

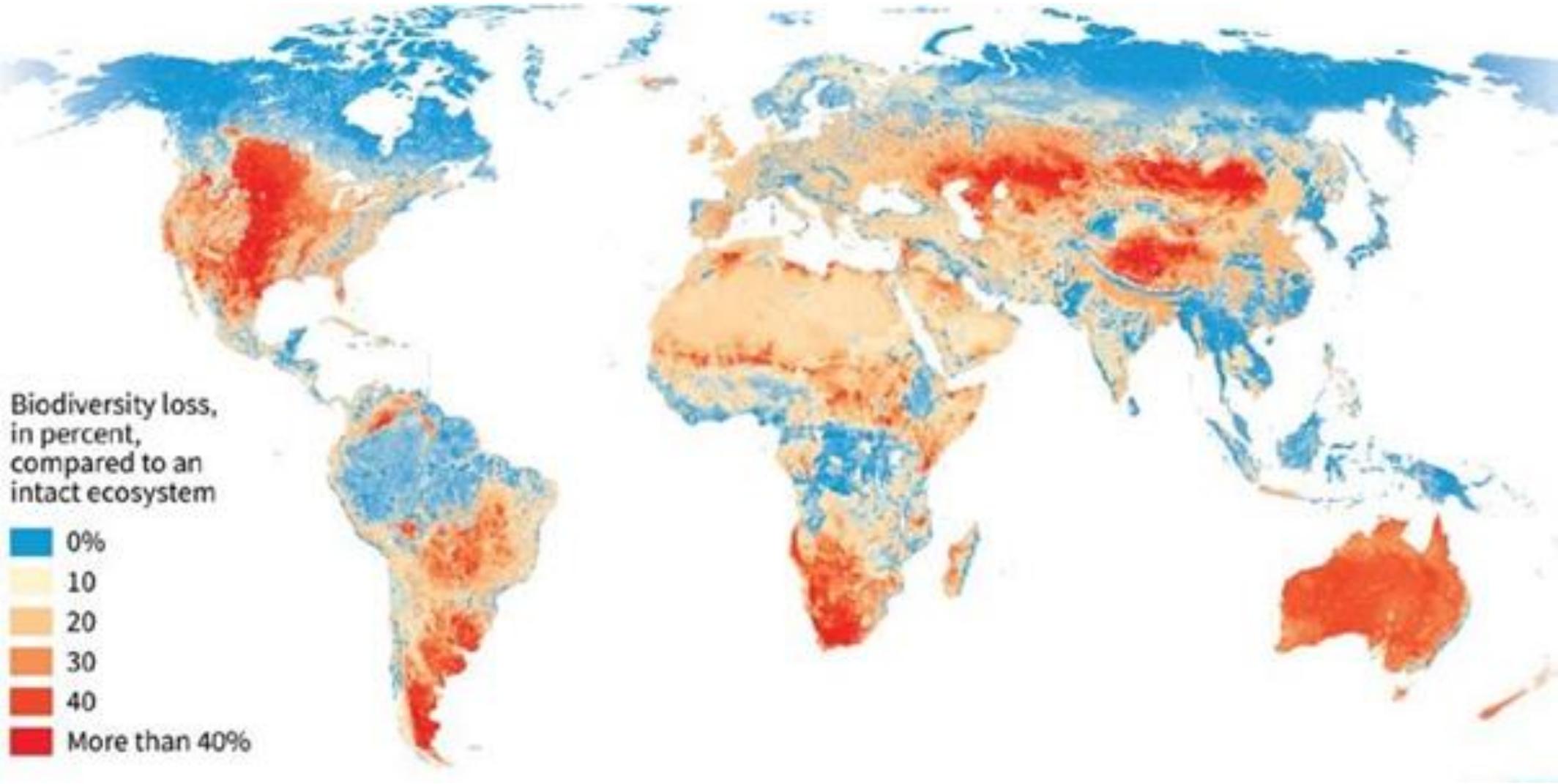
Biodiversity and environmental change in southern Africa: trends, mechanisms, and applications through partnerships

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Ara Monadjem, Bob McCleery

University of Florida, University of Eswatini

Biodiversity loss across the planet

(IPBES 2019)





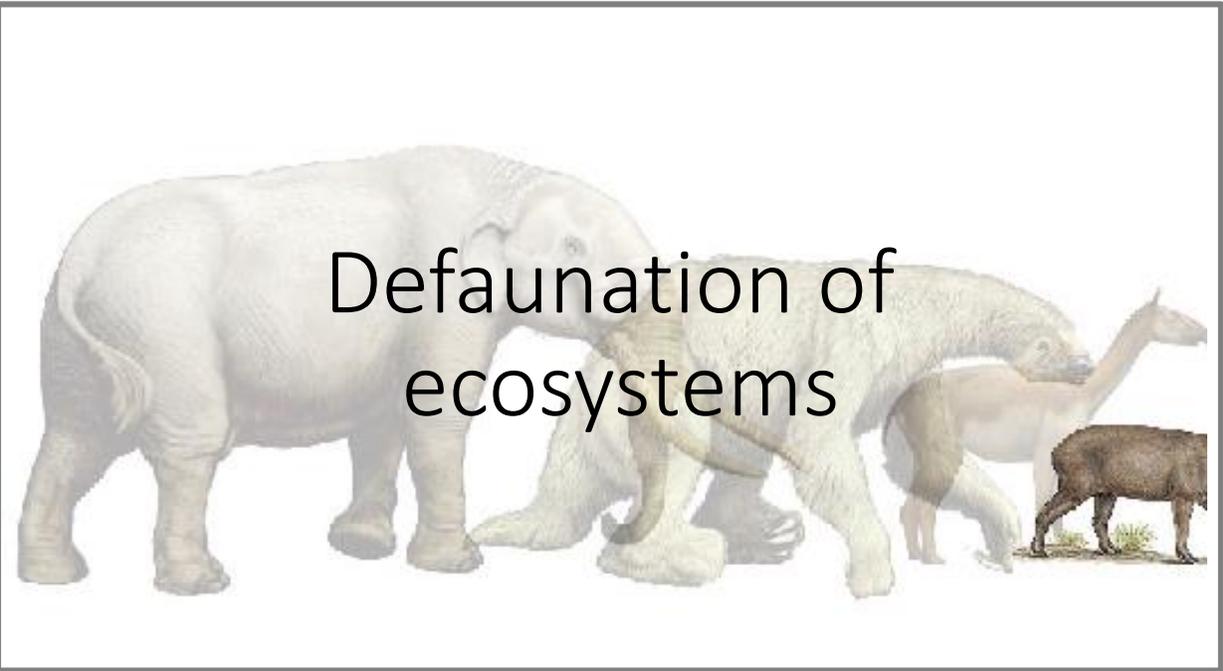
Land-use and
land-cover change



Climate
change



Over-exploitation



Defaunation of
ecosystems

Addressing these issues requires collaborative partnerships





Land-use and land-cover change

Land-use and land-cover change



Land clearing for oil palm in Borneo



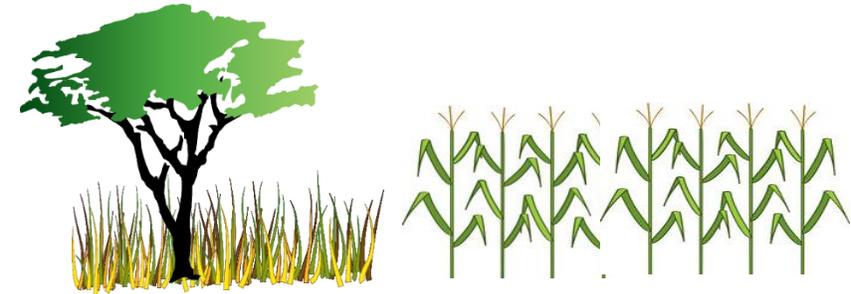
Agricultural intensification for rice production in Nepal



Urbanization in Florida

Land-use and land-cover change

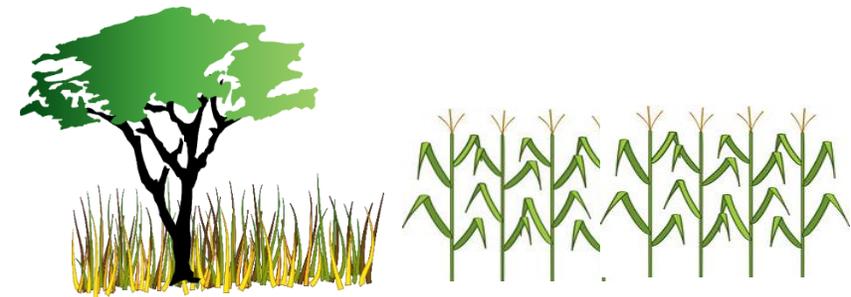
Agricultural intensification and savanna loss



*Clearing or degradation of
savanna for human uses*

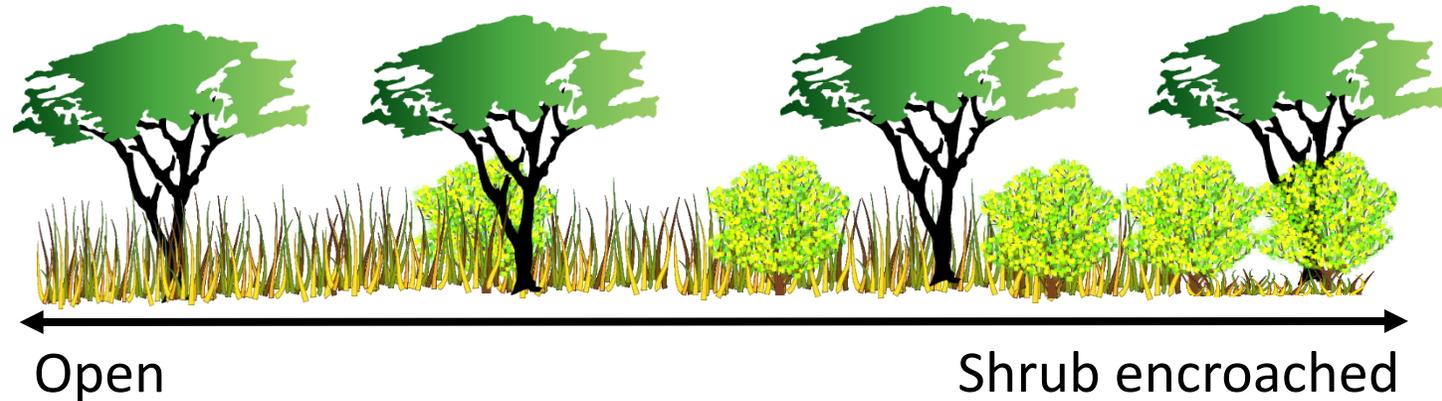
Land-use and land-cover change

Agricultural intensification and savanna loss



Clearing or degradation of savanna for human uses

Shrub / bush encroachment



Increase in density, cover, and biomass of short-statured woody plants relative to grasses

Land use, shrub encroachment, and bird diversity in Eswatini



Land use, shrub encroachment, and bird diversity in Eswatini



Land-use intensity



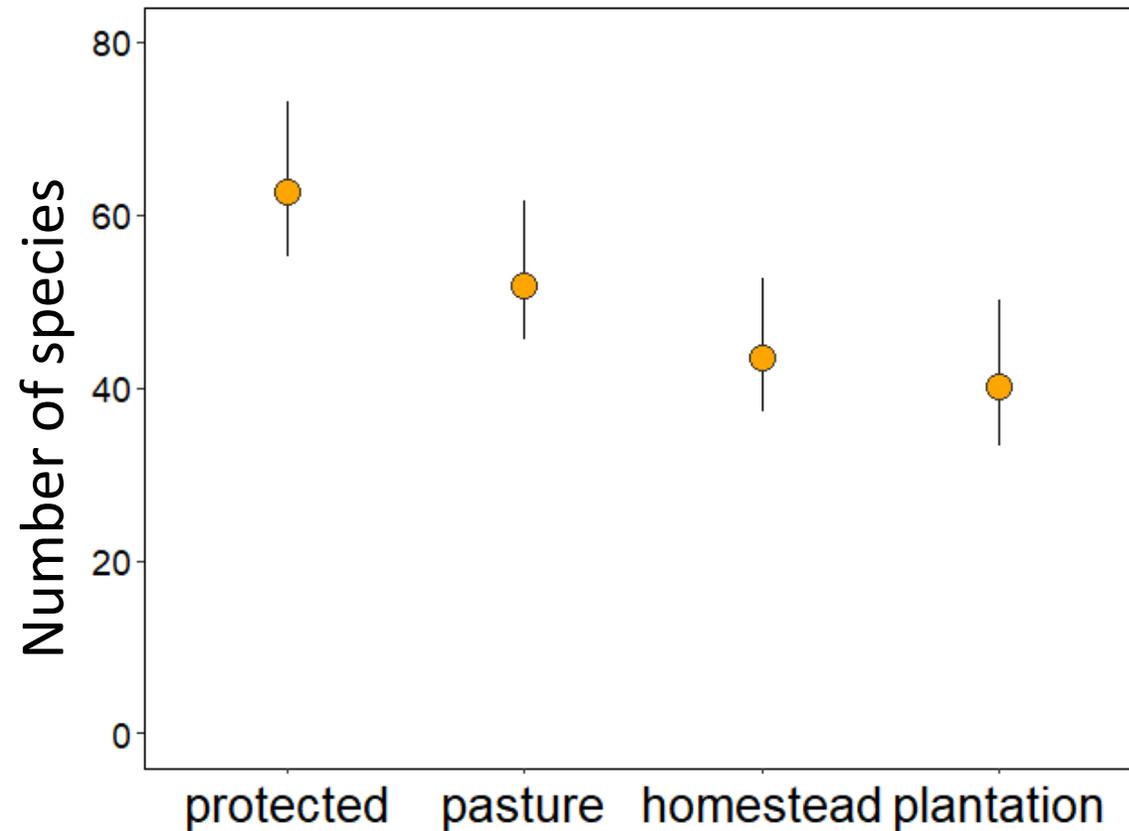
Protected Areas

Pastures

Homesteads

Sugarcane

The number of bird species varies with land-use intensity



Shrub cover, land use, and bird diversity

As shrub cover increased:

- 25% increase in the number of species
- 16 species increased in occupancy
- 4 decreased in occupancy



Shrub cover, land use, and bird diversity

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Benefits of shrub cover were greater in pastures & homesteads than in protected areas

Land-use intensity ↓



Protected Areas



Pastures



Homesteads



Sugarcane





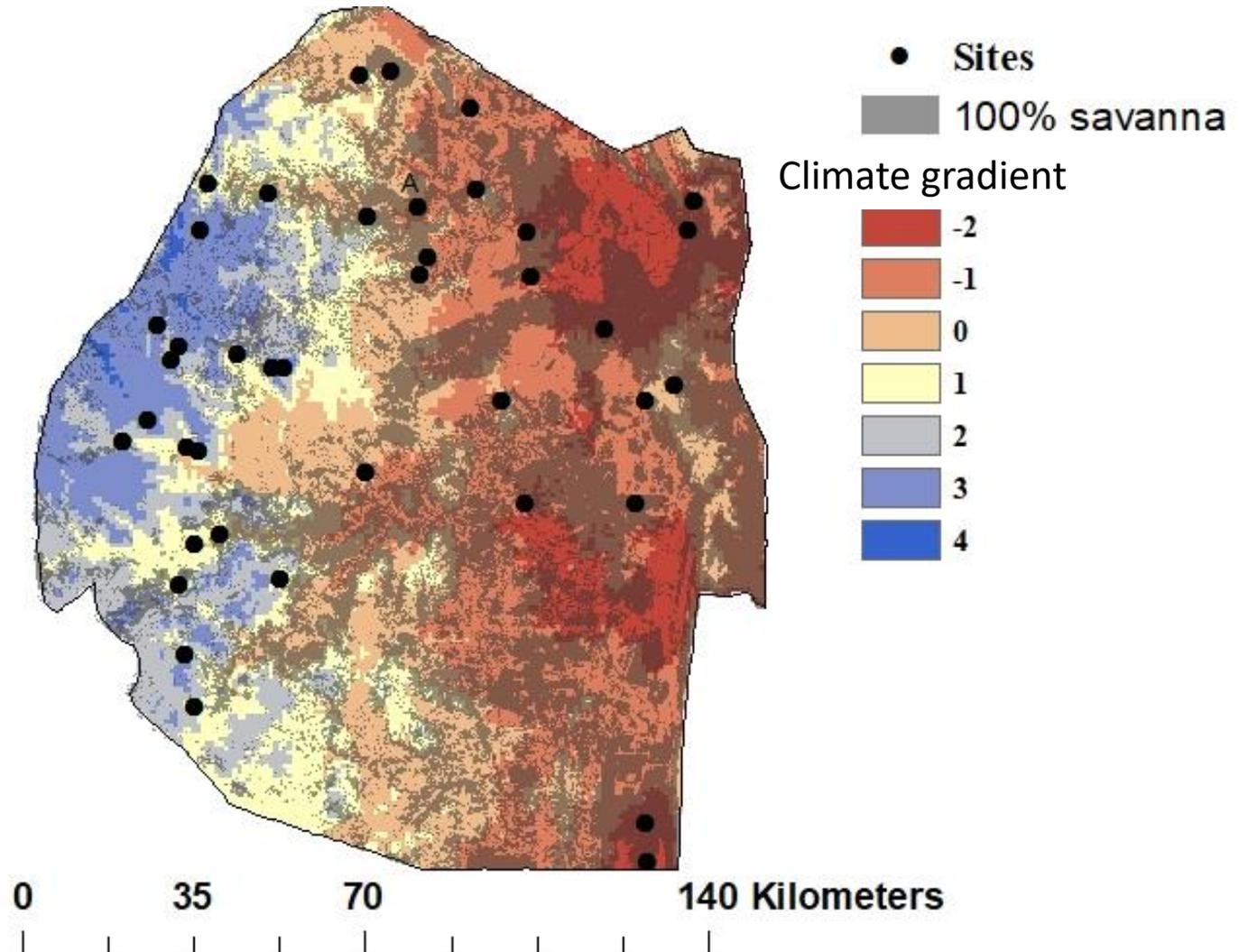
Climate
change

Savanna trees and climate change

Across Eswatini:

- Both Marula and Knobthorn adults and seedlings varied with temperature gradients

Fezile Mtsetfwa

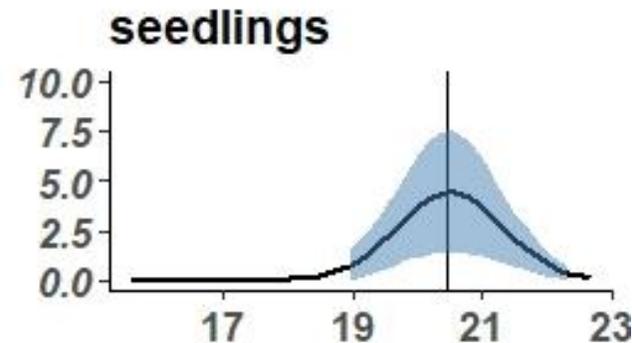
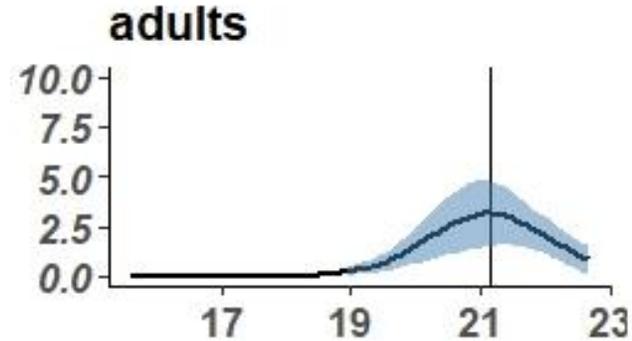


Savanna trees and climate change



- ❑ Strong relationships of both species to temperature
- ❑ Marula appears to be expanding range into cooler climates

Marula:



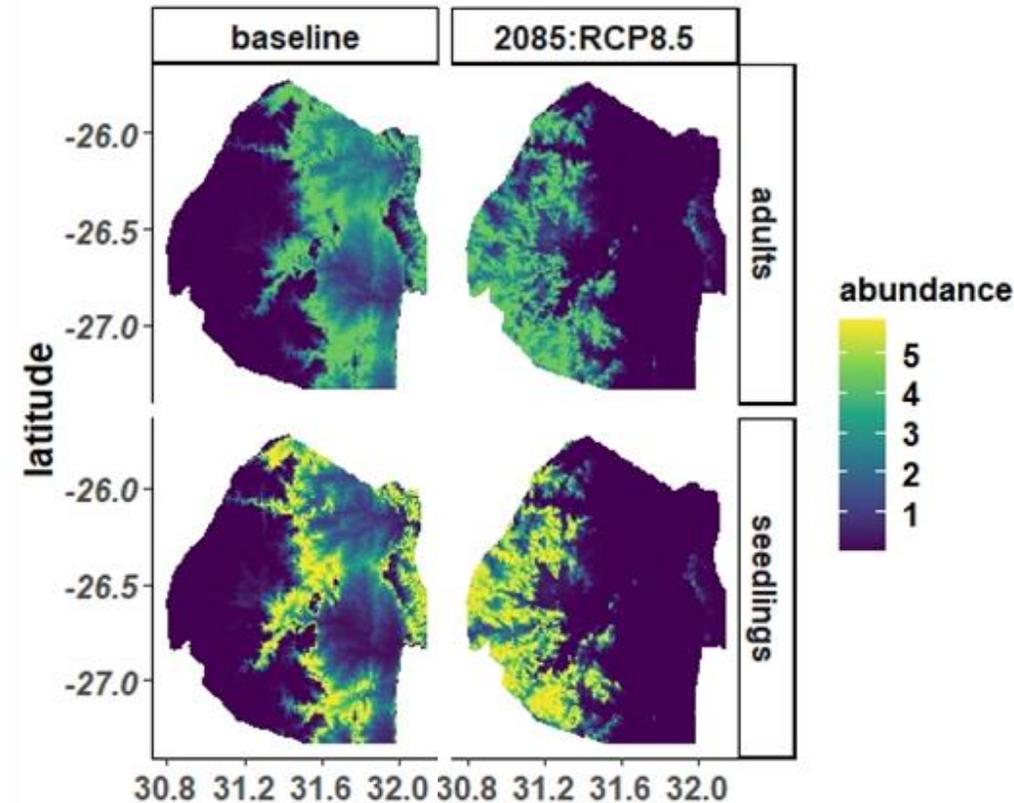
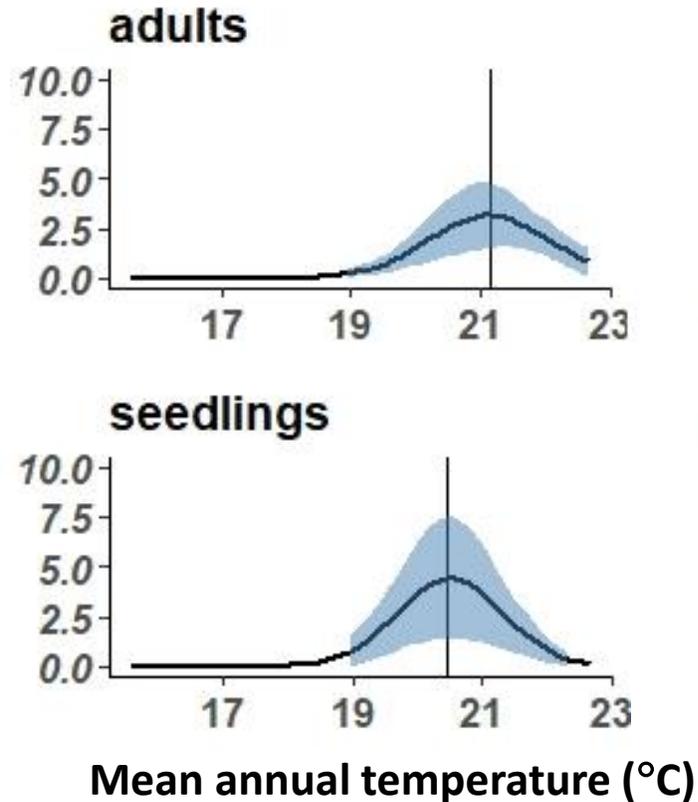
Mean annual temperature (°C)

Savanna trees and climate change



- ❑ Strong relationships of both species to temperature
- ❑ Marula appears to be expanding range into cooler climates
- ❑ Future projections suggest a shift away from current range to eastern Highveld

Marula:





Over-exploitation and poaching

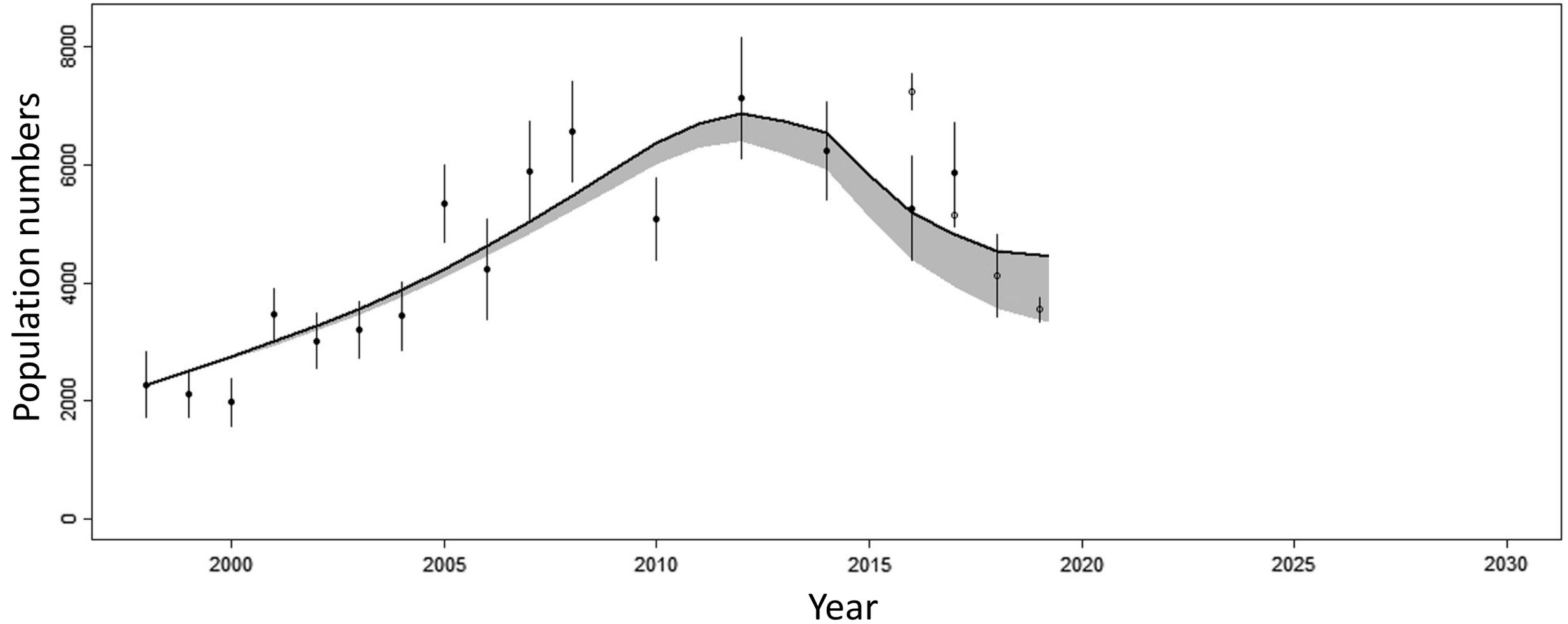
Poaching and white rhino in Kruger National Park

Current poaching has:

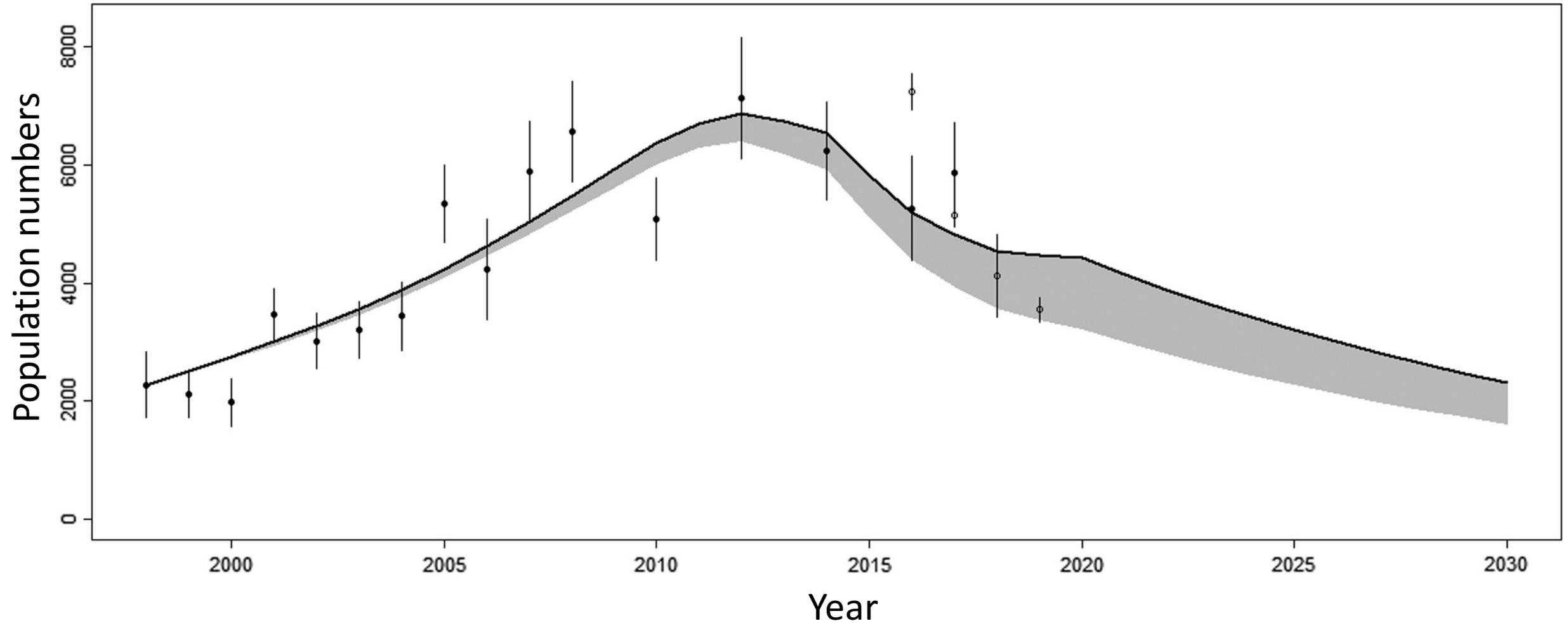
- Reduced the lifetime reproductive output per cow from ~ 6 to 0.7 calves
- With the loss of each cow, *5.3 future offspring* are lost



Rhino have declined since 2012 in Kruger National Park

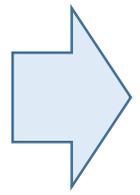


Projections suggest a 35% decline by 2030 based on current rates of poaching

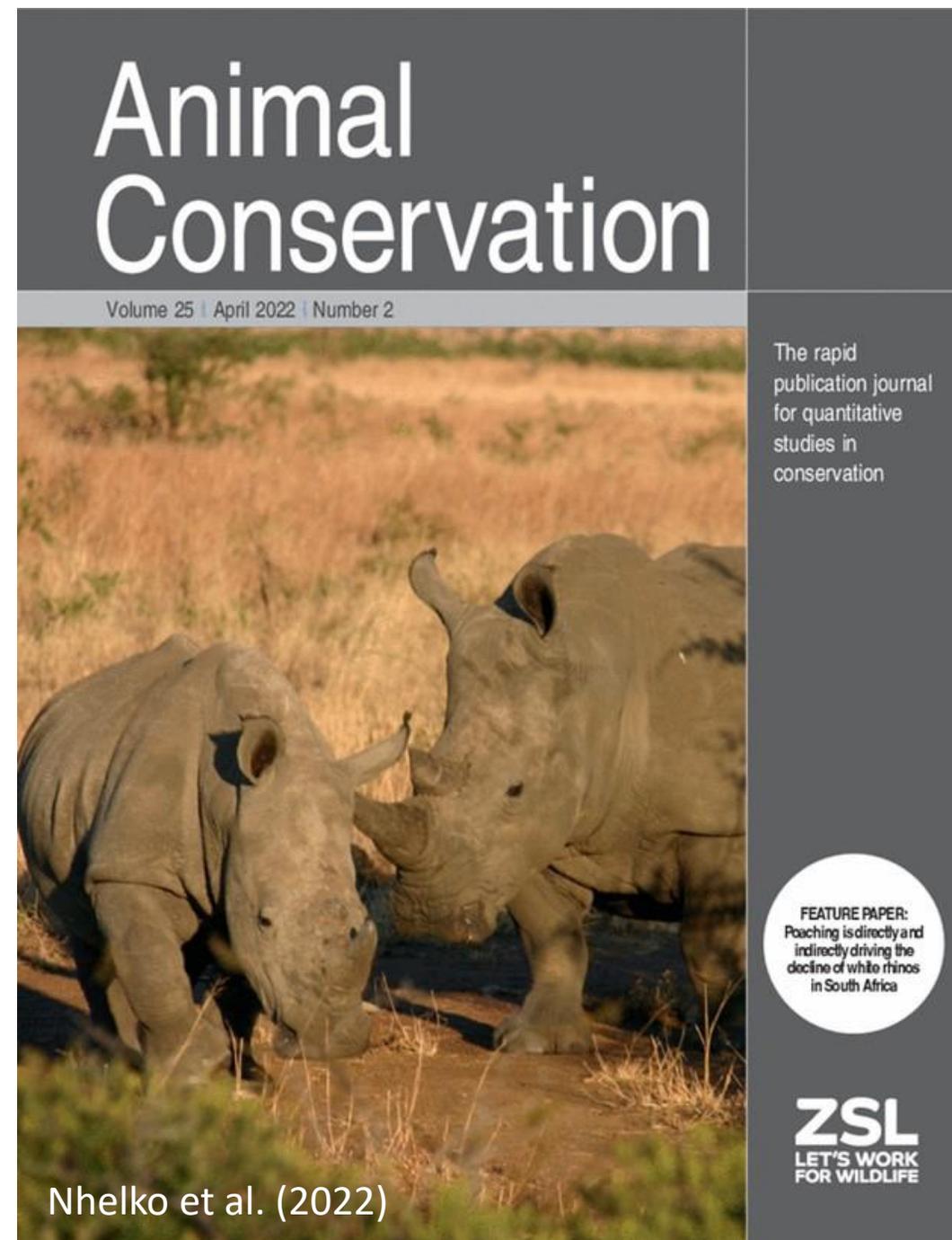


A sign of optimism:

Recently, poaching has slowed...



If poaching declines by 50%, project a doubling of population size by 2030



Conclusions

- Addressing the threats to biodiversity requires collaborative science and partnerships
- Students are making progress on understanding trends and implications of these threats
- We hope to continue to grow partnerships in the years to come

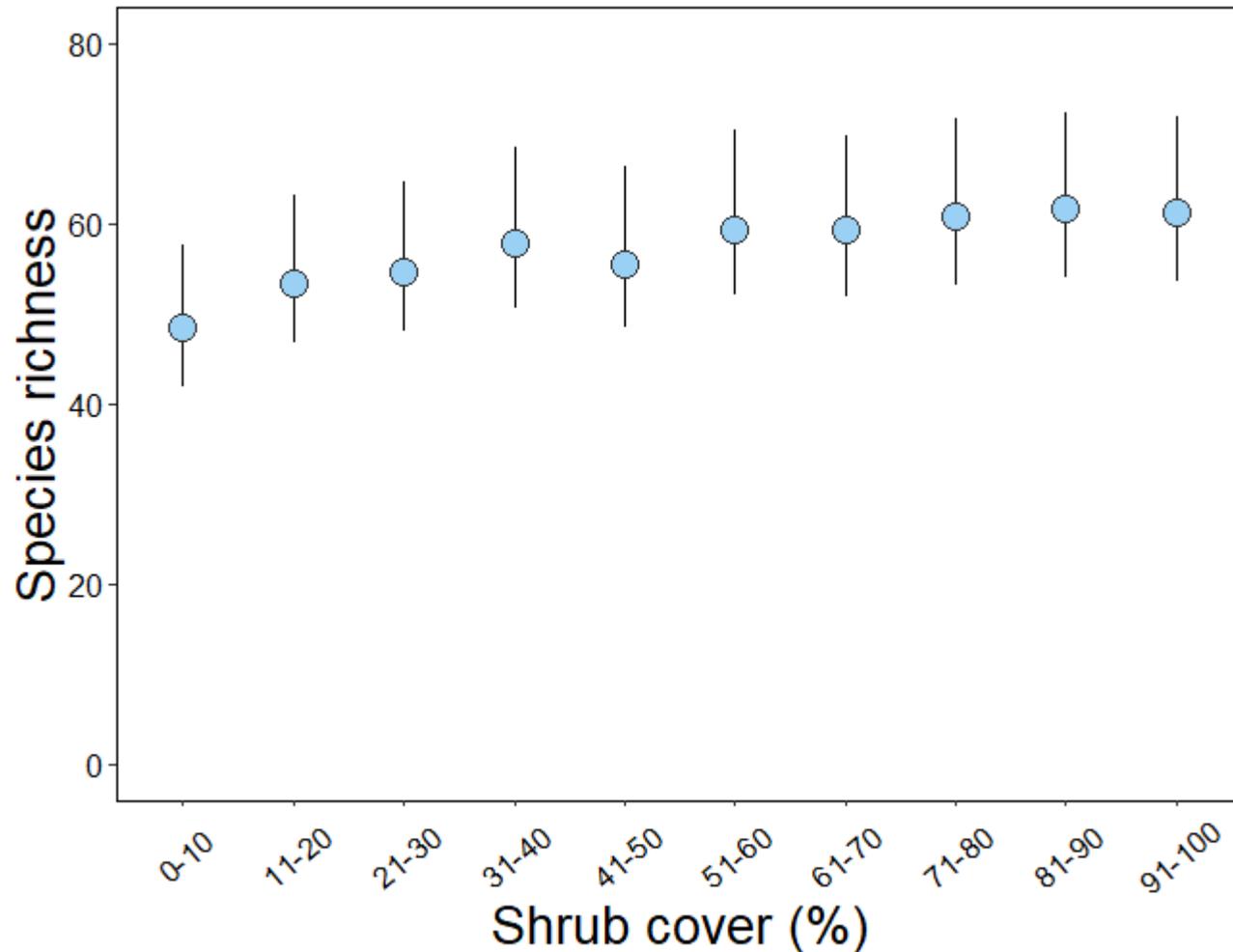


Acknowledgments



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Species richness varies with shrub cover

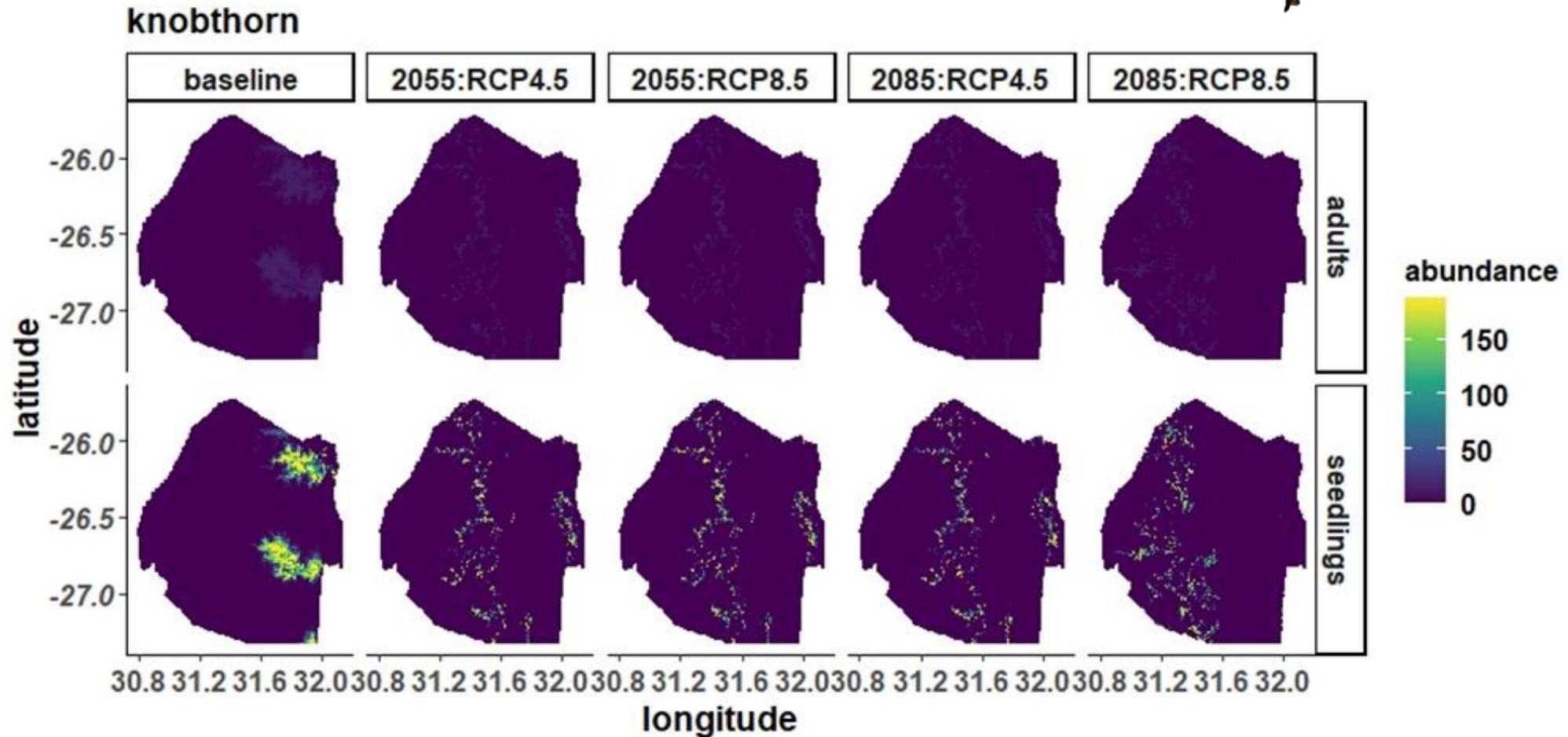


As shrub cover increased:

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Knobthorn and climate change



Land use, shrub encroachment, and bird diversity in Eswatini



Land-use intensity



Protected Areas



Pastures



Homesteads



Sugarcane

*Rich trained Muzi in birds, Muzi trained Savannah in birds...
They all learned from each other about science, culture, and collaboration*

Projections suggest a decoupling of knob thorn and marula in future savannas



Shrub encroachment and vertebrates



Increases in shrub cover can:

Reduce heterogeneity of habitat
Decrease open habitat for ground-foraging species

*Negative effects
on biodiversity*

Shrub encroachment and vertebrates



Increases in shrub cover can:

Reduce heterogeneity of habitat
Decrease open habitat for ground-foraging species

*Negative effects
on biodiversity*

Increase nest substrate for some species
Increase foraging perches
Increase refugia from predation

*Positive effects
on biodiversity*