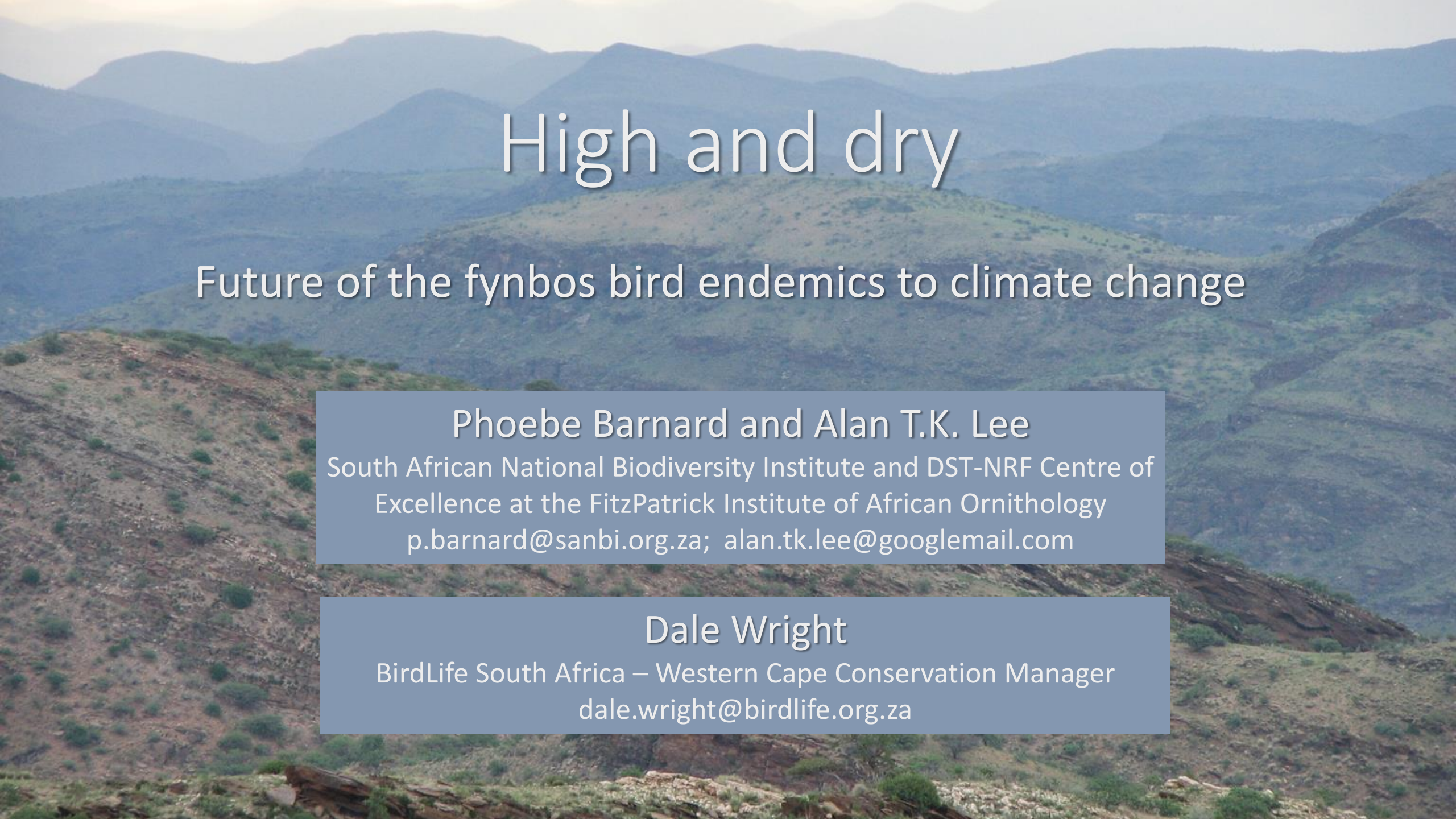

High and dry

Future of the fynbos bird endemics to climate change

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South Africa's Birds & Environmental Change Program

SANBI's/ UCT's joint program on fynbos endemic bird vulnerability

SANBI Biodiversity for Life

University of Cape Town · iYunivesithi yaseKapa · Universiteit van Kaapstad

Durham University

UNIVERSITY OF CAMBRIDGE

Université Paris Sud — Comprendre le monde

The University of Queensland AUSTRALIA

The Royal Society

Cape sugarbird

Cape siskin

Victorin's warbler

Orange-breasted sunbird

Cape rockjumper

Protea seedeater

Hottentot buttonquail

How will birds already at a continental edge
....or near mountaintops...
adapt to warming and more frequent fire?

Anders Moller

Bongani Mnisi

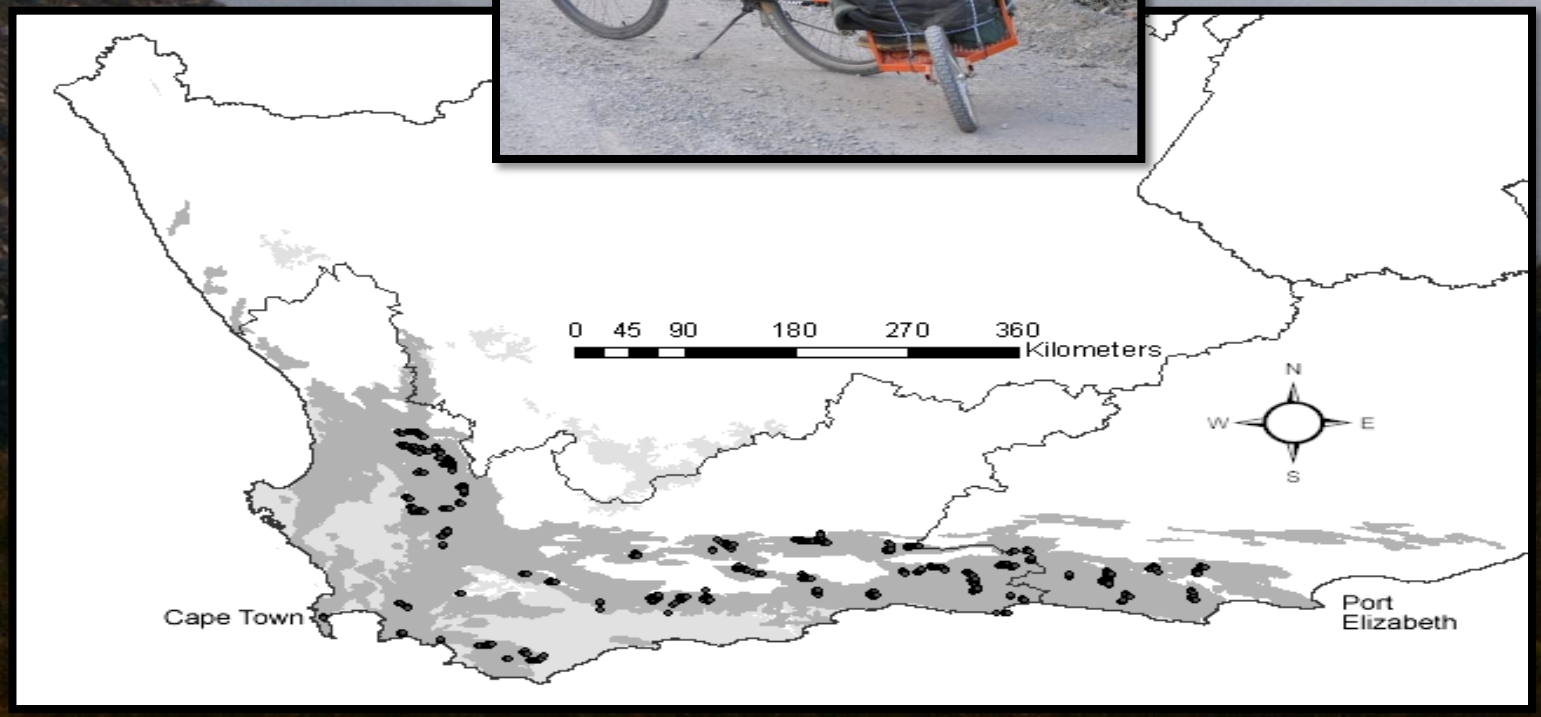
Brett Gardner & Miona Janeke

SANBI
Biodiversity for Life

"Looking glass" lenses

- Behavioural ecology
- Population and community ecology
- Stress physiology/ ecology
- Spatial ecology – e.g. range changes
- Molecular ecology

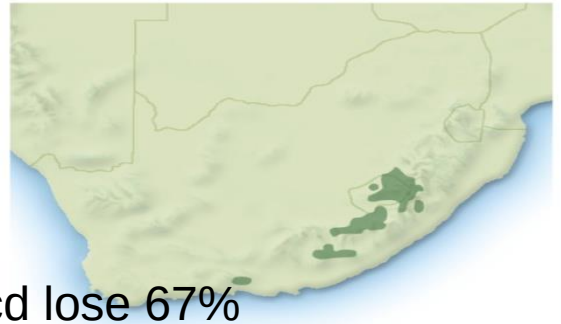

SWARTBERG
NATURE RESERVE
SEWEWEEKSPOORT


0 45 90 180 270 360
Kilometers
N
W
E
S
Cape Town
Port Elizabeth

Bioclimatic modeling is a 1st step

Blue Swallow: could lose 33% of range

Mountain Chat: could lose 51% of range

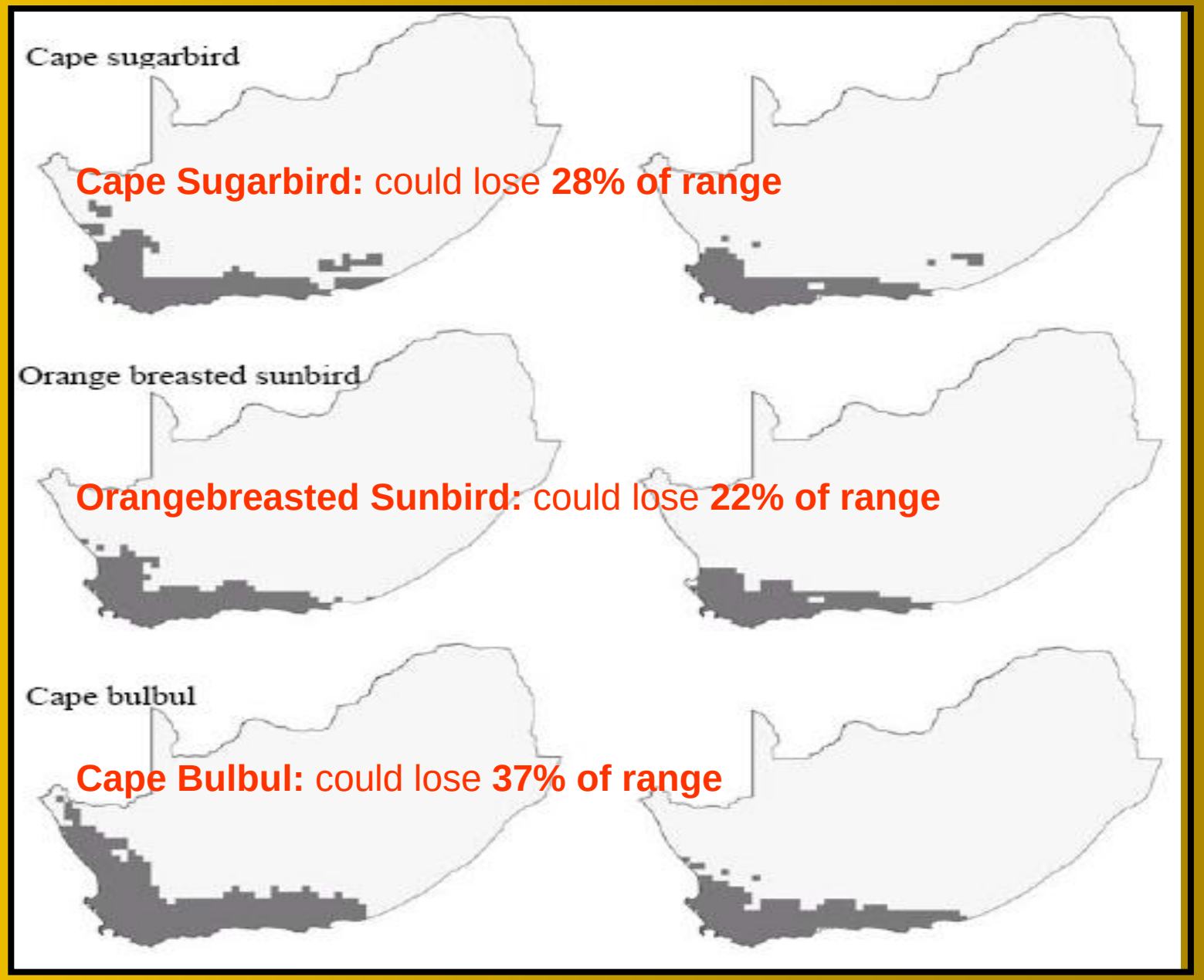


Drakensberg Rockjumper: cd lose 67%

Potential changes in distributions of South African birds under low- to mid-range projections of climatic change. The maps on the left illustrate the present distribution as depicted by Harrison *et al* (1997), while those on the right indicate the probable projections of distribution by the year 2050. All species are projected to lose between 22 and 69 per cent of their present range by 2050.
Maps generated by the Global Change Research Group at Kirstenbosch (G. Midgley, W. Thuiller and G. Hughes).

Ref: Simmons, Barnard, Midgley, Thuiller & Dean 2004 – Ostrich 75:295-308

Southern African birds – range shifts

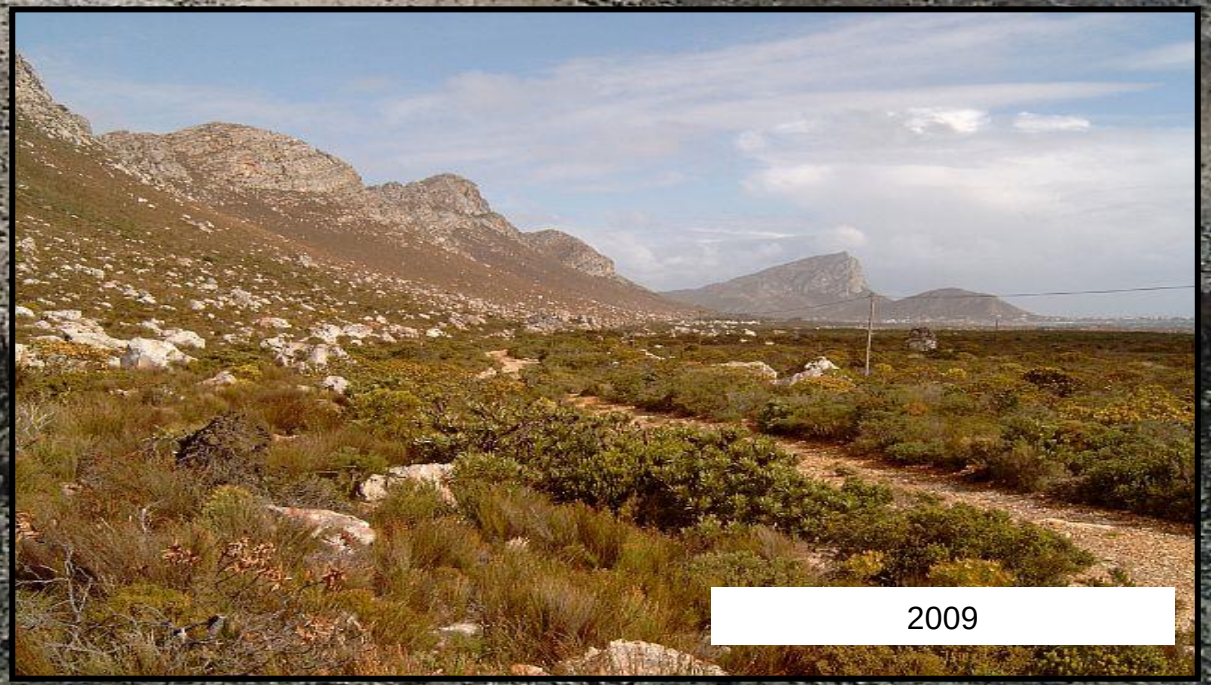


Ref: Simmons, Barnard, Midgley, Thuiller and Dean 2004 – Ostrich 75:295-308. Photos: Rob Simmons (top), Ian White (middle)

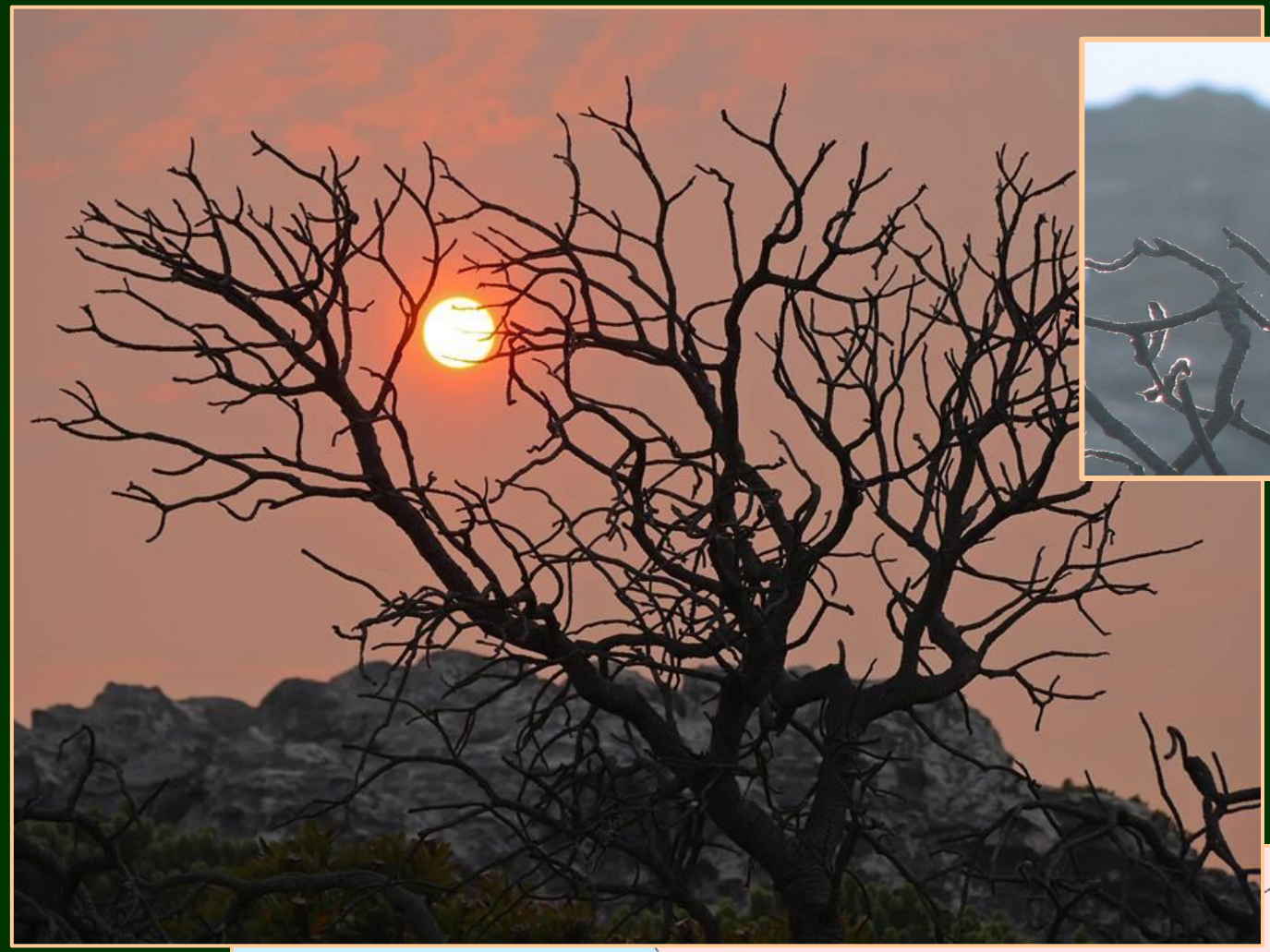
2005

Cape Rockjumper

2009



2009



Distribution in SABAP1 (1987-1991) and SABAP2 (2007 -)

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Original article

Effects of time since fire on birds in a plant diversity hotspot

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ABSTRACT

Global changes are influencing fire regimes in many parts of the world. In the Fynbos plant diversity hotspot (Cape Floristic Region, South Africa), fire frequency has increased in protected areas where the mean fire interval went from 12–19 to 6–9 years between 1970 and 2000. Fire is one of the main drivers of plant diversity in the Cape Floristic Region. Too frequent fires threaten the persistence of slow-maturing plant species, and such insights have led to the adoption of fire management principles based on plant responses. The effects of fire on Fynbos fauna are much more poorly understood, and have not generally been considered in depth in Fynbos conservation policies, planning or management. We assessed the response of bird communities to long-term fire-induced vegetation changes using space-for-time substitution. We studied bird communities, vegetation structure and plant functional composition in 84 Fynbos plots burnt between two and 18 years before. Ten of the 14 bird species analysed showed a significant change in their abundance with time since fire. We observed a significant species turnover along the post-fire succession due to changes both in vegetation structure and plant functional composition, with a characteristic shift from non-Fynbos specialists and granivorous species to Fynbos specialists and nectarivorous species.

If current trends of increasing fire frequency continue, Fynbos endemic birds such as nectarivores may become vulnerable. Conservation management should thus aim more carefully to maintain mosaics of Fynbos patches of different ages. Future research needs to estimate the proportion of vegetation of different ages and patch sizes needed to support dependent fauna, particularly endemics.

Orange-breasted Sunbirds pollinate 67+ species of *Erica* and many other fynbos plants

Living on the edge

Human settlements both exacerbate and reduce climate impacts on urban-edge fynbos birds

- Disease, stress-barring, fluctuating asymmetry as indicators of developmental stress

Tarsal mite scorecard – v 4 - 12 Sept 2013

Send data and/or digital photos to p.barnard@sanbi.org.za

0

No macroscopic signs of lesions

2

One or both legs moderately affected by active lesions. (This bird had only one leg visibly affected).

1

Macroscopic signs on one or both legs

2

More extensive macroscopic signs, one or both legs

1

Slight macroscopic signs on one leg only

3

One or both legs severely thickened, scaly, flaky +/or with lesions present

4

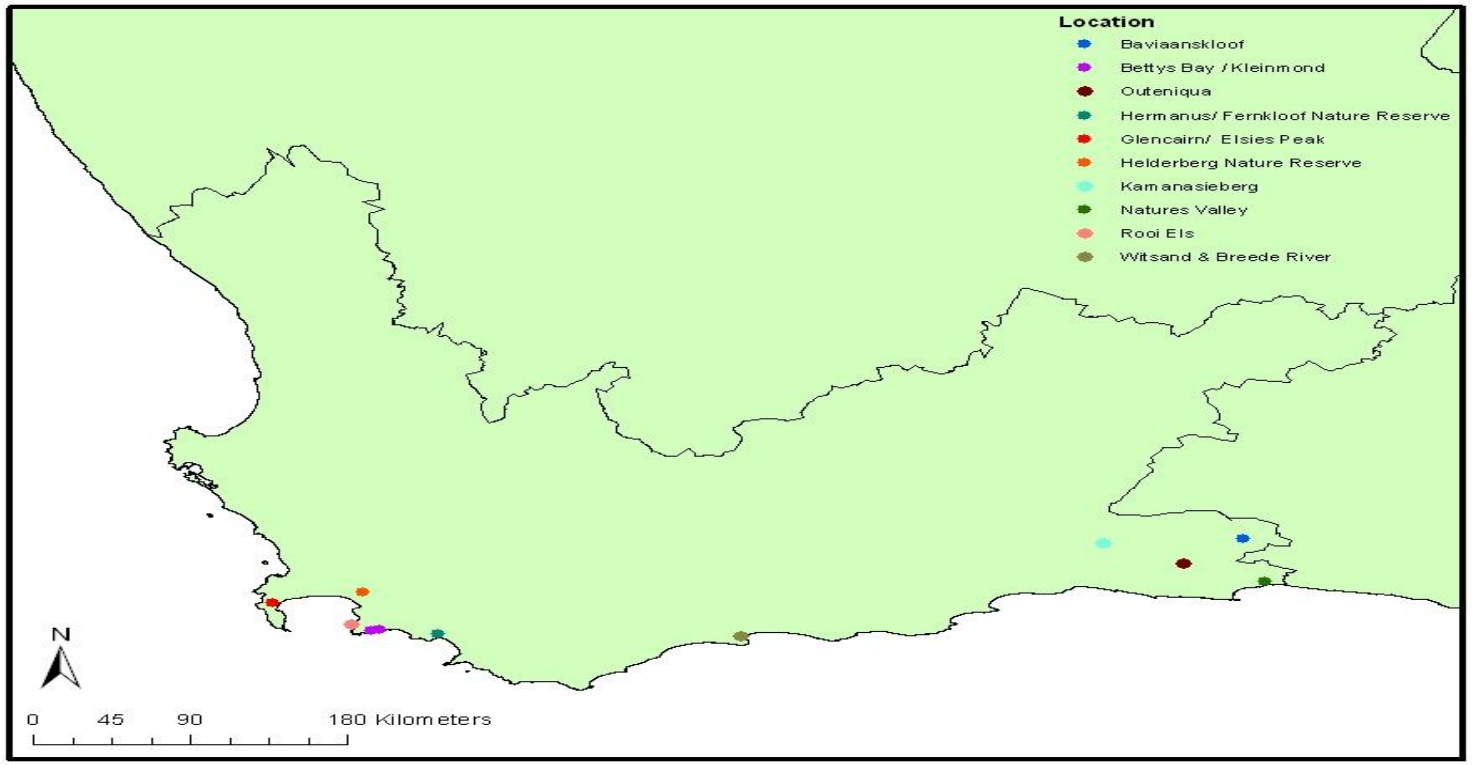
Recovered (maybe!)

One or both legs show signs of what appear to be previously raised or thickened scales

Photos: ATK Lee, R Simmons, M Janeke

Beth Mackay MSc thesis

Climate and urbanization impacts on sugarbird stress indices



Tarsal disease

The incidence of tarsal disease is strongly related to altitude ($z = -3.579$, $p = 0.000345$, $df = 1979$, Table 2) and average annual precipitation ($z = -2.199$, $p = 0.027871$, $df = 1979$, Table 2), with increasing altitude and precipitation associated with decreased incidence of disease. The incidence of tarsal abnormalities is not related to any of the urbanisation variables (Table 2).

Stress bars are NOT to be confused with daily growth bars ("corrugations"). They are a break in the feather, not just a detectable variation in surface. But growth bars, interleaved with poor nutrition/stress days, may result in stress bars.

0 No visible stress bars

(This tail is broken and thus cannot be used for FA or length measurements, but can be scored for SB)

1

Mild stress bars only

2

Moderate stress bars

3

Severe stress bars, either high density (higher than 2) or leading to multiple feather breaks, or both

4

Other abnormalities in tail growth
e.g. this juvenile sugarbird with atypical bare shafts

Photos: R Simmons, www.conuresandmore.proboards.com; www.powdermillarc.org, P Barnard

A Journal of Conservation Biogeography

Diversity and Distributions

Diversity and Distributions, (Diversity Distrib.) (2012) 1–13

BIODIVERSITY RESEARCH

Potential impacts of climatic change on southern African birds of fynbos and grassland biodiversity hotspots

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ABSTRACT

Aim To examine potential impacts of climatic change on bird species richness of the fynbos and grassland biomes, especially on species of conservation concern, and to consider implications for biodiversity conservation strategy.

Location Southern Africa, defined for this study as South Africa, Lesotho and Swaziland.

Methods Climate response surfaces were fitted to model relationships between recorded distributions and reporting rates of 94 species and current bioclimatic variables. These models were used to project species' potential ranges and reporting rates for future climatic scenarios derived from three general circulation models for 30-year periods centred on 2025, 2055 and 2085. Results were summarized for species associated with each biome and examined in detail for 12 species of conservation concern.

Results Species richness of fynbos and grassland bird assemblages will potentially decrease by an average of 30–40% by 2085 as a result of projected climatic changes. The areas of greatest richness are projected to decrease in extent and to shift in both cases. Attainment of projected shifts is likely to be limited by extent of untransformed habitat. Most species of conservation concern are projected to decrease in range extent, some by > 60%, and to decrease in reporting rate even where they persist, impacts upon their populations thus being greater than might be inferred from decreases in range extent alone. Two species may no longer have any areas of suitable climatic space by 2055; both already appear to be declining rapidly.

Main conclusions Species losses are likely to be widespread with most species projected to decrease in range extent. Loss of key species, such as pollinators, may have far-reaching implications for ecosystem function and composition. Conservation strategies, and identification of species of conservation concern, need to be informed by such results, notwithstanding the many uncertainties, because the certainties of climatic change make it essential that likely impacts not to be ignored.

Keywords
Conservation strategy, fynbos biome, grassland biome, red list species, southern Africa, species' distribution models.

"Looking glass" lenses – HIGH and DRY

- Community ecology

  Phenology mismatches, esp with pollinators; ghost of pollinators past

  Population ecology

  Population declines across the biome – all six passerine species?

- Stress physiology/ ecology

  Urbanization causes some stress, disease and novel mortality

- Spatial ecology – e.g. range changes

  The prognosis is not good, esp for those already fragmented

- Molecular ecology

  TBC – possible refugia and limits to gene flow