

# A small butterfly in a small country: Monitoring and management of *Lycaena helle* in the Luxembourgish Ardennes

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## Introduction

Thanks to the efforts of the Luxembourgish "Groupe de travail pour l'étude des Invertébrés", we have reliable data on the distribution of *Lycaena helle* in Luxembourg in the 1980s. Unfortunately the efforts were not followed up and the data is limited to random observations; no systematic monitoring of the species has been carried out before the LIFE project. Since the violet copper is on the appendix II and IV of the habitat's directive and classified as endangered on the European and Luxembourgish Red List, it is a species of uppermost importance. More so, through its role as an umbrella species of the mountainous wet habitats.

Being a surrogate species of wetlands in the Luxembourgish Ardennes, *Lycaena helle* has been selected (beside two bird species) as target species for the LIFE Eislek project. This inconspicuous butterfly has a size of only 24-26mm and is very sedentary. As a relict species of the postglacial area, it has withdrawn to colder, in Western Europe only mountainous, areas. Here, *Polygonum bistorta* is its only host plant. Besides the high prevalence of the host plant, the habitat is defined by high solar radiation and wind protection through hedges or trees. 5-7 morphologically and genetically defined subspecies have been identified. The subspecies in our region is called *arduinnae* and restricted to the Ardennes (BE), Eifel (DE), and Eislek (LU).

*Lycaena helle* is endangered by the loss of its habitat: the intensification of agriculture (pesticides, fertilisation, removal of structures), fragmentation, the disappearance of wet meadows through drains and spruce plantations, natural succession on fallow land and eutrophication through bad water quality.

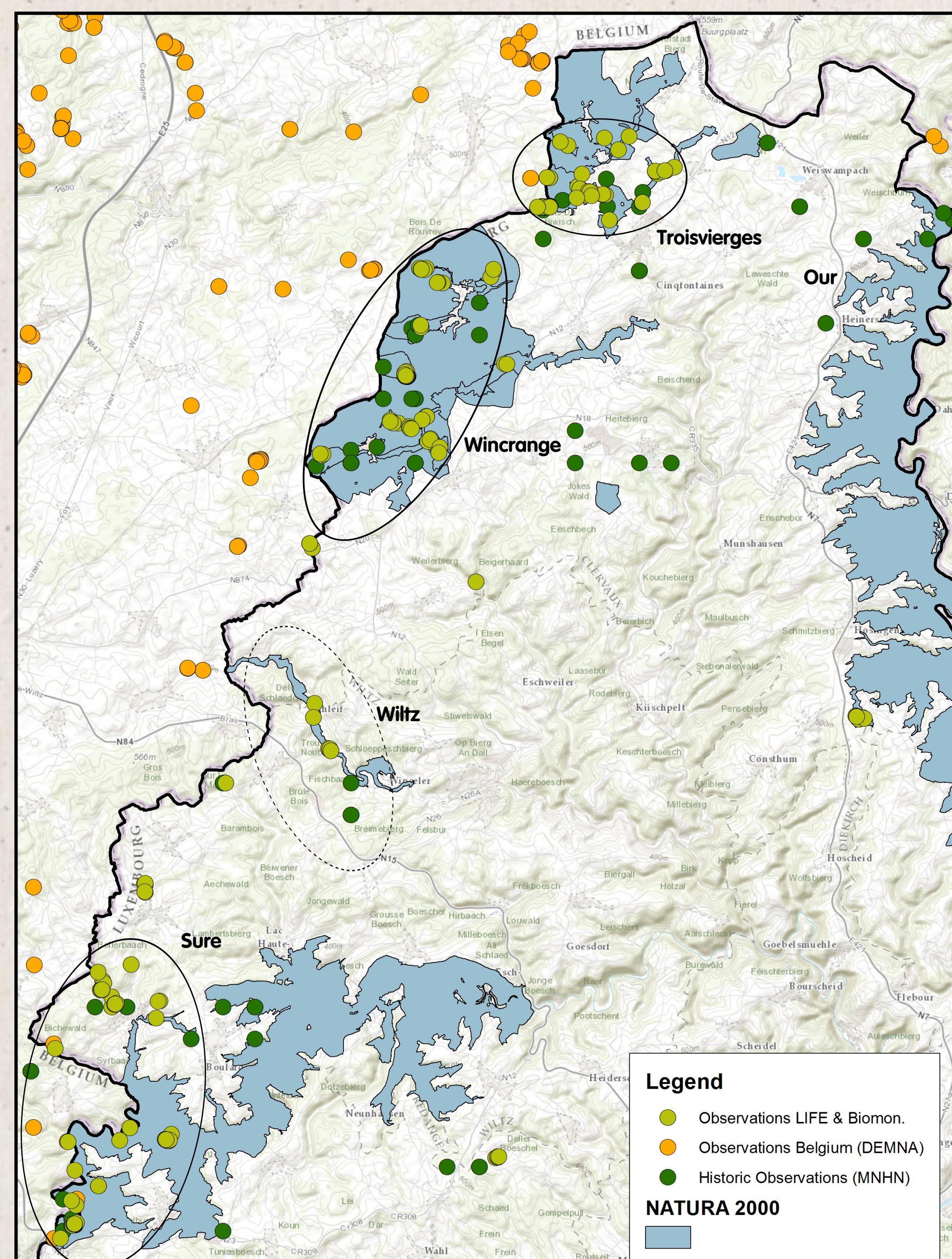
## Materials and Methods

Monitoring has started as part of the LIFE Eislek project (2012-2017) throughout the species' distribution range in the Eislek region (Luxembourgish Ardennes). Since the biology and requirements of *L. helle* have been sufficiently studied and its presence in the neighbouring regions is well known, our data will complement the work of other conservationists.

- The monitoring for LIFE took place in 2012-2015 during the months of May and June.
- In a first phase, the available habitats were identified by analysis of historic data and aerial images followed by field visits to control for the presence of *Polygonum bistorta*.
- Only the images were recorded and only during good weather conditions (sunshine, no wind) between 10.00 and 16.00 o'clock by zigzag transects with a stay of at least 30min in each habitat.
- The emphasis was on the NATURA 2000 network, but also interconnectivity between hotspots.
- Biomonitoring by LIST (Luxembourg Institute of Science and Technology) has started in 2010 on defined transects / sites throughout the country.
- Analysis of historic (MNHN) and biomonitoring data (LIST).

## Results

*Lycaena helle* is a very inconspicuous butterfly species, therefore data based on random observations only provide a very limited overview on its distribution range. The national biomonitoring (initiated by the Plan National pour la Protection de la Nature) but even more intensively LIFE Eislek have systematically monitored the suitable habitats of *L. helle* in Luxembourg in the past 5 resp. 3 years.



**Map 1.** Distribution of *Lycaena helle* in Luxembourg with its three hotspots: Troisvierges, Wincrange and Sure. A comparison between the historic data and the new observations made for the LIFE project (2012-15) and national biomonitoring (LIST, 2010-15) shows the regression of the most eastern and isolated populations. The remnants, isolated on the edge of its range, are probably not viable in the long term. Successful protection of the population depends on an interregional perspective on the population (origin of Belgian information: SPW-DC03-DEMNA).

## Literature

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*Lycaena helle* male



*Lycaena helle* female



*Lycaena helle* lower wing surface



*Lycaena helle* caterpillar



*Lycaena helle* habitat

The observations were introduced into a GIS mapping tool. An analysis of the data reveals the following results:

- Since 2010, the number of known *L. helle* sites has doubled.
- There are three hotspots for *L. helle* in Luxembourg: Troisvierges, Wincrange and the Upper Sure, to a lesser degree Wiltz.
- The main areas of distribution were historically known, not so the number and location of the occupied patches.
- About half of the historically recorded sites were no longer confirmed. Primarily the isolated populations, which existed in the eastern part of the distribution range, have disappeared.
- On the Our, only one last habitat is still colonised (Wahlhausen- Sauerwisen).
- In general, 1-20 individuals per site were observed in the LIFE project. Literature states a ratio of 1:10 observed/present individuals.
- Half of the colonised areas are reserves owned by an environmental NGO or the state.
- Potential and colonised habitats are often of small size, isolated in a fragmented landscape and/or of bad quality (invaded by fallow indicator species or managed too intensively).

## Conclusions

- The high number of colonised sites, that have been discovered since 2010, were probably not recorded before. The available historic data is based primarily on random observations rather than a systematic monitoring.
- Conclusions on the population trend are difficult with only random observations to compare with. Between 1962 and 1999, the destruction of 82% of wetlands, the fragmentation of the landscape as well as the disappearance of 28.5% of hedges and 55% of solitary trees were recorded. The destruction of the habitat and metapopulation structure (through fragmentation) of *L. helle* strongly suggests a decline of the population on a national level.
- The disappearance of the violet copper on the edges of the distribution range further indicates a decline on the national level.
- Very few individuals were recorded per site, most sites are small, often in bad shape and lack corridors for migration.
- The ideal habitat for this species does not exist in the current agricultural landscape. Remnants are either managed by conservation agencies or lie fallow and disappear through natural succession.
- The species is further threatened through climate change. It is therefore all the more important to manage the remnants accordingly.

## Habitat Management and Outlook

The goal of the LIFE Eislek project is the restoration of wetlands in the typical landscape mosaic of the region consisting of wet fallow land, extensive pastures and hay meadows, all of which represent typical habitats of our target species *Lycaena helle*.

The management actions planned for an amelioration of the status of *Lycaena helle* are:

- the acquisition of land,
- the optimisation of the grazing/cutting management of wet meadows,
- scrub clearance and restorative mowing on abandoned or fallow farmland,
- restoration of the hydrologic balance of the alluvial plains,
- clear-felling of spruce trees and conversion of deforested plantations into extensive grassland,
- restoration of bistort meadows through sowing, hay transfer and replanting of rhizomes and
- planting of hedges and solitary trees.



**Figure 1.** Wet meadows, that lie fallow for economic reasons, are often in a state that is no longer beneficial to the violet copper. Mowing by hand or soft track with removal of the material will reduce dominant species and restore the favourable habitat.



**Figure 2.** The water balance of many meadows has been manipulated in the past to allow a more intense management. The filling of trenches with material dug out for the creation of two ponds has led to spectacular results concerning the rewetting of the site.



**Figure 3.** Spruce plantations in valleys are removed and converted into extensive grassland to improve the connectivity between butterfly populations. The excess material is removed before the clear-felled area is milled and subjected to a targeted yearly management.



**Figure 4.** To restore the typical bistort meadows, former deforestation sites and intensively managed land receive a hay transfer from a suitable donor parcel. Seeds and rhizomes of the bistort plant are added to ameliorate the colonisation by the host plant of *L. helle*.

- During the next two years, LIFE Eislek will focus its monitoring on transects in habitats with different management methods as well as control plots using the methodology of the national biomonitoring.
- After LIFE: the national biomonitoring scheme will continue monitoring of all transects as defined.
- An exchange with the Belgian and German conservation organisations allows to develop an interregional protection plan for this species.
- Recurrent management methods:
  - mowing and low density grazing after the 01/08,
  - management in thirds and installation of enclosures.