BioSpace25 - Biodiversity insight from Space
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A framework for insect-based biodiversity intactness monitoring and reporting in Africa

Tobias Landmann, **Faith Ashiono, Vincent Magomere, Komi Mensah Agboka**
International Centre of Insect Physiology and Ecology (ICIPE), Kenya

Why insects?

- Insects are the most abundant group, they occur in all climate zones
- Highly sensitive to environmental change (indicator *sp*.)
  - Their abundance is related to a range of human impacts
- Scale appropriate in time and space
  - Fine-scale understanding of intactness, as opposed to mega-fauna
- Insect loss = decline in ESS (i.e., pollination)

Source: iNaturalist (Sevgan Subramanian)

Source: Returning lands to nature. Nat. Geosci.

Biodiversity status & intactness

Need unbiased, coherent (seamless) & spatially explicit indicators to measure progress towards biodiversity targets (e.g., AICHI targets)

The 20 Aichi Biodiversity Targets set by the CBD

The IBI – algorithm

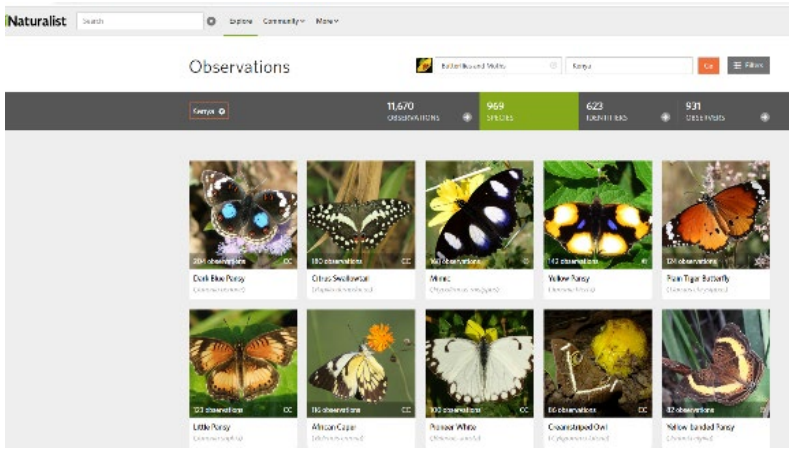
$$IBI_{i,j} = 1 - \left(\frac{D_{\text{pot},i,j} - D_{\text{cur},i,j}}{D_{\text{pot},i,j}} \right) A_{k,j}$$

$IBI_{i,j}$ = Insect Biodiversity Intactness for taxon i in ecosystem j.

- Can be computed for various taxa, scalable
- Needs species diversity/richness & impact matrix (D_{cur} & A) & baseline (D_{pot})

Novel data inputs for D (cur)

- "Big data" to predict insect diversity/richness (*Dcur*);
  - Occurrences: citizen science (iNaturalist) & genbank (response)
  - ESA Sentinel 2 satellite data variables (pred.)
  - GEDI Space station-based 25m tree heights (pred.)
  - Climate variables (pred.)



Source: iNaturalist

Source: eo-portal

Source: ESA

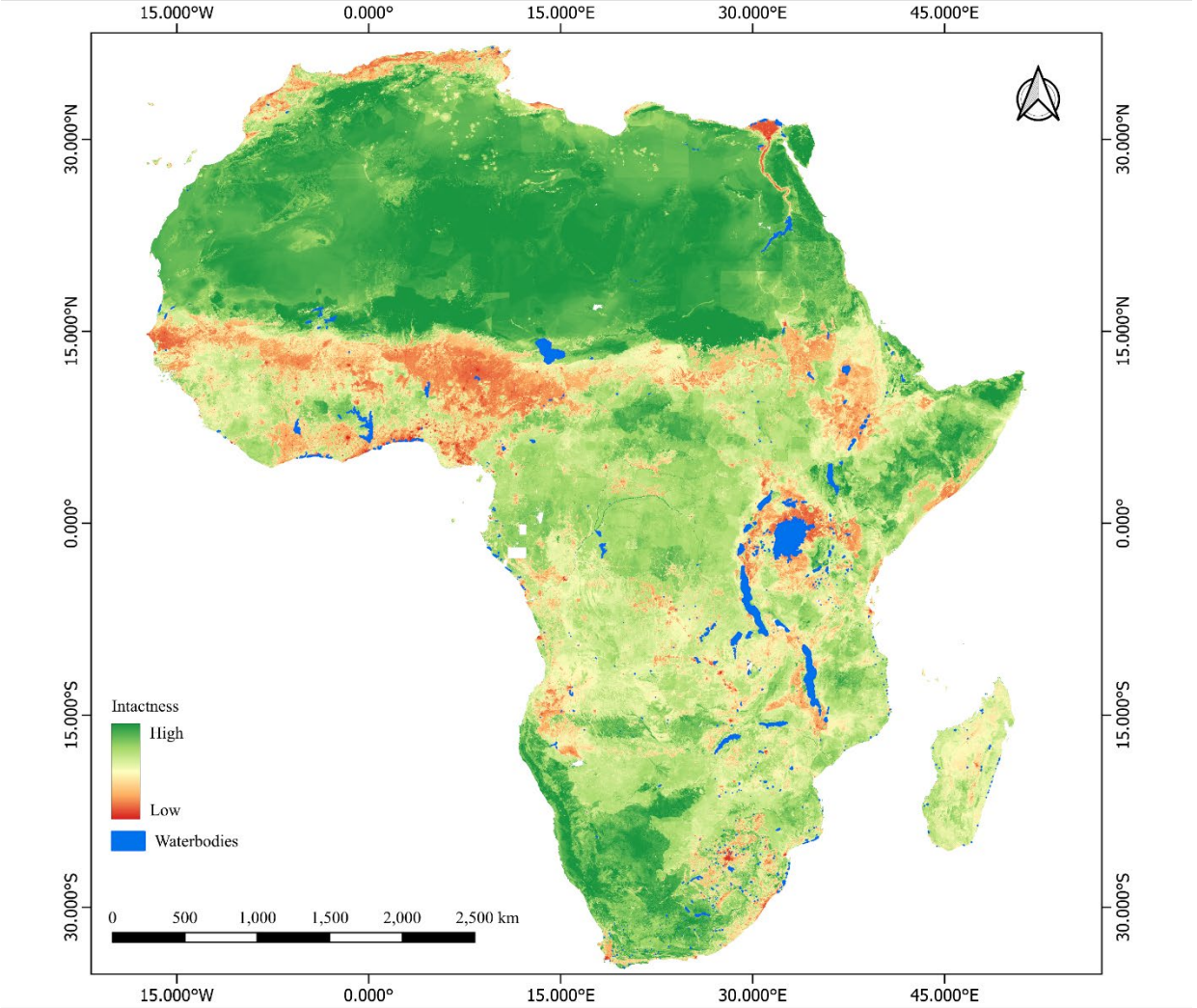
Potential Diversity - potential diversity

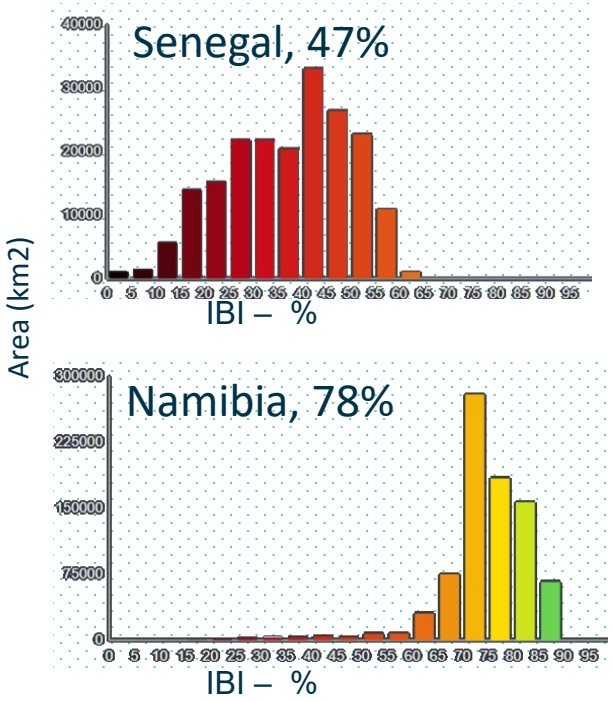
Potential insect biodiversity (*Dpot*)

Hengl et al., 2018

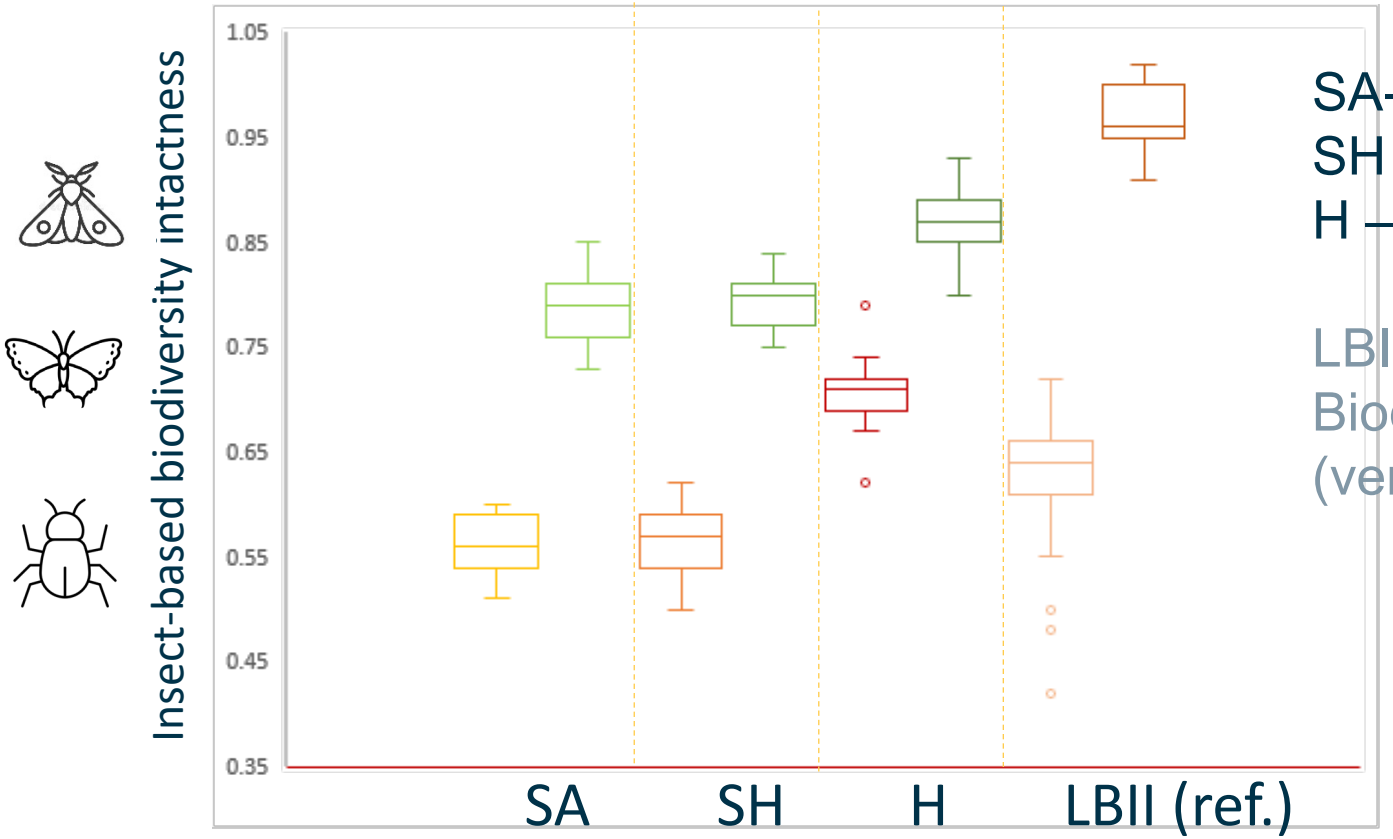
- Wetlands (1 - 0.95)
- Primary Forests (0.95 - 09)
- Savanna/Woodlands (0.9 – 0.8)
- Shrublands (0.8 – 0.7)
- Grasslands (0.7- 0.6)
- Deserts (0.6 – 0.5)

Results – Insect-based Biodiversity Intactness





Reliability of the IBI across Africa
– over various climate zones (key biodiv. areas)



SA- semi arid (n = 500)
SH – semi humid (n = 550)
H – humid (n = 600)

LBII (all climate zones) – Local Biodiversity Intactness Index (LBII) (vertebrates, reference data)

Recommendations - Future R&D & policies

- The IBI offers a policy-relevant alternative to LBII, since its **better suited for Africa's unique biodiversity and land-use conditions**.
- Because of the localized nature, accuracy, & scalability of the IBI, the indicator can propagate be seen to **bring together policymakers and local stakeholders** to co-develop biodiversity strategies that **align with global sustainability goals**
  - The IBI is scale appropriate in time and space (robust) & insects occur in all climate zones
- The IBI can be used to refine agricultural and land-use policies; this will **promote nature-positive farming**, and maintain overall biodiversity & ecosystem services

Donor Acknowledgement