TRANSYLVANIA DISSERTATION/THESIS PROJECT

TR93 Butterfly communities as indicators of habitat change

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In Europe, agricultural landscapes often possess great conservation value. The European Environment Agency (Stoate *et al*. 2009) has estimated that 50% of all species in Europe have some reliance on agricultural habitats, including species considered threatened by the IUCN (2014). This is partly due to the wide spatial extent of agricultural land in Europe, but also because of the region's long history of low intensity farming practices which have allowed species-rich farmland communities to develop gradually over time (Stoate *et al*. 2009).

The conservation value of low intensity farming areas has been recognized by European agricultural policy since the 1990s. The term 'High Nature Value farmland' (HNVf) was coined at this time to define areas where predominantly agricultural landscapes overlap with either a high diversity of habitats and species, or where these landscapes support a species of particular conservation importance, or both (Lomba *et al*. 2014). Across Europe, the maintenance of High Nature Value farmland and its important biodiversity is usually dependent on the continuation of traditional farming practices (Henle *et al*. 2008). These traditional practices are, however, in sharp decline due to drivers in recent EU agricultural policy, and this is contributing to a concordant decline in farmland biodiversity. Three key trends are typically associated with the loss of traditional farming practices: intensification of agriculture, increasing scale of agricultural operations and abandonment of agriculturally marginal but High Nature Value farmland (Henle *et al*. 2008).

Environmental changes can be identified using bio-indicator species or communities. Commonly the indicators are species or assemblages which have parameters (biochemical, physiological, ethological or ecological) that describe very precisely the state of the environment, indicating their natural or anthropogenic changes. Several ecological characteristics make butterflies promising biodiversity indicators: easy to survey, intensely studied, worldwide distribution well documented, they represent a dominant fraction of biodiversity and, more important, they are sensitive to many environmental changes, natural or atrophic (Settele *et al.*, 2008). Consequently, monitoring the change in abundance and assessing the distribution of butterflies has been suggested as a potential tool for assessing large-scale biodiversity trends (Settele *et al.*, 2008).

In the Tarnava Mare Natura 2000 site we are monitoring these biodiversity trends using butterflies as indicators, in a region that is characterized by low-intensity land use practices which have created a mosaic landscape capable of sustaining high diversity and having high conservation value for both grasslands and also arable land (Loos *et al*., 2014). Nowadays the land use practices are changing and the biodiversity from this area is threatened, mainly due to land abandonment and agricultural intensification (Akeroyd & Page, 2011).

In 2013 through to 2018 we surveyed the butterfly species richness and abundance by using standardized "Pollard walks" in different types of habitat (High Nature Value grasslands, grasslands of lesser nature value, abandoned land, scrubland and farmland). The walks are located around 7 villages in the Târnava Mare region. All standardized walks are 50 meters in length and are

completed in 5 minutes. During the walks every individual butterfly within 5 meters (to either side and above) is identified and counted. The surveys take place between 10am and 4pm when butterfly species are most active. Counts do not take place in windy or rainy conditions.

The same sites and villages from 2014 to 2018 will be studied in 2019. These data will allow us to identify to what extent the changes of land abandonment and agricultural intensification may be affecting the butterfly communities. Students undertaking this project topic can use the butterfly survey data along with land cover mapping data that is also being produced to investigate whether certain butterfly species have particular habitat associations. Alternatively, a student could assess whether any species of butterfly can be used as indicators of High Nature Value grassland, using the butterfly survey data and data collected by the botany team.

Photograph: James O'Neill

Recommended Reading

Culbert, Patrick D, et al. (2017), 'Legacy effects of past land use on current biodiversity in a low-intensity farming landscape in Transylvania (Romania)', *Landsc. Ecol.*, 32 (2), 429-44.

Hanspach, Jan, et al. (2016), 'Characterizing social-ecological units to inform biodiversity conservation in cultural landscapes', *Divers. Distrib.*, 22 (8), 853-64.

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Lang, Andreas, et al. (2019), 'Monitoring environmental effects on farmland Lepidoptera: Does necessary sampling effort vary between different bio-geographic regions in Europe', *Ecol. Indic.*, 102 791-800.

Loos, Jacqueline, et al. (2014), 'Low-Intensity Agricultural Landscapes in Transylvania Support High Butterfly Diversity: Implications for Conservation', *PLoS One*, 9 (7), e103256.

Loos, Jacqueline, et al. (2015), ‘Challenges for biodiversity monitoring using citizen science in transitioning social-ecological systems’, *J. Nat. Conserv.*, 26 45-48.

Loos, Jacqueline, et al. (2015), ‘Changes in butterfly movements along a gradient of land use in farmlands of Transylvania (Romania)’, *Landsc. Ecol.*, 30 (4), 625-35.

Osvath-Ferencz, Marta, et al. (2017), ‘Population demography of the endangered large blue butterfly *Maculinea arion* in Europe’, *J. Insect Conserv.*, 21 (3), 411-22.

Pecsenye, Katalin, et al. (2017), ‘Regional pattern of genetic variation in the Eastern Central European populations of *Euphydryas maturna* (Lepidoptera: Nymphalidae)’, *J. Insect Conserv.*, 21 (2), 171-81.

Szentirmai, Istvan, et al. (2014), ‘Habitat use and population biology of the Danube Clouded Yellow butterfly *Colias myrmidone* (Lepidoptera: Pieridae) in Romania’, *J. Insect Conserv.*, 18 (3), 417-25.