A new method for detecting the presence of the endangered New Mexico meadow jumping mouse

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Introduction

Background: The Endangered Species Act protects listed species and their habitats. Recovery goals usually include monitoring and assessment of population size.

Focal Species: The New Mexico meadow jumping mouse (*Zapus hudsonius luteus*), a riparian obligate (Fig. 1), was listed as endangered in 2014. Traditional live capture methods are expensive and risk mortality. An alternative could improve detectability.

Objectives (O.)

1: Develop a track plate survey method.

2: Develop a track guide.

3: Compare the effectiveness of a track plating to live capture.

Methods

O. 1: We compared 4 types of pigment and 4 shelter designs. To capture footprints, we used ink (mineral oil and pigment 1:1), a track plate, and a shelter (Fig. 2A-B). The plate was self-adhesive paper with an ink-saturated pad in the center (Fig. 3A). Plates were centered in the shelter and baited with sweet feed (Fig. 3B). Ink tracks were adhered to white paper for permanent retention (Fig. 3D).

O. 2: We obtained tracks of sympatric mice and voles to create a track guide (Fig. 3A, C-D, Fig. 1). We compared morphologies across species using a Kruskal-Wallis test.

O. 3: We compared capture rate (number of captures/4 survey nights) and detectability between track plating and live capture methods with a Wilcoxon signed-rank test.

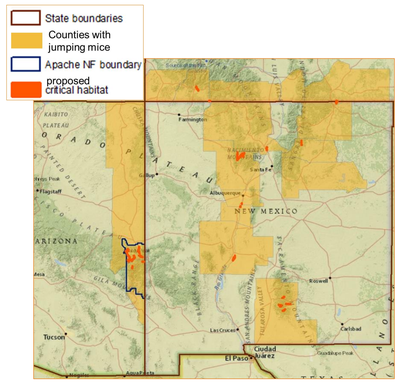


Figure 1. Jumping mouse range map. Study sites in proposed critical habitat of Apache National Forest.

Methods, cont.

Figure 2. Compared A) pigments: graphite powder, ponderosa pine charcoal, carpenter's chalk, and carbon black and B) Four shelter types

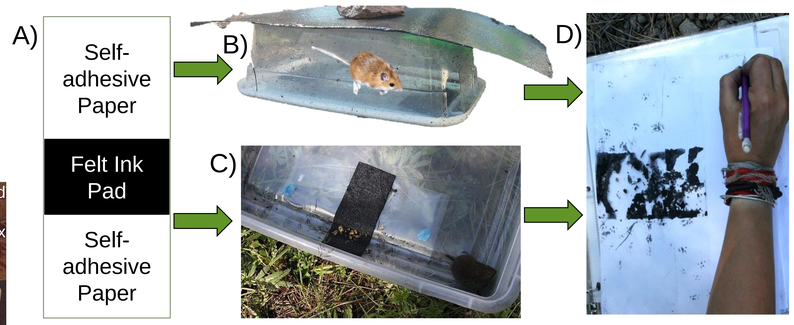
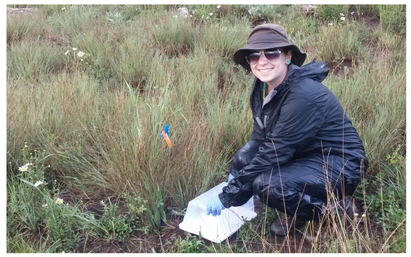


Figure 3. A) The track plate is a rectangular piece of self-adhesive paper placed sticky side up with an ink-saturated felt pad in the center. B & C) It is attached to a shelter or a chamber with double-sided tape or putty to obtain tracks from animals. D) The track plates with footprints were adhered to a white paper and retained as a permanent record.

Results

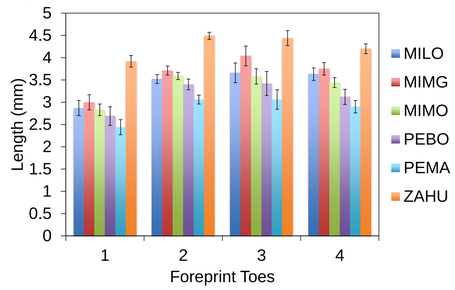
O. 1: Prints were best collected using carbon black and a modified shoebox shelter. Carbon black was easy to use and captured tracks accurately. The shoebox had the largest surface area, collected more tracks, and protected the track plate from the environment. It was stable and lightweight, did not compress vegetation, and could withstand flooding. Track plates were less expensive ($5 compared to a $25 Sherman trap). One technician was needed to check track plates once per day in high-use areas; ≥2 technicians were needed for live trapping to check traps twice per day in low-use areas.



O. 2: Jumping mouse tracks were distinguishable from other species (Fig.4, Table 1) due to their elongated hindprint (Fig. 4A) and length of the foreprint toes (Fig. 4C). No differences in the foreprint pad width, pad length, and foot length (Fig. 4B) were detected.

B)

Variables	X^2	*P*
Pad width	8.31	0.13
Pad length	8.85	0.11
Total foot length	4.36	0.49
Toe 1	14.23	**0.01**
Toe 2	16.11	**0.006**
Toe 3	13.49	**0.01**
Toe 4	16.18	**0.006**



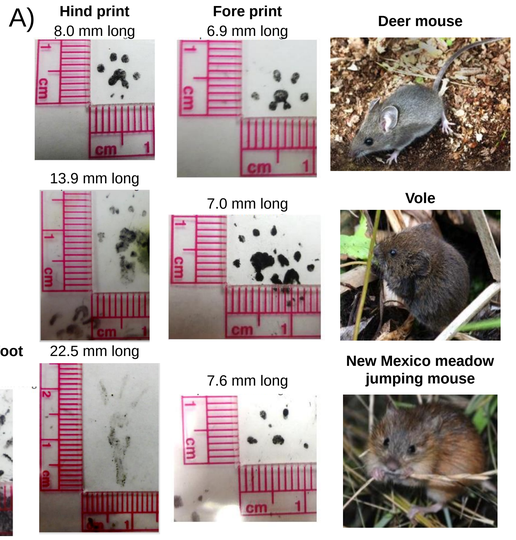


Figure 4. A) Track reference field guide. Jumping mouse partial hind prints of the ball of the foot and toes. B) Comparison of foreprints across all species. C) Jumping mouse (ZAHU) foreprint toes are significantly longer than vole (MILO, MIMG, and MIMO), and deer mouse (PEMA and PEBO) species.

Results, cont.

Variables	$\bar{x}$	$SE_{\bar{x}}$
Pad width	2.95	0.21
Pad length	3.01	0.38
Total foot length	7.52	0.43
Toe 1	3.92	0.18
Toe 2	4.49	0.04
Toe 3	4.44	0.17
Toe 4	4.21	0.07

Table 1. Jumping mouse average foreprint size.

O. 3: We did not detect a difference in detection rate between track plating and live capture (n = 20, Z = 1.19, P = 0.23; Fig. 5A). Track plates had a higher detectability than live capture (Fig. 5B).

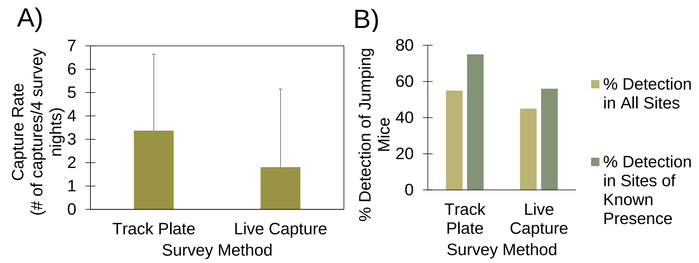


Figure 5. A) No difference in capture rates detected between survey methods. B) Higher detectability with track plates than live capture.

Discussion

Pros: Track plates are a good alternative method to live capture. They are safe, inexpensive, and easier to use, reduce the risk of disease transmission (Drennan et al. 1998), stress, hypothermia, and mortality. They require only one surveyor and are more compatible with human or natural disturbances.

Cons: Track plates may be difficult to read with high track density, and do not allow identification beyond genus, identification of individuals, or collection of demographic data. However, they may be used to collect tissue samples for genetic analysis.

Conclusion: Track plates improve our ability to detect jumping mice, estimate population size, and determine distribution and habitat use. Track plates can be an effective tool for monitoring, research, and recovery.

Literature Cited

Drennan JE, Beirer P, Dodd NL. 1998. Use of track stations to index abundance of Scurids. Journal of Mammalogy 79(1):352-359.

Acknowledgments

Project was supported with funding from U.S. Forest Service, AZ Game and Fish Department Heritage Fund, Natural Resources Conservation Service, and Hooper Undergraduate Research Award. G. Davis, B. Keeley, P. Langle, S. Langle, A. Nemecek, B. Noble and D. Smith provided field assistance.