**SUPPLEMENTARY INFORMATION: Online resource 2**

Butterfly biodiversity in the city is driven by the interaction of the urban landscape and the species traits: a call for contextualised management

Landscape ecology

Clàudia PLA-NARBONA, Constantí STEFANESCU, Joan PINO, Francisco J. CABRERO-SAÑUDO, Enrique GARCÍA-BARROS, Miguel L. MUNGUIRA, Yolanda MELERO

Corresponding autor: Yolanda Melero. CREAF, Cerdanyola del Vallés 08193, Spain. E-mail: y.melero@creaf.uab.cat, Phone: +34 935814677

**Appendix 2: Multinomial discrete choice models.**

Multinomial discrete choice models, estimate the probability of a single choice (i.e. gardens in our study) to be chosen among others choices due to its specific characteristics (the landscape variables in our study), those of the non-choice and the characteristics of the choice maker (i.e. each observed butterfly) (Cooper and Millspaugh 1999). In these models, the response variable is the choice (the garden in our case) and each choice event (i.e. being present and observed in a specific garden in our study) constitutes a single sample entry; thus, the total sample size equals the number of observed individuals’ choices made.

The models assume that an individual *i* (from a total on N individuals) selects its preferred patch (i.e. gardens in our study) from a finite number of alternatives *p* = 1,…,*P*-1. Relative preference by individual *i* is modelled through the latent variables, $Λ\_{i}$= ($Λ\_{i1}$*,…,* $Λ\_{i,p-1}$*)*, which are assumed to have a multivariate normal distribution, where the chosen patch is the one with the highest value for the variable $Λ\_{i}$*:*

$$Λ\_{i}=X\_{i}β+ε\_{i}$$

where $X\_{i}$ is a (p-1) x *k* matrix of choice- and individual-specific covariates, $β$ is a *k*×1 vector of regression coefficients. $ε\_{i}$ is (p−1) × 1 vector of errors $ε\_{i}\~N(0,$ Σ) where Σ is a (p-1)x(*p*-1) positive define matrix. The response variable, $Y\_{i}$, is the index of the selected patch for the individual *i* and is modelled in terms of this latent variable, $Λ\_{i}$, via:

$$Y\_{i}\left(Λ\_{i}\right)=\{0 if\left(Λ\_{i} \right)<0 p if\left(Λ\_{i} \right)= Λ\_{ip}>0 for i=1,…,N and p=1,…, P-1$$

Where $Y\_{i}$=0 is a randomly chosen reference patch (Imai and Van Dyk 2005; Vardakis, Goos, Adriaensen and Matthysen 2015; Jenkins et al. 2019).

**References**

Cooper AB and Millspaugh JJ (1999) The Application of Discrete Choice Models to Wildlife Resource Selection Studies. Ecology, 80(2), pp. 566-575. <https://doi.org/10.2307/176635>

Imai K and Van Dyk DA (2005) MNP: R package for fitting the multinomial probit model. Journal of Statistical Software, 14, 1–32. [https://doi.org/](https://doi.org/10.1038/s41598-019-42426-0)10.18637/jss.v014.i03

Jenkins JMA, Lesmeister DB, Wiens JD, Kane JT, Kane VR and Verschuyl J (2019) Three-dimensional partitioning of resources by congeneric forest predators with recent sympatry. Nature: Scientific Reports 9:6036. <https://doi.org/10.1038/s41598-019-42426-0>

Vardakis M, Goos P, Adriaensen F and Matthysen E (2015) Discrete choice modelling of natal dispersal: “Choosing” where to breed from a finite set of available areas. Methods in Ecology and Evolution, 6(9), 997–1006. https://doi.org/10.1111/2041-210X.12404