Sampling framework for the Wider Countryside Butterfly Survey

The remit of the WCBS is to produce unbiased abundance indices and trends for wider countryside species that are representative of the whole of the UK (Brereton et al. 2019). A random-stratified sampling framework was therefore adopted for the selection of survey locations. In addition, given the surveys are undertaken by volunteers, the sampling framework is adapted to increase participation. For a combination of scientific and practical reasons, the design approach of the Breeding Bird Survey (BBS) was adopted for the WCBS. The BBS uses 1-km grid squares of the Ordnance Survey national grid systems (separate grid systems for Britain and Ireland) as the unit of sampling. This was assessed as a convenient sampling unit for volunteer recorders, is readily identifiable in the field, is a scale at which climate and environmental data are often available in the UK (e.g. Land Cover – Morton et al. 2011; climate – Robinson et al. 2017). 1-km squares are also the unit that is commonly used by other national monitoring programmes in the UK in addition to the BBS (e.g. Countryside Survey, National Plant Monitoring Scheme, National Bat Monitoring Programme).

In the BBS, 1-km squares are selected by stratified random sampling. Regions receive a differing number of randomly selected squares, with the number of allocated squares being proportional to regional (BTO regions) recorder density (a measure of likely participation levels). During the consultation process, no major scientific concerns were identified in using the BBS design to sample butterflies, but a number of practical advantages were identified, including the potential to involve BTO recorders in recording their squares and the potential to analyse changes in bird and butterfly abundance from the same sample areas. Note, however, that a decision was made that the WCBS would use a range of other randomly selected 1-km squares (again stratified by recorder density) in addition to BBS squares, to enable participation by butterfly recorders not involved in the BBS.

A second random selection of 1-km grid squares was produced for recorders not part of the BBS. Random numbers between 0 and 1 were generated for all monads for the United Kingdom, excluding those with less than 50% land area. The outcome of this process was an ordered list from which monads are released for survey. In order to ensure even geographic coverage at larger scales, this release process is stratified by Butterfly Conservation Branches (hereafter termed ‘regions’). Based on the power analysis to design the WCBS (Roy et al. 2007), 800 1-km squares were initially made available. These 1-km squares were divided between the 33 regions based on the size of their Butterfly Conservation membership. There is a strong correlation between the BC membership, number of households and number of UKBMS transects per branch. At least 20 1-km squares were allocated to each branch, even for those less densely populated. More monads were subsequently made available to branches where more than 75% of allocated 1-km squares were surveyed.

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