Fragmented landscape management:
integrating and implementing ecological research across taxa and scales

Krug, C.B.[1], Cabral, J.2, Esler, K.J.[3], Grant, P.B.C.[3], Horn, A.[3], Heelemann, S.[4], Kieck, M.B.[3], Kongor, R.Y.[3], Meyer, J.[5], Vrdoljak, S.[3], Reisch, C.[4], Samways, M.J.[3], Schurr, F.[2], Sharma, G. P.,[3] and Poschlod, P.[4]

[1]University of Cape Town, [2]University of Potsdam, [3]Stellenbosch University, [4]University of Regensburg, [5]University of Marburg

"Biodiversity of Africa - Observation and Sustainable Management for our Future!"
International Congress, 29 September – 3 October 2008, at Spier, RSA

BIOLOG

Projektträger im DLR

Federal Ministry of Education and Research













BIOLOG

Universität Potsdam

Philipps Universität Marburg

BIOTA

Projektträger im DLR

Federal Ministry of Education and Research












BIOLOG

Universität Potsdam

Philipps Universität Marburg

UR BIOTA

Projektträger im DLR

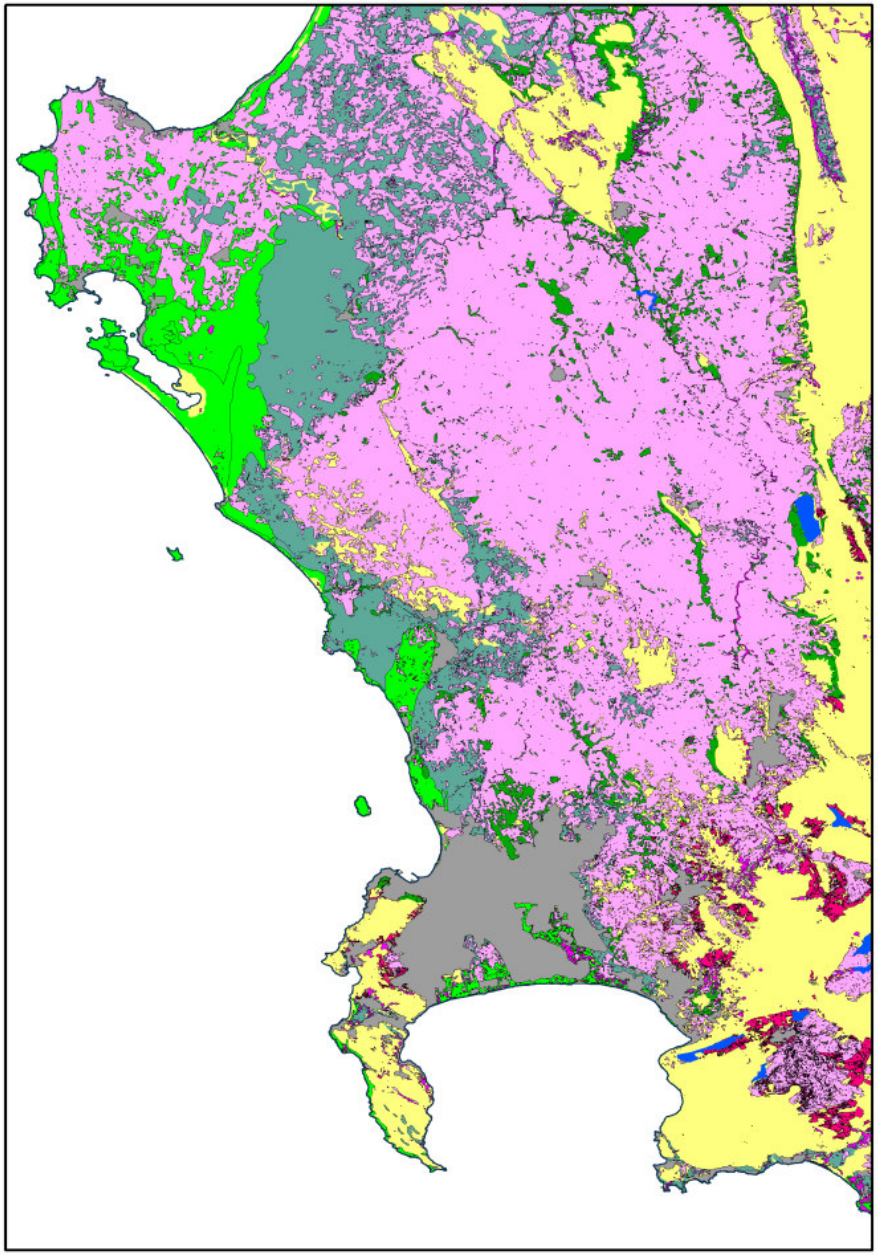
Federal Ministry of Education and Research





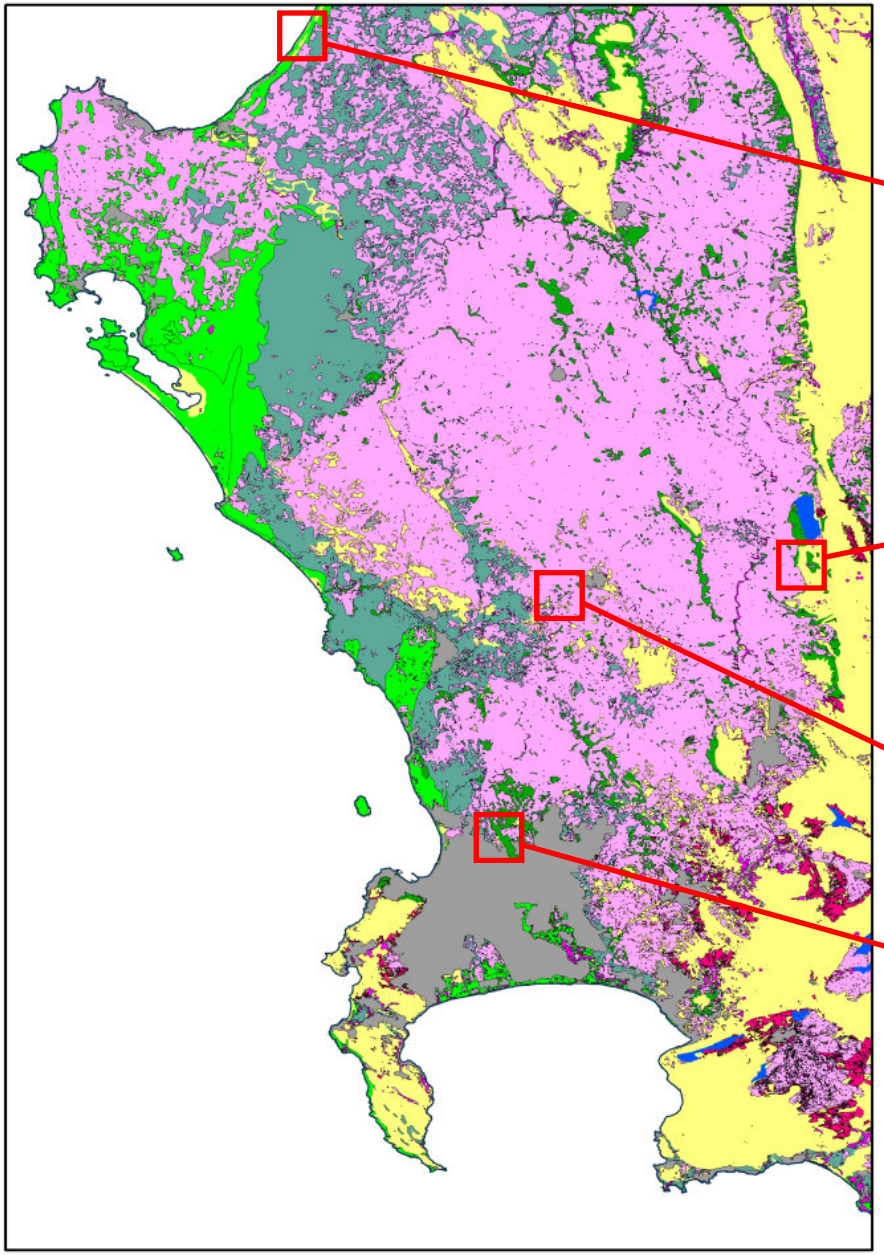


BIOLOG Universität Potsdam
Philipps Universität Marburg
BIOTA
Projektträger im DLR
Federal Ministry of Education and Research



- Cape Lowlands are highly fragmented
- Natural vegetation remains in isolated remnants
- All renosterveld remnants declared 100% irreplaceable, i.e. have to be conserved at all costs

- Further development (both urban and agricultural) necessary
- Spatial development frameworks used to guide land use planning and to aid conservation
- Ecological research required to inform fine-scale planning within SDFs



BIOLOG Universität Potsdam Philipps Universität Marburg BIOTA

Projektträger im DLR

Federal Ministry of Education and Research

Plant Diversity

NB: high complementarity of sites indicate that fragments do contribute significantly to overall regional plant diversity.

- Weak and inconsistent fragment size effects
- area rather than a fragmentation effect *per se*.
- Fragment size effect only in sand fynbos
- Masked by site factors (disturbance / landuse history) in renosterveld and strandveld
- Weak fragmentation effects due to
  - to sampling artefacts
  - time lag since fragmentation and
  - biological confounding factors

Kongor

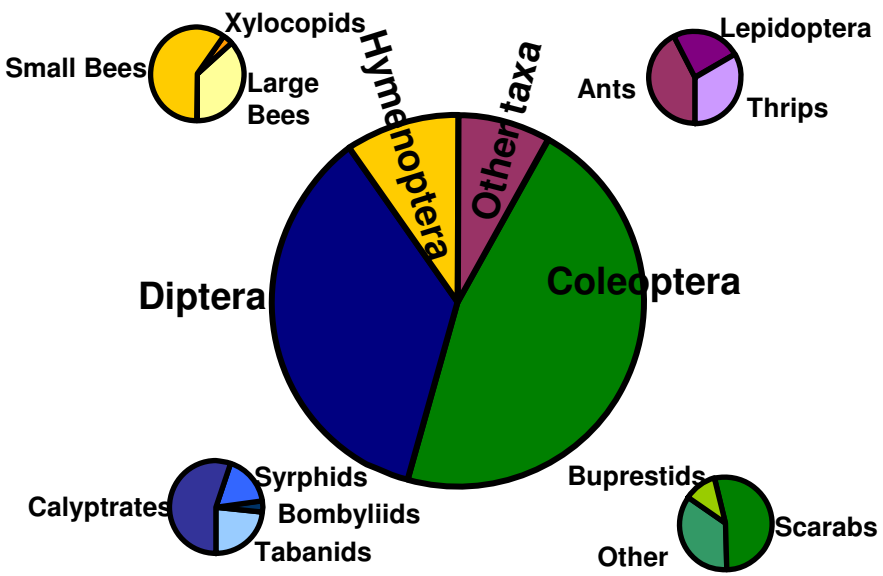
Plant Functional Traits

NB: Cape lowland fragments ARE worth conserving!

- More PFTs using subjective than objective approach, implying loss of detail through objectivity
- PFT diversity in all vegetations generally low for smallest fragment
- PFT diversity varied with scale implying a scale effect
- Fragmentation effect more evident in renosterveld
- No significant differences in PFT diversity between sites in fynbos (ASF) and strandveld (LDS), implying high functional redundancy

Kongor

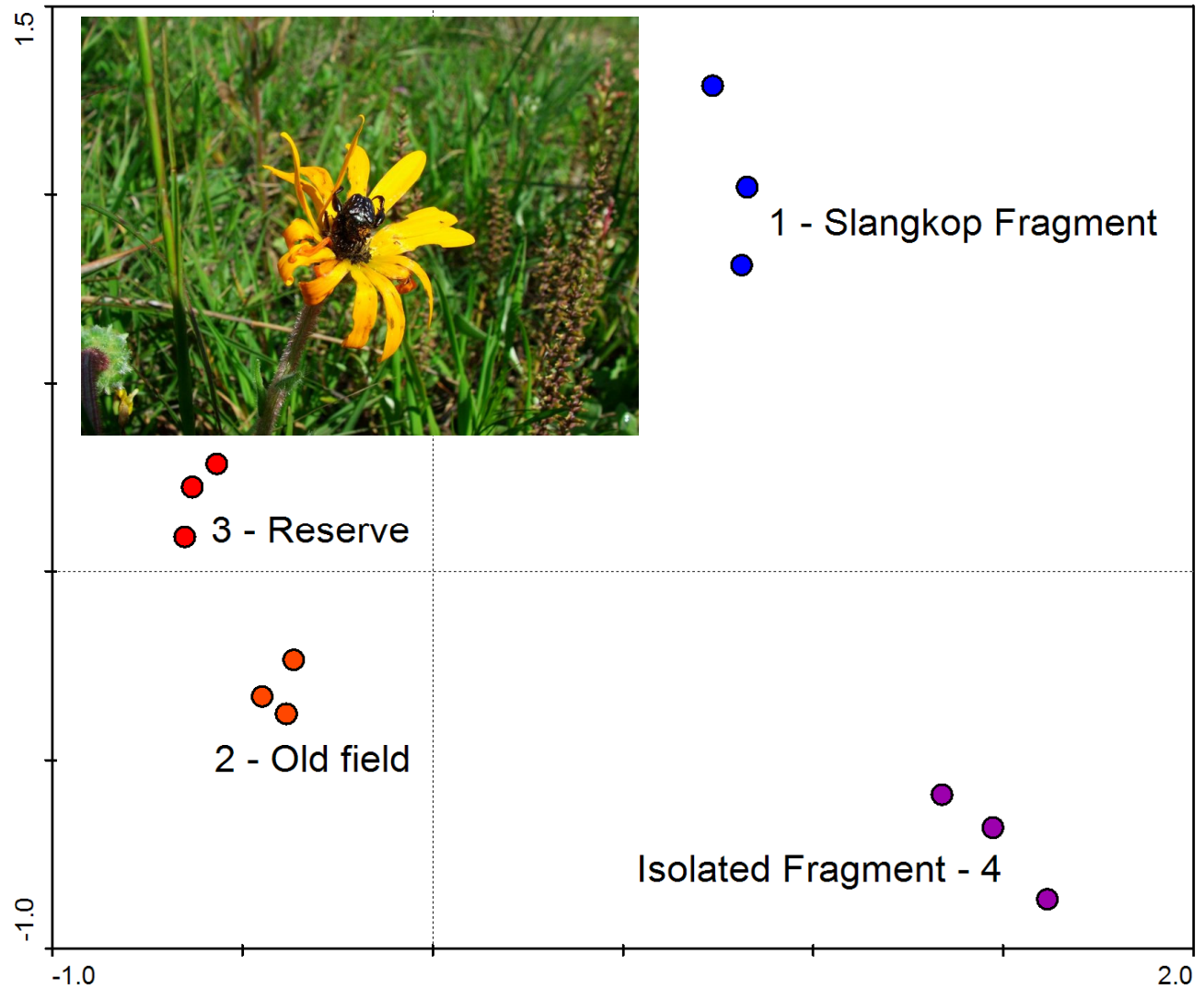
Insects



- In Alluvium Fynbos, floral visitation is strongly affected by both the number and density of flowers in floral patches
- High floral density = high pollinator activity
- Understanding broad interactions at the community level:
  - Provides a context for interactions between species
  - May help in explaining other observed patterns
  - Conceptual support for conserving interactions in fragmented landscapes

Vrdoljak

Insects

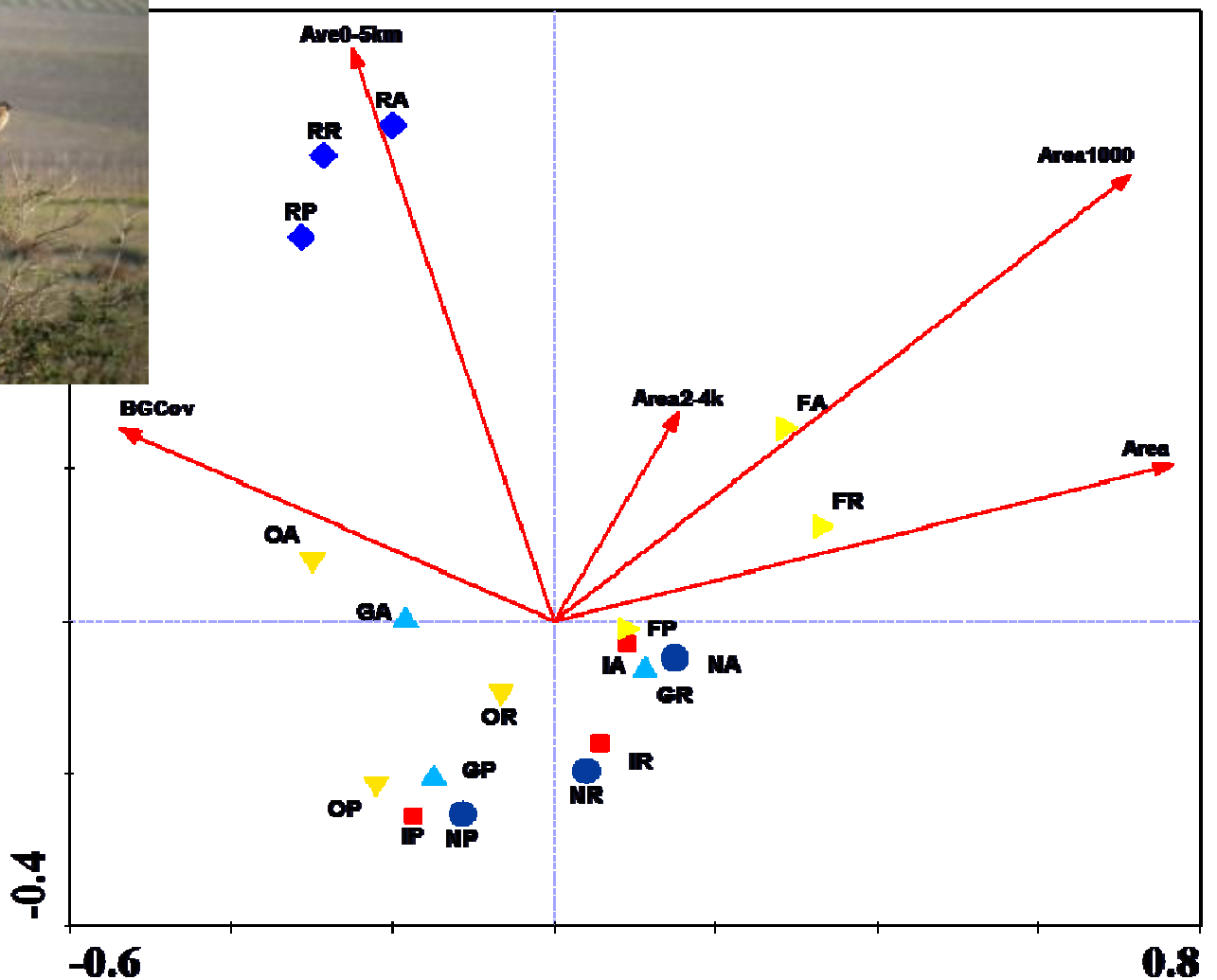


- Insect assemblages change with isolation and transformation
  - Assemblages shifts from beetles to flies
  - Loss of specialist pollinators

Vrdoljak

Birds

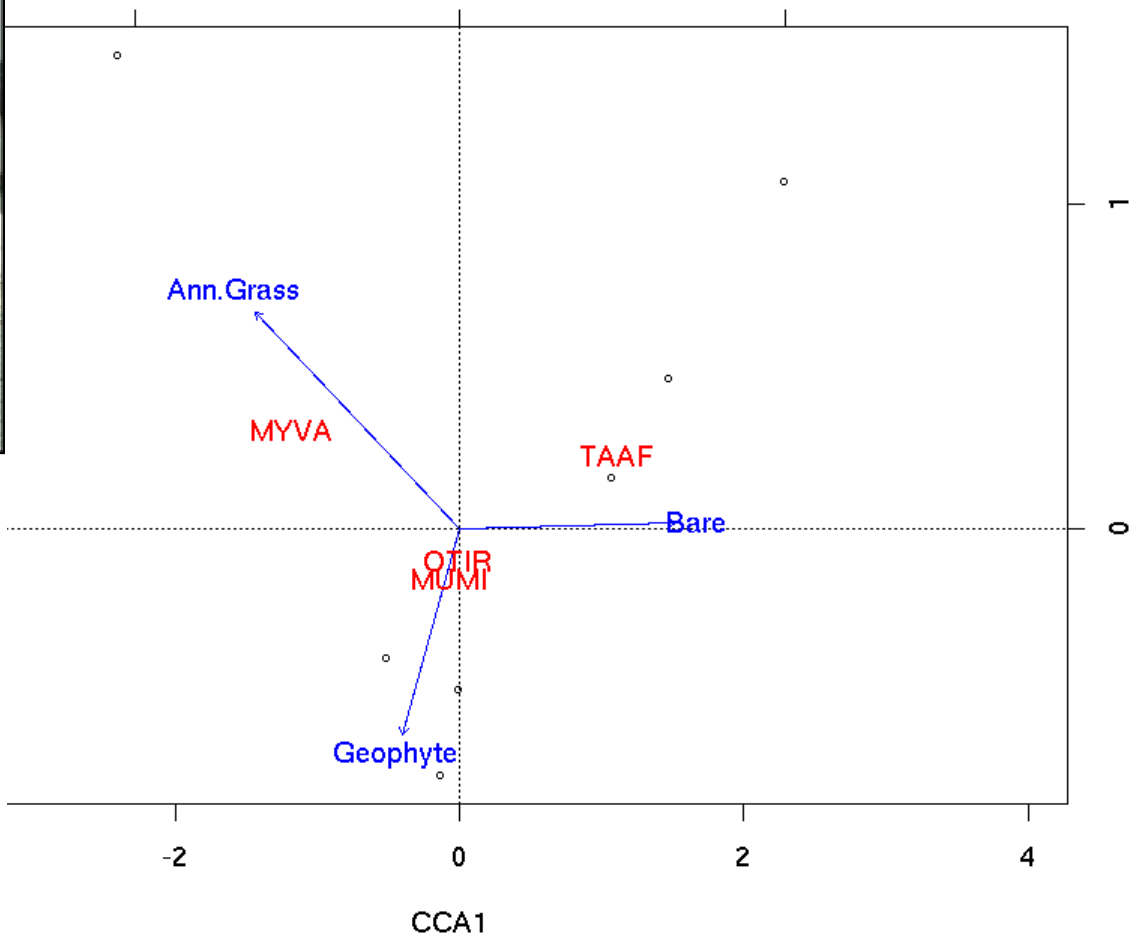
- Assemblages influenced by vegetation structure and amount of habitat around patch



Kieck

Small Mammals

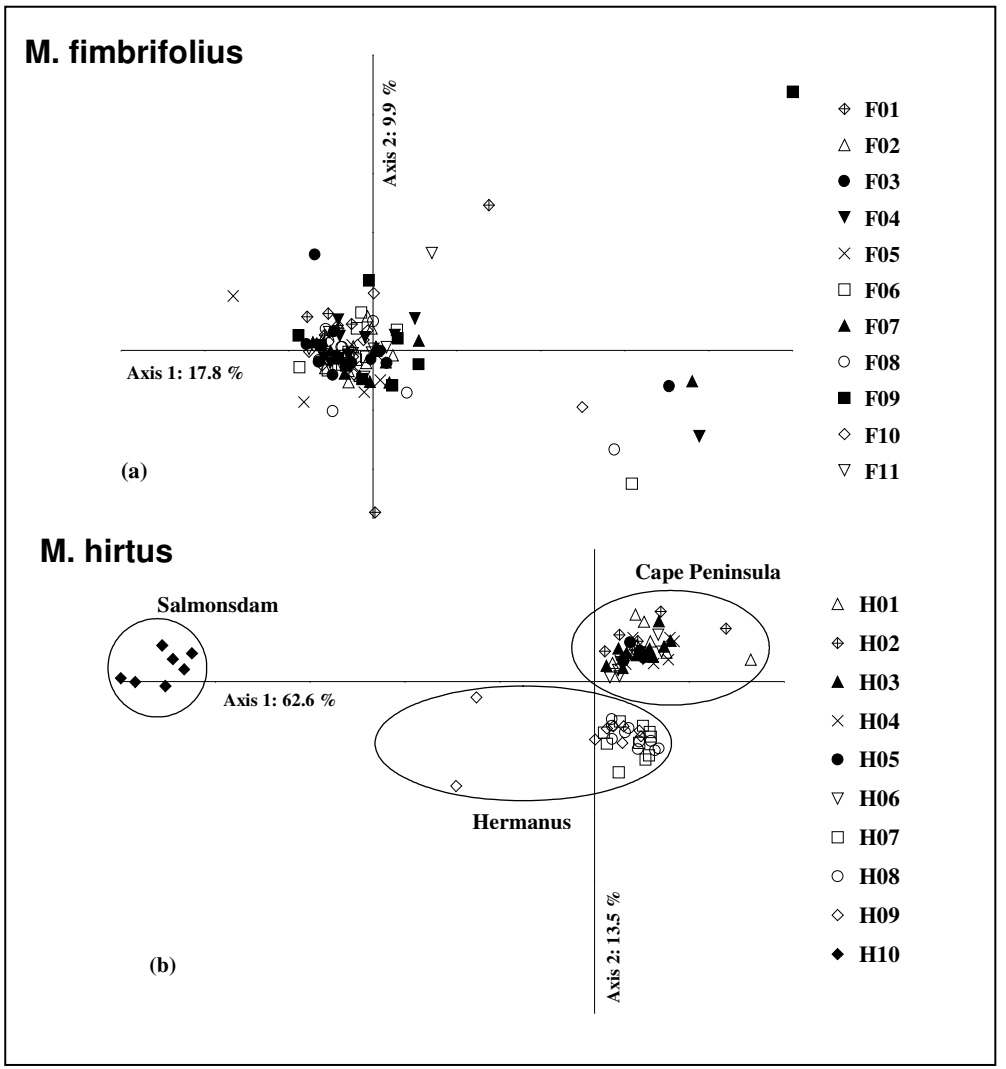
- Assemblage only influenced by habitat structure
- No fragmentation effects found



Krug

Spatial genetic variation of two Proteas

- Fragmentation reduces gene flow and leads to population differentiation



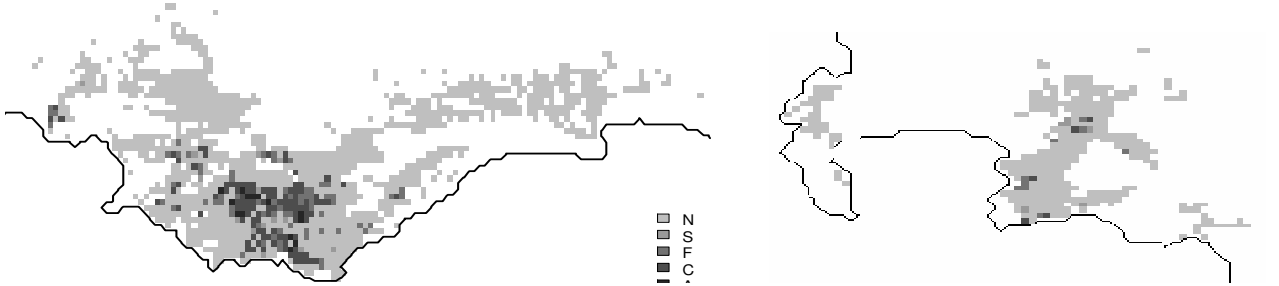
Kaiser, Reisch, Poschlod

Cabral, Schurr

Distribution models of Proteas

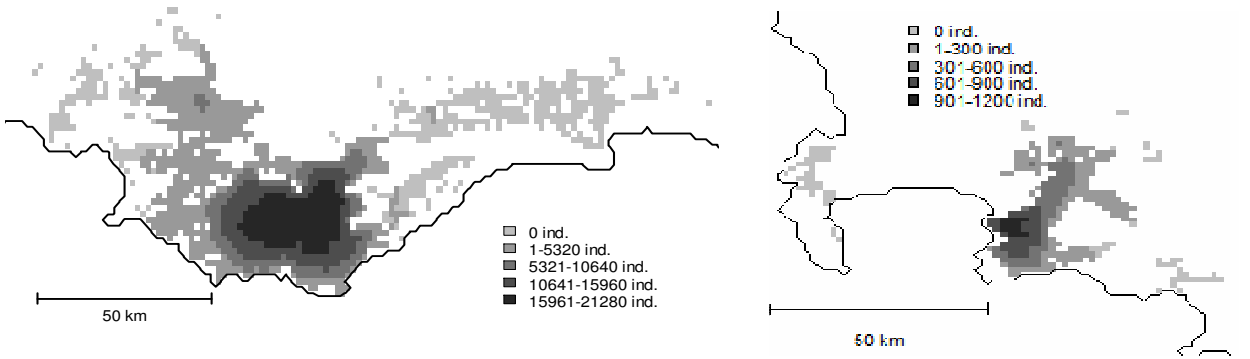
Leucadendron xanthoconus | *Protea stokoei*

Field Data – Protea Atlas



Simulated observation

Simulated abundance



Six out of eight species fitted best with models that incorporate Allee effects => importance for conservation of small and isolated populations

BIOLOG Universität Potsdam Philipps Universität Marburg BIOTA
Projektträger im DLR
Federal Ministry of Education and Research

What does this mean for ecological processes?

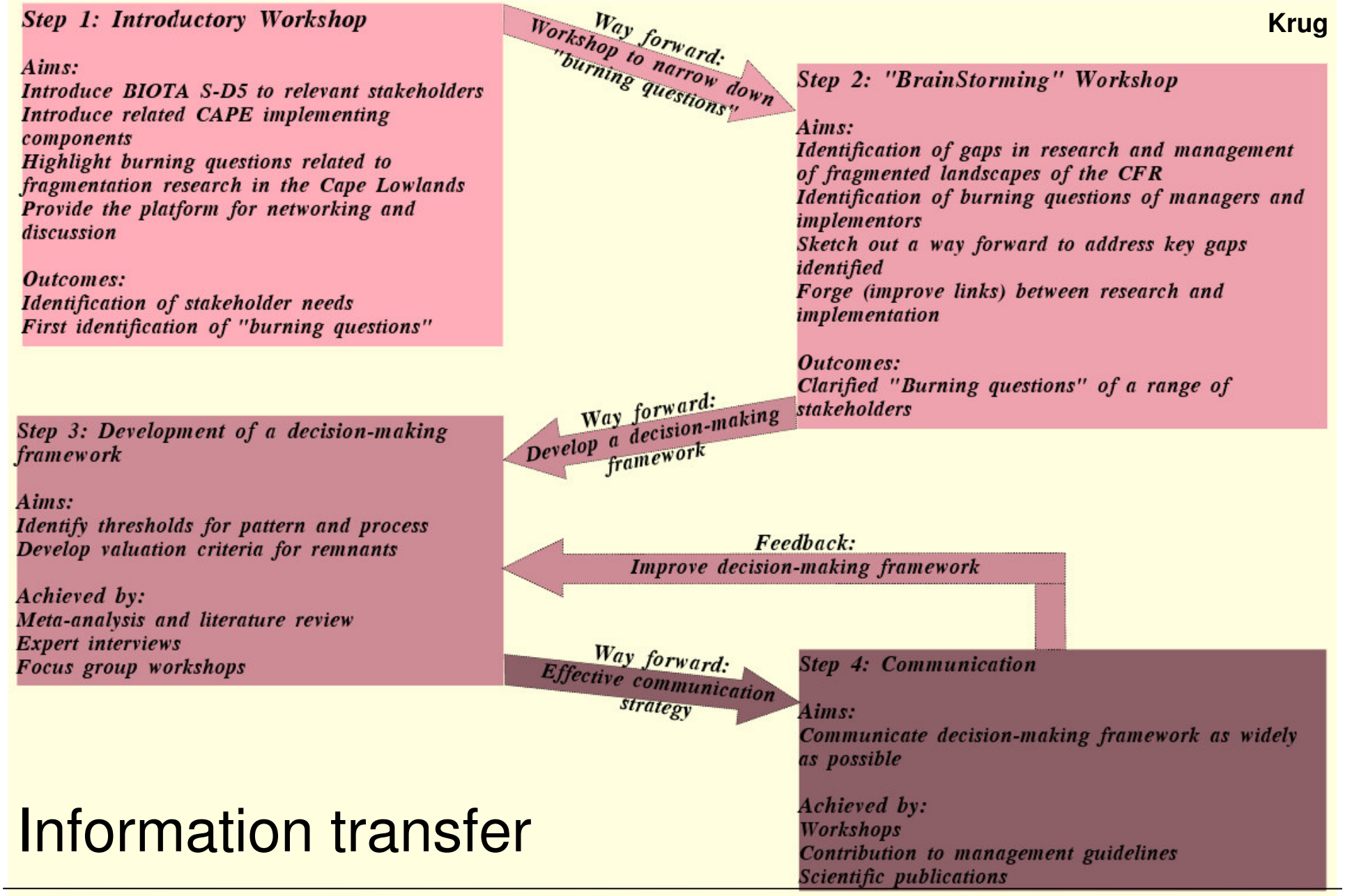
- Plants – loss of short distance dispersed reseeders and species with one pollination mode
- Insects – loss of pollinators
- Birds – loss of insectivores and frugivores, i.e. loss of dispersers
- => reduction in gene flow between populations

What does this mean for ecologial processes?

- Restricted movement between patches
- Break down of gene flow between patches
- Loss of specialist species – can common species come to the rescue?

Mitigating Measures

- Corridors and Stepping Stones to increase habitat connectivity
  - See poster by Kongor et al.
- Restoration of habitats to create buffers and corridors
  - See posters by Heelemann et al.



Information transfer

Way forward

- Identify indicator species
- Investigate gene flow in selected species
- Development of a Decision-making framework for managers
- Communication
  - DSS (via S-F2)
  - Management guidelines
  - Scientific publications

Beyond Phase III

- Expansion onto landscape scale
- Investigation of confounding effects
- Implementation of results into management
  - The will is there, we can see the way, but it needs to be paved

Acknowledgements

- CapeNature (for collection permits and access to land)
- Landowners / Managers (for access to land)
- Stakeholders (for input and suggestions)
- BMBF (for funding)
- Tessa Oliver (Photographs)
- Rainer Krug (for working on my slides while I was breast feeding)