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The role of *Sansevieria intermedia* in degradation and recovery in Kenyan drylands

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Key words: Kenya, succulents, overgrazing, competitive release, facilitation, biotic crust, resilience

Introduction In some heavily grazed rangelands of north-central Kenya, many local pastoralists are concerned over the proliferation of *Sansevieria intermedia*, a leaf succulent that forms dense patches and prevents livestock foraging and passage. As a first step toward understanding the dynamics of the increase of *S. intermedia*, this paper presents findings of both traditional and scientific ecological knowledge of the system, which suggest two key hypotheses regarding degradation and recovery dynamics.

Methods I interviewed 14 residents (men and women, age range 21 to 71 yrs) of Koiya Group Ranch, Laikipia District, Kenya to begin building a local environmental history of the proliferation of *S. intermedia* and other environmental changes. In 306 50x50 cm quadrats along transects that passed through *S. intermedia* patches and inter-patch areas, I measured percent cover by plant species and functional group, biotic crust cover. I used Wilcoxon nonparametric means comparisons and chi-square tests to compare the variables between patch and inter-patch quadrats (JMP, 2007).

Results Of 14 interviewees, 13 stated that *S. intermedia* abundance had increased noticeably during their lifetimes. Nine believed the increase had occurred mostly during the last 10-20 years. Three respondents pointed out particular sites that had no *S. intermedia* in the past, and now contained 13-45% cover of *S. intermedia* patches. All respondents believed that livestock forage had decreased at Koiya; 8 of the 14 felt that the decline started 10 to 20 years ago (Figure 1). Quadrats in *S. intermedia* patches had significantly higher biotic crust cover, associated vegetation cover, and species diversity, than inter-patch quadrats (Figure 2). Perennial grasses and the most common annual grass species at Koiya, *Eragrostis tenuifolia*, occurred more frequently in *S. intermedia* patches than inter-patch areas (Figure 3).

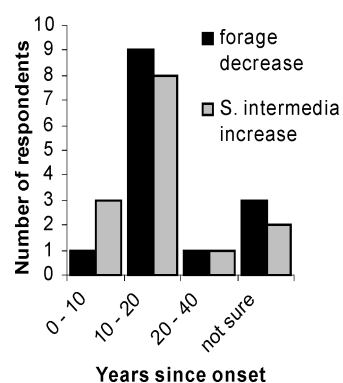


Figure 1 Koiya Group Ranch residents' perceptions of changes in forage and *S. intermedia* abundance ($n=14$).

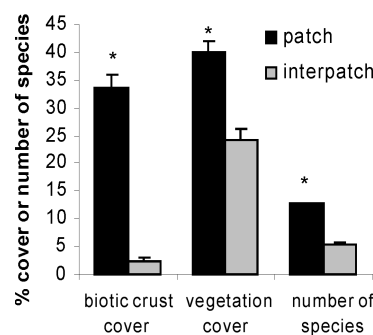


Figure 2 Comparisons soil crust and vegetation ($+1$)SE in *S. intermedia* patch quadrats ($n = 144$) and interpatch quadrats ($n = 162$). * Wilcoxon rank tests: $p < 0.001$.

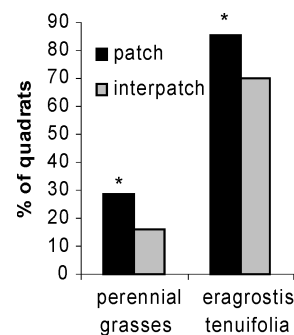


Figure 3 Perennial grasses and *E. tenuifolia* occurred more often in patch quadrats ($n = 144$) than interpatch quadrats ($n = 162$). * χ^2 tests: $p < 0.01$.

Conclusions According to local ecological knowledge, *S. intermedia* has always been present at Koiya, but the onset of its proliferation coincided with, or followed, forage degradation in the area. Thus the first key hypothesis suggested by this study is that *S. intermedia* has proliferated due to competitive release as surrounding vegetation became less abundant. Comparisons of patch and inter-patch quadrats indicated that soil and vegetation conditions are more favorable within *S. intermedia* patches than in the inter-patch areas. This may be due to the protection that *S. intermedia* leaves offer from livestock herbivory, due to shade increasing soil moisture, or due to soil disturbances created by the growth and emergence of *S. intermedia* ramets. These findings led to a second key hypothesis: after proliferating in response to overgrazing, *S. intermedia* patches in turn facilitate the recovery of degraded vegetation. The proliferation of *S. intermedia* may enhance ecosystem resilience by preventing runaway degradation in patches throughout the landscape (Walker and Salt, 2006). Manipulative tests of these hypotheses are currently underway.

References

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Walker, B., Salt, D., 2006. Resilience Thinking: Sustaining Ecosystems and People in a Changing World. Washington DC, USA, Island Press.