Coexisting species are bound together via a shared biotic and abiotic context and a network of species interactions. For species that are part of a single guild or share a common resource, these interactions are primarily competitive (rather than trophic or mutualisms).

From Portal, we know that these types of interactions are strong and can be understood via experimental manipulations.

We know comparatively less about how shifts in the combined competitive landscape and environmental conditions modulate the network of species interactions, and what conseuences these shifting dynamics have for larger-scale/system level attributes.

Portal has been one of the longest standing laboratories for studying how competitive interactions shift over time, and the conseuences for system-level properties. Established in the late 1970s, Portal provided some of the earliest evidence of resource ompetition among coexisting species. Over the decades, Portal has demonstrated delayed energetic compensation mediated by a colonizing species, and shifts in species composition that have resulted in reorganization of the competitive network. Portal has given us evidence of how environmental fluctuations has affected the entire assemblage synchronously, and how environmental change has affected particular species.

Portal demonstrates how shifts in both the environmental context and the regional/local species pool modulate competitive interactions and how these effects can manifest at the system level scale.

Portal has a history of implementing replications and novel experimental conditions, which allows us to test our capacity to test the generality of phenomena we observe – even those conducted at Portal itself – and our capacity to use the body of knowledge we have developed there to predict how manipulations will affect the system given its current state. This affords us an opportunity that is practically uniue in community ecology, to synthesize decades of work to illustrate how change endogenous and exogenous to species interactions affects the outcome of ecological scenarios. This is a uniue contribution to empirical ecology because it is using empirically derived knowledge and replication to test our capacity to make informed predictions about how the system should behave.

Here, we use a new set of experimental manipulations that replicate the maniplations that were instituted at the very beginning of the study. We combine the natural history we have amassed over the decades with the repeated manipulations to test whether the responses we have seen in past decades are consistent at present, and to test whether the shifts in species composition and environmental context that we have observed, and our beliefs about how these affect the rodents, allow us to predict the responses we observe now.

In our system, we have specific priors about how the species composition and abiotic conditions have shifted since 1977. We have seen shifts in the species pool which appear to affect the “bank” of traits present in the system and the network of competitive interactions. We have added Bailey’s, which appears to add traits that allow non-krats to access resources that previously only krats can; this resulted in a change at the functional scale. The presence of Bailey’s also appears to have modulated the interactions between krats and smaller granivores. We have also seen a sitewide habitat shift from grass to shrubland, which seems to have advantaged small granivores over kangaroo rats, especially *D. spectabilis.*

The uestion stands in 2015, whether the same manipulations we have used in the past result in the same outcomes:

* Removing krats results in an increase in numerical abundance of small granivores – especially PB.
* Because Bailey’s is now present in the system, there may now be energetic compensation (or near compensation) without a long time lag.
* Because Bailey’s appears to negatively affect the other small granivores, most of the response may be an increase in Bailey’s (and not other small granivores). In fact we might see relatively little response in the small granivores.
* However, shifts in habitat structure and competitive dynamic may cause different dynamics. We’ve seen and can’t explain a decline in Bailey’s and an increase in small granivores generally. Control plots are also getting similar to exclosures in small granivore abundance.
  + It may be that at this point krats are having a relatively weak effect on small granivores, possibly due to the habitat shift. That is, krats are now using a subset of resources that are largely inaccessible to small granivores. Removing the krats would not result in a release of small granivores.
  + Or that we just won’t be able to tell, because we’re simultaneously witnessing a loss of Bailey’s and a loss of krats. Small granivores could therefore increase on both controls and exclosures, but for different reasons.

How have the combined shifts in the habitat and species pool affected the role of kangaroo rats in the system, and how the system experiences a perturbation, at the species and system levels?

* Did the dynamics from 1977 and/or the 1990s persist despite all this change?
  + Despite changed conditions and species pool, krats are still using lots of resources, some uniue, and competitively suppressing small granivores. Removing krats 🡪 numerical increase in small granivores, but not functional compensation
* Have shifting conditions modulated the competitive landscape such that we get different responses (falling into a couple scenarios)?
  + Shifting species pool (adding Bailey’s) 🡪 functional replacement. Bailey’s slots in rapidly, suppressing tiny granivores and resulting in near-complete energetic match without an extended lag
  + Overall shift favoring small granivores 🡪 krats are still affecting them, but more of the resources used by krats would be available to small granivores given the chance. Removing krats results in numerical and functional compensation
  + Overall shift favoring small granivores 🡪 krats are now using a parallel set of resources, the crumbs in the corner. Removing krats does not result in an increase in small granivore abundance, leaving a functional shortfall.

Can we use our knowledge about the system to predict the outcome of an experimental replication? Much has been made of the context-dependence and messiness of community ecology. Long-term studies give us the knowledge that might help us infer what conseuences shifting conditions have for the species and functional status of a system.

Competition and compensation revisited

Are competitive networks robust over time? Are they predictable from empirical results?

How does a system respond to a perturbation – at granular and broad scale? Can we successfully predict the response to a perturbation from history and empirical, mechanistic results?

Is compensation context dependence even in the same system?

How much of this belongs in the discussion?