# Personality composition in a translocated population of the endangered species of kangaroo rat, *Dipodomys stephensi*

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## Introduction

Translocations, movement of wild-captured animals to other natural locations, are a key management practice for certain species, primarily because of habitat loss (Griffith et al. 1989). Most translocation attempts, however, have been unsuccessful in establishing self-sustaining populations (Kleiman 1989).

Historically, post-translocation mortality is high and highest during the initial days to weeks after release as animals confront their novel environments (Kleiman 1989; Short et al. 1992). Such a mortality rate is likely because the stressors characteristic of typical translocations strain the coping mechanisms an animal uses to survive in the wild (Texeira et al. 2007). Current theory suggests that these stressors will differentially affect individuals in a population because of personality type; the few studies that have explored physiological and behavioral effects bear this out (e.g., McEwen & Sapolsky 1995; Mendl 1999; Franceschini et al. 2008).

Thus, understanding the personality composition of a translocated population is important for animal conservation and welfare concerns. Knowledge of personality composition and how certain personality types respond to potential stressors should help increase survival as we are able to anticipate and reduce the negative impact of stressors on individuals.

**Figure 1.** Stephens' kangaroo rat, *D. stephensi*, emerging from trap bag

## Materials and methods

Study species: *Dipodomys stephensi* is a nocturnal, granivorous heteromyid rodent; it is a keystone species native to open grasslands of southern California. This species was federally listed as endangered by U.S. Fish and Wildlife in 1988. To date, no confirmed populations have been successfully established via translocation.

In this preliminary study, personality types within a population of *D. stephensi* were assessed pre- and post-translocation. Animals were rated using 21 adjectives along a 7-point scale during mirror-image-stimulation trials and by observations made during the acclimation period.

Additional measures of personality type include trapping order, latency to enter acclimation burrow, seed hoarding behavior and fecal corticosterone levels (analyses pending).

In the event that personality types are established the goal is to determine if they are predictive of behavioral responses to translocation activities.

**Figure 2**. Stephens' kangaroo rat in acclimation cage

## Results

Preliminary analyses were done with Statistical Package for Social Sciences (SPSS):

- Intraclass correlations were used to assess reliability of ratings across two raters: →→ 11 of 21 descriptive adjectives remained (Table 1).
- A reliability analysis was used to assess the stability of the ratings across the two contexts: →→ No adjectives were rated the same across context.
- Due to lack of stability Mirror Image Stimulation (MIS) ratings were used to run a Principal Components Analysis (PCA): →→ The first component suggests a bold/shy axis (Table 2).
- A scale using unit weights for "Bold" with score labeled in the data analysis was used to assess whether this axis was predictive of Site Fidelity at release and Site Fidelity at 1 month post release: →→ Neither was significant, but a trend is suggested (Tables 3a & 3b).

Table 1. Intraclass correlations to examine inter-rater reliability for Mirror Image Stimulation trials

| Adjective | Cronbach's alpha |
|---|---|
| Active[a] | .782 |
| Aggressive | .339 |
| Apprehensive[a] | .600 |
| Confident[a] | .588 |
| Curious[a] | .546 |
| Eccentric | .057 |
| Effective[a] | .549 |
| Equable | .380 |
| Excitable | .358 |
| Fearful[a] | .693 |
| Irritable[a] | .653 |
| Opportunistic | .084 |
| Playful[a] | .662 |
| Protective | -.310 |
| Slow | .479 |
| Sociable[a] | .740 |
| Solitary[a] | .716 |
| Strong | .384 |
| Subordinate | .206 |
| Tense[a] | .681 |
| Understanding | .153 |

[a]Indicates variable retained for Principal Components Analysis

Table 2. Total variance from MIS trial ratings explained by Principal Components Analysis: Component 1 holds over 60% of the behavioral variance

| Component | Initial eigenvalues | | | Extraction sums of squared loadings | | | Rotation sums of squared loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of variance | Cumulative % | Total | % of variance | Cumulative % | Total | % of variance | Cumulative % |
| **1** | **6.955** | **63.223** | **63.223** | **6.955** | **63.223** | **63.223** | **5.660** | **51.452** | **51.452** |
| 2 | 1.717 | 15.609 | 78.832 | 1.717 | 15.609 | 78.832 | 3.012 | 27.380 | 78.832 |
| 3 | .790 | 7.178 | 86.011 | | | | | | |
| 4 | .383 | 3.492 | 89.503 | | | | | | |
| 5 | .378 | 3.433 | 92.937 | | | | | | |
| 6 | .242 | 2.216 | 95.153 | | | | | | |
| 7 | .181 | 1.642 | 96.795 | | | | | | |
| 8 | .129 | 1.173 | 97.968 | | | | | | |
| 9 | .109 | .995 | 98.963 | | | | | | |
| 10 | .082 | .750 | 99.713 | | | | | | |
| 11 | .032 | .287 | 100.000 | | | | | | |

Table 3a. Logistic regression to determine if behavioral ratings are predictive of site fidelity immediately after translocation for *D. stephensi*

| | B | S.E. | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|
| score | -.069 | .045 | 2.366 | 1 | .124 | .933 |
| constant | .605 | .620 | .951 | 1 | .329 | 1.831 |

| -2 Log likelihood | Cox & Snell $R^2$ | Nagelkerke $R^2$ |
|---|---|---|
| 31.864[a] | .104 | .139 |

Table 3b. Logistic regression to determine if behavioral ratings are predictive of site fidelity one-month post translocation for *D. stephensi*

| | B | S.E. | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|
| score | -.066 | .048 | 1.880 | 1 | .170 | .936 |
| constant | -.665 | .627 | 1.127 | 1 | .288 | .514 |

| -2 Log likelihood | Cox & Snell $R^2$ | Nagelkerke $R^2$ |
|---|---|---|
| 21.564[a] | .088 | .133 |

## Conclusions

Consistency of behaviors across time and context suggests persistence of personality among animals; studies indicate further that variation of individual personality exists within species (Wilson 1998). Sih et al. (2004) cite 2 consequences of personality persistence: 1) explanation of non-optimal behavior; 2) limitation of behavioral plasticity, both potentially affecting fitness, and response to changing environmental situations.

Theory contends that limited behavioral plasticity may confer a disadvantage to given species and to individuals when confronted with novel situations. The ability of animals, or the accessibility of a context which enables animals, to respond favorably to the stress imposed by novel situations is critical in translocations.

That there is not consistency for *D. stephensi* across the two contexts examined may be indicative of the species' level of behavioral flexibility or simply may be an artifact of methodology and small sample size (N=28; F,14; M,14). However, if the trend obtains, the plasticity that may be inherent in *D. stephensi* may suggest that the species could more readily cope with translocation activities than less flexible species.

Regardless, greater contexts need to be examined and the sample size expanded. If personality and level of plasticity (coping ability) can be determined I intend to investigate, in addition to behavioral measures, whether morphological, physiological, epigenetic and genetic measures are predictive of how well an individual will fare, in terms of survival post-translocation and in terms of ability to cope with the entire translocation process.

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## For further information

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