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Visual conspecific cues will not help in pygmy bluetongue lizard translocations

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ABSTRACT

Where a translocation program is used to reinforce an existing population of an endangered species, the response of the introduced individuals to cues from conspecific residents will have an important impact on the success of the translocation. If those cues induce the translocated individuals to stay at the release site the translocation is more likely to succeed than if the cues cause individuals to move away. We used conspecific models of the endangered Australian pygmy bluetongue lizard to identify behavioural parameters relevant to translocation success, that change when the visual conspecific cues are presented. Pygmy bluetongue lizards typically remain in or at the entrance of their refuge burrows. In the presence of conspecific models, introduced lizards significantly increased, and nearly doubled, the number of movements out of their burrows (mean (SE) number of movements with models = 0.44 (0.03); without models = 0.25 (0.03); $P = 0.012$) and more than doubled the number of movements away from the release area (mean (SE) number of movements with models = 0.28 (0.03); without models = 0.08 (0.02); $P = 0.003$), suggesting they would be less likely to remain within a resident population where they were released. We found that, by the end of the first day of experimental trials 11 of 16 lizards in treatments with models present had occupied burrows that did not have a model nearby, and that number increased to 14 of 16 lizards by the fourth day. The results suggest that cues from conspecifics will not encourage translocated lizards to stay at a release site.

1. Introduction

A range of behavioural responses to conspecific individuals, particularly responses associated with agonistic or mating behaviours, are mediated by unique cues, and models that contain features of those cues can be used to manipulate animal behaviour in practical ways (Craven, 1984), including their use in conservation related translocations.

For many endangered species, one potential management strategy is conservation translocation, the intentional movement and release of individuals primarily for conservation benefit (IUCN, 2013). Two important problems in any translocation attempt are the initial stress on release, and the tendency to disperse from unfamiliar habitat (Mihoub et al., 2009). Examples of post-release movement in release habitats include translocated birds (Kemink and Kesler, 2013) and snakes (Reinert and Rupert, 1999). The novel location and resource competition from conspecific residents may increase the stress level of translocated animals (Letty et al., 2000; Teixeira et al., 2007; Drake et al., 2012), but stress may be reduced if individuals recognise conspecific cues that allow them to rapidly identify refuge shelters or feeding locations (Lorenzo and Lazzari, 1996; Göth and Evans, 2004; Gautier et al., 2006; Kullmann et al., 2008). In those cases the provision of conspecific cues may reduce both stress and the tendency to disperse. For instance Ahlering et al. (2010) reported that, in 20 of 24 reviewed studies, songbirds were encouraged to settle in habitat where conspecific songs were played. Alberts (2007) suggested that captive

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reared individuals of the endangered Caribbean rock iguana, when released back into the wild, may be more likely to preferentially settle where there are familiar cues such as known conspecifics or their odours. On the other hand, in species that are aggressively territorial, the use of conspecific cues may have the opposite effect, and increase stress. The potential to use conspecific cues to promote translocation success needs to be examined carefully on a species by species basis.

The endangered pygmy bluetongue lizard (*Tiliqua adelaidensis*) is now restricted to a few isolated fragments of its native grassland habitat in the mid-north region of the state of South Australia, Australia. Its current distribution is a small part of its previous range, most of which has been taken over by cereal cropping and grazing farmland. Its endangered status has resulted from the now restricted geographical range, and from the isolated nature of the few remaining small populations. Models that explore likely future climate change scenarios within the range of this lizard, show that reinforcement or reintroduction translocation will be a certain requirement for the future preservation of this species (Fordham et al., 2012). If we adopt that strategy, we need to know how best to prevent translocated lizards from dispersing away from release sites. Can we use cues from conspecifics, to encourage them to preferentially settle close to where they are released?

The pygmy bluetongue lizard is normally solitary and lizards spend most of their time associated with single entrance burrows constructed by lycosid and mygalomorph spiders (Hutchinson et al., 1994; Fenner and Bull, 2011b). Individuals usually occupy a single burrow for extended periods of time and most suitable burrows are taken by lizards (Hutchinson et al., 1994; Milne et al., 2003; Souter et al., 2004; Fellows et al., 2009). This suggests there is competition between lizards for limited high quality burrows, and although occupied burrows can be as close as 1 m apart (Fenner and Bull, 2009) lizards actively defend a very small area with a radius of less than 15 cm around their burrow entrance from approaching conspecifics (and from conspecific models) (Fenner and Bull, 2011a). This would suggest that conspecific cues might increase stress in newly introduced lizards. On the other hand, when in a novel environment, lizards recognise conspecific olfactory signals and prefer to choose unoccupied burrows that have previously held a conspecific (Fenner and Bull, 2011b); that is they select refuges where other lizards have been. In that case, conspecific cues that are not directly challenging might help lizards adjust to a novel environment. In the current study we asked whether the provision of conspecific models near some, but not all burrows in a novel habitat, might reduce or increase movements and dispersal among newly introduced pygmy bluetongue lizards.

2. Methods

2.1. Experimental trials

We used eight male (average snout-to-vent length (SVL) 85.1 ± 0.2 mm) and eight female (average SVL 89.2 ± 0.2 mm) pygmy bluetongue lizards that had been captured from two natural populations near Burra, South Australia (33°42′S; 138°56′E). These lizards had been used in several other short behavioural experiments during the austral spring and summer of 2009/10 and 2010/11 (Ebrahimi and Bull, 2012, 2013a,b,c), and so had briefly experienced the experimental habitat of the current experiment (total of 60 days in the cages over a 2-year period). Before the current experiment the lizards were held in individual cages (52.5 × 38 × 31 cm) in ambient conditions and fed every day with crickets and mealworms.

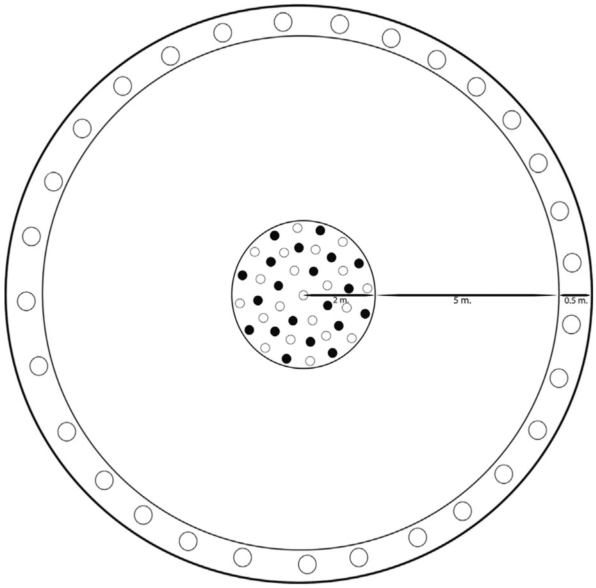

Fig. 1. The layout of each cage used in the experimental trials, showing burrows with models placed 5 cm from the burrow entrance (in the model addition treatment; filled circles) and the burrows with no models (open circles).

The experimental cages have been described previously (Ebrahimi and Bull, 2013b) as four, 15 m diameter cages at Monarto Zoo, 70 km SE of Adelaide, South Australia (35°06′S; 139°09′E). Each cage had a 1 m high galvanized wall and a bird-proof wire roof. Each cage was divided into three areas; a 2 m radius central area where lizards were released, which was lightly vegetated with annual grass cut to ground level before the experiment started, and where burrows were provided, a 5 m wide ring of marginal habitat, similarly vegetated but with no burrows, and a 0.5 m wide perimeter area around the inside cage wall, again similarly vegetated but with burrows. We considered the no-burrow habitat marginal because we assumed that lizards would perceive they were exposed and at risk where there were no burrows. We placed 41 artificial burrows into the central area, one in the centre and 40 in three concentric rings, so that burrows were 65–75 cm apart. We also spaced 30 burrows evenly around the inside cage perimeter (Fig. 1). Burrows were made from 30 cm lengths of 3 cm diameter wooden dowling with the central 2 cm diameter drilled out. These were hammered into 30 cm deep, 3 cm diameter holes drilled into the soil surface. The burrows in the perimeter area allowed us to detect lizards that had dispersed from the central area.