The effect of cage size on stress levels in captive green anole (Anolis carolinensis)

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Abstract

Reptiles are often used as model species in scientific research and are popular in the pet trade, yet how they cope with captive conditions has not been well studied. Stress caused by captivity could affect the endocrinology, physiology and behaviour of animals, resulting in a general decrease in welfare and could confound the results of scientific experiments. One of the factors that could influence stress in a captive environment is the size of the cage. However, the effect of cage size on stress has rarely been investigated in reptiles. In this study, the effect of cage size on the behaviour, morphology and physiology of the green anole (Anolis carolinensis) was quantified. We were unable to find an effect of cage dimensions (range 0.05 to 0.2 m³) on body mass, tail-base width, heterophil to lymphocyte ratios (H/L ratios), behaviour and faecal corticosterone metabolite (FCM) levels.

Keywords: animal welfare, cage size, captivity, green anole, reptiles, stress

Introduction

Reptiles are popular in the pet trade and as model species in laboratory studies (eg Waters et al 2005; Lailvaux & Irschick 2007; Merchant 2008; Montuelle 2008; Stellar & White 2010). In the period between 1975 and 2014, 152 million reptiles were traded worldwide, compared to 79.8 million invertebrates, 24.1 million birds, 13 million mammals and 12.8 million fish (Harfoot et al 2018). In many animals, captivity is known to induce stress, especially when aspects of the captive housing conditions depart from the natural habitat (as they almost inevitably do: Morgan & Tromborg 2007). This stress is reflected in the endocrinology, physiology and behaviour of the subjects and may lead to a general decrease in welfare (Morgan & Tromberg 2007). It may also confound the results of scientific experiments or observations (Garner 2005).

Given the variation in natural history among species, the stress of limited locomotion due to enclosure size is expected to have varying degrees of impact (Clubb & Mason 2007). Generally, it is assumed that a small cage size would have a negative effect on animals given the disparity between the size of the cage in captivity and their natural home range. An argument that is often used in this context, is that a small cage size would not allow an animal to perform its full range of natural behaviours.

The effect of differences in enclosure size has received considerable attention in mammals (Hite et al 1977; Horton et al 1991; Pearce & Patterson 1993; Saito et al 1996; Kaufman et al 2004; Whitaker et al 2007), birds (Adams & Jackson 1970; Sefton 1976; Nicol 1987; Buchwalder & Huber-Eicher 2004; Jalal et al 2006) and fish (Kilambi et al 1977; Teng & Chua 1978; McGinty 1991; Rowland et al 2006), and while many aspects of the effect of captivity on reptiles (for a review, see Burghardt 2013; Michaels & Campbell-Palmer 2014) have been investigated, the consequences of changes in enclosure size on reptiles is rarely studied. Research on loggerhead turtles (Caretta caretta: Gregory et al 1996) and tuataras (Sphenodon punctatus: Tyrrell & Cree 1998) showed that also in reptiles, enforced confinement can lead to an acute stress response and the study by Wheler and Fa (1995) is a rare example investigating the effect of enclosure size in reptiles. They found that in Round Island geckos (Phelsuma guentheri) enclosure size does not appear to influence activity cycles, but large enclosures may encourage greater use of available space.

A problem that arises when conducting stress research in reptiles is that previous studies used a wide variety of ways to gauge captive stress, including: behavioural observations; resting and stereotypic behaviour (Therrien et al 2007); social behaviour (Phillips et al 2011); heterophil to lympho-