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# Hluhluwe-iMfolozi Park

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- PhD: influence of spatial heterogeneity on resource partitioning among large savanna grazers
- From large-scale landscape gradients to local scale patch heterogeneity, such as lawn and bunch grass patches
- But, now for something completely different...

# Monitoring large herbivores in a shifting conservation paradigm

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Evaluating large herbivore monitoring methods at different scales: implications for diversity indicators



# The shifting paradigm



- Focus on individual species to the conservation of complete communities
- Functional ecology of herbivore species diversity
  - Interactive effects of small and large species on vegetation structure/composition, soil nutrient cycling
- From managing homogeneity to heterogeneity, i.e. importance of spatial variation and spatial scale!
- Recognized at management levels from international to park level

# Diversity targets

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- SAEON: long-term data on diversity trends (e.g., CBD 2010)
- Kenyan Wildlife Service (E. Kanga): from big 5 to 'smaller 500' (including smaller herbivores, < 100 kg)
- HiP management plan: herbivore management focus on relative densities of species (next to focal species such as rhino)

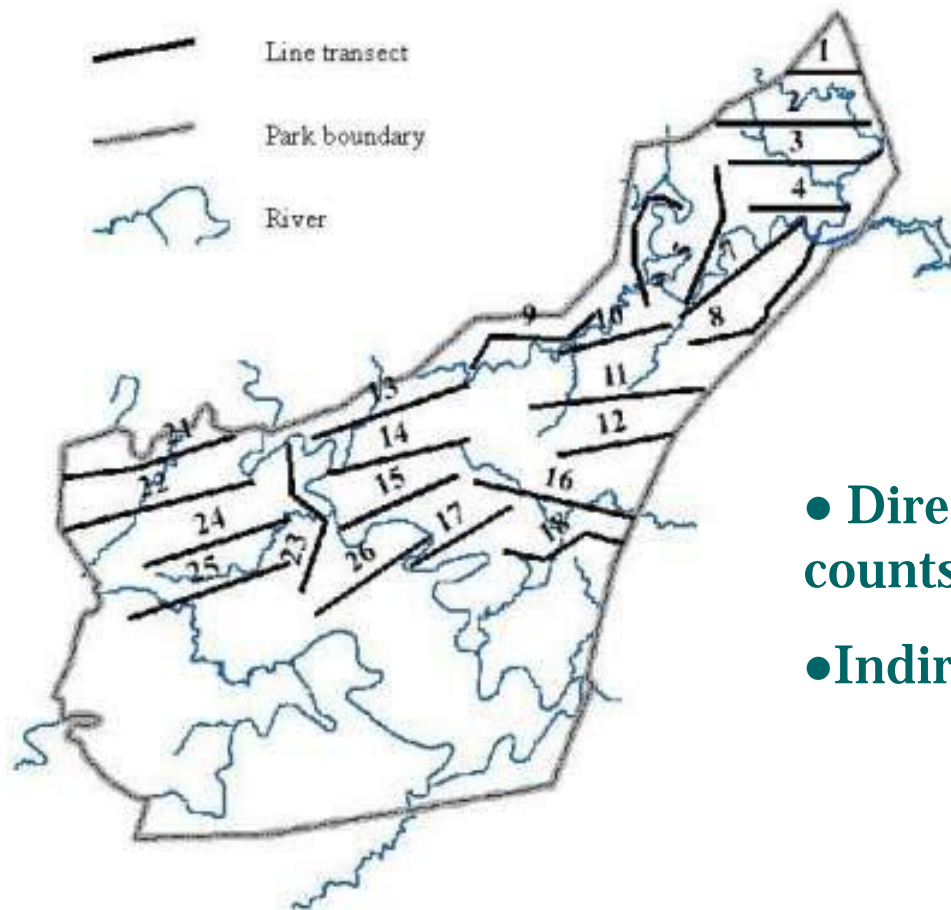


# Monitoring diversity



- Monitoring programs to evaluate targets
- Current programs might not be suitable to evaluate these new diversity targets
- Current programs: population abundance of target species based on direct observational counts (especially large species)
  - Indirect counts (dung) better
- Whole park estimates, poor insight in processes
  - Include spatial scale!
- But how do methods compare?

# Evaluating methods



- Direct observational counts on foot
- Indirect dung counts

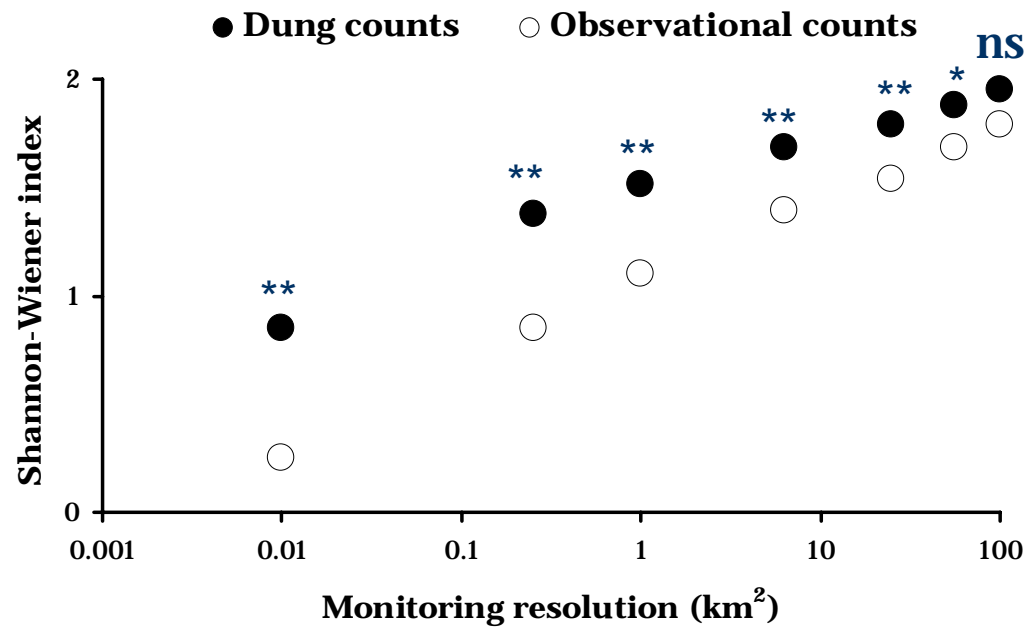
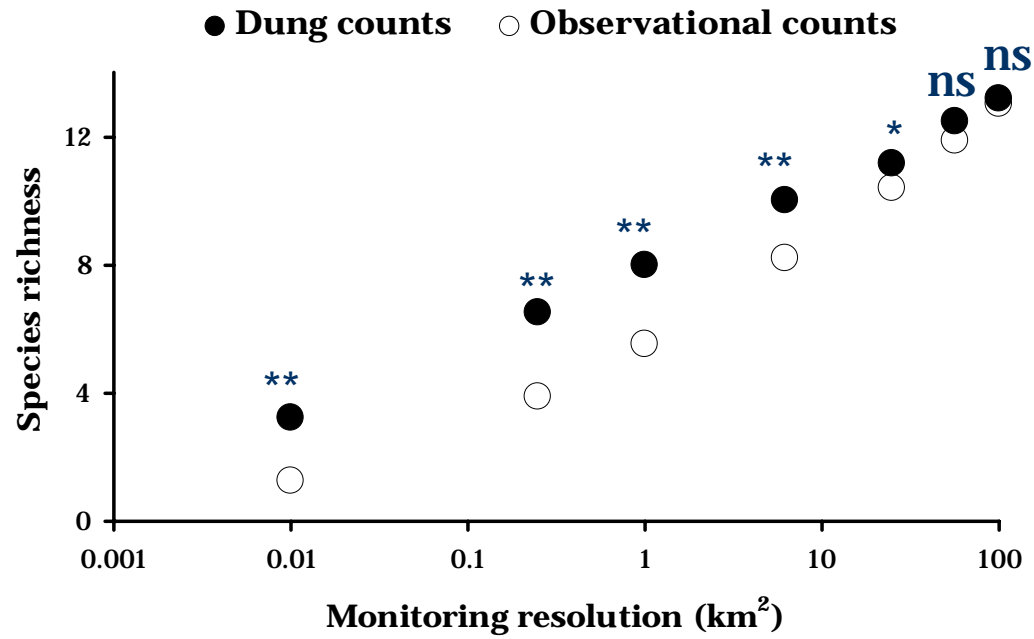


# Comparing diversity

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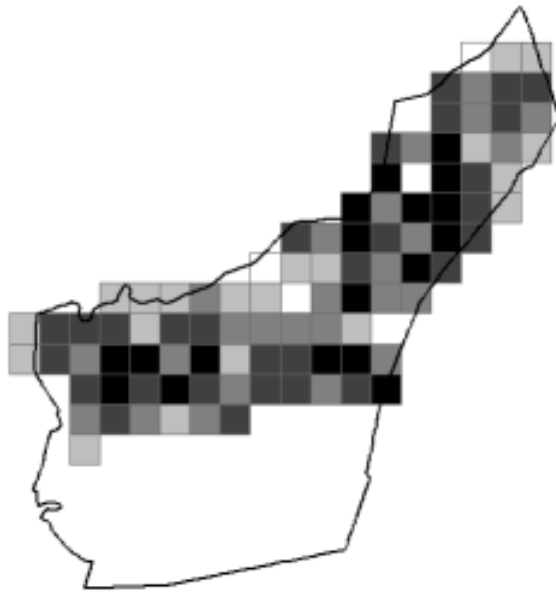


- Species richness
- Diversity also include relative densities of species: Shannon-Wiener index
  - Measure of evenness of abundance
  - Insight in community structure
- Better insight in response of community to environmental change



# Spatially different diversity estimates

Shannon-Wiener index (6.25 km<sup>2</sup>)

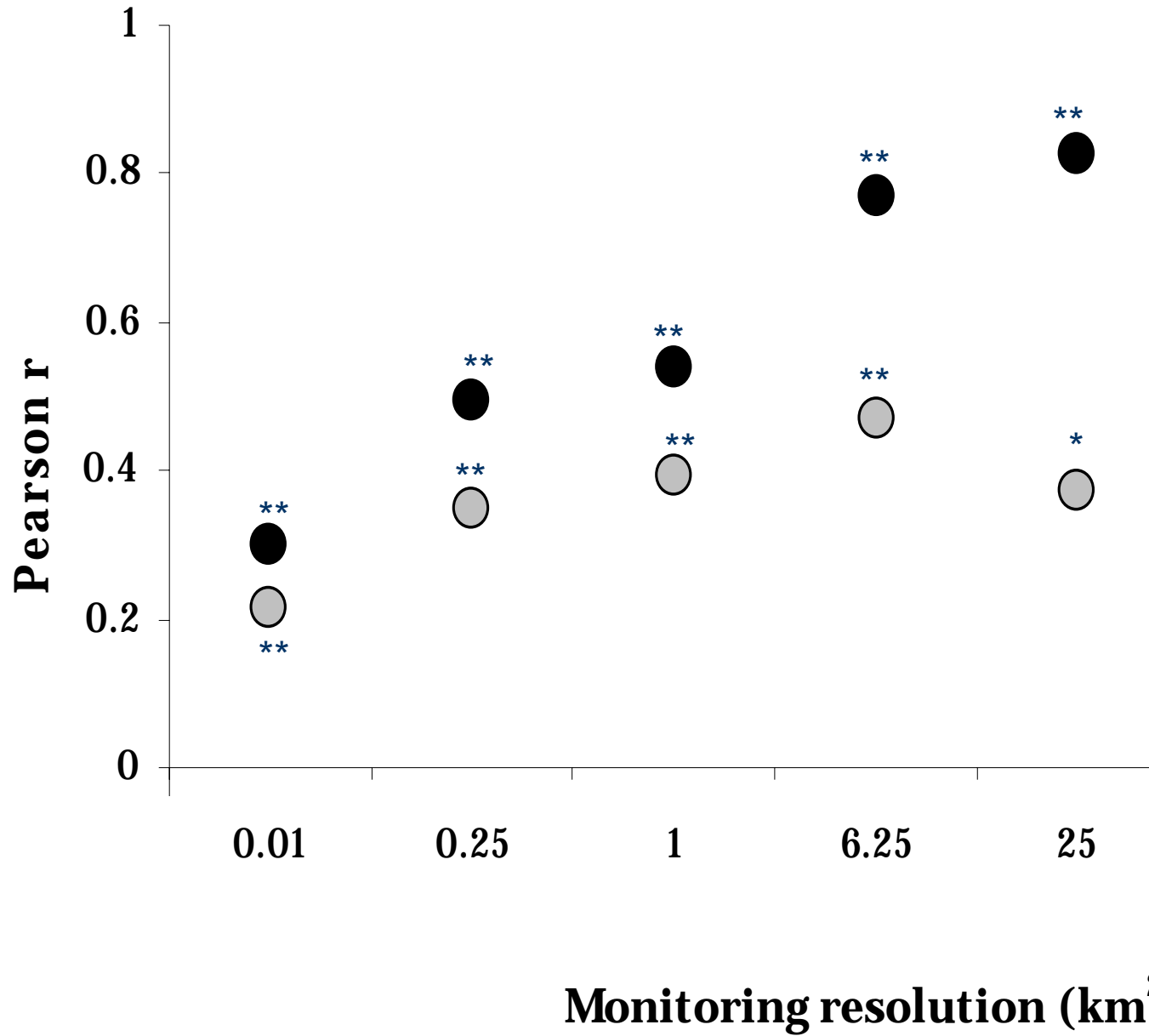


Dung counts

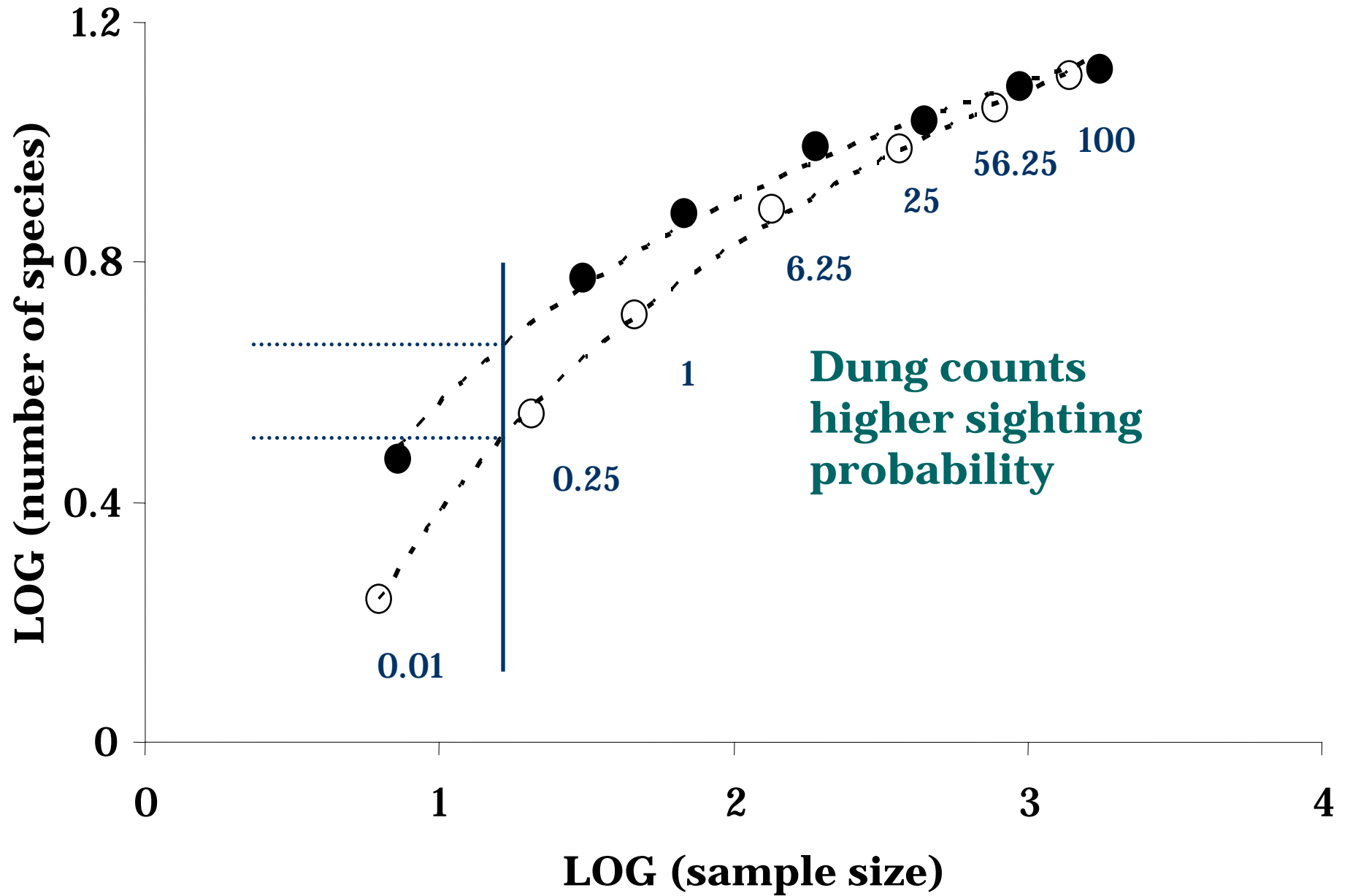


Observational counts

○ Shannon-Wiener ● Species richness

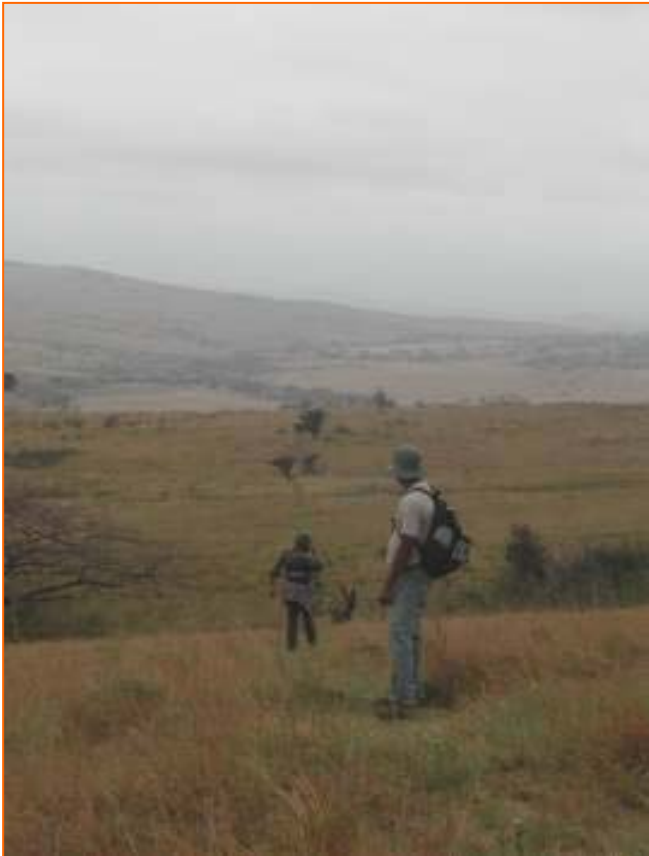


● **Dung counts** ○ **Observational counts**



# Conclusion

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- Indirect dung counts give better insight in herbivore diversity trends
  - especially at finer scales
  - and for diversity based on relative densities
- Same estimates at large scale, but sampling effort dung counts much lower (120 versus 850 man hours)
- 7 dung count programs for 1 observational program
- Indirect method more flexible

# Potential conflict



- Estimating abundance versus diversity and community structure
- Direct observational counts might be better for accurate abundance estimates (distance sampling)
- Important for endangered species
- But, has been contested for low visibility systems (rain forests)
- Visibility in many savannas also low (75 m in HiP)

# Main message

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**We have to evaluate the suitability of current large herbivore monitoring programs as we change from the conservation of focal species to diverse communities**



# Thanks!

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- Sue van Rensburg, coordinating and collecting observational counts
- Siphso Kumalo, Emmanuel Buthelezi, and Mariska te Beest for helping with counting close to 25,000 piles of shit!
- Ezemvelo KZN wildlife management and research staff
- Earthwatch institute funded observational counts
- Earthwatch volunteers
- NWO-WOTRO



<b>Species</b>	<b>Pearson <math>r</math></b>	<b>Body mass</b>	<b>Feeding type</b>
Impala	0.72	50	Grazer/mixed
Warthog	0.56	70	Grazer
Zebra	0.53	275	Grazer
White Rhino	0.44	1800	Grazer
Wildebeest	0.43	210	Grazer
Nyala	0.42	85	Browser/mixed
Elephant	0.32	3800	Browser
Buffalo	0.26	580	Grazer
Duiker	0.25	15	Browser
Giraffe	0.18	1000	Browser
Bushpig	0.10	65	Browser
Kudu	-0.03	210	Browser
Bushbuck	-0.03	42	Browser
Black Rhino	-0.05	1000	Browser