Lepidoptera as bioindicator of the conservation degree of olive groves in the Mediterranean

Rodríguez Sousa, Antonio Alberto (antonr05@ucm.es)[1]; Rescia Perazzo, Alejandro J.[1]; Barandica Fernández, Jesús M.[1]

[1] Departamento de Biodiversidad, Ecología y Evolución: Unidad Docente de Ecología; Facultad de Ciencias Biológicas, Universidad Complutense de Madrid. C/ José Antonio Novais 12, 28040 Madrid, Spain.

Introduction

In Spain olive groves have great socioeconomic and landscape relevance because of the wide area they occupy (1.5 M ha in Andalusia region), and the proportion of population that depends economically on this crop (SSO 2014). However, these systems have been intensified or abandoned in recent years due to the rural exodus and the economic unsustainability of this crop without the Common Agricultural Policy (CAP), carrying out undesirable environmental consequences.

Materials and methods

Estepa region (Seville, Spain), was chosen as a case of study. This region presents two differents olive managements: 1) Integrated management, where is allowed the implementation of drop irrigation and the use of chemical fertilizers in a controled way; and 2) Ecological management, with organic fertilizers and rainfed regime. To analyze the influence of the agrarian management on the degree of conservation of olive groves, diversity of butterflies was studied as a bioindicator following the BMS protocol (Schmucki et al. 2016).
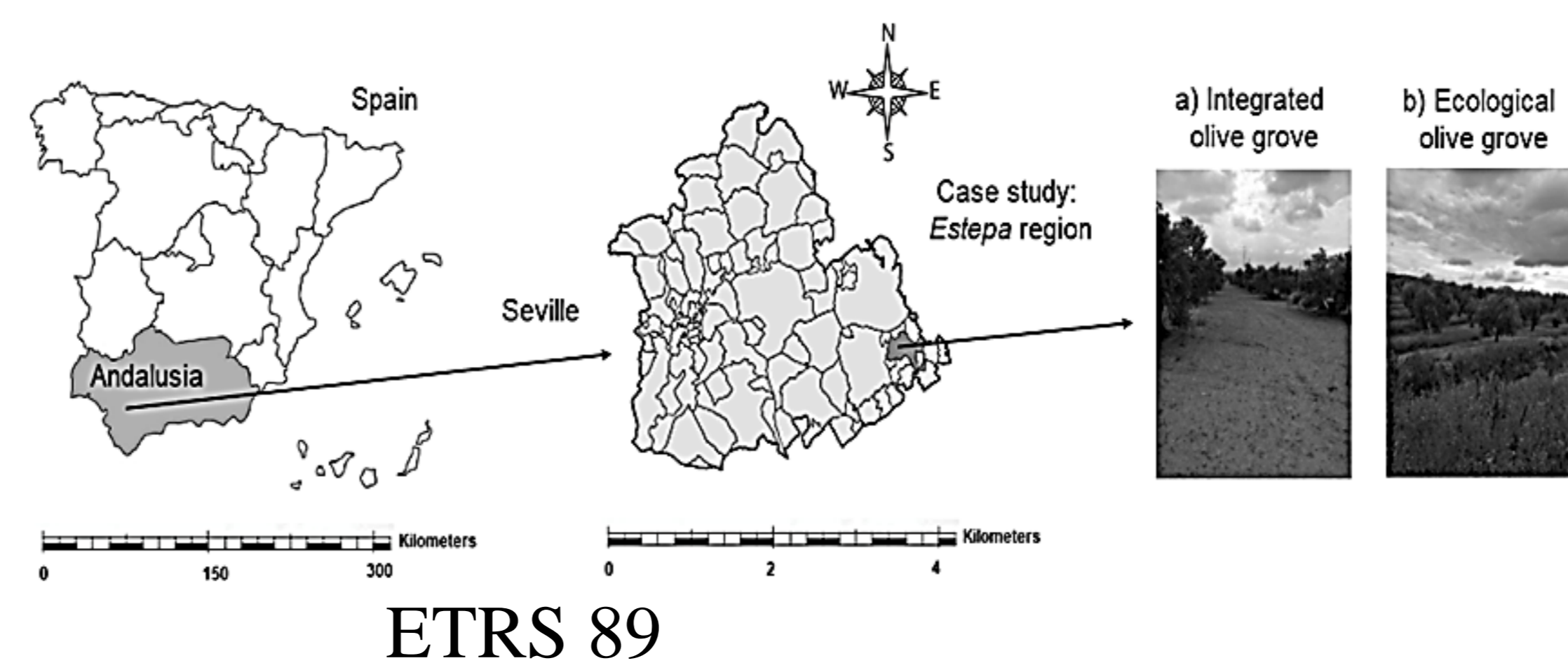

Figure 1 Geographic location of *Estepa* region.

The following indices related to the biological diversity of butterflies for olive management were calculated, also obtaining the exclusive species of each management: 1) Wealth (species): S; 2) Shannon index (bits): $H' = -\Sigma p_i \cdot log_2 p_i$, where p_i: abundance of each species.

Results

Results regarding the implementation of biodiversity indices were:

Table 1 Results about the wealth (species number), and diversity (bits) for *Estepa* region

Management	S	H´
Integrated	9	0.112
Ecological	5	0.079

Results showed, in a descriptive way, a greater richness and diversity in terms of the indicator analyzed under the integrated olive grove. On the other hand, the differences appreciated were significant through the application of a means comparison test ($p < 0.05$).

While the most abundant generalist species was *Pieris brassicae* (L. 1758; Fam. *Pieridae*), integrated olive grove showed 4 exclusive species:
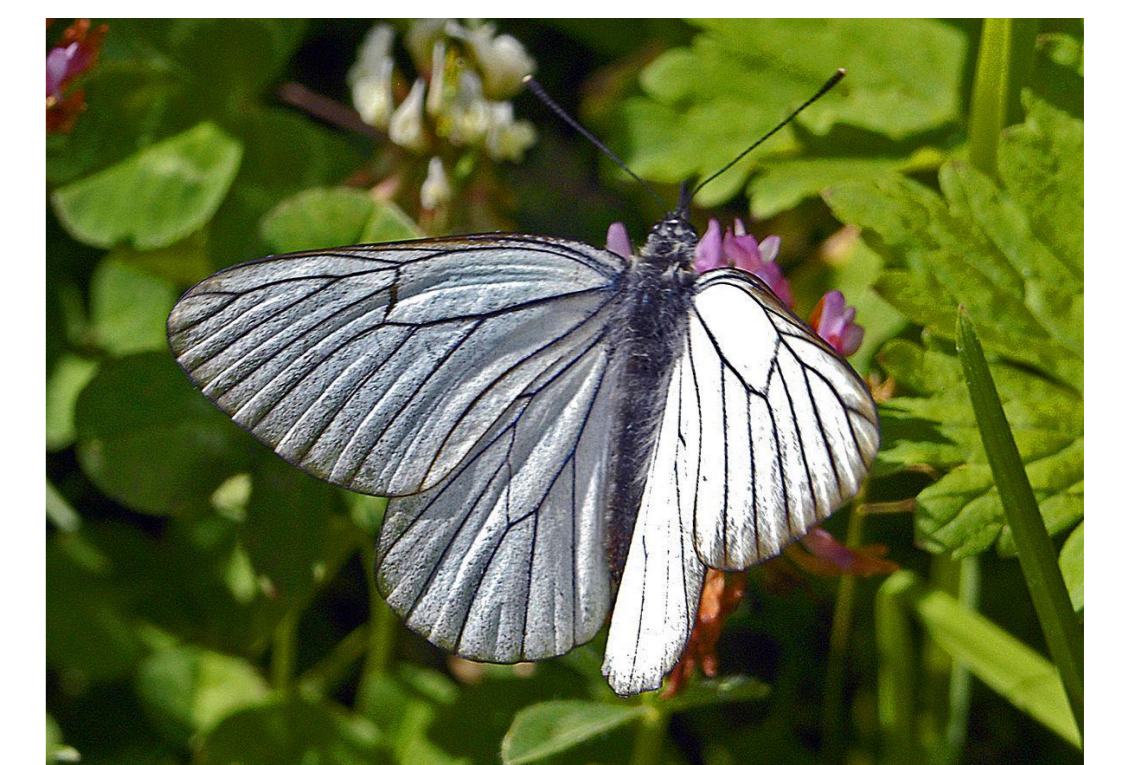

Maniola jurtina (L. 1758) Fam. *Nymphalidae*
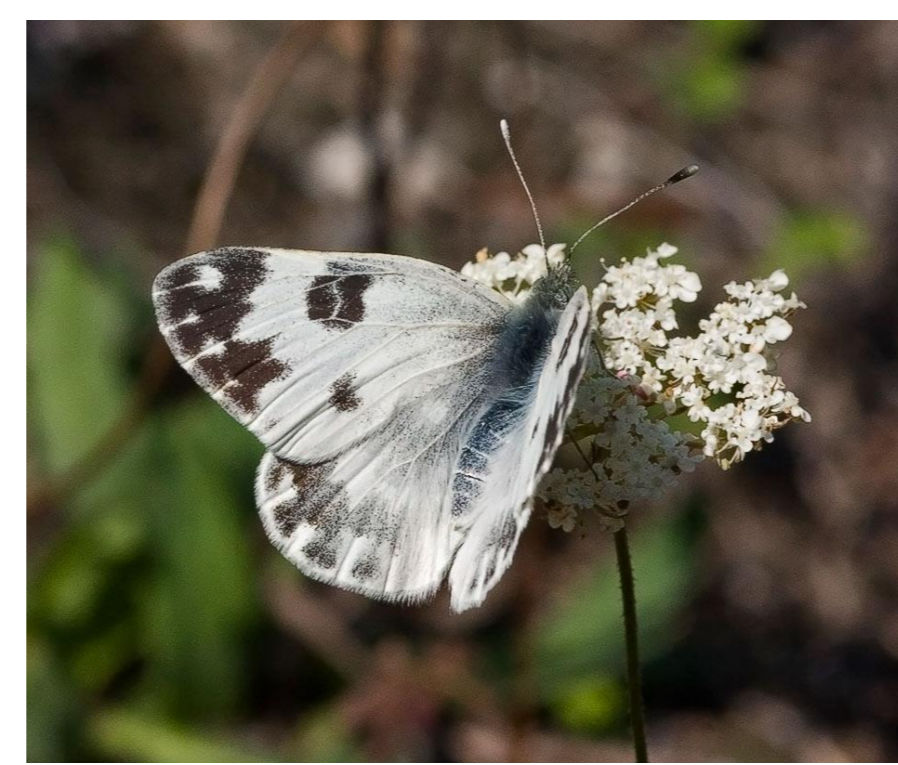
Pontia daplidice (L. 1758) Fam. *Pieridae*

Callophrys rubi (L. 1758) Fam. *Lycaenidae*

Aporia crataegi (L. 1758) Fam. *Pieridae*.

Discussion & Conclusions

Given that presence of *lepidoptera* in olive groves can be affected by several factors such as diffuse contamination (nitrogen, phosphorus and potassium among others), and farming practices, this group is consolidated as one good bioindicator of the olive grove quality (Scandurra et al. 2016). Considering that organic practices are more respectful with the environment, it is logical to expect a greater richness of lepidoptera under the plots with this management, however, the greatest richness of butterflies observed at integrated olive groves plots with agrochemicals may be due to the ecological plots of the *Estepa* region are in a conversion phase.

References

Scandurra A, Magliozzi L, Fulgione D, Aria M, D'Aniello B (2016) Lepidoptera Papilionoidea communities as a sentinel of biodiversity threat: the case of wild boar rooting in a Mediterranean habitat. J Insect Conserv 20(3): 353-362. https://doi.org/10.1007/s10841-016-9863-0

Schmucki R, Pe'Er G, Roy DB, Stefanescu C, Van Swaay CA, Oliver TH, Kuussaari M, Van Strien AJ, Ries L, Musche M, Carnicer J, Schweiger O, Breretom TM, Harpke A, Heliölä J, Kühn E, Julliard R (2016) A regionally informed abundance index for supporting integrative analyses across butterfly monitoring schemes. J Appl Ecol 53(2): 501-510. https://doi.org/10.1111/1365-2664.12561

SSO (Spanish Statistical Office) (2014) Agriculture and environment. Available from: https://www.ine.es. Accessed 27 October 2018.