**Optimising the reintroduction of a specialist peatland butterfly Coenonympha tullia onto peatland restoration sites**

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**Keywords**

Conservation translocation, peatland, lowland raised bog, habitat resources, distance-bearing, segmented regression.

**Summary**

Study of a C. tullia butterfly species reintroduction onto a peatland restoration site on Chat Moss, Manchester, UK.  The GPS coordinates of flight points and behaviour at these fight points were recorded over three flight seasons (2020, 2021, 2022).  A grid of 167 10 m x 10 m compartments was defined.  A 2 m x 2 m survey quadrat was placed at the centre of each compartment and relevant environmental factors (defined by previous studies) were recorded.  C. tullia presence / absence and the number of flight points in each compartment were defined using QGIS.

Statistical analysis was performed in R.  The biotic and abiotic environmental characteristics and the use of various plant species as resting resources were analysed. The most important predictors of C. tullia presence were identified using GLMM and logistic regression and segmented regression was used to estimate the optimal abundance of the critically important habitat resources.

The following files have been archived:

|  |  |
| --- | --- |
| File name | File description |
| Astley\_Habitat\_Dispersal\_Data.csv | Dispersal and habitat data |
| 2020-22 ChiRestPoints\_EnvStats.R | Basic environmental analysis.  Rest points analysis |
| GLMM\_Models.R | GLMMs |
| Logistic\_Plots.R | Plots and segmented regression analysis |
| Segmented\_Regression\_Demo.R | Example of segmented regression |

**Description of the data and file structure**

Description of dataset:

Data is stored in Astley\_Habitat\_Dispersal\_Data.csv

Number of rows:         472

            Each row relates to a single butterfly flight point

Number of columns:   23

Column A; DateTime

Column B; Survey\_quadrat                Compartment description

Column  C; Number                           Compartment number

Column  D; CGB\_1\_0                        Within/outside cottongrass bed

Column E; lat                                      Latitude (approx.)

Column F; long                                   Longitude (approx.)

Column G; Sphagnum\_total              % Sphagnum moss cover

Column H; Bryophytes\_mixed         % cover other mosses

Column I; E.tetralix                           % cover cross-leaved heath

Column J; E.vaginatum                     % cover hair’s-tail cotton sedge

Column  K; E.angustifolium             % cover common cotton sedge

Column  L; M.caerulea                      % cover purple moor grass

Column M; C.vulgaris                       % cover ling heather

Column N; Ev\_tussock\_count           Number of E. vaginatum tussocks

Column O; EC                                   Electrical Conductivity (μS)

Column  P; ORP                                Oxidation-reduction potential (mV)

Column Q; CGB\_Percent                  % cottongrass bed

Column R; Flt\_Season                       Flight season year

Column S; Survey\_quad                 Survey quadrat description

Column T; Polygon                            Within / outside of dispersal polygon

Column U; C.t\_FP                              Number of flight points

Column  V; Type                                Description of present / absent

Column  W; C.t\_PA                           Numeric description; present 1, absent 0

**Code/Software**

Geographical data processing was performed in QGIS

Statistical analysis was performed in R:

2020-22 ChiRestPoints\_EnvStats.R           Basic environmental analysis.  Rest points analysis

GLMM\_Models.R                                      GLMMs

Logistic\_Plots.R                                          Plots and segmented regression analysis

Segmented\_Regression\_Demo.R                Example of segmented regression