Population size and habitat management of frillneck lizards in a suburban park: Yanyula Park, Darwin

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Contents

Introduction

The frillneck lizard (*Chlamydosaurus kingii* Gray 1825) is a member of the family Agamidae or Dragons, which is particularly diverse in Australia, consisting of 64 species (Cogger, 2000). Frillneck lizards are arboreal and insectivorous. They are widespread and common across northern Australia and Papua New Guinea's tropical savannas, favouring open forests and woodlands (Shine & Lambeck, 1989). During seasonally dry periods (May to October), frillneck lizards reduce their metabolic rate and activity to conserve energy. This is contrasted by increased activity, growth and reproduction during the seasonally wet period of November to April (Christian, Griffiths, & Bedford, 1996; Griffiths & Christian, 1996a). Frillneck lizards are well adapted to cope with regular fire in this tropical environment, showing a clear preference for recently burnt habitat. They are able to increase the volume of food ingested after fire, probably due to the increased visibility of prey items following the removal of shrub and grass layers, and show poor body condition in habitat unburnt for over five years (Griffiths & Christian, 1996b). However, in more intense fires up to 30% of the population can be killed directly (Griffiths & Christian 1996b).

The aim of this report is to provide an estimate of the density and population size, and recommendations for habitat management, for a suburban park of Anula in the northern suburbs of Darwin, Northern Territory.

Methods

All fieldwork was conducted at Yanyula Park situated in the Darwin suburb of Anula (12°23` S, 130°53` E), Northern Territory, Australia (Figure 1). Darwin experiences a strongly seasonal monsoonal climate with two dominant seasons: the monsoon or wet season (October – April) and the dry season (May – September). The wet season is characterised by high maximum (32 °C) and minimum (25 °C) air temperatures; high mean relative humidity (77 % at 0900 h); and high rainfall (1657 mm). The dry season is characterised by high maximum (32 °C) and low minimum (21 °C) air temperatures; low mean relative humidity (66 % at 0900 h) and low rainfall (45 mm) (Commonwealth Bureau of Meteorology, 2004).

Yanyula Park covers an area of approximately 8.9 ha (excluding the sporting oval). There is no under-storey present and the ground cover consists mainly of leaf litter, grass patches and bare ground. The Park is dominated by introduced tree species; Weeping Rosewood (*Pterocarpus indicus*) and African Mahogany (*Khaya senegalensis*) interspersed by

a mixture of natives such as *Maranthes corymbose*, *Pongamia pinnata*, *Ficus* sp. and *Eucalyptus* spp.. During the dry and early wet season the tree canopy is sparse, developing denser foliage with the onset of the monsoonal rain.

The density of frillneck lizards was determined using the line transect and capture-mark-recapture methods, at the end of the reproductive season (Buckland, Anderson, Burnham, & Laake, 1993). Line transects calculate a probability density function that models the decrease in sightings of animals with distance from the centre line of each transect. This function is then used to calculate the density of individuals with standard error and 95% confidence limits, given the three assumptions that are critical to achieve reliable estimates of density from line transects: the objects on the line are detected with certainty (if objects on or near the line are missed, the estimates will be biased low); objects are detected at their initial location; measurements are exact (Buckland et al., 1993).

Transect lines were walked slowly with two observers. When a frillneck lizard was sighted, the perpendicular distance from the line to the lizard was measured using a laser range finder (Bushnell Yardage Prop Sport®) or a tape measure (Buckland et al., 1993). The width of each transect was treated as large and effectively unbounded, with any outlier data removed if necessary during the analysis. The computer program DISTANCE V4.1 (Thomas et al., 2003) was used to estimate density from the line transects. Data from the transects were used to relate the detection probability to the distance from each transect (Lancia, Nichols, & Pollock, 1996). Four models of the probability density function (uniform cosine, negative exponential cosine, half-normal cosine, and hazard rate cosine) were applied to the data. The best model describing the data was chosen on the basis of minimum Akaike information criterion (Buckland et al., 1993; Foster et al., 2004; Raman, 2003). Once the density of individual lizards per hectare was calculated, we extrapolated a population estimate for the entire park. It is important to note that juvenile and hatchling frillneck lizards are very difficult to detect during surveys due to their small size, camouflage and cryptic behaviour. Therefore, estimates relate to the adult frillneck lizard population.

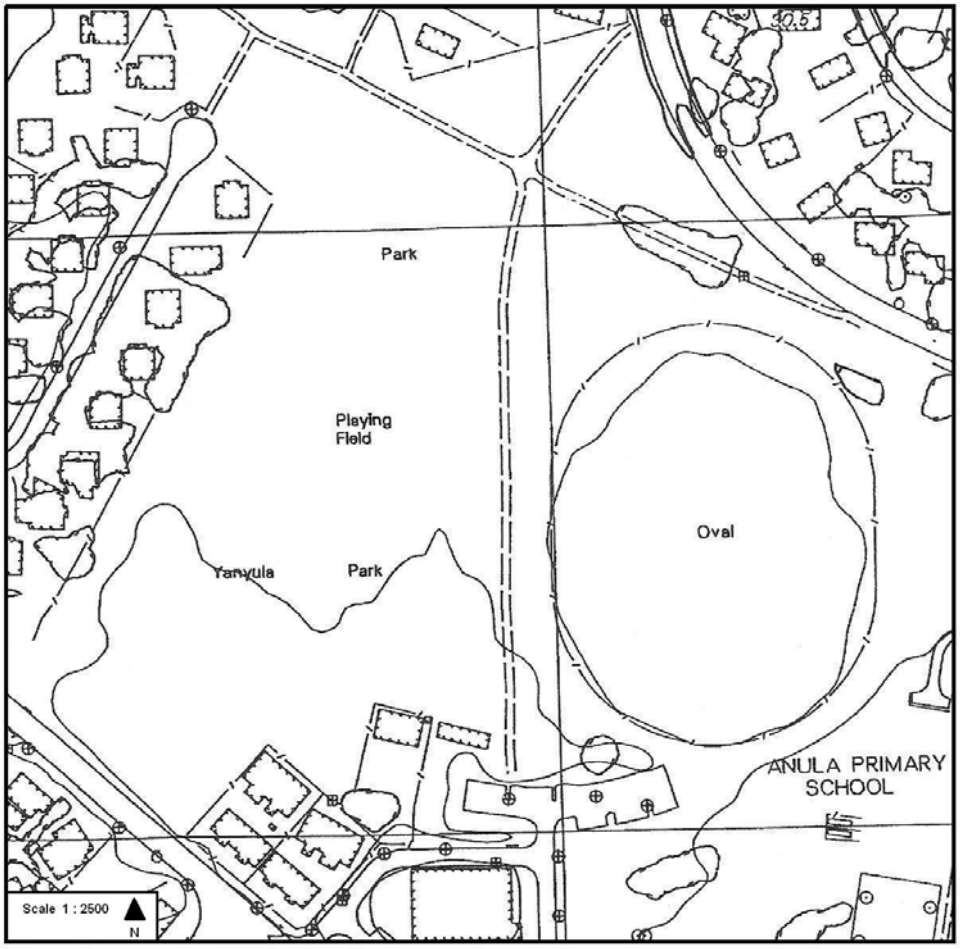

Figure 1: Study site at Yanyula Park situated in the Darwin suburb of Anula, Northern Territory, Australia.

Results and Discussion

Population estimates

2004 survey summary

Using 11 line transects covering a total distance of 1772 m, 32 adult frillneck lizards were observed. The maximum distance to a lizard from the line transect was 27 m and the probability of detection was 0.51 (i.e. the 32 lizards represented approximately half the population). The calculated density was 6.53 lizards per hectare (95% confidence intervals, 3 and 14 lizards per hectare). Given the study area was 8.9 ha, the population of frillneck lizards in the park was estimated to be approximately 58 adults. Based on the 95% confidence intervals, the population size could be as low as 27 adults and as high as 123. The number of hatchlings in the population is difficult to determine, as they are too small to sample using this technique. However, by using assuming a stable age distribution of 22% of non-reproductive individuals an estimate of 17 hatchlings is possible. This gives a total population of 75 frillneck lizards.

2006 survey summary

Using eight line transects covering a total distance of 1719 m, 38 adult frillneck lizards were observed. The maximum distance to a lizard from the line transect was 48 m and the probability of detection was 0.26 (i.e. the 38 lizards represented approximately a quarter of the population). The calculated density was 8.95 lizards per hectare (95% confidence intervals, 4.6 and 17.4 lizards per hectare). Given the study area was 8.9 ha, the population of frillneck lizards in the park was estimated to be around 81, ranging between 42 and 147. By using assuming a stable age distribution of 22% of non-reproductive individuals an estimate of 22 hatchlings is possible. This gives a total population of close to 100 frillneck lizards.

Habitat management

The density of frillneck lizard population inhabiting Yanyula Park is substantially higher than populations living in native vegetation. For example, the density of frillneck lizards in Kakadu National Park ranged from 0.1 to 0.9 per ha (Griffiths, 1999). There are a number of reasons for such an elevated density, but in general it hinges on the capacity of the environment to support the population. A brief summary of possible reasons is given below.

Frillneck lizards spend almost all their time perched on tree branches, occasionally coming to the ground to feed on insects. In native vegetation they prefer trees with rough dark bark, branches without lots of sticks and a thick canopy such as the Darwin Stringybark (*Eucalyptus tetrodonta*), Ironwood (*Erythrophleum chlorostachys*) and Black Wattle (*Acacia auriculiformis*). Frillneck lizards clearly avoid trees that have smooth or white bark as this makes it difficult for them to climb and provides poor camouflage against predators such as kites and dogs. At Yanyula Park and other suburban parks in Darwin City, frillneck lizards show a clear preference for trees with similar characteristics, such as the Weeping Rosewood (*Pterocarpus indicus*). In the dry season when lizards are less active they tend to prefer the larger African Mahogany (*Khaya senegalensis*), which offer better protection from predators. New plantings that aim to enhance the quality of habitat for frillnecks lizards should focus on either native or exotic species that possess these characteristics (i.e. rough bark, thick canopy).

The presence of mown lawn offers excellent foraging opportunities. In native vegetation, frillneck lizards prefer areas that have been burnt as this makes it much easier for lizards to find food (Griffiths & Christian, 1996b). Another factor contributing to elevated density at Yanyula Park is the mulched areas underneath the Weeping Rosewoods. These are excellent places for female frillneck lizards to lay their eggs, which are placed in a shallow moist burrow.

Conclusion

The density of frillneck lizards at Yanyula Park in suburban Darwin is high and has probably grown between 2004 and 2006. The density observed in 2006 is almost 10 times the density seen in native vegetation, and reasons for this elevated density revolve around the quality of habitat available. There are no specific threats to the population and the current management of the Park is sufficient to ensure a healthy population persists.

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