in fire intensities between plots. The paper overlooked the fact that frog populations have persisted through a known fire history of 3-6 fires during the last 36 years.

INTRODUCTION

In a study of the impact of fuel-reduction burning in forest on the frog *Geocrinia lutea*, Driscoll and Roberts (1997) drew several important conclusions:

1. A single fire in spring caused a significant decline in the number of calling males, which had not recovered two years after the fire.
2. There was a higher *in situ* egg death but lower predation at burned sites.
3. The short-term impact of spring fires may post a serious threat of extinction for very small populations.

These authors then speculated about the long-term impact of frequent fire.

CRITIQUE

We have several concerns with the paper by Driscoll and Roberts (1997).

1. The control (unburned) treatments are not true controls and are therefore inappropriate. Although the authors state that the control sites were burned in spring 1997 and 1989 (sites A, NP, OQE), at least 10 years before spring 1992 (NQW, NQE) or in spring 1982 and 1976 (L), they appear unaware that all these sites have a much longer history of prescribed fire (Table 1), in several cases 5 or 6 fires in 30 years. This in itself suggests that frog populations recover by about 5 years after fire, or that the frog's habitat did not always burn during these fires.
2. The paper addresses only the period 2 years after fire. It is no surprise that fire has an acute impact on organisms living in habitat patches that are burned. What is of genuine interest is how rapidly such populations recover, generally through a combination of *in situ* reproduction, recolonization of burned patches from

unburned patches, and recolonization from adjacent forest blocks that were not burned. Publication of the paper is thus premature as it presents data from the early post-fire succession stages. This issue could also have been addressed if a concurrent space-for-time study had been performed throughout the geographical range of *G. lutea*, based on CALM's detailed fire history records.

3. Fire intensities were atypical of low intensity prescribed fires normally set to achieve fuel reduction. Driscoll requested CALM staff at Walpole to burn the experimental sites as hot as possible. Burning occurred in the week of 11 November 1992 when the Soil Dryness Index was 498 (approaching the upper limit), the Fire Danger Index was 34 (exceeding the limit) and the predicted Surface (fuel) Moisture Content (SMC) was 9% (exceeding the limit). Normally fuel reduction burns are carried out when the Fire Danger Index is about 24 and the SMC is 10-15%. Even under these conditions, which are relatively mild, the non- forested flats and creek systems (frog habitat) in the study site were reluctant to burn, which is normal at this time of year. One of the advantages of setting fuel reduction burns under cool, moist spring conditions is that while ridges and mid-slopes may burn, wetter parts of the landscape do not readily burn, resulting in a patchy, or mosaic burn pattern across the landscape.

CALM officers involved in the burns experienced difficulties in igniting the wetlands where the A, NP, OQE, NQW and NQE plots were situated. In an effort to comply with Driscoll's request for a "hot" burn, crews deliberately applied fire by stripping the areas out on foot and also by walking into the flats where the plots were located and ensuring that these were burnt. Under a normal prescribed burn in spring, none of these methods would be employed unless the area posed some form of threat to fire security (as, for example, adjacent to a town).

Driscoll and Roberts (1997) fail to mention that the fires differed in intensities from that achieved when the normal prescription is followed. It is reasonable to expect that a study of CALM's burning practices would investigate the practice as it is usually applied by the agency.

4. Differences in fire intensities between plots were not quantified. Driscoll and Roberts (1997) state that fire intensity varied among sites and rather vaguely note that there was unburnt grass at NQE, NQW and OQE and complete removal of vegetation at other sites. This anecdotal information suggests that the 6 burned plots were not strictly comparable and therefore not valid replicates of a

single treatment. Fire intensity should have been quantified and an ANACOVAR analysis then performed on the data, not an ANOVA.

5. The discussion section in Driscoll and Roberts (1997) goes beyond the bounds of reasonable extrapolation of the data collected towards alarmist speculation. For example, high levels of predation in control sites are speculated to result from predators moving from burned sites into control sites - what are the predators? What specific monitoring was performed with respect to assessing predation?

   While acknowledging that this frog species has persisted under several decades of prescribed burning, Driscoll and Roberts (1997) omit mention of the many thousands of years of fire management in southwest forests by Aborigines. They introduce an unnecessary *ad hoc* hypothesis (that it may take more than 4 or 5 fires to cause local extinction) to account for the lack of evidence of any local extinctions of frog populations as a result of fire.

6. The design of the study and the content of the paper appear to indicate an unscientific approach to fire in southwest forests. This is evidenced by points 1-5 above and by a note (held on CALM File) written by Driscoll requesting advice about the fires "so that I can come down and count the number of fried frogs". As pointed out by Abbott and Christensen (1996), the use of scientific data to justify personal beliefs about forest management is of concern and seems regrettably to be on the increase.

CONCLUSION

The paper by Driscoll and Roberts (1997) is of an inadequate scientific standard and its conclusions do not stand the test of critical analysis.

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Table 1.

Fire history of Driscoll and Roberts' (1977) control sites. Information extracted from maps held by CALM.

Control site	Years burned
NP	spring 1989, spring 1982, autumn 1977, spring 1966, spring 1961
OQE	spring 1989, spring 1982, autumn 1977, spring 1966, spring 1961
NQW	spring 1989, spring 1982, spring 1966, ?spring 1961, spring 1956
NQE	spring 1989, spring 1966, ?spring 1961, spring 1956
L	spring 1973, spring 1975, spring 1956
A	spring 1989, spring 1982, autumn 1977, spring 1966, spring 1960, spring 1956