Linking geodiversity and biodiversity

An agenda for developing more integrated nature conservation and protected area management

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OUTLINE

- Why geodiversity is important for biodiversity
- How do we address the lack of integration in conservation policy and PA management?
- For discussion: an agenda for progressing interconnectivity

AIM

- To generate discussion

GEODIVERSITY IS IMPORTANT FOR BIODIVERSITY

- Ecosystem: “a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit” (Tansley1935).

- Adopted by the Convention on Biological Diversity (1992).

CONSERVING NATURE’S STAGE

- Physical environment is a stage that supports the actors - the species that are the primary target of biodiversity conservation (Anderson & Ferree 2010).

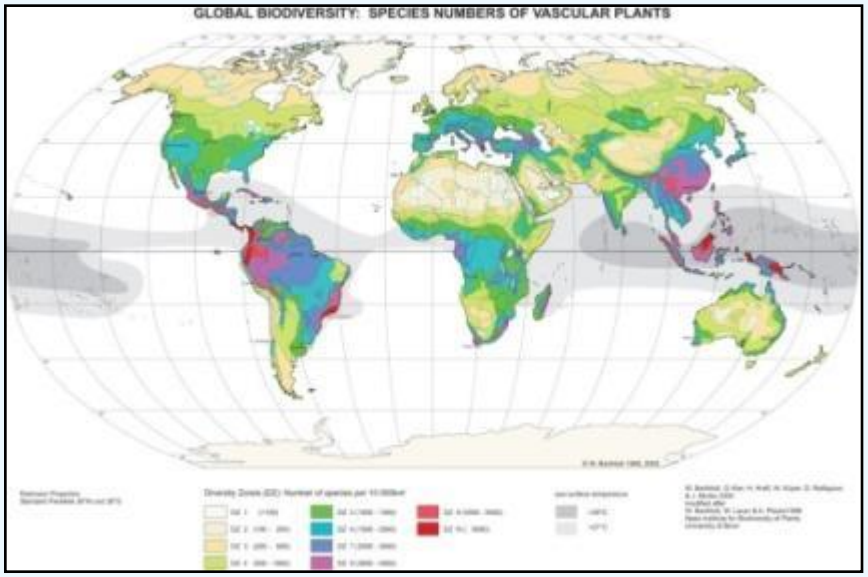
- Species may change – but conserving geodiversity offers a coarse filter approach that enhances opportunities for biodiversity under both current and future climates.

NATURE'S STAGE

Habitat provision – substrate, landform mosaics, soil formation, geomorphological processes.

Habitat dynamics and species support depend on geomorphological processes (e.g. water flow regimes, sediment supply, erosion and deposition); biogeochemical and water cycling; disturbance regimes.

Landscape heterogeneity & increase in biodiversity/species richness assisted by geo processes & disturbance regimes.



Barthlott et al. 2005

- Geodiversity forms the foundation for most ecosystems from global to local scales in both terrestrial & marine environments .
- Distinctive habitats support rare/unique biota adapted to particular abiotic conditions.
- But also, dynamic and complex mosaics support high species richness and areas of high geodiversity correspond with high biodiversity.

EXAMPLE: Mount Chudalup: D'Entrecasteaux National Park, WA

The importance of granite outcrops

Balga shadow on lichen-spotted granite

Granite outcrops greatly influence the lives of plants, micro-organisms, animals, and people. They provide a water source for mammals and birds, shelter for insects and reptiles, and a surface for cryptogams to grow on. On Mount Chudalup the granite is home to 42 species of moss, 28 species of lichen, and 6 species of liverworts, several of which are rare and only known from this site. They are an integral part of the complex ecosystem that exists on this 'granite island' and great care should be taken not to damage them.

You will notice that the bare surface of Mount Chudalup is highly sculptured, covered by a variety of cracks, shallow and deep depressions, terraced shelves, gullies, and crevices. Such features form ponds or channels when it rains and so become important microhabitats for plants and animals. Look out for the different kinds of plants and animals that live in these environments, but be careful not to move any rocks as this can disturb their habitats.

Moss-covered granite

The loamy soils that form from the weathering of Mount Chudalup are also very important. They allow a fringe of karri to grow around its base. This forest is a haven for birds including purple-crowned lorikeet, white-browed babbler, golden whistler, and white-tailed cockatoo, which you might see nesting in hollows within trunks of karri trees. Around rock pools you may also glimpse the rare red-eared firetail finch.

Karri bark (Eucalyputs diversicolor)

Lichen

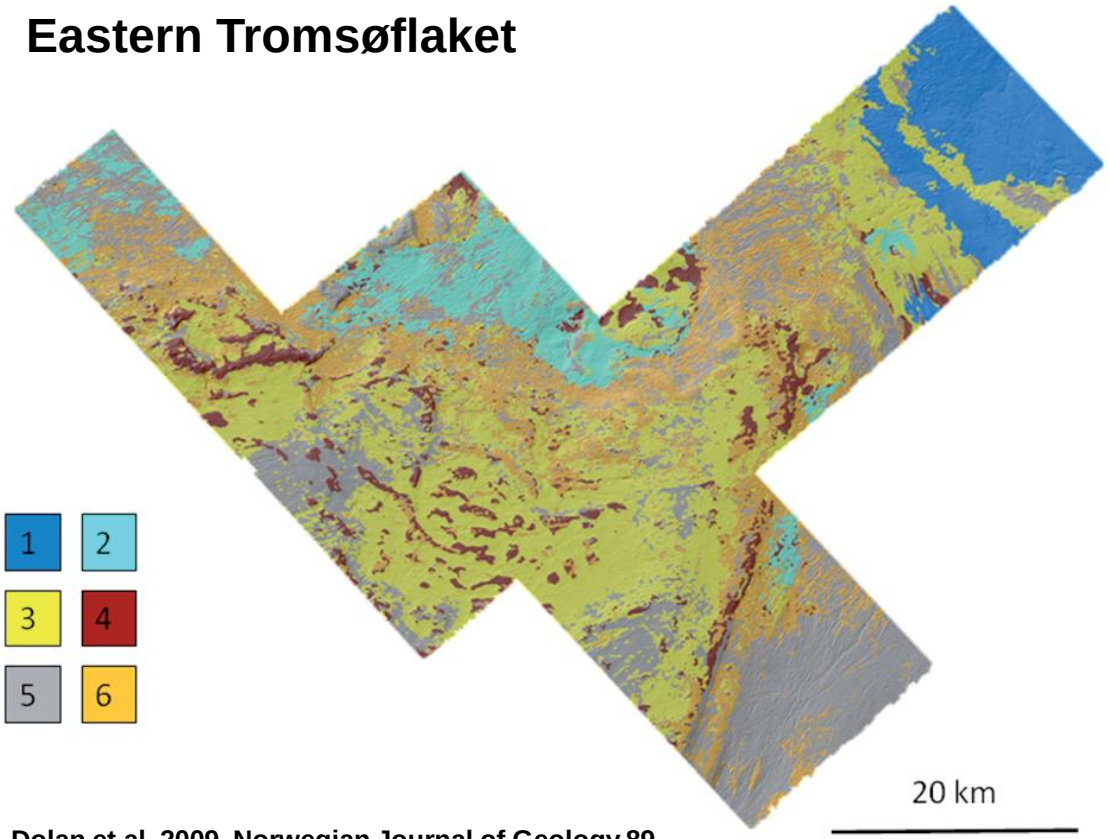
moss and pincushion plant

... A living rock ...

Photos by Iain Copp

EAAMPLE: SUPPORTING MARINE ECOSYSTEMS

Seabed nature-type mapping



Dolan et al. 2009. Norwegian Journal of Geology 89.

1. Muddy sediments in basins with pockmarks. Typical species: *Pelosina arborsecens, Asbestopluma pennatula.*
2. Sandy muddy sediments with iceberg ploughmarks. Typical species*:* large sponges - *Geodia spp.*
6. Sandy-gravelly sediments with cobbles on moraine ridges. Typical species: *Polymastia sp. and Poraniomorpha sp.*

NATURE'S STAGE

Some implications & applications

- Improving PA design: measures of geodiversity appear to be useful indicators for the distribution of biodiversity.
- Geodiversity confers resilience to climate change and enables species to adapt or relocate through availability of suitable environmental mosaics, corridors and elevational opportunities – macro & micro refugia.
- Geomorphological sensitivity to climate change will impact biodiversity in non-linear ways.
- Informing restoration and management interventions: opportunity mapping; learning from the past (100s – 1000s) of years.
- Not a static approach - maintain processes.

BUT

Geodiversity remains generally poorly integrated in nature conservation and protected area design and management:

- Biodiversity more advanced as conservation science, as societal imperative and as an area for government action.
- Geodiversity links to biodiversity not yet fully recognised by traditional nature conservationists, particularly what this means in management terms and helping to deliver targets.
- No meeting of minds of fundamental interconnections bio and geo diversity conservation

ADDRESSING THE LACK OF INTEGRATION

For discussion: an agenda for progressing interconnectivity

1. Site level - improve advice on geoheritage conservation for ecologists and others in PAs with 'Best Practice Guideline on Geoheritage Conservation in Protected Areas' – in progress.

2. System level landscape/biome – develop **Key Geodiversity Areas** to complement Key Biodiversity Areas.

3. Develop our 'working principles' to connect geo with bio.

4. Prepare specific guidance on key biomes e.g. grasslands, volcanic landscapes?

5. Enhance communication and networking between geo & bio specialists and PA managers to promote 'conserving nature's stage'.

6. Other suggestions?

2. DEVELOPING KEY GEODIVERSITY AREAS: SOME ISSUES

1. **What criteria?**

   Mimic Key Biodiversity Areas amended to reflect KGAs?

   Use 10 Focus Areas of Global Geoparks?

2. **What spatial units?**

   Take a geological province perspective?

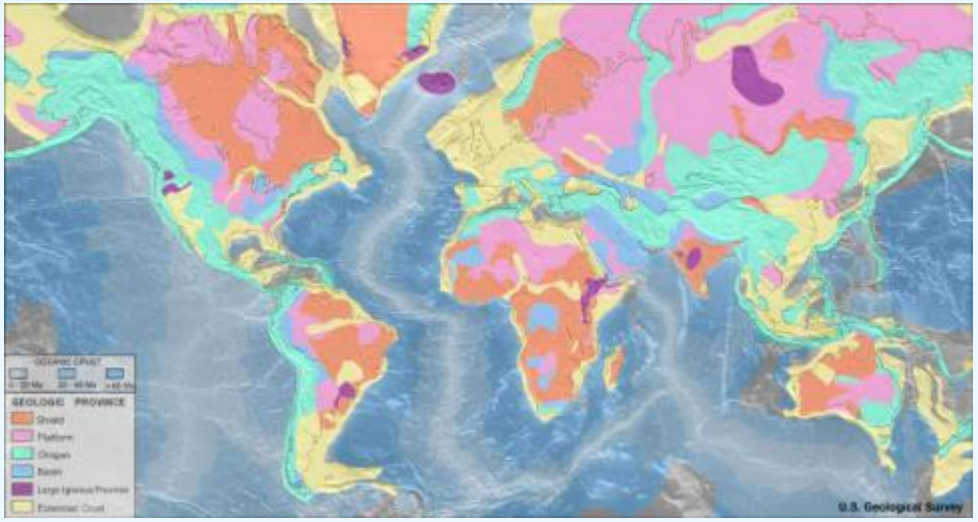
   Base it on existing globally recognised sites & areas: Geoparks and Natural World Heritage Sites (excluding biodiversity)

3. **Organisation?**

   Who leads and who participates?

   Partnerships?

   Funding?



KEY BIODIVERSITY AREAS

The aims of the KBA Standard are to:

- Harmonise existing approaches to the identification of important sites for biodiversity.
- Support the identification of important sites for elements of biodiversity not considered in existing approaches.
- Provide a system that can be applied consistently and in a repeatable manner by different users and institutions in different places and over time.
- Ensure that KBA identification is objective, transparent and rigorous through application of quantitative thresholds .
- Provide decision-makers with an improved understanding of why particular sites are important for biodiversity.

https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf

CRITERIA FOR KEY BIODIVERSITY AREAS

A. Threatened Biodiversity

1. Threatened species
2. Threatened ecosystem types

B. Geographically restricted biodiversity

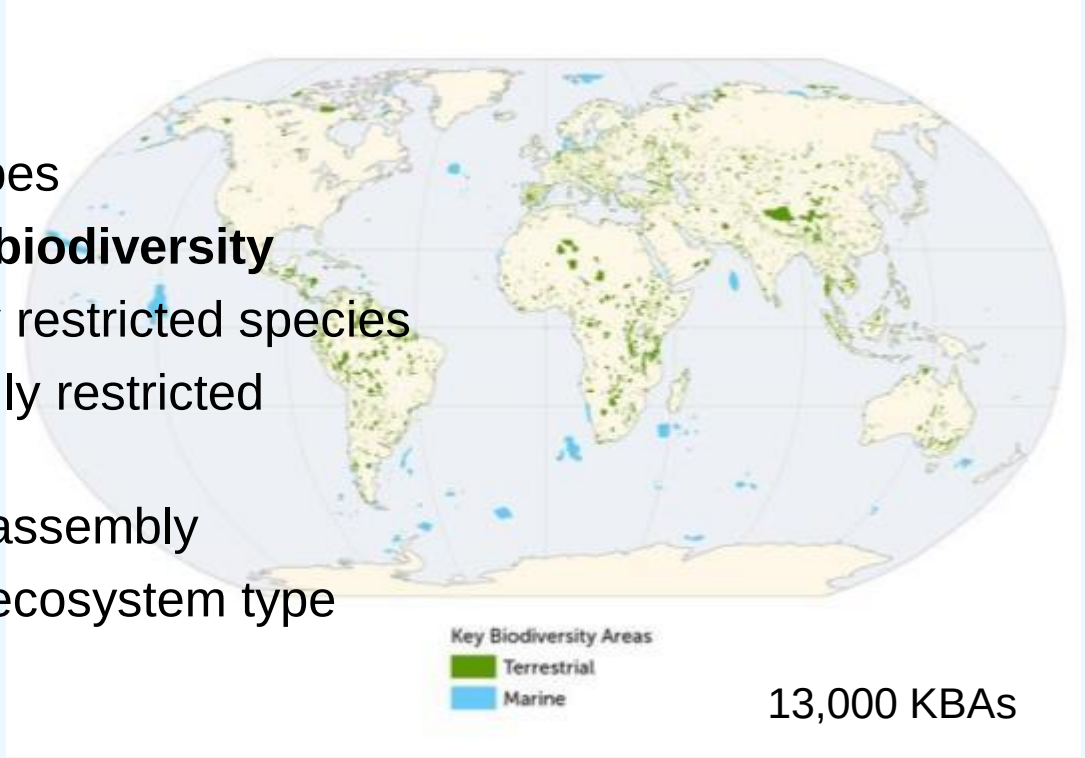
1. Individually geographically restricted species
2. Co-occurring geographically restricted species
3. Geographically restricted assembly
4. Geographically restricted ecosystem type

C. Ecological integrity

D. Biological processes

1. Demographic aggregations
2. Ecological refugia
3. Major species recruitment sources

E. Irreplaceable quantitively



13,000 KBAs

https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf

3. DEVELOP ‘WORKING PRINCIPLES’ TO CONNECT GEO WITH BIO

What do they mean in practice? Case studies to demonstrate value?

Working Natural Principle	Consequence for management
Manage natural systems by ‘working with nature’	Plan for space for nature to operate naturally
Manage natural systems in a spatially integrated manner	No artificial lines or barriers to conservation on ground
Natural change is inevitable	Dynamic approach to conservation planning for future changes
Climate change & geomorphological responses impacts on condition of habitats & species	Dynamic approach to conservation planning for future changes
Sensitivity of natural systems should be recognised	Assess thresholds of change & moderate management
Understand physical processes & landscape evolution of active systems	Adapting species & habitat management accordingly

4. PREPARE SPECIFIC GUIDANCE ON KEY BIOMES

Priorities ?

Biomes or ecoregions most at risk?

e.g. tropical dry forests (69% converted in SE Asia), temperate broadleaf and mixed forests, temperate grasslands and savannas (> 50% lost in North America), and Mediterranean forests, woodlands and scrub grasslands

Hoekstra et al 2005 Ecology L:etters 8, 23-29

5. HOW TO CONNECT GEO AND BIO PEOPLE IN IUCN?

Find ways of engaging with biodiversity colleagues.

Ideas please!

- Gain agreement in WCPA Steering Group for action on improving the geo/bio linkage
- Provide material to WCPA/SSC Joint Task Force on Biodiversity & Protected Areas to broaden their remit and approach
- Interact with CEMs Specialist Group on Ecosystem Function & Services
- Ensure geodiversity input to other Best Practice Guidance;
- Arrange joint meetings/workshops with scientists and practitioners to progress 'conserving nature's stage' approach in protected area management; What does it mean in practice?
- Publish paper on interconnections in *Parks* arising from this meeting.

OTHER SUGGESTIONS?