



A decade of hunting dragons: monitoring Grassland Earless Dragon populations in the Majura and Jerrabomberra Grasslands of the ACT⁺

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Abstract: The ACT populations of the endangered Grassland Earless Dragon have been monitored by the ACT Government and University of Canberra in the Majura Training Area (Defence) and Jerrabomberra Grassland Reserves for more than a decade. This monitoring program enabled researchers to detect an alarming decline in the abundance of these populations during the prolonged drought conditions in the mid 2000s, leading many to fear the worst for the future of this species. However, the last two years of data are showing encouraging signs of recovery for populations of dragons at these sites. The knowledge gained from this long-term monitoring program has informed management decisions and actions for the species and its grassland habitat, such as the establishment of a captive breeding colony and a study of grassland habitat structure management.

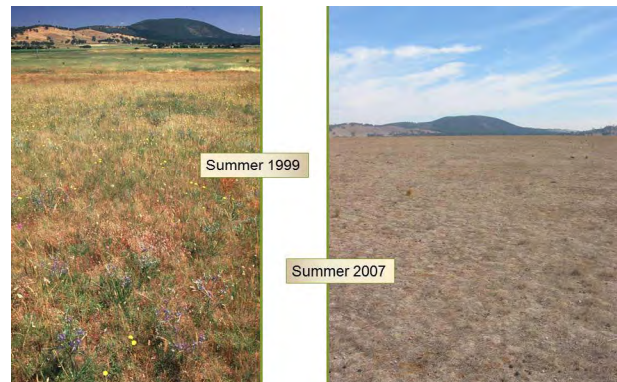
In the ACT we have had been hunting dragons for a decade or more, in teams from the ACT Government and University of Canberra Institute for Applied Ecology. Our target is the Grassland Earless Dragon *Tympanocryptis pinguicolla*. (The photo at right shows an adult dragon on the back of a hand, with its long tail out of sight.) I am going to tell you about monitoring these dragons in a few remnant patches of Natural Temperate Grassland in the ACT.



In its current form, the monitoring began in 2002 at the Majura Training Area, which is Defence land just north of the Canberra airport, and has run for 12 years. One year a different method was used, relating to disturbances. That particular year, they were looking at the effects of a big dirt road on populations of the animals that had homes nearby. The road is used for carrying troops through to the firing range, and is in regular use.

Other monitoring programs have been running at Jerrabomberra West grassland reserve since 2006, and Jerrabomberra East since 2009, and from these we have 9 years and 6 years of data respectively. Through these programs we were able to detect a steep drop in the population numbers of the dragons, specifically at Jerrabomberra West, during the Millennium drought.

The photos at right show the effects of the drought on the grassland habitat of the Grassland Earless Dragon at the Majura firing range. They compare the area in summer 1999 (before the drought set in) and in summer 2007 after grazing by large numbers of kangaroos. Not only was the 2007 photo taken during the drought, it was also after a huge summer storm that had washed away the standing dead grass structure that had been there beforehand. In 2009, kangaroo-grazing exclosures were put in place on the three sites, one on each. The exclosures differ in size, according to the size of the reserve and the kangaroo population at each site.



We now have practical equipment that we use in monitoring these dragons – the 'spider tube'. The tubes were designed based on the experience gained by the staff on these programs over the years, especially Don Fletcher, Murray Evans and numerous others.



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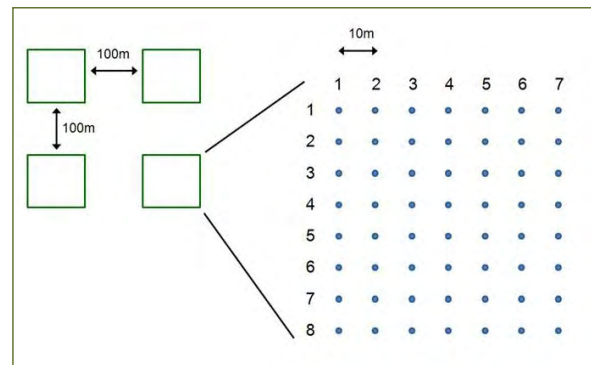
Spider tubes (photos, right) mimic Wolf Spider burrows, and the *Tympanocryptis* use them for shelter, both for thermal regulation and for shelter from predators. They consist of just two tubes of conduit, the outside one bigger than the inside one. In the close up, you can see a dragon inside the 'burrow'. The inner tubes are sealed at the bottom (with a drainage hole) so we can just pull the dragons out if we need to. We go along with a torch looking in each tube for the dragons hiding there. Often we scare them in.

'Spider tube' design

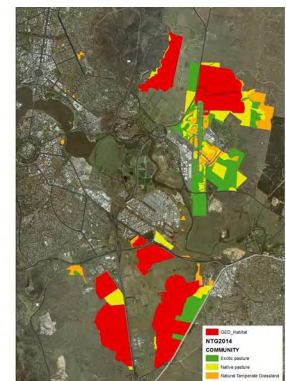
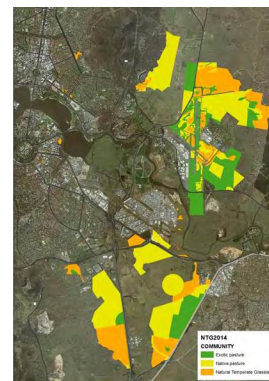


I often think that people looking out of the aeroplane window as they fly out of Canberra airport, on the mornings when I am out monitoring, must wonder what is going on. We would look like a random group of people walking up and down, gazing at the ground, with torches and toothbrushes in hand and a strange array of things in our packs for keeping our spider tubes functioning!

The tubes are arrayed in a grid, so it looks something like the diagram at right. There are seven rows of eight tubes, all at least 10 m apart. There are four grids at each of our monitoring sites, and the grids are at least 100 m apart or slightly more, to avoid any overlapping of the home ranges of animals from one grid to another. We had one case of juvenile dispersal over more than that distance; we think he was trying to get far enough away to get a good spot.

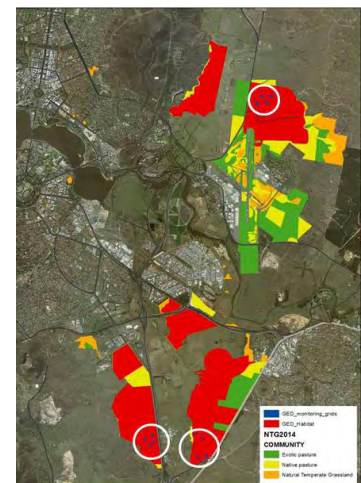


The coloured-in aerial views of the Majura (north) and Jerrabomberra (south) valleys, in the photos at right, show the grassy landscapes. The lefthand photo shows exotic pasture (bright green), native pasture (yellow) and Natural Temperate Grassland (orange); in the righthand photo the red overlay shows the areas mapped as *Tympanocryptis* habitat a number of years ago.



Our monitoring spots are shown by the blue grids inside the white circles in the aerial photo below. Four spots are just north of the airport in the Majura firing range; four are in the kangaroo enclosure at Jerrabomberra West; and there are another four in the Jerrabomberra East reserve, two in the kangaroo enclosure and two outside it.

The photos below (top of next page) show a typical find. In the top corner is a hatchling weighing less than 1 g, probably only a day old, or possibly born that morning if he was a large baby. The other dragon is an adult, weighing 6.33 g. We measure their length, and weigh and photograph them for identification purposes so we can recognise them if they are recaptured. We give each one its own number on its belly with a permanent fine-tip black marker pen: these two are therefore numbers 7 and 24. When they shed their skins the number comes off too, but there is no other reasonable or ethical way, yet, for permanently marking the individuals.

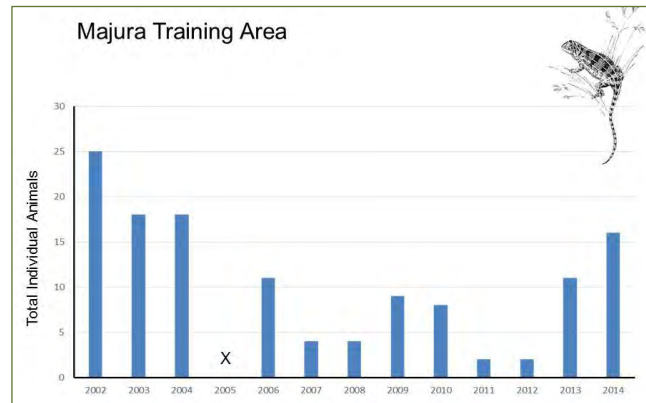
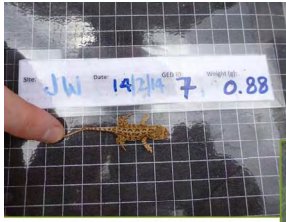




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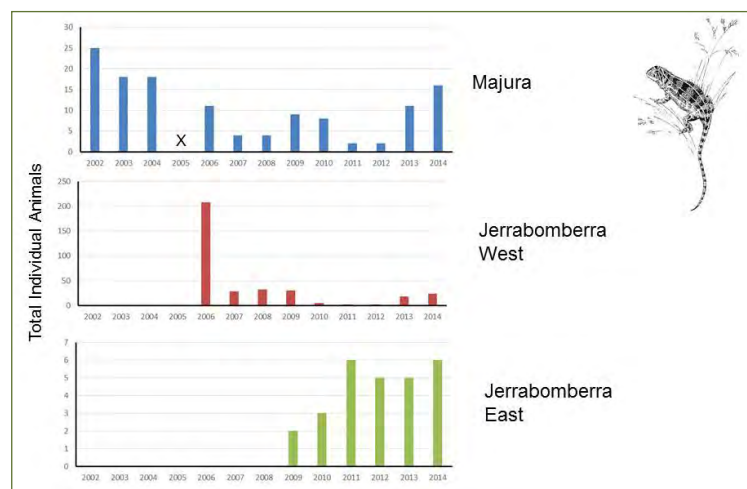


Total individuals found each year, from 25 in 2002 to 16 in 2014, are shown in the bar charts above and right. (2005 was the year I mentioned when the method was different.) There is an apparent decline as the drought persisted, with 11 individuals in 2006 and only 4 in each of 2007 and 2008. The drought broke in 2010, but the numbers dropped down to 2 in 2011 and 2012 when there were very wet periods in summer. We do not know if these changes are truly representative

of population changes or if they are specific to our method, because the spider tube is not a true trap; the animals can come and go as they please. We do not know if detectability dropped in those wet seasons, or whether the hatching and breeding were affected by ground temperature, soil moisture and other factors.

We recorded how many of our tubes were being flooded over those wet summers. There was so much rain it was washing soil into the spider tubes and plugging up their drainage holes. On many days we did not find any dragons because the tubes were full of water and these reptiles do not go swimming voluntarily. We know not to survey on days when it has been really wet that morning or the night before, because in those wet conditions the dragons will choose to shelter in a large well-drained Speargrass tussock rather than a sodden plastic tube. I was fairly depressed by the numbers we were finding in 2012, and cheered when surveys in 2013 and 2014 found larger numbers: up to 6 in Jerrabomberra East and around 20 in Jerrabomberra West (note different vertical scales).

At Jerrabomberra West the decline in numbers during drought was steeper, from 206 in 2006 to single figures in 2010–12, than at the Majura Training Area during the drought. However, the patterns at the two areas were similar, unlike the pattern at Jerrabomberra East. We do not know why the East site appears different. Although for the first two years of monitoring there we had only enough funding to put in two monitoring grids, there are four there now – two in the enclosure and two outside. Yet the numbers are still low at Jerrabomberra East. One explanation may relate to the biomass there. Since the drought broke, with no kangaroo grazing inside the enclosures the grass is so dense it has overcrowded itself now (spring 2014). There are no gaps where any other plant can grow, and some of the grasses are senescing instead of flowering.

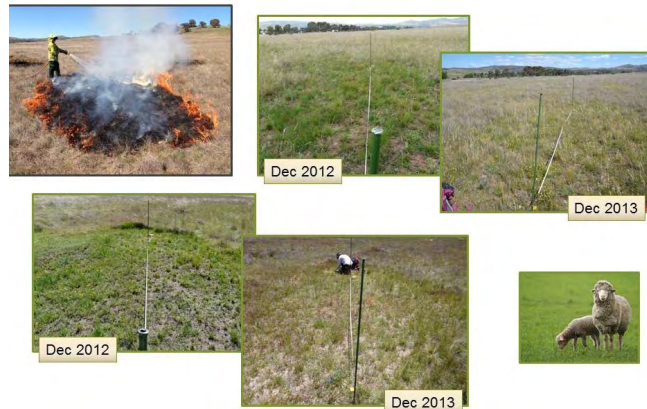




Trying another approach to measure numbers of dragons there, Dr Will Osborne, who monitors the Jerrabomberra East reserve for ACT Parks, put two transects across the kangaroo enclosure this year (2014), where the groundcover was more heterogeneous. During the last few weeks of our survey season he found four dragons along those two transects compared to a total of six found across four grids during eighteen checks. Clearly the dragons are still present, and we may need to rethink our monitoring grids to get more representative data about the population.

The threatening processes that have impacts on the grasslands are an ever-present issue for *Tympanocryptis*. Three populations of Grassland Earless Dragons have been negatively affected by land use or management decisions or history. One, known as the Amtech site, is a patch outside a reserve area, in Symanston near Fyshwick (see map in Mulvaney 2015, this proceedings). This patch was overgrazed during the drought and we believe that population of dragons is now extinct because we have not detected any animals there in some years. Another area of dragon habitat was cultivated when it should not have been, and therefore we presume the dragons are no longer there, though we have not surveyed the area since. The population formerly known to be west of the airport, alongside the current Majura Parkway extension, is potentially surviving, although transects used to survey for dragons before the road works, in those very wet summers, did not detect any activity. These losses, actual or potential, make our monitoring work all the more important.

Lack of grazing and lack of burning in our enclosures have resulted in dense swards of tall grass, predominantly Speargrass (*Austrostipa* sp.). In the Jerrabomberra West kangaroo enclosure (photos at right) we have begun a burning and grazing program within part of the habitat, starting out small, getting a feel for how to do the burns and get them right. We have done three burns there now in late winter to early spring, in a patchy formation. The last one was done in mid-October (2014). We have been able to follow that up with some grazing, by arrangements with a sheep owner.



I have collected a small set of data from this trial, over only a 12 month period. We measured grass sward structure, because the structure is very important for dragons for thermal regulation, shelter and hunting, in the same way as for other reptiles such as the Striped Legless Lizard *Delma impar* (e.g. Howland *et al.* in press). We also measured floristic values using the Rehwinkel method (Rehwinkel 2015, this proceedings). Thanks to collaborative experts who have helped us, our results show that the site now has a groundcover comprising 50–70% native vegetation, which we believe is almost ideal for this species, and 10–30% bare ground, and 0–2% exotic vegetation.

There was regeneration of exotic plant species after the burning, but less than we had expected. The forbs flourished: a number of people asked me, 'What's that great big green clump over there?', and it turned out to be enormous Wire Lilies *Tricoryne elatior*! Also, I noticed in 2013 that the only places where tall Speargrass was flowering was where we had burnt it in 2012. None was in flower anywhere else. Grazing alone is not effective because the sheep do not eat the dead grass thatch though they do break it down by walking around. Therefore, having concluded that burning and grazing together work very well, we are now deciding on the best balance for *Tympanocryptis* in this habitat. Doing any more, however, will depend on having both time and adequate funds available – as they were, fortunately, when we burnt and grazed before.



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Finally, although we are managing primarily for the Grassland Earless Dragon in these sites, we recognise that dragons are not the only important species here, and that other species will also benefit from the management work that we are doing in these areas.

References

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- Mulvaney M. (2015) The moths and lizards that shaped Canberra. In: Grass half full or grass half empty? Valuing native grassy landscapes. Proceedings of the Friends of Grasslands 20th anniversary forum, 30 October – 1 November 2014, Canberra, Australia. Eds: A. Milligan & H. Horton. Friends of Grasslands Inc.
- Rehwinkel R. (2015) A revised Floristic Scoring Method to assess grassland condition. *Under 'Field sites and talks: Jerrabomberra Grassland Reserves' in: Grass half full or grass half empty? Valuing native grassy landscapes. Proceedings of the Friends of Grasslands 20th anniversary forum, 30 October – 1 November 2014, Canberra, Australia. Eds: A. Milligan & H. Horton. Friends of Grasslands Inc.*

Emma has been working as a Research Officer and Ecologist with the ACT Conservation Research Unit since early 2009 after completing her Bachelor of Environmental Science at University of Canberra as a mature age student in 2008. Her primary role includes monitoring and management of endangered flora and vegetation communities, as well as work with the Grassland Earless Dragon populations and the current ACT Vegetation Community mapping project.

+ This record of the talk given at the forum has been checked by the presenter, and cleared for publication, but not peer-reviewed. To find out more, contact the presenter, via their institution or by email to: info@fog.org.au.