

Mapping diversity using BRAHMS 6.5

During the last year, functions have been added to BRAHMS to generate distribution summaries for taxa and based on these, to calculate diversity indices for the selected geographic scale. Results are displayed in spreadsheets and/or mapped to Google Earth, ArcView or another GIS.

For documentation on all procedures, see <http://dps.plants.ox.ac.uk/bol/documentation/Default.aspx>: Mapping > Quick Links.

Distribution calculations

By selecting a Taxa x Geographic combination on the distribution-diversity calculation form (see top right), the process creates a summary table based on the selected data sources. With Family x Country selected, the table would include one record per family-country combination together with totals and ranges for each combination (collection total, altitude range, lat/long boundaries, etc.). Similarly, the selection Species x Grid cell would create one record for each species-grid cell combination. Cell sizes can be defined.

When mapping, lat/long range values can be adjusted to area centre, origin or average. Grid cells can be plotted as polygons. Summaries can be mapped directly from BRAHMS or exported elsewhere for further analysis. An explicit export link is provided for PC-ORD for multivariate analysis.

Diversity calculations

Distribution results are further processed into a separate 'diversity indicators' table with one record for each area or cell. Each record includes totals of families, genera, species, taxa and collections/plots.

Also calculated are a Chao2 species richness estimate, a Rarity Weighted Diversity (RWD) index and the Genetic Heat Index (GHI). Chao2 estimates species richness based on the number of species that are found once, twice, and more often than twice. This formula is important as it estimates the true number of species, not the number actually found, effective when mapping diversity for areas with different collection densities. The RWD calculation (grid cell calculations only) first calculates the number of cells each taxon in a given cell occurs in. Taxa that occur in fewer cells are assigned a higher value. Finally, values are summed for all species occurring in the cell to create a cell total.

GHI values are based on a weighted species scoring system devised by William Hawthorne. These are 'bioquality' scores that can be applied to samples of species at any scale, and show the degree of localness or edemicity of the species in the sample. Each species is assigned a Star value (black, gold, green, etc.), these representing global distribution, refined by local factors such as local distribution and taxonomic relatedness. A separate BRAHMS table lists Stars and

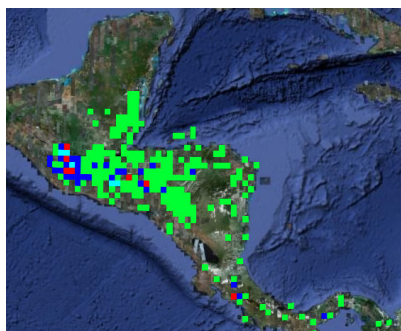
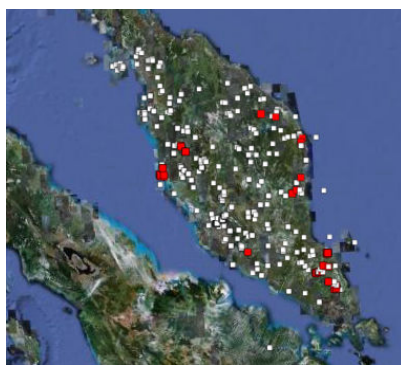
The upper part of the BRAHMS distribution-diversity calculation form.

their adjustable numeric weights, which are determined by mean global range on a degree square resolution of the species of each Star. The GHI field in the diversity table sums the species x Star-weight value per selected area, divided by the species total. Areas with many species may have a lower GHI than areas with a small number of high scoring species. Hotspots can be detected at any scale.

Google Earth mapping

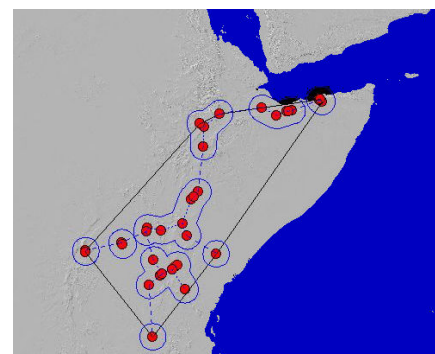
BRAHMS plots directly to Google Earth using individual points or polygons (grid cell boundaries). Colours, symbols, point size, text and labels are controlled within BRAHMS using map style setting options. Google Earth is ideal for displaying diversity analysis results at different scales.

Displayed below, records of *Vatica* on the Malay Peninsula with *V. cimeria* in red; A 1/4 degree cell map of all conifer taxa in Mesoamerica plotted as polygons, style set on Rarity Weighted Diversity, red cells with highest index values. Data from FRIM, Malaysia and A. Farjon, Kew respectively.

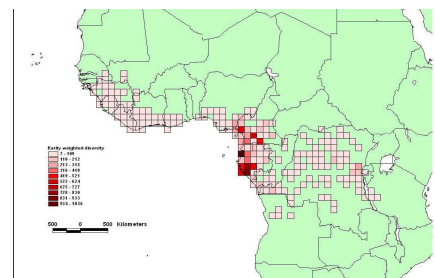


Two ArcView extensions

The Conservation Assessment Tool (CAT) ArcView extension developed by the GIS Unit, RBG Kew generates preliminary conservation assessments (IUCN Categories and Criteria) based on extent of occurrence (EOO), area of occupancy (AOO), number of sub-populations and number of locations. The species level results can be stored in a BRAHMS species link file.



Preliminary conservation assessment using CAT, for *Kalanchoe marmorata* from East Africa showing 9 sub-populations and the extent of occurrence (T. Pearce, Kew).



Anthonotha species per grid cell mapped using an ArcView extension developed at Wageningen University (J. Wieringa, Wag.)

ArcView extension download links are provided via the Mapping > Quick Links reference given in the introduction. The analysis functions discussed here have been developed in collaboration with W. Hawthorne (Oxford), J. Wieringa (Netherlands) and the GIS unit, RBG Kew.

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