**EuroBirdPortal (EBP) – “Corrected occurrence” maps**

Short version

These maps are derived from spatial and temporal aggregation and smoothing procedures applied to the raw data enclosed in the ‘Occurrence maps’. The procedures allow estimating bird distribution patterns in poorly surveyed areas based on information in the neighbouring squares and from the previous week (see also ‘Traces’ map). In this case, the “corrected occurrence” maps indicate the species presence frequency over a predefined area in the neighbourhood of each 30x30 square.

Long version

Bird observations and reporting activity are unevenly distributed in space (between squares), over time (between weeks) and between species. Hence, it is important to account for such variations and sources of uncertainties to derive maps with the corrected occurrence of the species.

The approach to create corrected occurrence maps is based on (1) an aggregation procedure using spatial and temporal rules to increase the sampling effort and the amount of bird occurrence information available when/where the local sampling effort is insufficient and on (2) a spatial smoothing approach to calculate the frequency of species presence over a predefined area in the neighbourhood.

1. **Estimation of an adequate sampling effort and calculation of reporting rates based on a spatial and temporal aggregation procedure**

For each species, reporting rates are calculated in each square and each week as the percentage of observations of the species relative to the total number of observations for all the species. These reporting rates are estimated at different spatial and temporal resolutions depending on the sampling effort in each square and each week. If the sampling effort is considered as sufficient, these percentages are calculated at fine spatial (30x30 km) and temporal (1 week) resolutions. If not, bird observations during the previous week and/or in the neighbouring squares are also used to calculate consistent reporting rates with a sufficient number of observations.

The total number of observations for all the species is assumed to be an indirect estimate of sampling effort. The total number of observations needed to calculate consistent reporting rates is estimated from plotting reporting rates calculated in all 30x30 km squares and during the different weeks along the year against the total number of observations in those squares and those weeks. As expected, the variability in estimated reporting rate decreases with an increasing sampling effort, i.e. with an increasing number of observations to estimate it. An adequate sampling effort is defined as the total number of observations above which the reporting rate becomes stable.

If the total number of observations in a focal 30x30 km square and during a focal week is below this adequate sampling effort, bird observations reported during the previous week and/or in squares around the focal square are added. Such inclusion of additional bird observations increases the sampling effort but decreases the spatial and/or temporal resolution at which reporting rates are estimated. In order to find the best compromise between sampling effort and resolution, this aggregation procedure is carried out in an iterative way by using a gradually increasing number of squares in the neighbourhood until the adequate sampling effort is reached. The maximum number of squares used to increase the sample of bird observations from the neighbourhood was limited within a radius distance of 120 km. In poorly sampled regions or during certain periods of the year, the adequate sampling effort is not reached using this maximum radius distance and the reporting rates are impossible to estimate.

The reporting rates calculated across a range of spatial and temporal resolutions are then allocated to each 30x30 km square and to each week (i.e. the basic spatial and temporal resolutions of the EBP demo viewer) irrespective of the spatial and/or temporal level of aggregation used for the calculation.

1. **Spatial smoothing procedure**

For each 30x30 km square and each week, the reporting rate estimated above is converted into binary species presence/absence: 1 when reporting rate is higher than 0 (presence) and 0 when reporting rate is equal to 0 (absence). It is important to note that this conversion is based on reporting rates that were previously estimated for each square and each week in a consistent way according to a spatial and temporal aggregation procedure so that sampling effort is considered as adequate to estimate species presences and absences.

Based on this binary information, the proportion of neighbouring squares with estimated species presence within a 250-km radius distance is calculated for each 30x30 km square and each week. This neighbourhood analysis allows obtaining weekly “corrected regional species frequency” maps that show species presence frequency over a predefined area in the neighbourhood.

The legend of the “corrected regional species frequency” maps is based on the following rules:

* Grey for no data (where there is less than 50% of squares with estimated reporting rates within the 250-km radius distance to apply the spatial smoothing procedure)
* Yellow-to-red gradient based on fixed classes of regional species frequency (0-10%, 10-20%, … 90-100%)