D3407: A comparison of arthropod diversity & abundance along four elevational gradients in Colorado for ants, beetles, and grasshoppers

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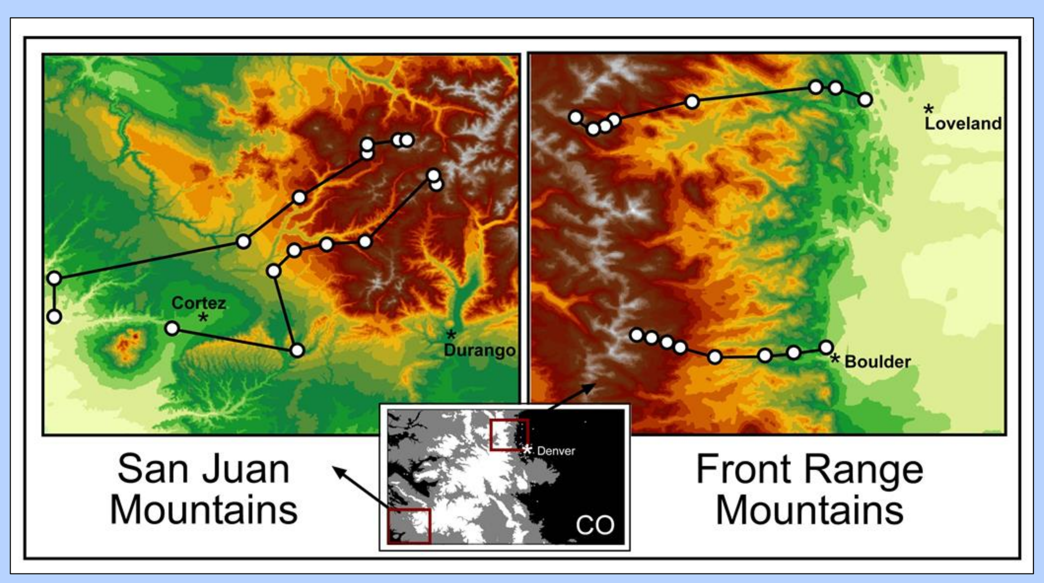
Introduction

Elevational gradients are a powerful test system to understand biodiversity patterns and drivers. Their spatial scale is small enough for field studies of interacting communities, and the climatic, habitat, and taxonomic variability can be as great as that seen along latitudinal gradients[1-3]. Systematic elevational sampling allows for detection of species distributions[4-5], the importance of biotic interactions[6] and abiotic niche constraints[1-6], as well as responses to land use change and climate change[7,8].

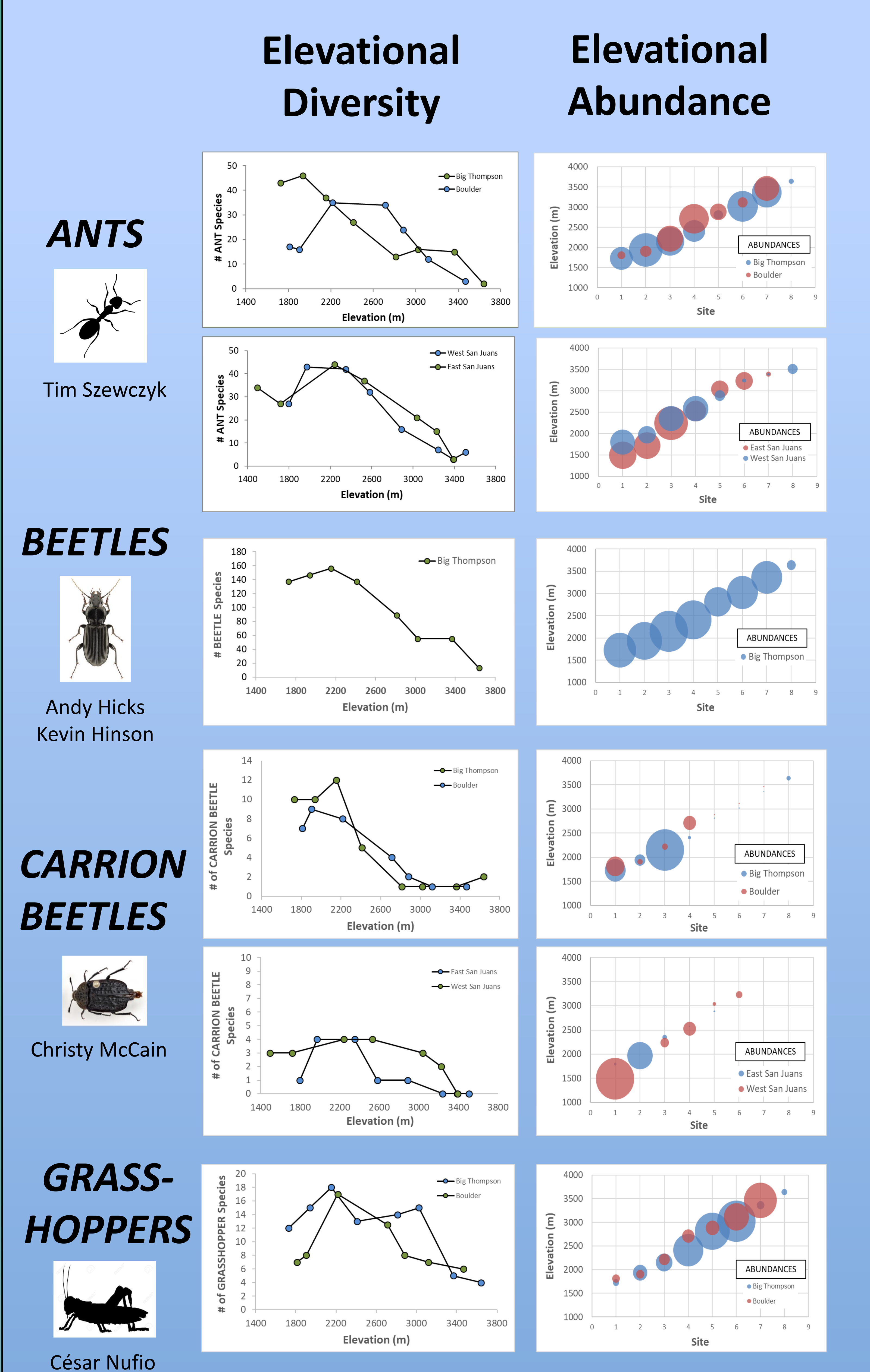
Our understanding of elevational trends in biodiversity are dominated by vertebrates[1,4,6]. Although there are meta-analyses for ants[2] and moths[3], which generally display mid-elevational peaks in diversity. But there are few elevational diversity studies for multiple arthropod groups[9], very few for all beetles, and are lacking for most arthropod groups in the Rocky Mountains.

Methods

- Four elevational gradients: 2 in the Front Range Mountains & 2 in the San Juan Mountains
- Surveyed for ground-dwelling arthropods (2010-2012)
- 30 sites each sampled for 90 days in the summer months
- 40 unbaited pitfall traps per site



- Standard pitfall design[10] →two nested 16 oz. cups, buried flush with the ground, covered with a small plate, and propylene glycol as a preservative.
- To increase surface-area of interception→ three 30 cm wood shims radiated from cups.
- Samples: cleaned & preserved in 70% ethanol or pinned.
- Each pitfall: (a) regional & local climate data; (b) 3 visits of vegetation data: habitat; ground cover of grass, forbs, shrubs, cacti & bare ground; understory vegetation height; # of trees by species; average DBH; and canopy cover.



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Taxon	# Specimens	# Sites Sorted	ID'd to Species	# Species
Ants (Hymenoptera: Formicidae)	135,039	30	135,039	105
Bees & Wasps (Hymenoptera)	17,500*	13	0	--
Beetles (Coleoptera)	125,250*	13	23,421	349
Grasshoppers & Crickets (Orthoptera)	29,186	30	21,538	55
Spiders & relatives (Arachnida)	190,970*	13	0	--
Bulk	??	30	--	--

- Estimated based on sorting so far

- We want to let people know these specimens & data are available for research.
- We would love for more taxa to be pulled from bulk and identified.
- Enormous #s of dipterans, collembola, hemipterans, mites, etc. in the bulk samples.

Discussion

- For the groups identified so far: diversity is predominantly highest at middle elevations
- Although some gradients display high diversity across the low-mid elevations then decline
- Abundance patterns across the gradients were highly variable. Decreasing, increasing, and uniform are exhibited
- These diversity data are in accordance with elevational diversity studies of moths and ants globally.
- Since we collected complementary climate, habitat, & vegetation data at each pitfall, many future analyses are planned and possible
- Let us know if you might be interested in another taxa in the bulk or in collaborating!

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