

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. 2011). For a combination of scientific and practical reasons a sampling framework was adopted based on random 1km squares, stratified by recorder density in different regions, following the model of the BTO/JNCC/RSPB Breeding Birds Survey (BBS) (i.e. regions with more potential recorders had more random 1km squares generated for sampling). The unit of sampling of 1-km grid squares of the Ordnance Survey national grid systems (separate grid systems for Britain and Ireland) is a convenient sampling unit for volunteer recorders, is readily identifiable in the field, and 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 (e.g. BBS, Countryside Survey, National Plant Monitoring Scheme, National Bat Monitoring Programme).

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. Just under half of the WCBS sampling framework now consists of BBS surveyors carrying out butterfly sampling on additional visits to their BBS 1km squares. The remainder of the sampling framework involves a new set of random stratified squares, generated in a similar manner, and allocated to butterfly recorders not involved in the BBS.

BBS square selection

In the BBS, regions receive a differing number of randomly selected squares, with the number of allocated squares being broadly proportional to regional (BTO regions) recorder density (a measure of likely participation levels). This results from the original regional allocation of sites at the start of BBS in 1994 being proportional to BTO membership at that time (judged to be a proxy for volunteer density). Over the 25 years since the onset of BBS, further random squares are allocated within regions as the original ones are taken up by observers, at a rate dependent on the ability of the regional organiser to promote the survey and recruit participants. The surveyed BBS squares on which WCBS surveys are undertaken is a result of self-selection by a subset of current BBS participants, and also influenced by promotion from the regional organiser and the BBS National Organiser.

Additional square selection for non-BBS surveyors

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.

Unrecordable Squares

On BBS, if an allocated square is uncoverable (e.g due to access being denied or physical obstacles), recorders are invited to replace that square with another of the allocated squares within the region, ideally the next randomly-selected square in the order first generated but in practice often one of the allocated regional squares within reasonable distance of the observer's residence.

On non-BBS (BC squares) since 2019, if allocated sampling squares are unrecordable (e.g. due to access being denied), recorders have been allowed, with agreement from the National Co-ordinator, to sample the monad adjacent to it (preferentially considering the square directly to the south, then west, then north, then east). If a square and its adjacent squares are truly unrecordable then the location is removed from the sampling network.

References

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