**Energetic compensation breaks down over time in a desert rodent community**

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**Background and Methods**

Energetic compensation can occur when declines in energy use from some species in an assemblage are offset by gains from others. When observed, energetic compensation is consistent with a zero-sum competitive dynamic, and renders assemblage-level function resilient to species’ fluctuations. When compensation is mediated by niche structure, it is contingent on the degree to which the species present in an assemblage are functionally substitutable. If species differ in their responses to changing conditions over time, shifting conditions may modulate the degree of redundancy between species and cause compensation to be variable over time – even within a single assemblage.

Some of the strongest evidence of energetic compensation has come from long-term experiments on the rodent community near Portal, AZ. Since 1977, kangaroo rats have been excluded from experimental plots. Partial energetic compensation from smaller granivores was observed immediately, and near-complete compensation occurred in the 1990s following the establishment of the functionally analogous *Chaetodipus baileyi.* We combine long-term temporal analysis of the original experiment with new implementations of the same treatments, initiated in 2015, to explore whether the historically documented energetic compensation has persisted despite major transitions in the habitat and rodent community structure at the site over time.

**Results and Conclusions**

Since 2010, compensatory gains in energy use from small granivores on treatment plots relative to controls declined to near zero, contrasting to the partial compensation prior to the establishment of *C. baileyi* and the near-complete compensation following its arrival. This coincided with a long-term, sitewide increase in the proportion of energy use from smaller granivores, and a recent precipitous decline of *C. baileyi*. Therefore, while kangaroo rat removal now results in a smaller decline in energy use than at the beginning of the study, there is now little to no energetic compensation from other species. These findings are consistent between long-term and new experimental plots.

We suggest that over time, the degree of functional overlap between kangaroo rats and smaller granivores has decreased, greatly weakening the potential for energetic compensation. This may be partially driven by a sitewide transition from grassland to shrubland, which may increase spatial partitioning between kangaroo rats and smaller, more cover-dependent, species.

Our results highlight that energetic compensation, even within a single system, is a dynamic and contingent phenomenon. Assemblage-level resilience to species loss, and zero-sum competitive dynamics, may therefore be temporary and most detectable over long temporal scales – in this case, spanning decades.

Abstract Submission Guidelines

Abstract guidelines

The body of the abstract is up to 400 words, split between the two sections (up to 200 words each): 1) Background/Question/Methods, in which the objective of the study is clearly identified and the methods are described; and 2) Results/Conclusions, in which specific results of the study are explicitly reported and their implications for ecology are briefly discussed.

The abstract must primarily report on new work within the field of ecology.

Reviews of previous work are not permissible for contributed presentations.

The abstract must report specific results. The results may be preliminary, but they may not be vague. Abstracts without explicitly stated results will be rejected.

It is understandable that abstracts describing non-traditional work may lack quantitative data; however, it is still expected that the abstract will address some question and have a “take-home message” describing specific findings.

Abstracts must be clear. Poorly written abstracts will be rejected.

Abstracts must be written in English and must follow standard grammar and punctuation rules. Abstracts that do not meet this guideline will be rejected.

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