How to incorporate spatially and temporally dynamic biodiversity information into a MARXAN analysis

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Talk Outline

• Problem statement
• 2 examples of current projects that attempt to deal with the problem
• 2 examples of future projects
• Take home messages
SCP Status Quo

Current area prioritisation approaches in conservation planning use static environmental variables or features (Snapshots of current state)
Biodiversity in Space and Time

...biodiversity is dynamic in space and time...

...it is relatively easy to consider spatial and temporal dynamics in a MARXAN analysis.
Example 1: Namibian CC Assessment

- **Objective:** Quantitative assessment of the current PA networks ability to achieve future targets
- **Data used:** CC model outputs for future species distribution & primary productivity
Namibian CC Assessment

PA design concepts that can be addressed by including future states as “features” in a MARXAN analysis:

- Area contributes to current targets only
- Direction of range change can indicate axis for CC corridors
- Area contributes to current and future targets
- Option for PA expansion to achieve future targets
Example 2: PA network for Saiga

• Objective: Design a PA network to conserve a migratory antelope species
• Data used: Modelled distribution using historic primary productivity data (NDVI 2000-2010)
• Target: PA network achieves a minimum PP target for all years & captures % of modelled range
Implementing in MARXAN

• Past or future states (snapshots) included as features
Future Project 1: Succulent Karoo PA CC Adaptation Assessment

• Assess how well the current PA network achieves future targets for the genus Conophytum; and,
• Make recommendations for PA expansion (CC adaptation strategy)
• Advances:
  – Species modelling with point locality dataset in the SK
  – Modelling at 1km resolution
  – Conceptual ecological adaptation principles replaced by modelled response data
Succulent Karoo PA Adaptation

Distribution of Conophytum under current and 2 future CC scenarios
Future Project 2: meta-PA for Bushmanland Larks

- Design a PA for nomadic Karoo birds that is based on historic spatial and temporal variation in primary productivity
Meta-PA for Bushmanland Larks

A PA or IBA could comprise a collection of spatially discrete units which combined achieve an ecological process target for nomadic larks.

Target species is always present in PA but rarely in all patches at the same time.
Take Home Messages

• Biodiversity is dynamic in space and time, and we can factor this into SCP
• MARXAN is a very powerful spatial optimisation tool that is underutilised
• If the data exists, it is relatively easy to incorporate (1) future predicted or (2) historic data on biodiversity variability
• A method is to incorporate multiple temporal or spatial snapshots as features
• How we conceptualise targets for future states needs attention