



EcoVitis

Maximizing ecosystem services in Douro Demarcated Region vineyards

Newsletter

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Project update

The EcoVitis project has developed over three years in six properties of the Douro Demarcated Region: Aciprestes, Carvalhas, Casal da Granja and Cidrô from Companhia Geral da Agricultura das Vinhas do Alto Douro, S.A. and Arnozelo and S. Luíz from Sogevinus Quintas S.A. The main effort has been on the identification of potential ecological infrastructures already existing on the properties, and assessing their merits for a habitat management strategy that will maximize the ecosystem services provided in vineyards. The work is progressing beyond enhancing biological control of the European Grapevine Moth (EGVM), *Lobesia botrana*, to the use of endemic plants to provide other ecosystem services. These include aesthetic values and the conservation of biodiversity. A framework was first developed by a landscape analysis mapping the main features of each property within a geographic information system (GIS). This required creation of maps with a common land use database, for each property. A detailed inventory was made of key species of plants, fungi, arthropods, birds, bats and small vertebrates, to better understand their role in the vineyard ecosystem. Using the landscape-level information, we are currently identifying practices to conserve or enhance biological diversity in and around the vineyards. On the basis of experimental results and other work, information was provided to landowners concerning the native plant species that can be planted at each site, so as to enhance ecosystem services in the vineyards. Some 2,500 plants that were selected according to these guidelines were cultivated in a nursery and are now being planted in the vineyards. The plants are being monitored for their suitability for vineyards as well as the ecosystem services provided. Other recent progress includes the development of biodiversity trails, currently at Carvalhas. These will allow visitors to experience the relationship between the winemakers and the environment, offering them the opportunity to tour the unique landscape that exists in Douro Demarcated Region. We look forward to welcoming you on our trails when you are next in the Douro Valley!



Erysimum linifolium (Pourr. ex Pers.) J. Gay, an endemism of the Iberian northwestern quadrant

Environmentally safe strategies to control the European Grapevine Moth, *Lobesia botrana* in the Douro Demarcated Region

One major objective in the EcoVitis project is to promote a habitat management strategy for Douro Demarcated Region vineyards, with a primary emphasis on enhancement of biological control of the European Grapevine Moth (EGVM), *Lobesia botrana* (Den. & Schiff.), but which can also produce other ecosystem services. To ensure an effective and sustainable control strategy against this key pest of vineyards, we are maximising the potential for biocontrol by increased use of pheromone-based mating disruption (MD) rather than insecticides. We began by evaluating the role of non-crop plants as a source of beneficial insects in vineyards, at a landscape scale in several properties. Initially, experimental plots were established to identify parasitoids of EGVM's on the properties of the project, and to relate the landscape structure to populations of these beneficial species. We found that 94.4% of the parasitoids collected were only from three species: a eulophid *Elachertus affinis* (Masi) (80.8% of the total), as well as an ichneumonid *Campoplex capitator* (Aubert), and a braconid *Ascogaster quadridentata* (Wesmael). Estimated rates of parasitism were as much as 46.4% in the Aciprestes site and 33.9% in Carvalhas, in the first generation of EGVM annually. Parasitism was correlated with biodiversity measurements (Shannon index) at each site, showing that increasing diversity in landscapes led to increased parasitism of the pest insects. We are now evaluating if it is possible for landscape-related biological control to reduce EGBV below the economic threshold for pesticide use, perhaps by integrating natural parasitoids with natural entomopathogens, also under study in the project. Experiments to improve use of MD technology against the EGVM are also in progress, primarily with novel dispensers of pheromone (ISONET-LTT, Shin-Etsu Chemical Co.). The results are raising new ideas concerning the variable results that occur in some sites or seasons owing to terrain, the heterogeneity of plots and their different shapes, or wind patterns, and are being analyzed with international colleagues.



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European Grapevine Moth is a key pest of the vineyards which causes damages to grapes, through the feeding activity of larvae and by promoting the development of botrytis



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In the EcoVitis project, we are testing a new mating disruption dispenser, ISONET-LTT, for use in the control of European Grapevine Moth



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European Grapevine Moth larvae parasitized by *Elachertus affinis*, the main natural enemy of this pest, and adult of the parasitoid



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Spiders are common predators of insects found in vineyards and are known to help in pest control

Natural flora and vegetation

Detailed knowledge of the on-site flora across various scales is essential for the understanding and characterization of biodiversity, so as to understand the role of plants as structural elements and as supporting ecosystem services. Building on previous work, we launched a new field campaign to study the plants and ground cover of all six sites within the EcoVitis project in May 2013. The large area concerned, about 1,247 ha, requires a concentrated effort in the spring and summer months (March-August), which corresponds with the flowering season of most species, but also requires some continuous effort for the duration of the project. The main tasks are to assess in situ the flowering plants at each farm, and any patches of natural vegetation, to characterize the different types of vegetation, identify specific vascular plant communities with value for conservation, and to compare the results with suggested “Natura 2000” habitats. To achieve these objectives, phyto-ecological inventories and collections of plant material are underway, so as to identify and prepare definitive herbaria for each farm (with associated data from collection sites), and for inclusion in the herbarium at UTAD. Significant taxa, such as those indicative of specific communities, endemic and other important species for conservation, are also being marked and geographically referenced. In addition, the collecting of bryophyte species has begun; a task that was not originally planned but that will be an important asset in the knowledge of local biodiversity.

The results obtained for the flora and vegetation studies will be critical in explaining other data being gathered from fungi, arthropods, birds, bats and small vertebrates, and compiled within a Geographic Information System. The results will lead to better understanding of the distribution of biological diversity in Douro Demarcated Region and will indicate the most important areas for conservation and on which to concentrate biologically, for enhanced ecological services.



© M. Martins / UTAD

The herbaceous layers of natural vegetation in our six sites, include several endemic species of the North of Portugal, namely from the Douro Valley, such as *Digitalis purpurea* subsp. *amandiana* (Samp.) Hinz. (endemism of the basins of the rivers Douro and Tua)

Dragonflies, bats and birds: key elements of biodiversity



© D. Carvalho / UTAD

The European Pied Flycatcher, *Ficedula hypoleuca* (Pallas), is known to suppress insects that are harmful to crops

There are relatively few inventory and ecological monitoring studies of vertebrate species in Portugal outside of Protected Areas (PA) and Sites of Community Importance (SCI), resulting in relatively little information being available on vertebrates in other situations. The present study is very important to increase awareness of biodiversity in the Douro region (World Heritage Site), but also in contributing to better knowledge of how such animals are a part of vineyard ecosystems, particularly for rare species or those with threatened status of conservation. We aim to develop landscape management policies that optimize all of the resources, and which are integrated into an appropriate strategy for the conservation of species and important habitats.

Ecological monitoring being carried out by the Laboratory of Applied Ecology (LEA) in the six farms of the EcoVitis project has identified 23 species of Odonata, as well as 12 species of bats and 62 bird species. These represent a significant portion of the total diversity of such species occurring in Portugal. Early results of the species that are found in each farm show a relatively heterogeneous distribution across farms at various points, owing to the complexity of habitats present.

Lav Sharma's research helps in developing a sustainable control strategy against the European Grapevine Moth, *Lobesia botrana*

Lav's PhD research aims to evaluate the diversity and features of locally native entomopathogenic fungi as biological control agents against *Lobesia botrana* (EVGM). This has three main tasks: 1) isolation and bioassays of toxicity of entomopathogens; 2) analysis of population genetics using molecular approaches, and 3) analysis of distribution of entomopathogens using GIS. Many isolates were found in the study vineyards, especially those of the genus *Beauveria*, and which are important entomopathogenic fungi, worldwide. A few isolates of *Metarhizium* and *Cordyceps* were found so far, and identifications are continuing. Concurrent molecular identifications and toxicity bioassays are in process.



Lav Sharma, PhD student, assessing the infection spectrum of his isolates of entomopathogenic fungi

A Journey through the Native Flora of the Douro Region



Visitors enjoying the field trip and observing plants and animals at Quinta das Carvalhas



Polypodium interjectum Shivas is an eurasian paleo species occurring in Quinta das Carvalhas

To celebrate the "International Day of Biological Diversity" on May 22, an "Open Day for Biodiversity", and "A Journey through the Native Flora of Douro" occurred at Quinta das Carvalhas, sponsored by Companhia Geral da Agricultura das Vinhas do Alto Douro, S.A. The purpose was to promote the dissemination of biodiversity conservation and of practices related to sustainable wine tourism. It included a botany field trip led by António Crespí and Mónica Martins from UTAD, as well as technicians from ADVID and from Companhia Geral da Agricultura das Vinhas do Alto Douro. During the field trip, stops were made at key points along the trail, in order to observe the fragmentation and organization of the landscape for different land uses, of specific sites that were created or enhanced with specially selected plants in gardens or paths, and of areas set aside for production of grapevines or of natural vegetation. To support the interpretation of the new areas and of vineyard plants for future participants, a small field guide was developed. It includes information on about 40 taxa, primarily endemic species which convey important information about the evolution, paleoclimatology and natural history of the Alto Douro Wine Region. The flora and associated ground cover vegetation are typical of the Neogene period, and so possess great value for conservation efforts.

Workshop “Maximizing ecosystem services in vineyards”

A Workshop was held at the University of Trás-os-Montes and Alto Douro (UTAD), on 13 and 14 November 2013, discussing a multidisciplinary solution to maximize ecosystem services in vineyards, within the EcoVitis project. Presentations were made by winegrowers, technicians and researchers from the project, and by two invited speakers: Dr. Andrea Lucchi from the University of Pisa and Dr. Piero Bianco from the University of Milan. Their presentations focused on innovative strategies to protect vineyards against the disease “Flavescence dorée” and on observations of vineyard biodiversity as related to ecosystem services provision. The workshop concluded with a visit to Quinta das Carvalhas, one of the most emblematic Quintas in the Douro, to observe activities occurring in the EcoVitis project. Some two hundred and fifty people attended this successful Workshop, and the level of participation showed the timeliness and value of the project for the region.



Audience at the "EcoVitis Workshop" held in UTAD on November 13th



Visit to Quinta das Carvalhas on November 14th

Leaflet “Infra-estruturas ecológicas. Guia de instalação de comunidades vegetais” available

A publication of the EcoVitis project is available as an illustrated leaflet and on our website: “Infra-estruturas ecológicas. Guia de instalação de comunidades vegetais”. It provides guidelines to local winegrowers concerning native plant species that can be planted at different sites according to the soil, climate, and other characteristics that are site-specific. A set of 39 species is presented, including herbaceous plants, shrubs and trees, with descriptions of their value in providing various ecosystem services. These include enhancement of biodiversity for associated species, of biological control of pests, of colour or shape for attracting interest to the sites, and for ecotourism.



EcoVitis on-line

The latest EcoVitis updates are now available on-line. Go to www.ecovitis.utad.pt to read our latest news, previous EcoVitis newsletters, and various scientific publications from the researchers in the project. The site is regularly updated to ensure you're kept in touch with events and research findings.

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Participating properties

Quinta das Carvalhas (RCV)
Quinta de Cidrô (RCV)
Quinta de S. Luíz (SGV)
Quinta do Arnozelo (SGV)
Quinta do Casal da Granja (RCV)
Quinta dos Aciprestes (RCV)

Weblinks

<http://www.ecovitis.utad.pt>
[http://europa.eu/legislation_summaries/agriculture/
general_framework/l60032_pt.htm](http://europa.eu/legislation_summaries/agriculture/general_framework/l60032_pt.htm)
<http://www.advid.pt/>
<http://www.citab.utad.pt/>
<http://www.realcompanhiavelha.pt/>
<http://www.sogevinus.com/>
<http://www.utad.pt/>

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Natural vegetation provides shelter and food (nectar and pollen) for natural enemies of pests



Some adults of arthropods feed on nectar and pollen. In the image an adult female of the syrphid fly *Eupeodes corollae* (Fabricius) is foraging on a *Cistus ladanifer* L. flower



The stone walls are important infrastructures where the fauna can find shelter