Measuring biodiversity homogenisation with distributed fractals

One of the greatest threats to the ecosystems we rely upon is not just a reduction in biodiversity, but also its homogenisation. Vast swathes of diverse, yet identical, fields are vulnerable to pathogen outbreaks or environmental disturbances. As the UK government plans to restore the country under schemes such as the 'Northern Forest', there is a pressing need to quantify landscape-scale diversity and homogenisation. The central goal of our network is to measure UK assemblage homogenisation and structure. We will achieve this by having network members establish sites, within which they will use fractal plot arrangements to efficiently measure diversity across spatial scales.

We have three specific objectives. (1) Measure co-occurrences across taxonomic groups in local-scale assemblages. By spreading our sites across the UK, we will be able to examine the tendency of taxa with overlapping ranges to locally co-occur. (2) Contrast spatial homogenisation across taxa and sites. Our site design will allow us to quantify variation/homogenisation in composition (β-diversity) among sites, and within sites at 900m, 300m, and 100m scales. (3) Develop a scientific community using a common protocol for future experiments and grants. Our design allows for replicated experiments (with controls) and unlimited expansion, and is particularly appropriate for questions about spatial scaling.

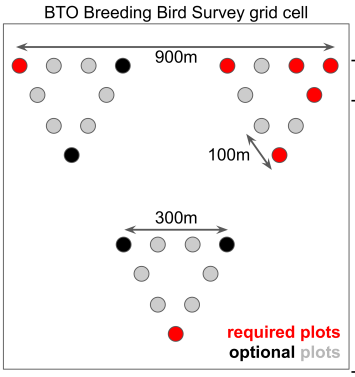
What do you want me to do and why? Identify plants, collect beetles, and take a trowel of soil seven times in one area to contribute to a dataset on biodiversity homogenisation in the UK.

What will I get out of this? Co-authorship on the paper(s) addressing Obj. 1 and 2 above that will also release all data. Get early access to that data, and help design add-on experiments/observations to the design. If you place microclimate sensors, you join the SoilTemp network (another co-authorship).

How much money/time will this take? Surveying the required 7 sites for plants takes a day; you may be able to set and collect the pitfall traps in that same day. We will perform all microbial sequencing, beetle identification, and soil texture analysis. HOBO microclimate sensors are optional, but are ~£35 each.

Only 7 sites? Why the weird shape? The triangle/fractal shape allows us to efficiently sample in space. We have a paper on bioRxiv with a power analysis and empirical test of this approach.

How do I find out more? Email Will Pearse (will.pearse@imperial.ac.uk) to be kept in the loop or join.



Data	Required	Optional	Ideal
Plants	7 quadrats	11 quadrats	27 quadrats
Beetles	7 pitfall traps	11 traps	27 traps
Microbes & Soil texture	7 soil cores	11 cores	27 cores
Birds	—	New survey	Existing BBS
Butterflies	—	WCBS site	UKBMS site
Microclimate	—	7/11 sensors	27 sensors

(A) Site design and layout **(B)** Data requirements; not all data facets need be collected at the same intensity

Overview of site design (A) and flexible data requirements (B). Data is only required from **7 sites** to join the network, although additional sites (**11**, or **ideally 27**) may be added. Plant quadrats are $1m^2$ squares. We encourage you to choose sites already surveyed by the BTO's BBS program.