

EARTHWATCH INSTITUTE FIELD REPORT

Project Title: Land-use Change: Orchid and Butterfly Populations in the Hay Meadows of the Picos de Europa, Spain

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Research Site: The Deva Valley, Picos de Europa, Spain

Local Management Status of the Research Site(s) (e.g. National Park, RAMSAR Site, World Heritage Site, IBA etc.): National Park

Key Research Objectives:

The appraisal of changes in land-use in a valley of the Picos de Europa and its impact on butterflies and orchids:

- Distribution studies of butterflies in meadows and tracks
- Comparison of relative abundance of butterflies in hay meadows
- Continuing floristic studies of hay meadows in the orchid/butterfly study area
- The gathering of socio-economic data from landowners, local authorities and businesses
- Further capture of information for a digital map of the study area

Date this report was completed: 4 January 2006

Data Collection and Results

a) Give a concise account of the data you have collected during the past field season.

We carried out butterfly transects to provide additional data on the species of butterfly in our study area and to make comparisons of butterfly density in areas under different management

In previous year's work we identified butterfly species that might be vulnerable to land-use change in our study area. Because these species were not widely distributed and were in low numbers we contracted the study area slightly and carried out intensive mark-release-recapture on: the scarce copper, the sooty copper, the lesser-marbled fritillary, the pearl-bordered fritillary and the small pearl-bordered fritillary. We also worked on the marbled white to act as a 'control' organism as it is widely distributed in the study area and found in substantial numbers.

We continued monitoring the permanent orchid quadrats set up in 2004.

We carried out further interviews with data holders of interest for our socio-economic study (regional department of agriculture, library of the University of Cantabria, local personalities, local archives).

We continued to refine our digital map data to act as a host for the display of our spatial information and to generate area and distance data for our analysis of butterfly and orchid results

b) What progress have you made towards achieving your original objectives?

We have made steady progress towards our original objectives, but have modified our work programme in the light of field realities. After completion of the fieldwork in 2005 we finally got the 3-D model of our study area up-and-running – this is significant, as this aspect of our GIS work was holding up data analysis and consequently publication of our data.

c) Please provide a summary of your results (even if they are preliminary).

- **Distribution studies of butterflies**

In 2005 the general distribution/species richness study was a less important component of the work than in 2004; nevertheless, data was collected on 72 species in 30 meadows and 8 tracks.

- **Mark-release recapture of butterflies**

Over the field season the teams marked 1120 marbled white butterflies, 179 scarce coppers, 147 generation I sooty coppers and 73 Generation II sooty coppers, 144 small pearl-bordered fritillaries, 141 pearl-bordered fritillaries and 154 lesser marbled fritillaries (as well as a number of other species which were either present in too few numbers to be useful or were subject to problems with identification). Of the useable species the total marked over the season was a staggering 1958 individuals.

- **Orchid permanent quadrats/floristics**

The orchids in the meadows above Fuente De have been surveyed in each of the three years of the project to discover where different species of orchids are found. The different species were mapped onto a hand held computer and these maps have been used to see if there are any patterns in the data. It is obvious that some meadows are much more important than others for the overall populations of orchid species. Meadows that are good for one species tend to be good for several species whereas bad meadows have no species. As expected the meadows at higher altitude flower later than the meadows lower down. Over the altitude range in the meadows the difference in flowering date is about two weeks and flowering date varies from one year to the next.

The presence of animals can have a large effect on the number of orchids flowering. In one of the most floristic meadows in 2004 over-wintering cattle had trampled the

ground so much that there were almost no plants flowering in 2005. Whether this will be a long-term effect is not yet known.

Detailed plots were set-up in 2004 and revisited in 2005. The aim is to follow individual plants through their lives to see how many times they flower and how successful they are at producing seeds. Orchids can be long-lived plants, 20 years is not uncommon so the plots will need to be revisited in the coming years. By doing this over a number of years it will be possible to work out if the populations are growing, are stable or are shrinking. The ultimate aim is to see if the populations are being affected by changes in land-use as the farming practices in the area change.

- **Socioeconomics**

The emphasis this year was on the collection of data from agencies such as the Agriculture department of the Government of Cantabria, local archives and from local personalities. This data will be used to ‘flesh-out’ the farmer/tourist/enterprise data collected in 2003 and 2004.

- **Digital map**

Some boundary and track data were added to the digital map to make it as accurate as possible. An example of how the mapping, together with the 3-D model of the landscape and aerial photography, will be used is given below. Figure 1 is an image of male marbled white butterfly movements in the study area in 2005 superimposed on a 3-D model of the landscape with the 2001 aerial photograph ‘draped’ over it. The geographical coordinates of the butterfly movement data were calculated from the digital map of the study area (which is not displayed here). This 3-D image not only allows us to calculate ‘real’ movement distances where there is topographical variation but is also easier to interpret than a standard 2-D image (figure 2).

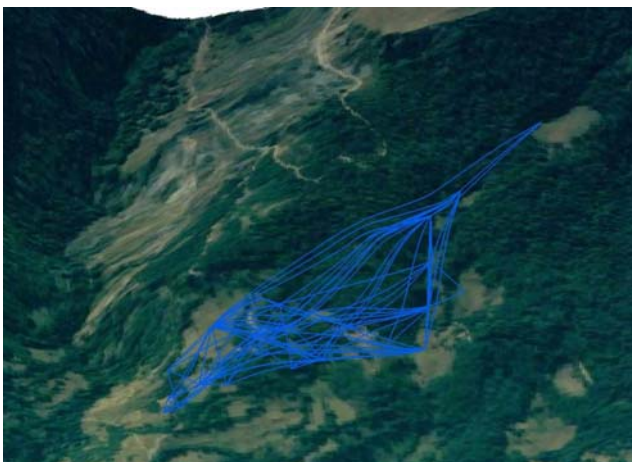


Figure 1 3-D image of male marbled white movements in 2005, Fuente de.



Figure 2 2-D image of male marbled white movements in 2005, Fuente de. Grey areas = mapped meadows

Significance/Benefits of Research

a) What is/are the significance/benefits of your research at the following levels?

- local (in the area of the research site)

The research outcomes will support the National Park in its management planning, and as such will provide an important resource. Our permanent monitoring stations will be particularly valuable in this respect (we anticipate that the orchid monitoring will continue).

- national

The data we are collecting on land use change and impacts on the biota will have applicability wherever there are hay meadows in Spain, but more generally as a case study in the impacts of changing socioeconomic drivers on biodiversity.

- international

Hay meadow management is not restricted to Spain but is transcontinental (e.g. found throughout Europe and in the USA). In many places traditional hay meadow management has been abandoned in favour of more production oriented intensive practices with consequent loss of biodiversity. Nevertheless some countries have hay meadows which retain high ecological value: but almost everywhere they are under pressure: whether they are the few remnants in the UK, or the more extensive meadows of the new accession countries in the EU. The project data have relevance wherever there are hay meadows and will help to inform both national and international agri-environment policies.

b) How do your findings contribute to issues of sustainability?

The traditional hay meadow system is essentially a sustainable one providing a landscape with high biodiversity, coupled with sustainable agricultural products such as beef, milk and cheese. However, the system was developed under a different economic model to that currently in operation: the local populace now has access to global markets (e.g. food, tourism), but at the same time the local production must compete with those global markets. Systems which are sustainable economically may not be the same as those which are ecologically sustainable. **We hope our work, which integrates socioeconomics and biodiversity, will lead to the identification of a mechanism which will reconcile economic and ecological sustainability.**

Dissemination of Results

a) Have you provided details of results from your research to or within:

- Scientific papers (indicate status; e.g., peer reviewed or in progress/press)

Work is currently in progress on analysing the butterfly data following the delay in getting the 3-D model working and we hope to have at least one paper submitted by the end of 2006. We have set up an analysis programme for the socioeconomic data (one of the Spanish students has applied for a stipend from the Complutense University Madrid to

help in the analysis) and we hope to submit at least one paper from this part of the study in October 2006.

- Management plans and reports (in progress or completed)
- Presentations (given or planned)

The lead PI gave a presentation on 'Landscape influences on butterflies' at an international meeting of butterfly ecologists in Leipzig in December 2006 and included preliminary analyses from the project in the presentation. A very general abstract (which does not mention the specific detail in the talk) was published as:

Dover, J.W. (2005) Landscape influences on butterflies. In: E. Kuhn, J.A. Thomas & J. Settele (eds) *Studies on the Ecology and Conservation of Butterflies in Europe Volum, 1: General Concepts and Case Studies*, pp. 9-10. Pensoft Publishers, Sofia-Moscow

The lead PI is giving a public presentation in the Picos de Europa by invitation of the Picos de Europa National Park in July 2006. The public event (which includes other butterfly ecologists) will be followed by a closed session with National Park staff to discuss how butterfly conservation can be progressed in the park.

The project team are also giving a poster presentation at a Joint Conference called by the British Grassland Society, the British Ecological Society and the British Society of Animal Science on: High Value Grassland: providing biodiversity, a clean environment and premium products. 17 to 19 April, 2007 Venue: University of Keele, UK.